FORT WORTH AREA HIGH-OCCUPANCY VEHICLE FACILITIES: A FEASIBILITY ASSESSMENT

Technical Memorandum
Final Draft

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Research Study Number 2902-4
Research Study Title: Highway Planning and Operations for District 2,
Task 4: High-Occupancy Vehicle Lane Planning

Sponsored by the
Texas Department of Transportation
Fort Worth District

January 1995

TEXAS TRANSPORTATION INSTITUTE
The Texas A&M University System
Arlington, TX 76011

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EXECUTIVE SUMMARY

In recent years, demand for freeway facilities in major Texas metropolitan areas has increased faster than the ability to increase freeway capacity. High-occupancy vehicle (HOV) improvements have been recognized as one alternative for cost effectively increasing freeway capacity. HOV facilities increase the people carrying capacity of a freeway corridor by offering a travel time savings to higher occupancy vehicles.

In July 1992, the Texas Transportation Institute (TTI) began a feasibility study of high-occupancy vehicles needs in the Fort Worth area. This study was sponsored by the Fort Worth District of the Texas Department of Transportation (TxDOT). The intent of the study was to use sketch planning methods to evaluate the HOV needs in selected Fort Worth freeway corridors and to determine if and when HOV alternatives could be considered feasible in providing increased capacity for those corridors.

The initial study was in the internal review stages when the Mobility 2010 Update was released by NCTCOG. At the direction of the District, TTI required some additional time to update the study to reflect the updated traffic volumes.

HOV CONSIDERATIONS

As a general guideline, for HOV lanes to have the potential to be effective, at least three conditions must exist:

- Extreme congestion must be present on the freeway so that the HOV lane offers a potential travel time advantage.

- Geometric conditions must allow the cost effective construction of an HOV alternative.
- Travel patterns must be conducive to being served by transit and ridesharing.

The existing and projected traffic congestion for each freeway corridor were individually evaluated in this study to determine whether HOV improvements merited consideration. The results of the individual evaluations were then used to develop overall recommendations for an HOV system for the Fort Worth area.

The HOV feasibility assessments were performed for two planning horizons: short term (Year 1991) and long term (Year 2010). The projected traffic volumes and roadway geometry were based on the Updated Mobility 2010 Plan as conducted by the North Texas Central Council of Governments (NCTCOG).

Three general congestion requirements must be met before the modal shift to HOVs will occur:

- There must be a minimum travel time savings of one minute per mile for HOV traffic.
- A minimum travel time savings of at least five to eight minutes is necessary to initiate the modal shift.
- Freeway congestion should exist for at least one hour during each peak period.

SUMMARY OF FINDINGS

The results of the congestion evaluations were used to assess the need for HOV improvements and the development of an HOV system plan for the Fort Worth area. Individual corridor segments were classified into one of the three categories shown below.

Category 1 -- HOV Implementation Appears Cost Effective

Category 2 -- Cost Effectiveness of HOV Implementation is Uncertain

Category 3 -- HOV Implementation Appears Either Infeasible or Not Warranted

The assessment indicated that, for short-term traffic congestion, HOV implementation appears to be cost effective on two corridors. The cost effectiveness is uncertain on segments in two corridors. The results of the short-term (Year 1991) congestion assessment are summarized in Table S-1 and Figure S-1, and the results of the long term assessment are shown in Table S-2 and Figure S-2.

Table S-1. Findings on HOV Feasibility, Based on 1990 Congestion Levels

HOV Implementation Appears Cost-Effective
S.H. 121/183: I.H.820E to Dallas County Line
East I.H. 820N: I.H. 35W to S.H. 121/183
HOV Implementation Possible
East I.H. 30: I.H. 35W to I.H. 820E
S.H. 360: I.H. 20 to S.H. 183

Table S-2. Findings on HOV Feasibility, Based on 2010 Congestion Levels

HOV Implementation Appears Cost-Effective
S.H. 121/183: I.H.820E to Dallas County Line
East I.H. 30: Dallas County Line to I.H. 35W
South I.H. 35W: Johnson County Line to I.H. 30
North I.H. 820E: S.H. 121 to S.H. 121/183
East I.H. 820N: Rufe Snow to S.H. 121/183
HOV Implementation Possible
West I.H. 30: I.H. 35W to I.H. 820W
S.H. 121 Proposed: I.H. 35W to Alta Mesa Blvd.
East I.H. 20: I.H. 35W to Dallas County Line

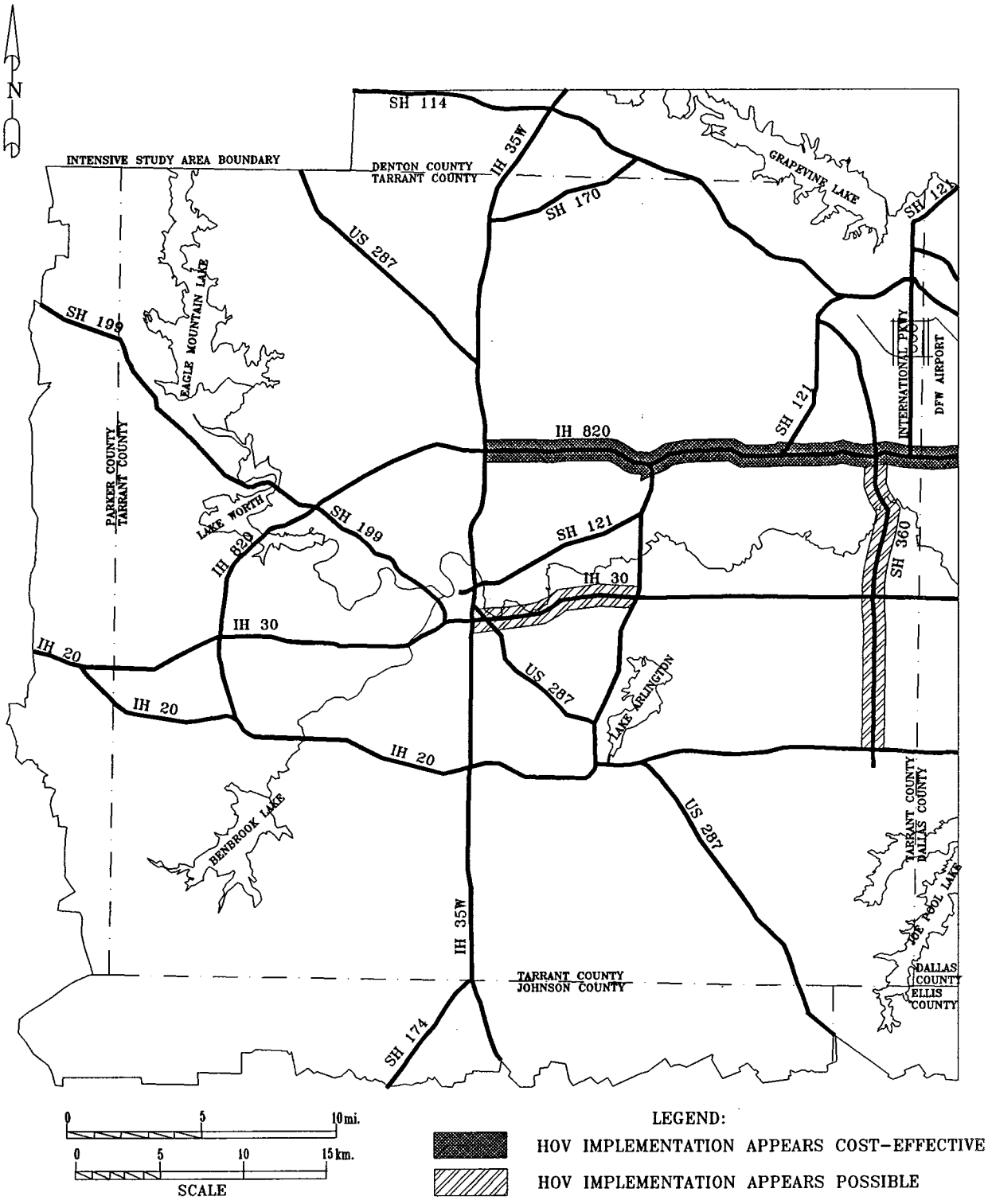

Figure S-1. Short-Term HOV Assessment (Year 1991)

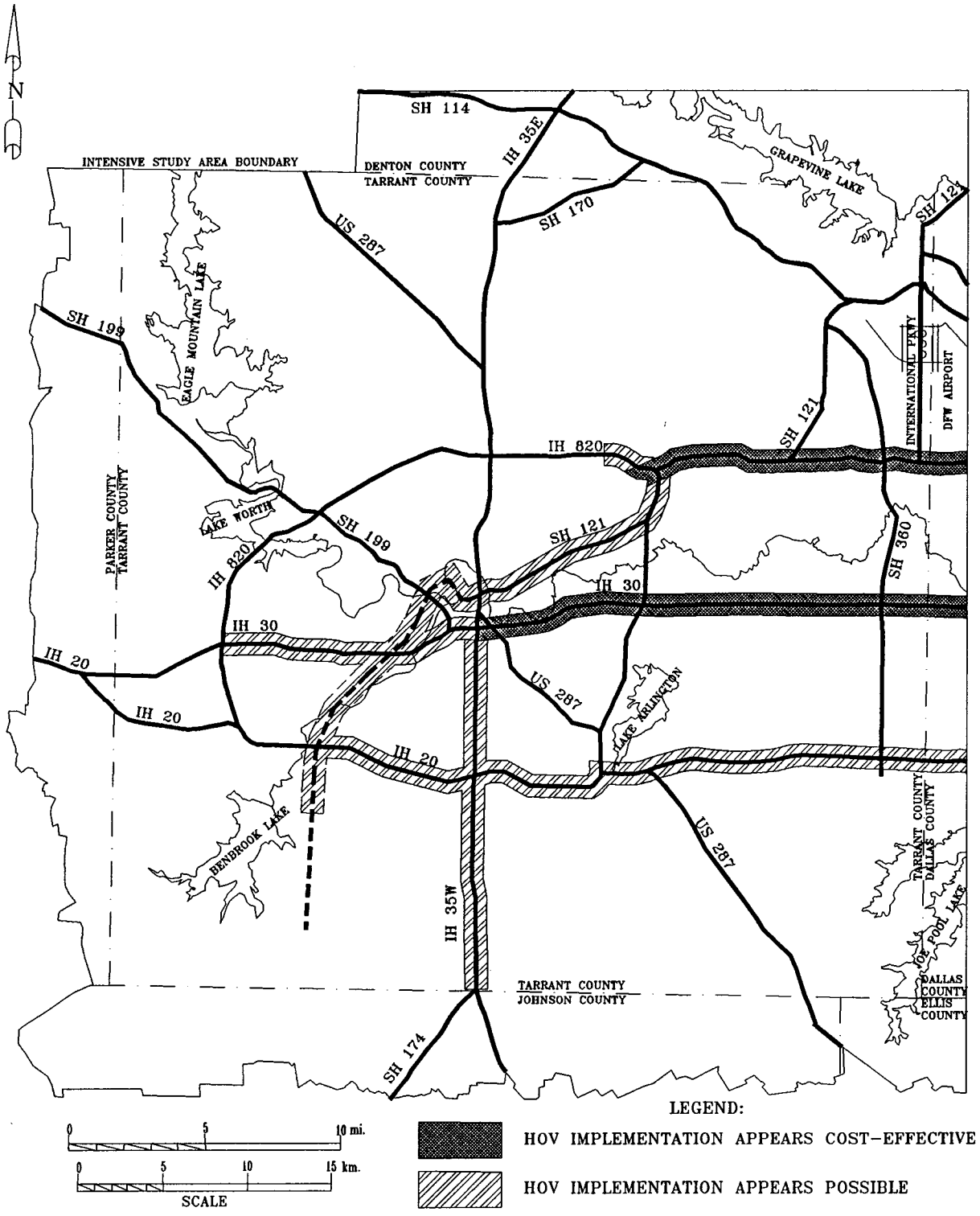

Figure S-2. Long-Term HOV Assessment (Year 2010)

CONCLUSION

HOV improvements have become an important part of the future transportation system in some cities in Texas. Houston currently operates an extensive system of HOV facilities, with plans to expand the system in the future. A system of HOV facilities has been proposed for Dallas, one which is operational now and others in the near future. This report describes a macroscopic assessment of HOV feasibility, based on traffic congestion, in selected freeway corridors in the Fort Worth area.

The results of this study indicate that on a very limited basis, HOV improvements could prove beneficial in the future in some corridors. The role that HOV facilities will serve in addressing the overall mobility problem in Fort Worth would appear to be less than the role they may play in Texas cities such as Houston and Dallas, where congestion has outstripped the ability to provide capacity. However, by anticipating the future need for HOV improvements, their eventual implementation can be made less complicated and less costly.

SECTION 1
INTRODUCTION

In recent years, demand for freeway facilities in major metropolitan areas in Texas has increased faster than the ability to increase freeway capacity. The construction of additional freeways has been limited by restricted right-of-way availability and high construction costs. As a result, transportation officials are faced with the dilemma of how to move increasing numbers of people through major freeway corridors without large expansions of the freeway network. This dilemma has led to the evaluation of alternative methods of maximizing the movement of people while minimizing delay to all motorists.

High-occupancy vehicle (HOV) improvements have been recognized as one alternative for increasing freeway capacity without spending large sums of money on right-of-way and construction. HOV facilities increase the people carrying capacity of a freeway corridor by offering a travel time savings to higher occupancy vehicles. These improvements are sometimes readily implementable within existing right-of-way at relatively minimal construction costs. HOV improvements include exclusive HOV lanes, contraflow lanes, concurrent flow/reserved lanes, and freeway control with priority entry.

To date, the most popular and effective of these measures in Texas are the exclusive HOV lanes. Houston Metro and the Texas Department of Transportation are committed to a 100-mile system of HOV lanes in Houston. Other Texas cities have made plans or provisions to implement HOV improvements in the future. In some corridors, these improvements have been found to be a particularly effective way to increase the overall corridor capacity by providing priority treatment for high-occupancy vehicles.

In July 1992, the Texas Transportation Institute (TTI) began a feasibility study of high-occupancy vehicle needs in the Fort Worth area. This study was sponsored by the Fort Worth District of the Texas Department of Transportation (TxDOT). The intent of the study was to use sketch planning methods to evaluate the high-occupancy vehicle (HOV) needs in selected Fort Worth freeway corridors to determine if and when HOV alternatives could be considered feasible in providing capacity for those corridors.

This study addresses one possible component of an areawide transit and highway plan - high-occupancy vehicle improvements within the freeway right-of-way. The objective of the recommendations is to present potential alternatives for using HOV technology to improve the overall transportation system in the Fort Worth area. The HOV assessment should also assist the State in meeting its responsibility to identify cost-effective approaches for operating the state roadway system.

The development, implementation, and funding of an areawide transportation improvement plan should be a multi-agency undertaking. In the Fort Worth area, those agencies may include, but are not limited to the Fort Worth District of the Texas Department of Transportation, Fort Worth Transportation Authority, City of Fort Worth, Tarrant County, Federal Highway Administration, and Federal Transit Administration. The material presented in this document was prepared for one agency -- TxDOT, and addresses one possible component of the transportation system -- HOV facilities. The implementation of any HOV improvement should result from agreement between all affected agencies. In fact, at present time, all HOV projects undertaken in Texas have been joint projects between the local transit agency and TxDOT. ***Therefore, this study should be considered as a beginning, rather than an end, to the HOV planning process.***

STUDY OBJECTIVES

The primary objective of this study is to use sketch planning methods to identify future freeway corridors where traffic congestion levels may be great enough to warrant high-occupancy vehicles facilities. The corridors evaluated in this project include the current and proposed freeways in the Tarrant County area. The designated freeways and the study limits of each are provided in Table 1 and illustrated in Figure 1. The results of the sketch planning analysis should be considered as conceptual level HOV planning.

The actual implementation of a Fort Worth area HOV plan is dependent on many factors, not all of which are currently foreseeable. For those freeways which do appear to warrant further HOV analysis, more detailed evaluations will be necessary before a decision can be made to implement any alternative. Those evaluations are not performed as part of this study, but would include such issues as quantification of a benefit/cost ratio, estimated ridership, specific access/egress locations, operational concerns, enforcement approaches, necessary support facilities, and trade-off analyses between HOV lanes, mixed-flow freeway lane improvements, operational improvements and demand management programs.

Another report prepared as part of this study presents a summary of the national HOV experience, how HOV lanes have been developed in Texas and characteristics that have been present in the decision-making and implementation process of successful HOV lanes.

Table 1. Study Corridors and Study Limits

Corridor	Study Limits	Length, km (miles)
East I.H. 30	I.H. 35W to Dallas County	31.2 (19.4)
West I.H. 30	I.H. 35W to Parker County	20.1 (12.5)
South I.H. 35W	I.H. 30 to Johnson County	25.4 (15.8)
North I.H.35W	I.H. 30 to Denton County	22.8 (14.2)
West I.H. 20	Parker County to I.H. 35W	20.3 (12.6)
East I.H. 20	I.H. 35W to Dallas County	20.9 (13.0)
South I.H. 820E	I.H. 20 to I.H. 30	10.8 (6.7)
North I.H. 820E	I.H. 30 to S.H. 121/183	8.0 (5.0)
East I.H. 820N	S.H. 121/183 to I.H. 35W	9.0 (5.6)
West I.H. 820N	I.H. 35W to Lake Worth	14.0 (8.7)
North I.H. 820W	Lake Worth to I.H. 30	5.8 (3.6)
South I.H. 820W	I.H. 30 to I.H. 20	4.5 (2.8)
S.H. 121	I.H. 35W to I.H. 820E	10.5 (6.5)
S.H. 183	I.H. 820E to S.H. 121	9.3 (5.8)
S.H. 121	S.H. 183 to S.H. 114	10.8 (6.7)
North S.H. 360	S.H. 183 to I.H. 30	9.0 (5.6)
South S.H. 360	I.H. 30 to I.H. 20	10.3 (6.4)
S.H. 183	Dallas County to S.H. 121	10.8 (6.7)
U.S. 287	I.H. 30 to I.H. 820E	9.0 (5.6)
S.H. 121 - Prop.	I.H. 35W to Johnson County	24.9 (15.5)
	Total Distance Studied	287.5 (178.7)

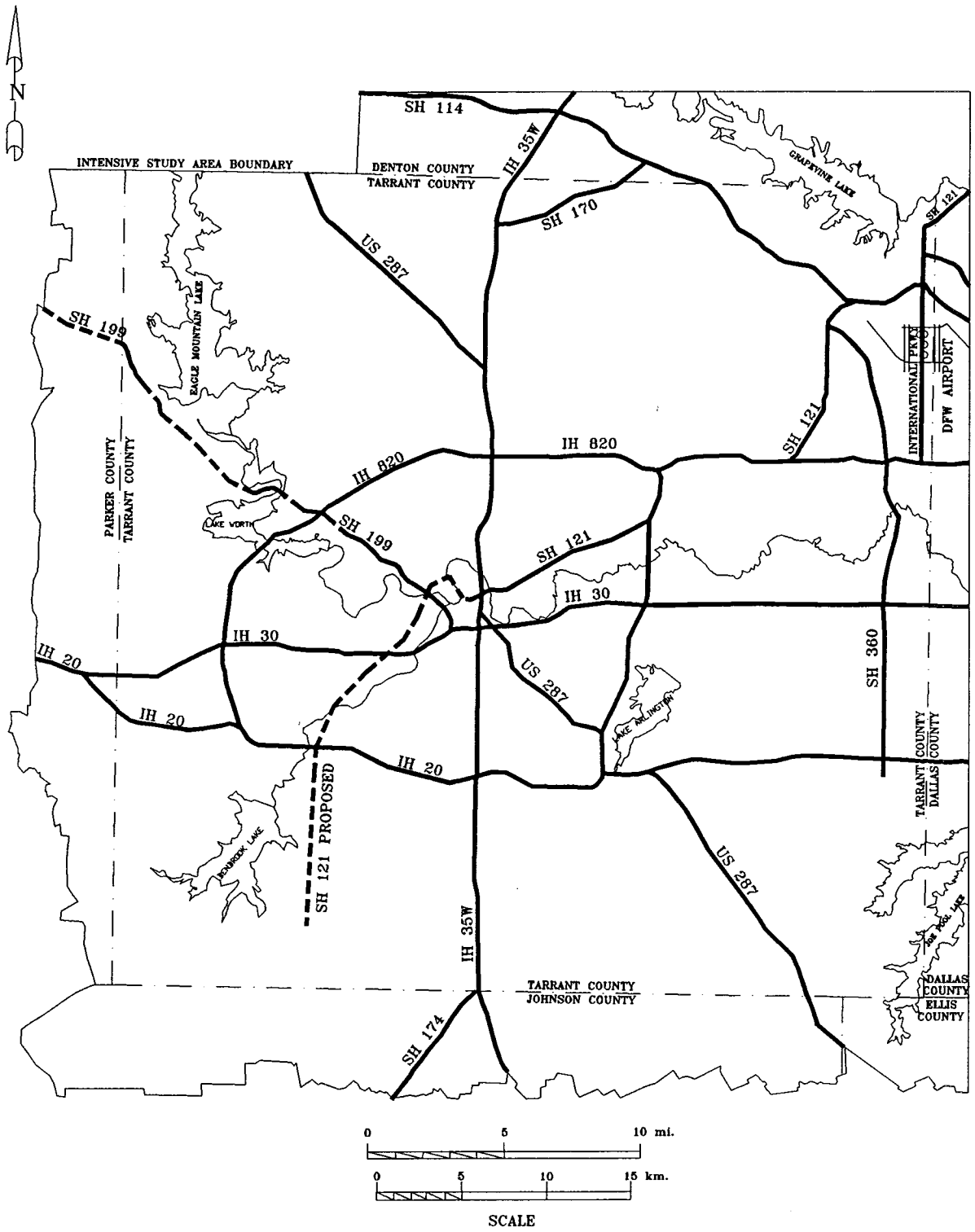

Figure 1. Fort Worth Area Freeways

SECTION 2
BACKGROUND INFORMATION

As a general guideline, for HOV lanes to have potential to be effective, at least three conditions must exist:

- Extreme congestion must be present on the freeway so that the HOV lane offers a potential travel time advantage.
- Geometric conditions must allow the cost-effective construction of an HOV alternative.
- Travel patterns on the freeway must be conducive to being served by transit and ridesharing.

Given the relatively low level of congestion that currently exists on many Fort Worth area freeways, it was reasonable to begin with the identification of undesirable congestion levels in this study.

PLANNING HORIZON AND DATA

The HOV feasibility assessments were performed for two planning horizons: current conditions (year 1991) and long term (year 2010). Several sources of data were used in performing the evaluations used in this study. The data concerning the current conditions (year 1991) were obtained from the Texas Department of Transportation, Fort Worth District, county traffic maps. The data for long term conditions were obtained from the North Central Texas Council of Governments (NCTCOG).

The highway networks used in this study are the existing roadway conditions (1991) and the projected conditions (2010) as provided by NCTCOG. The network represents those highways which are planned to be operational in the year 2010. The freeway network used in this study are shown in Table 2.

Table 2. Highway Network Geometry Used for Analysis

Freeway Corridor	1991		2010	
	Lanes[1]	Traffic Capacity[2] (1000)	Lanes[3]	Traffic Capacity (1000)
East I.H. 30				
Dallas County to I.H. 35W	6	108	8	144
West I.H. 30				
I.H. 35W to Parker County	6/8	108/144	6/8	108/144
South I.H. 35W				
Johnson County to I.H. 30	6/8	108/144	6/8	108/144
North I.H.35W				
I.H. 30 to S.H. 183	6	108	10	180
S.H. 183 to I.H. 820N	4	72	8	144
I.H. 820N to Denton County	4	72	4	72
West I.H. 20				
Parker County to I.H. 820W	4	72	4	72
I.H.820W to Prop. S.H. 121	6	108	6	108
Prop. S.H. 121 to I.H. 35W	4/8	72/144	8	144
East I.H. 20				
I.H. 35W to Dallas County	8	144	8/10	144/180
South I.H. 820E				
I.H. 20 to I.H. 30	4/8	72/144	8	144
North I.H. 820E				
I.H. 30 to S.H. 121	4	72	8	144
S.H. 121 to S.H. 121/183	8	144	10	180
East I.H. 820N				
S.H. 121/183 to I.H. 35W	4	72	8	144
West I.H. 820N				
I.H. 35W to Lake Worth	6	108	6	108
North I.H. 820W				
Lake Worth to I.H. 30	6	108	6/8	108/144
South I.H. 820W				
I.H. 30 to I.H. 20	6	108	6	108
S.H. 121				
I.H. 35W to I.H. 820E	6/8	108/144	6/8	108/144
S.H. 183				
I.H. 820E to S.H. 121	6	108	8	144
S.H. 121				
S.H. 183 to F.M. 157	4	72	4	72
F.M. 157 to S.H. 114	6	108	6	108
North S.H. 360				
S.H. 183 to I.H. 30	6	108	6	108
South S.H. 360				
I.H. 30 to I.H. 20	6	108	8	144
S.H. 183				
Dallas County to S.H.121	6	108	8	144
U.S. 287				
I.H. 30 to I.H. 820E	6	108	6	108
S.H. 199				
Parker County to F.M. 1886	4 DIV	72	4/6	72/108
F.M. 1886 to S.H. 183	4 UNDIV	72	8	144
S.H. 183 to I.H. 30	4 UNDIV	72	6	108
S.H. 121 - Prop.				
I.H. 35W to I.H. 30	-	-	8	144
I.H. 30 to I.H. 20	-	-	6	108
I.H. 20 to Johnson County	-	-	4	72

Sources: 1. Verified Field Conditions.
2. Daily Vehicle Volume, TxDOT Transportation Planning Division.
3. North Central Texas Council of Governments, Updated Mobility 2010 Plan.

TRAFFIC CONGESTION

Recent research by the Texas Transportation Institute evaluated the traffic congestion levels in 7 major cities in Texas and 43 others in other states. Table 3 indicates the congestion levels since 1982 for the five large Texas cities. As this table shows, Fort Worth's traffic congestion level is not as high as Houston and Dallas, and has not reached the undesirable level indicated by a congestion index of 1.0 or greater. Recent freeway lane additions in the Fort Worth area have maintained congestion at approximately the same level as in 1986, a notable achievement since during the same period, congestion in the 43 cities outside of Texas increased six percent.

Table 3. Texas Congestion Index Values, 1982 to 1991

	CONGESTION INDEX									
Urban Area	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Austin	.77	.84	.89	.91	.98	.96	.96	.96	.94	.94
Dallas	.84	.89	.94	.98	1.04	1.02	1.02	1.02	1.05	1.06
Fort Worth	.76	.79	.80	.82	.87	.87	.87	.87	.90	.92
Houston	1.17	1.21	1.25	1.23	1.21	1.19	1.15	1.13	1.12	1.11
San Antonio	.77	.79	.82	.87	.90	.85	.86	.87	.88	.89

Source: Trends in Urban Roadway Congestion - 1982 to 1991, Volume 1: Annual Report, Research Report 1131-6, 1993.

The measure of congestion used in this HOV assessment is average daily traffic per lane (ADT/lane). The ADT/lane values were calculated from the Mobility 2010 model run as performed by the North Central Council of Governments. Evaluations of the ADT/lane projections indicate that peak hour level-of-service E or F could exist on the following portions of the freeway system:

- 50 percent of the 1991 system of 251 km. (156 miles) freeway.
- 63 percent of the 314 km. (195 mile) system in 2010.

SECTION 3
CONGESTION EVALUATION

The effective use of HOV improvements is dependent on a mode shift from vehicles with a single occupant to vehicles with higher occupancies (such as buses and carpools). A major factor behind this modal shift is the presence of significant congestion in the mixed-flow freeway lanes. Transferring from a congested freeway to an HOV facility results in travel time savings and increased trip time reliability. However, the modal shift will not occur without the presence of some minimum level of congestion on the freeway, regardless of the travel patterns in the corridor.

Observations of numerous HOV projects indicate that, as freeway congestion increases, so does HOV lane utilization. Research sponsored by the United States Department of Transportation has quantified this relationship. The study concluded that "as a general rule of thumb, the point at which time savings perceived by motorists cause a significant shift to HOV's appears to be when time savings exceed one minute per mile." Of the six projects evaluated in that study that had time savings in excess of one minute per mile, the average increase in auto occupancy was 9.8 percent. For the five projects evaluated that provided time savings of less than one minute per mile, the average increase in auto occupancy was 4.4 percent.

As a result of this and other research, three general congestion requirements appear to be necessary before the modal shift to HOVs will occur:

- There must be a minimum time savings of one minute per mile for HOV traffic.
- A minimum travel time savings of at least five to eight minutes is necessary to initiate the modal shift.
- Freeway congestion should exist for at least one hour during each peak period.

These requirements imply that freeway speeds of 40 kph (25 mph) or less are required for periods of one hour or longer in order for conditions to favor implementing an HOV improvement. This relates to level-of-service E or F on the freeway. It should be noted that significant congestion alone does not justify implementing HOV improvements. Congestion must be matched with sufficient demand and favorable geometrics before an HOV alternative can receive consideration as a potentially cost-effective improvement.

TTI has extensively evaluated the cost-effectiveness of HOV lanes on Texas freeways. Analyses have been conducted using FREQ simulation models for freeways in Houston, Dallas, and San Antonio. Those analyses were reviewed in an effort to develop relatively simple indicators of HOV lane cost-effectiveness on radial freeways. One readily available measure of congestion would be average daily traffic per lane (ADT per lane). A preliminary evaluation of Texas freeways suggests that, for an HOV lane to be cost-effective, the ADT per lane on the freeway should be a minimum of 15,000 vehicles per day per lane in the first year (base year) of operation of the HOV lane. This is a necessary, but not sufficient, indicator of HOV lane needs. Consideration also must be given to freeway travel patterns.

This study is a macroscopic assessment of HOV feasibility in Tarrant County. As such, detailed analyses of freeway congestion and travel time savings were not made. The congestion guidelines used in this study are based on ADT/lane values. Similar guidelines are used by the TxDOT to classify the level-of-service for various highway types. The congestion guidelines used in this study to assess the feasibility of HOV improvements are given in Table 4.

The base year congestion assessment was performed by obtaining the existing (1991) ADT from the Districts' County Traffic Maps. Projected ADT was obtained from

Table 4. HOV Congestion Guidelines

ADT Per Lane	Feasibility Assessment
Over 20,000	Projected congestion is heavy enough for HOV implementation to be considered **feasible** based on congestion only and worthy of thorough evaluation in the planning and design process. Determination of an HOV improvement as feasible based on congestion alone does not imply the improvement is recommended.
15,000-20,000	Projected congestion is sufficient for HOV implementation to be considered **plausible** based on congestion only and deserving of analysis in the planning process.
0-15,000	HOV improvement **not likely** to be cost-effective.

Sources: Guidelines for Estimating the Cost-Effectiveness of High-Occupancy Vehicle Lanes, Research Report 339-5, Texas Transportation Institute, 1985.

the Updated Mobility 2010 model run performed by NCTCOG. To calculate the existing and projected ADT/lane, the ADT was divided by the existing number of lanes (1991) and the projected number of lanes as provided in the Updated Mobility 2010 run. It should be noted that the locations used to identify the beginning or ending of congestion do not represent a specific point of congestion, but a general location where congestion appears significant. Finally, the length of candidate segments was evaluated to determine if an acceptable minimal travel time savings could be provided.

The highway network represents the planned 2010 network previously described in Table 2. The existing and projected ADT/lane for important locations (See Figure 2) in 1991 and 2010 is shown in Figure 3. Tables 5 and 6 along with Figures 4 and 5 contain the results of the evaluation for all the analysis locations for the existing and projected traffic volumes, respectively.

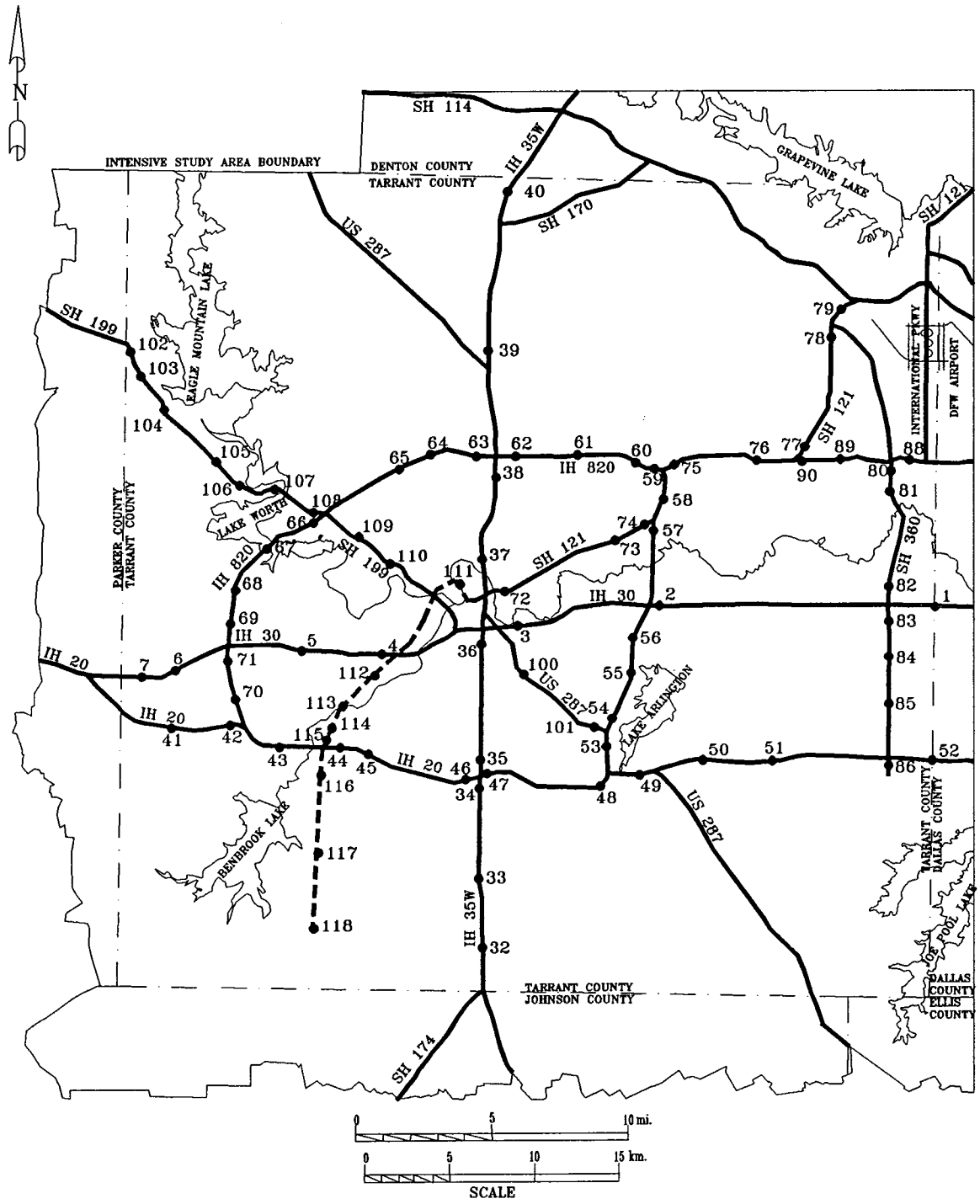

Figure 2. Count Locations

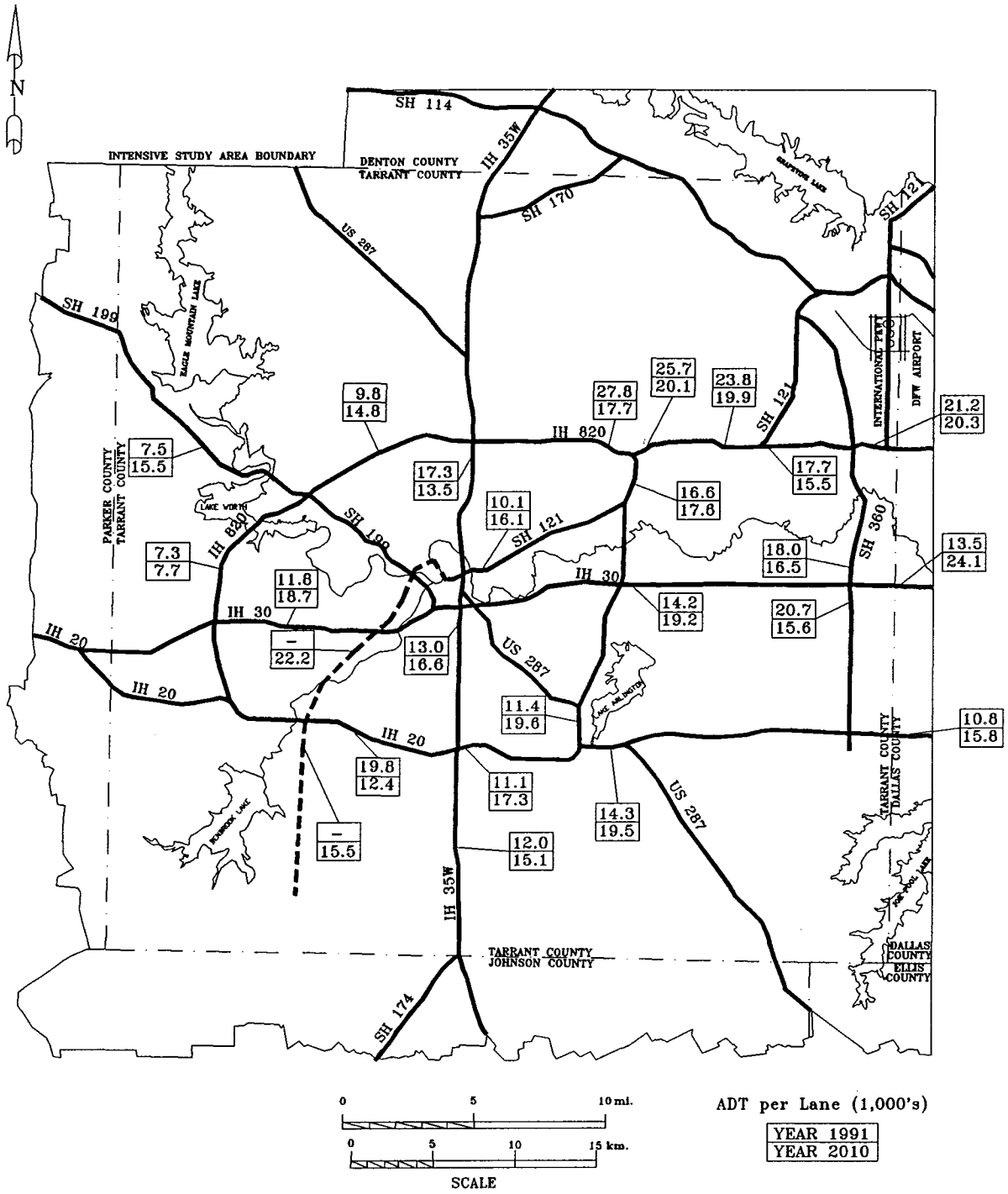

Figure 3. Existing and Projected ADT/Lane

Table 5. Traffic Volumes and Design Conditions for Year 1991

HIGHWAY	COUNT LOCATION	1991 LANES	1991 ADT (1000)	1991 ADT/LANE (1000)	1991 V/C RATIO	1991 LOS
IH30	1	6	81	13.5	0.75	E
	2	6	85	14.2	0.79	E
	3	6	90	15.0	0.86	E
	4	8	114	14.3	0.79	E
	5	6	71	11.8	0.66	C-D
	6	4	33	8.3	0.46	A-B
	7	6	38	6.3	0.35	A-B
IH35W	32	6	68	11.3	0.63	C-D
	33	6	72	12.0	0.67	C-D
	34	8	100	12.5	0.69	C-D
	35	8	84	10.5	0.58	A-B
	36	8	104	13.0	0.72	C-D
	37	6	87	14.5	0.81	E
	38	4	69	17.3	0.96	F
	39	4	28	7.0	0.39	A-B
IH20	41	4	13	3.3	0.18	A-B
	42	4	14	3.5	0.19	A-B
	43	6	44	7.3	0.41	A-B
	44	4	40	10.0	0.56	A-B
	45	4	79	19.8	1.10	F
	46	8	87	10.9	0.60	A-B
	47	8	89	11.1	0.62	C-D
	48	8	91	11.4	0.63	C-D
	49	8	114	14.3	0.79	E
	50	8	102	12.8	0.71	C-D
	51	8	109	13.6	0.76	E
	52	8	86	10.8	0.60	A-B
IH820	53	8	91	11.4	0.63	C-D
	54	4	61	15.3	0.85	E
	55	4	68	17.0	0.94	F
	56	8	75	9.4	0.52	A-B
	57	4	80	20.0	1.11	F
	58	8	133	16.7	0.92	F
	59	6	114	19.0	1.06	F
	60	4	111	27.8	1.54	F
	61	4	92	23.0	1.28	F
	62	4	79	19.8	1.10	F
	63	6	73	12.2	0.68	C-D
	64	6	66	11.0	0.61	C-D
	65	6	59	9.8	0.55	A-B
	66	6	44	7.3	0.41	A-B
	67	6	44	7.3	0.41	A-B
	68	6	44	7.3	0.41	A-B
	69	6	49	8.2	0.45	A-B
	70	6	27	4.5	0.25	A-B
	71	6	32	5.3	0.30	A-B

Table 5. Traffic Volumes and Design Conditions for Year 1991, Continued

HIGHWAY	COUNT LOCATION	1991 LANES	1991			
			ADT (1000)	ADT/LANE (1000)	V/C RATIO	LOS
SH121/183	72	8	81	10.1	0.56	A-B
	73	6	76	12.7	0.70	C-D
	74	6	69	11.5	0.64	C-D
	75	6	154	25.7	1.43	F
	76	6	143	23.8	1.32	F
SH121	77	4	52	13.0	0.72	C-D
	78	6	53	8.8	0.49	A-B
	79	4	54	13.5	0.75	E
SH360	80	6	98	16.3	0.91	F
	81	6	98	16.3	0.91	F
	82	6	108	18.0	1.00	F
	83	6	124	20.7	1.15	F
	84	6	123	20.5	1.14	F
	85	6	90	15.0	0.83	E
	86	4	194	4.9	0.27	A-B
SH183	88	6	127	21.2	1.18	F
	89	6	96	16.0	0.89	E
	90	6	106	17.7	0.98	F
US287	100	6	42	7.0	0.39	A-B
	101	6	41	6.8	0.38	A-B
SH199	104	4	28	7.0	0.39	A-B
	105	4	31	7.8	0.43	A-B
	106	4	33	8.3	0.46	A-B
	107	4	36	9.0	0.50	A-B
	108	6	35	5.8	0.32	A-B
	109	4	22	5.5	0.31	A-B
	110	4	26	6.5	0.36	A-B
SH121-PR	111	-	-			
	112	-	-			
	113	-	-			
	114	-	-			
	115	-	-			
	116	-	-			
	117	-	-			

Source: Texas Department of Transportation.

Notes: 1. V/C ratio based on 18,000 vphpl.
2. LOS criteria based on: LOS A-B - 0 to 11,000, Good Flow
LOS C-D - 11,001 to 13,200, Tolerable Flow
LOS E - 13,201 to 16,100, Desirable Flow
LOS F - 16,101 or more, Capacity

Table 6. Traffic Volumes and Design Conditions for Year 2010

HIGHWAY	COUNT LOCATION	2010 LANES	2010 ADT (1000)	2010 ADT/LANE (1000)	2010 V/C RATIO	2010 LOS
IH30	1	8	194	24.3	1.35	F
	2	8	176	22.0	1.22	F
	3	8	131	16.4	0.91	F
	4	8	112	14.0	0.78	E
	5	8	111	13.9	0.77	E
	6	4	52	13.0	0.72	C-D
	7	4	57	14.3	0.79	E
IH35W	32	6	110	18.3	1.02	F
	33	6	102	17.0	0.94	F
	34	6	148	24.7	1.37	F
	35	8	125	15.6	0.87	E
	36	8	154	19.3	1.07	F
	37	11	138	12.5	0.70	C-D
	38	8	109	13.6	0.76	E
	39	4	43	10.8	0.60	A-B
IH20	41	4	19	4.8	0.26	A-B
	42	4	16	4.0	0.22	A-B
	43	6	59	9.8	0.55	A-B
	44	4	31	7.8	0.43	A-B
	45	8	80	10.0	0.56	A-B
	46	8	98	12.3	0.68	C-D
	47	8	110	13.8	0.76	E
	48	8	128	16.0	0.89	E
	49	10	152	15.2	0.84	E
	50	8	112	14.0	0.78	E
	51	8	122	15.3	0.85	E
	52	8	138	17.3	0.96	F
IH820	53	8	163	20.4	1.13	F
	54	8	105	13.1	0.73	C-D
	55	8	110	13.8	0.76	E
	56	8	112	14.0	0.78	E
	57	8	136	16.3	0.90	F
	58	10	214	21.4	1.19	F
	59	8	195	24.4	1.35	F
	60	8	180	22.5	1.25	F
	61	8	118	14.8	0.82	E
	62	8	123	15.4	0.85	E
	63	6	67	11.2	0.62	C-D
	64	6	71	11.8	0.66	C-D
	65	6	75	12.5	0.69	C-D
	66	6	54	9.0	0.50	A-B
	67	6	55	9.2	0.51	A-B
	68	6	31	5.2	0.29	A-B
	69	6	34	5.7	0.31	A-B
	70	6	25	4.2	0.23	A-B
	71	6	29	4.8	0.27	A-B

Table 6. Traffic Volumes and Design Conditions for Year 2010, Continued

HIGHWAY	COUNT LOCATION	2010 LANES	2010 ADT (1000)	2010 ADT/LANE (1000)	2010 V/C RATIO	2010 LOS
SH121/183	72	8	125	15.6	0.87	E
	73	6	149	24.8	1.38	F
	74	6	117	19.5	1.08	F
	75	8	221	27.6	1.53	F
	76	8	224	28.0	1.56	F
SH121	77	4	48	12.0	0.67	C-D
	78	6	48	8.0	0.44	A-B
	79	6	94	15.7	0.87	E
SH360	80	6	119	19.8	1.10	F
	81	6	111	18.5	1.03	F
	82	6	108	18.0	1.00	F
	83	8	105	13.1	0.73	C-D
	84	8	92	11.5	0.64	C-D
	85	8	85	10.6	0.59	A-B
	86	8	47	5.9	0.33	A-B
SH183	88	8	193	24.1	1.34	F
	89	8	177	22.1	1.23	F
	90	8	189	23.6	1.31	F
US287	100	6	84	14.0	0.78	E
	101	6	98	16.3	0.91	F
SH199	104	4	66	16.5	0.92	F
	105	6	88	14.7	0.81	E
	106	8	88	11.0	0.61	C-D
	107	8	88	11.0	0.61	C-D
	108	8	78	9.8	0.54	A-B
	109	6	47	7.8	0.44	A-B
	110	6	64	10.7	0.59	A-B
SH121-PR	111	8	106	13.3	0.74	E
	112	6	98	16.3	0.91	F
	113	6	68	11.3	0.63	C-D
	114	6	67	11.2	0.62	C-D
	115	6	35	5.8	0.32	A-B
	116	4	62	15.5	0.86	E
	117	4	15	3.8	0.21	A-B

Source: North Central Texas Council of Government, Updated Mobility 2010.

Notes: 1. V/C ratio based on 18,000 vphpl.
2. LOS criteria based on: LOS A-B - 0 to 11,000, Good Flow
LOS C-D - 11,001 to 13,200, Tolerable Flow
LOS E - 13,201 to 16,100, Desirable Flow
LOS F - 16,101 or more, Capacity

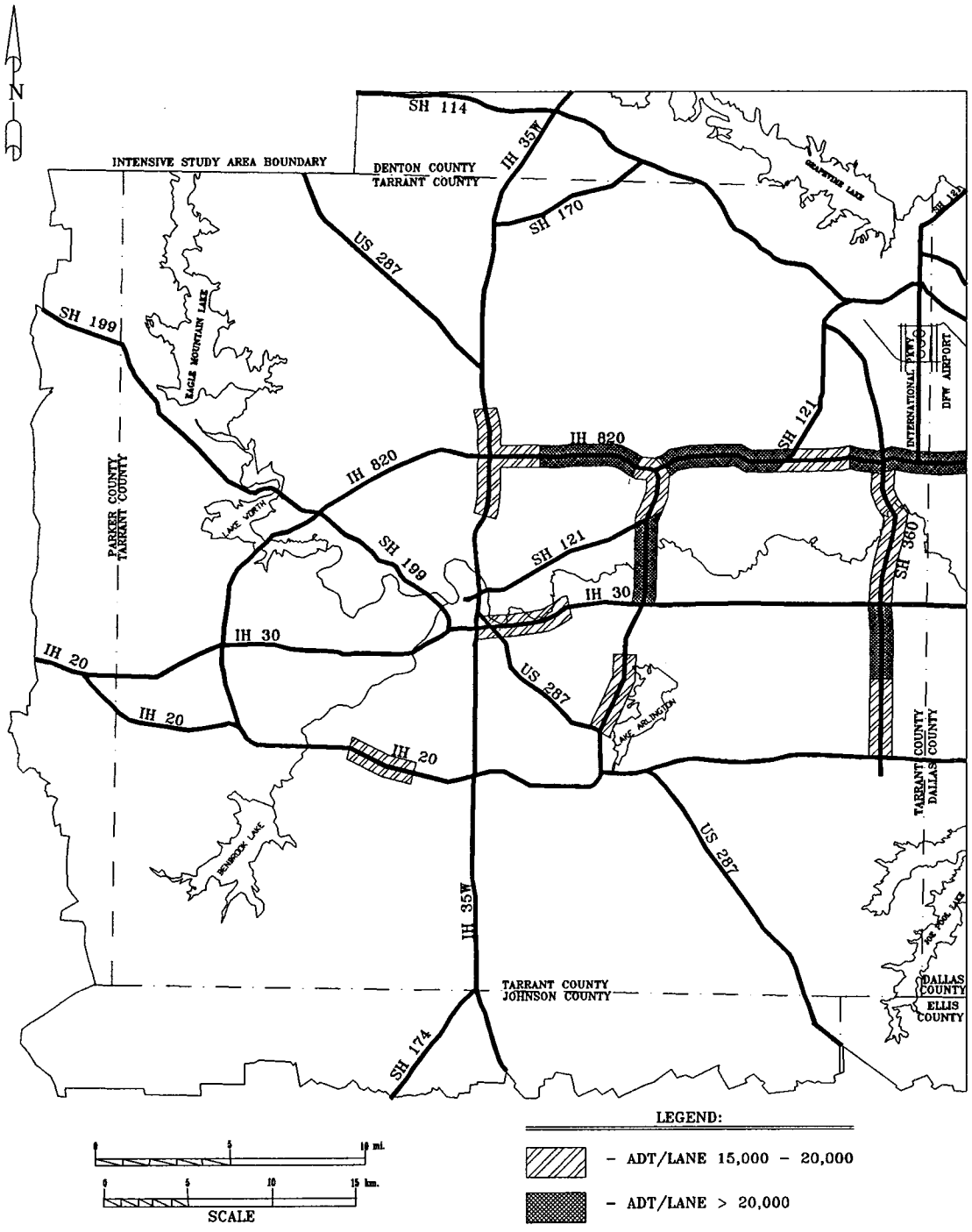

Figure 4. Short-Term Level-of-Congestion, 1991

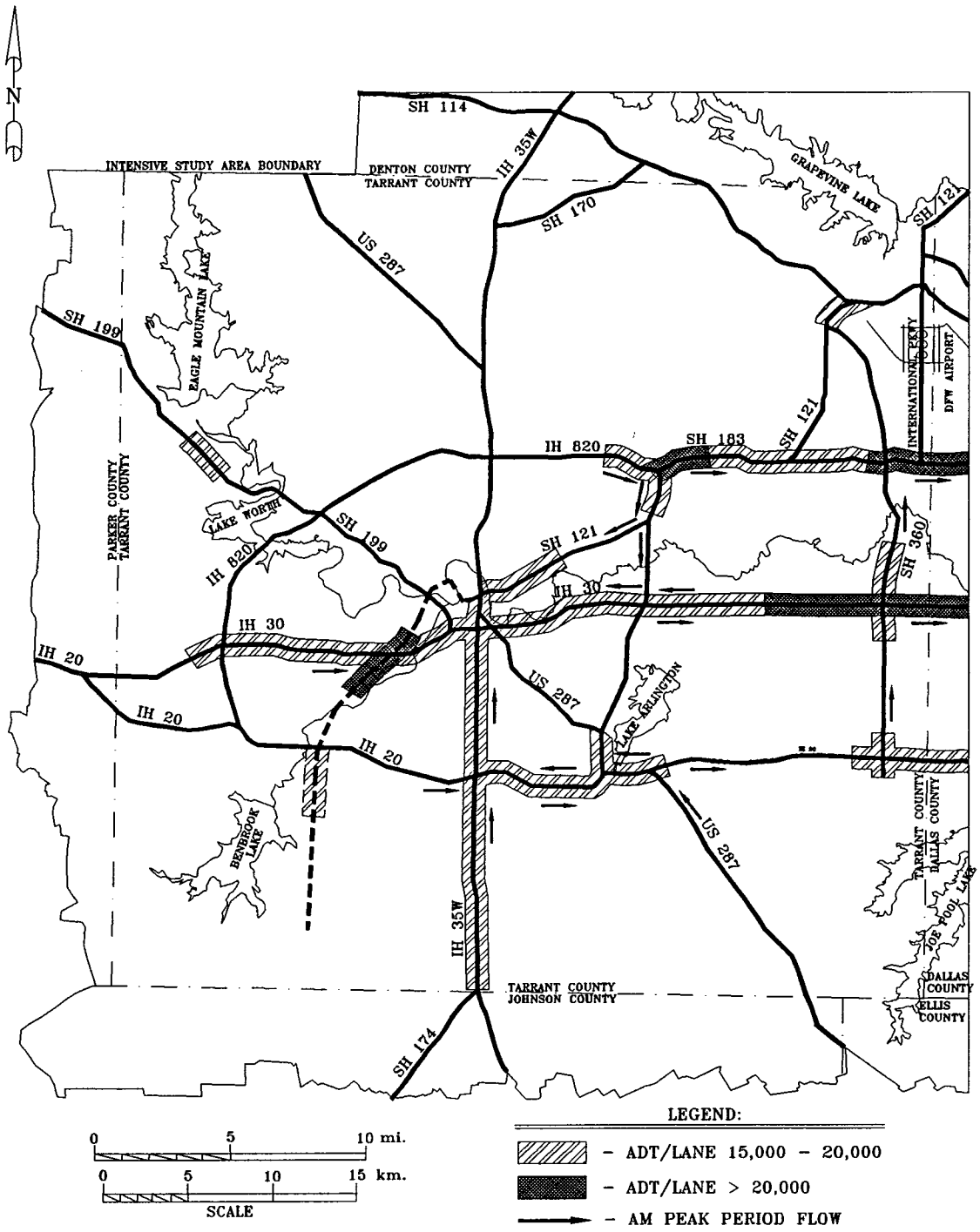

Figure 5. Long-Term Level-of-Congestion, 2010

CONGESTION EVALUATION CONCLUSIONS

The congestion guidelines mentioned earlier in this section were used to identify those segments of the study corridors which possessed some minimum potential for implementing HOV improvements solely on the basis of congestion. The short and long term evaluations identified corridor segments where further evaluation of HOV improvements would be useful.

As the congestion evaluation is the most important of the three evaluations, it was also used to indicate those corridor segments which did not indicate a potential for effective implementation of HOV improvements. If a significant length of corridor did not meet the minimum congestion guidelines, it was then identified as inappropriate for HOV improvements in that year.

Existing Average Peak Period Travel Speeds

To evaluate the existing conditions, both the existing average peak period travel speeds and existing level of congestion were used. The average peak period travel speeds were obtained from the Dallas - Fort Worth Regional Travel Time Study conducted for the Regional Planning Office of TxDOT in 1990. The results of this study are illustrated in Figure 6 and indicate that several freeways are experiencing congestion to the extent that average peak period travel speeds are less than 55 kph (35 mph). The locations with average peak period speeds less than 55 kph (35 mph) all possess the delay characteristics that might be conducive to modal shift from single-occupant vehicles to high-occupancy vehicles.

Congestion Evaluation for Short Term (Year 1991)

To evaluate the existing levels of congestion for the short term, the peak period travel speeds (Figure 6) and level of congestion (Figure 4) were used. Several corridors exhibit enough congestion over an adequate distance to consider implementation of HOV improvements as **feasible** on the basis of travel speeds - less than 55 kph (35 mph) and congestion (ADT/lane over 20,000). The corridors in which implementation of HOV improvements is considered **feasible** are:

- ♦ North I.H. 820 from I.H. 35W to S.H. 121/183 - 11.4 km. (7.1 miles)
- ♦ S.H. 121/183 from I.H. 820 to Dallas County Line - 16.1 km (10.0 miles)
- ♦ East I.H. 820 from S.H. 121 to S.H. 121/183 - 3.2 km. (2.0 miles)

Several corridors (Figure 4) have sections in which the congestion is sufficiently high for HOV implementation to be considered **plausible** on the basis of congestion (ADT/lane between 15,000 and 20,000). The additional corridor segments in which HOV implementation may be considered **plausible** include:

- ♦ East I.H. 30 from I.H. 35W to I.H. 820E - 9.0 km. (5.6 miles)
- ♦ S.H. 360 from I.H. 20 to S.H. 183 - 19.3 km. (12.0 miles)

Congestion on remaining portions of the study corridors was either too low or over too short a distance to appear capable of inducing a modal shift to HOVs.

Congestion Evaluation for Long Term (Year 2010)

The freeway system identified by the Updated Mobility 2010 Plan had several corridors that exhibited significant congestion over the appropriate distance to warrant HOV implementation. These **feasible** corridors are identified below and illustrated in Figure 5.

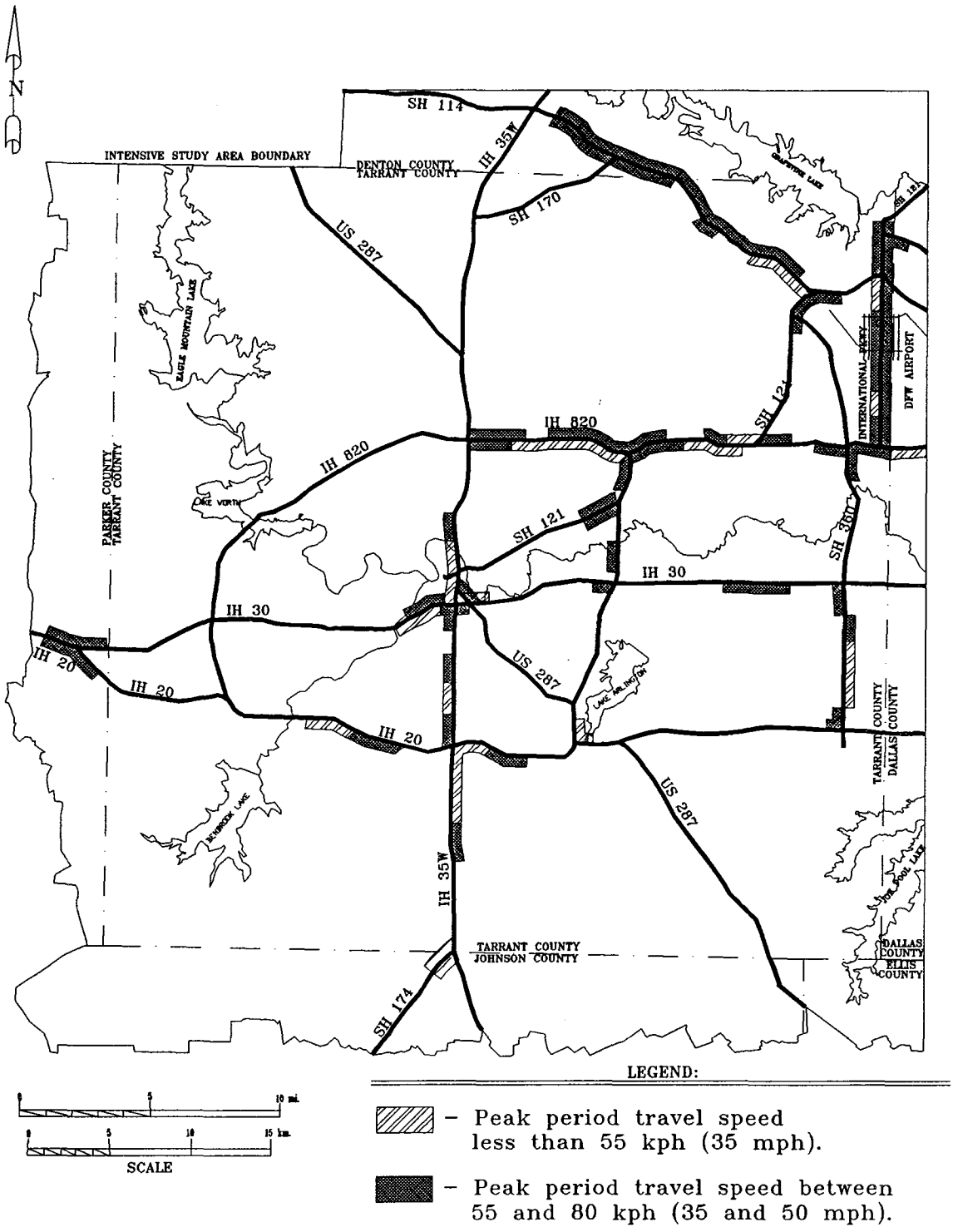

Figure 6. Existing Peak Period Travel Speeds

The corridors exhibiting significant congestion in 2010 include:

- East I.H. 30 from I.H. 35W to Dallas County Line - 31.2 km. (19.4 miles)
- South I.H. 35W from Johnson County Line to I.H. 30 - 25.4 km. (15.8 miles)
- North I.H. 820 from I.H. 35W to S.H. 121/183 - 11.4 km. (7.1 miles)
- S.H. 121/183 from I.H. 820 to Dallas County Line - 16.1 km. (10.0 miles)
- East I.H. 820 from S.H. 121 to S.H. 121/183 - 3.2 km. (2.0 miles)

There are several corridors (Figure 5) in which congestion is sufficiently high for HOV implementation to be considered **plausible** on the basis of congestion (ADT/lane between 15,000 and 20,000). The additional corridor segments in which HOV implementation may be considered **plausible** are:

- West I.H. 20 from Wichita Street to U.S. 287 - 3.2 km. (2.0 miles) and from F.M. 157 to Dallas County Line - 7.2 km. (4.5 miles)
- S.H. 360 from U.S. 180 to S.H. 183 - 8.8 km. (5.5 miles)
- East I.H. 820 from I.H. 30 to S.H. 121 - 4.0 km. (2.5 miles)
- South I.H. 35W from I.H. 30 to I.H. 20 - 6.9 km. (4.3 miles) and from Sycamore School Road to Johnson County Line - 7.4 km. (4.6 miles)
- North I.H. 35W from S.H. 121 to I.H. 30 - 2.1 km. (1.3 miles)
- East I.H. 30 from Oakland Blvd. to I.H. 35W 4.8 km. (3.0 miles)
- S.H. 121 from I.H. 35W to Haltom Road - 3.9 km. (2.4 miles) and from Handley Ederville to East I.H. 820 - 0.8 km. (0.5 miles)
- U.S. 287 from East I.H. 820 to Berry Street - 3.7 km. (2.3 miles)
- Proposed S.H. 121 from S.H. 199 to Vickery Blvd. - 4.3 km. (2.7 miles) and from West I.H. 820 to Altamesa Blvd. - 3.2 km. (2.0 miles)
- S.H. 121 from S.H. 360 to S.H. 114 - 2.7 km. (1.7 miles)

The remaining corridors did not exhibit enough congestion (ADT/lane) to warrant consideration of HOV implementation.

SECTION 4
INITIAL ASSESSMENT OF AN HOV SYSTEM PLAN

This section of the report addresses the results of the individual corridor evaluations to develop an overall assessment of HOV feasibility for Fort Worth freeways. The HOV improvement feasibility is based on sketch planning methods, and as such, does not represent a detailed analysis of the HOV alternatives.

A detailed analysis is necessary before the final decision to implement a specific HOV improvement can be made. This type of detailed analysis should evaluate the impacts of the HOV improvement and determine specific design characteristics such as type of HOV lane, lane width, access location, and minimum occupancy level. In addition, the decision to implement HOV improvements should be made only after careful consideration of many other factors, a few of which include:

- Cost-effectiveness of HOV improvements.
- Geometric design of the corridor.
- Costs of implementation, operation, and maintenance.
- Potential utilization of the HOV improvement.
- How the improvement fits into the overall transportation plan for the area.

Therefore, as stated previously, these study findings must be considered as a *beginning*, rather than an end, to the planning process. All planning efforts for these corridors should strive to provide the flexibility for implementing improvements as needs dictate in the future.

SPECIAL CONSIDERATIONS CONCERNING THE FORT WORTH HOV SYSTEM PLAN

Before proceeding with the discussion of the Fort Worth HOV System Plan, several considerations have developed concerning the ultimate HOV System Plan. Given the travel patterns in the Metroplex and the service area of Fort Worth Transportation Authority ("T"), potential problems arise with the development of an HOV System Plan for the Fort Worth District of the Texas Department of Transportation. These concerns are discussed below.

Operational Agencies

The development, implementation, and funding of an areawide HOV system plan should be a multi-agency undertaking. In Houston and Dallas, the Texas Department of Transportation has worked with the local transit agencies on the development, implementation, and operations of HOV facilities. These agreements have greatly contributed to the success of the HOV facilities in these cities.

The service area of the "T" is illustrated in Figure 7. Several sections of congested roadway that might be considered for HOV development are outside the T's service area. This may result in an HOV facility that must be developed without the local transit authority being involved.

Nontraditional Directional Distributions

Another concern is the nontraditional directional distribution of traffic on some of the Fort Worth area freeways. In developing the initial phase of the Fort Worth HOV System Plan, it was found that three radial freeways in eastern Tarrant County (I.H. 20, I.H. 30, and S.H. 121/183) all have peak directional flows toward Dallas in the morning peak period and toward Fort Worth in the evening. This may create problems with the

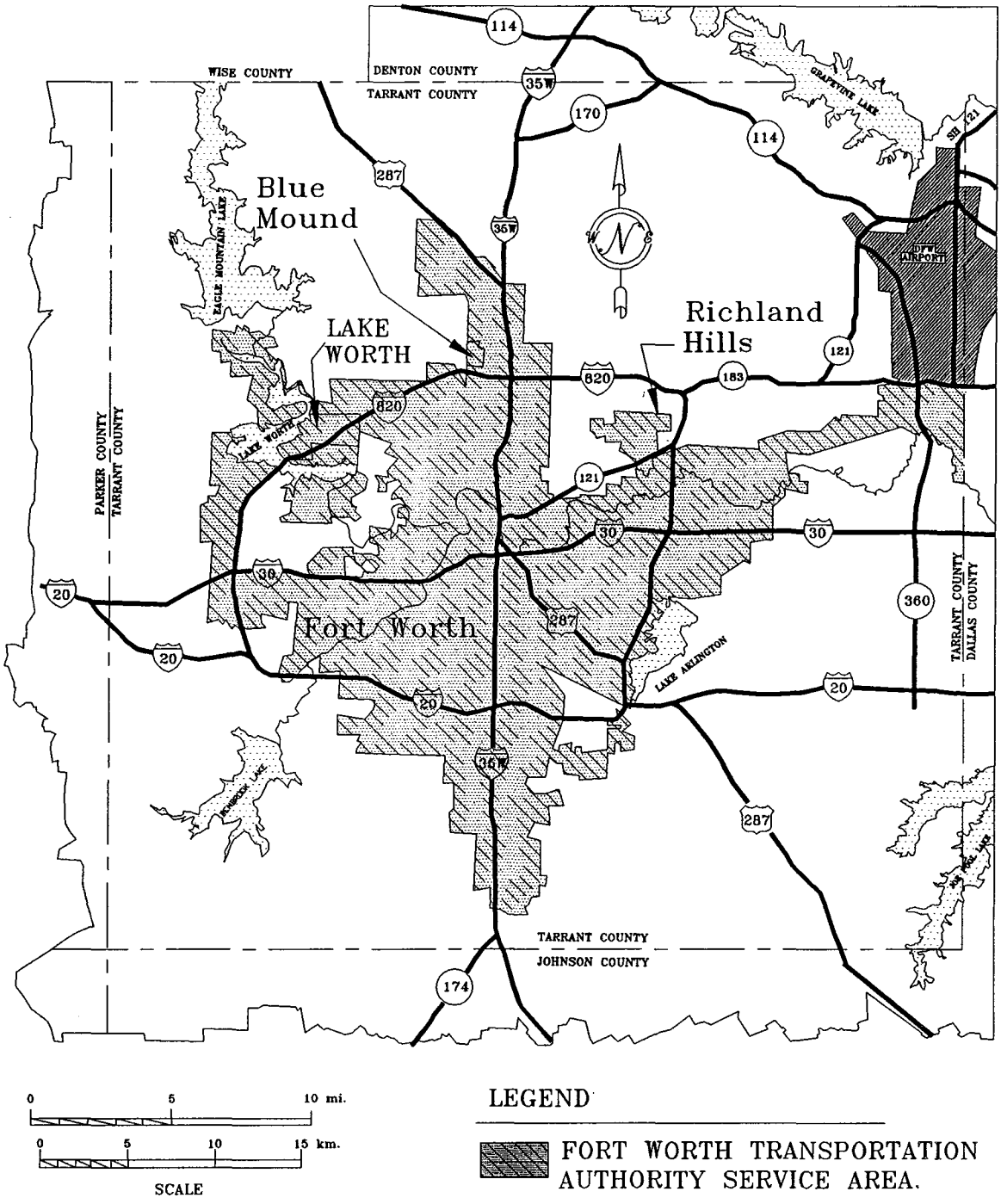

Figure 7. Fort Worth Transportation Authority Service Area

local transit agency in that the predominant traffic flow is away from their service area. If the local transit authority is not committed to providing service to those motorists leaving Fort Worth, this leaves the Texas Department of Transportation as the potential operating agency on these HOV facilities. TxDOT is not currently operating, or planning to operate, any HOV lanes.

Accessibility to the CBD

Accessibility to the Fort Worth CBD is another major concern of the Fort Worth HOV System Plan. The two freeways that provide access to the CBD are I.H. 30 and I.H. 35W. These freeways are scheduled for reconstruction in the near future and accessibility to the CBD for HOV lanes remains unclear at this time. It may be appropriate to ensure that a space for the implementation of HOV facilities is included. On the recently reconstructed I.H. 30, west of the CBD, provisions have been made for the inclusion of HOV facilities within the freeway median.

Impact of the Federal Clean Air Act of 1990

Another overall concern of the Fort Worth HOV System Plan is the impact of the Federal Clean Air Act Amendments of 1990. This act limits the construction of additional capacity on urban freeways in "non-attainment" areas for use by single-occupant vehicles. The Dallas-Fort Worth metroplex is considered a "non-attainment" area, and therefore, the construction of additional capacity is severely limited. The implementation of HOV improvements would increase the person movement capacity of a given corridor and reduce the need for additional freeway lane capacity.

These four concerns apply to several of the corridors examined in this initial screening of HOV facilities in Fort Worth. Other concerns that are more specific to a corridor are discussed for individual freeways.

PRESENT TERM FINDINGS (YEAR 1991)

Two freeway corridors have congestion levels to the extent that HOV improvements are considered cost effective and two corridors have enough congestion to be considered uncertain at this time. Figure 8 summarizes the HOV assessment for the Present Term (Year 1991). Discussion of how HOV improvements can be implemented in each of these corridors follows.

S.H. 183/S.H. 121

The section of freeway in which HOV improvements is considered cost effective is from I.H. 820 to the Dallas County Line. This section of freeway is experiencing moderate levels of congestion during the peak periods and because of this congestion, it is likely that this freeway will be reconstructed. The suggested HOV improvement for this corridor is a reversible HOV lane operating towards Dallas in the morning and Fort Worth in the evening. The Fort Worth Transportation Authority has plans for Railtran to operate in this corridor. If Railtran is operating and successful in removing vehicles from the freeway, the need for HOV improvements in this corridor may diminish to the extent it may not be needed.

East I.H. 820 North

This corridor is also operating over capacity during the peak periods due to the number of lanes (two) in each direction between I.H. 35W and the I.H. 820/S.H. 183/S.H. 121 interchange. The suggested HOV improvement is a reversible HOV lane with connections to the HOV improvements described for the S.H. 121/183 corridor.

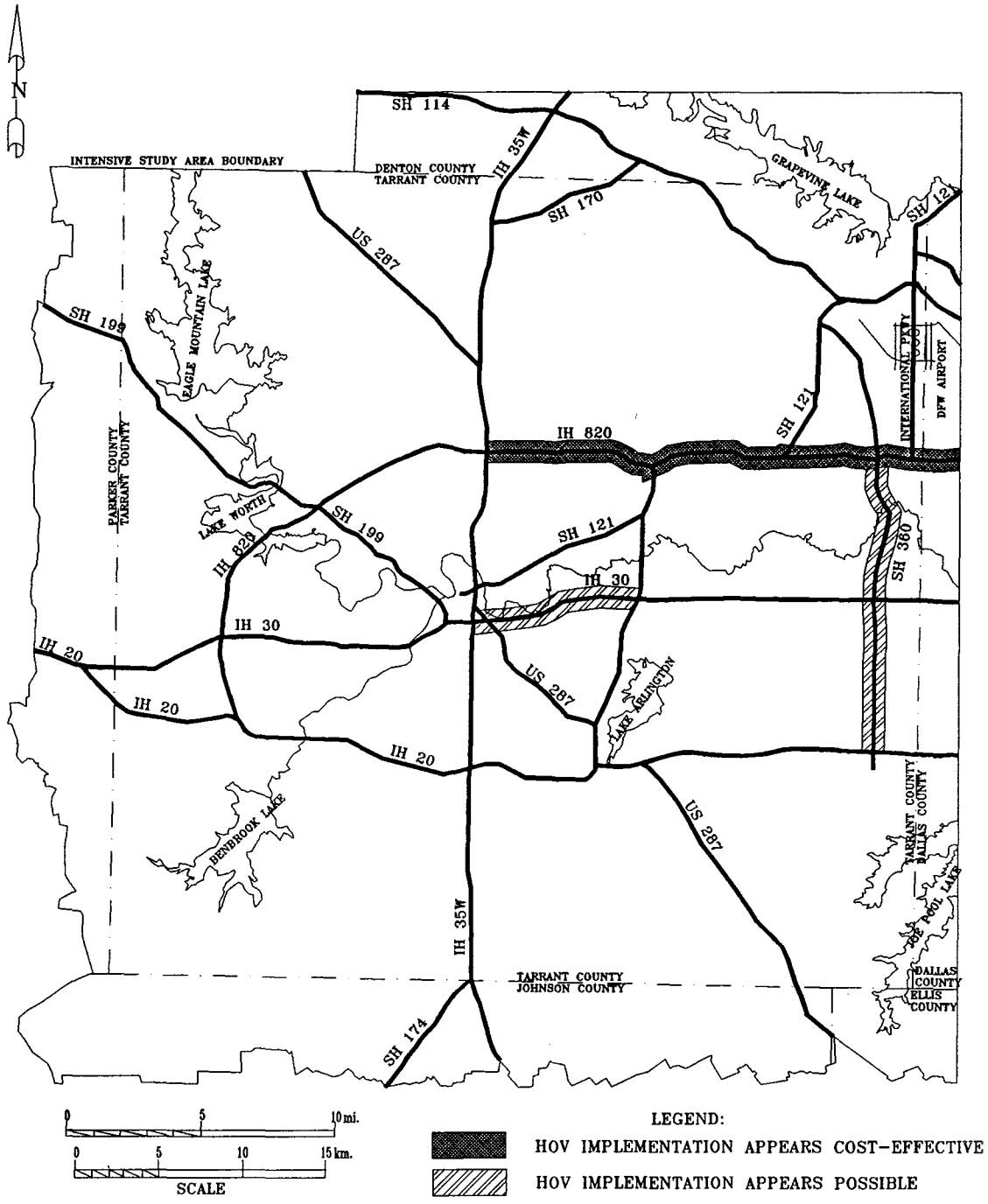

Figure 8. Short-Term HOV Assessment (Year 1991)

S.H. 360

This corridor is experiencing moderate levels of congestion in certain locations within the corridor. In the morning peak period, congestion is experienced in the vicinity of Spur 303 northbound and approaching I.H. 30 in the evening peak period. Perhaps some type of contraflow HOV treatment could be implemented to bypass the current congestion experienced in the vicinity of the U.S. 180 and I.H. 30 interchanges; the directional distribution of the traffic is consistent with this type of HOV lane.

The Dallas District of the Texas Department of Transportation has a parallel freeway (S.H. 161) that may be constructed. This parallel freeway would remove some of the existing congestion from S.H. 360 during the peak periods, thus reducing the need for HOV improvements in the future.

East I.H. 30

The section of I.H. 30 between I.H. 820 and I.H. 35W is experiencing moderate levels of congestion during the morning and evening peak periods. A reversible HOV lane is suggested with operations toward Fort Worth in the morning and toward Dallas in the evening.

LONG TERM FINDINGS (YEAR 2010)

By the Year 2010, several freeway segments in the Fort Worth area appear to support cost effective use of HOV improvements with regard to congestion. However, the length of many of these segments is such that the total travel time savings may not be sufficient to induce a cost effective shift to HOVs. There are also many segments for which the cost effectiveness of HOV improvements are uncertain. Figure 9

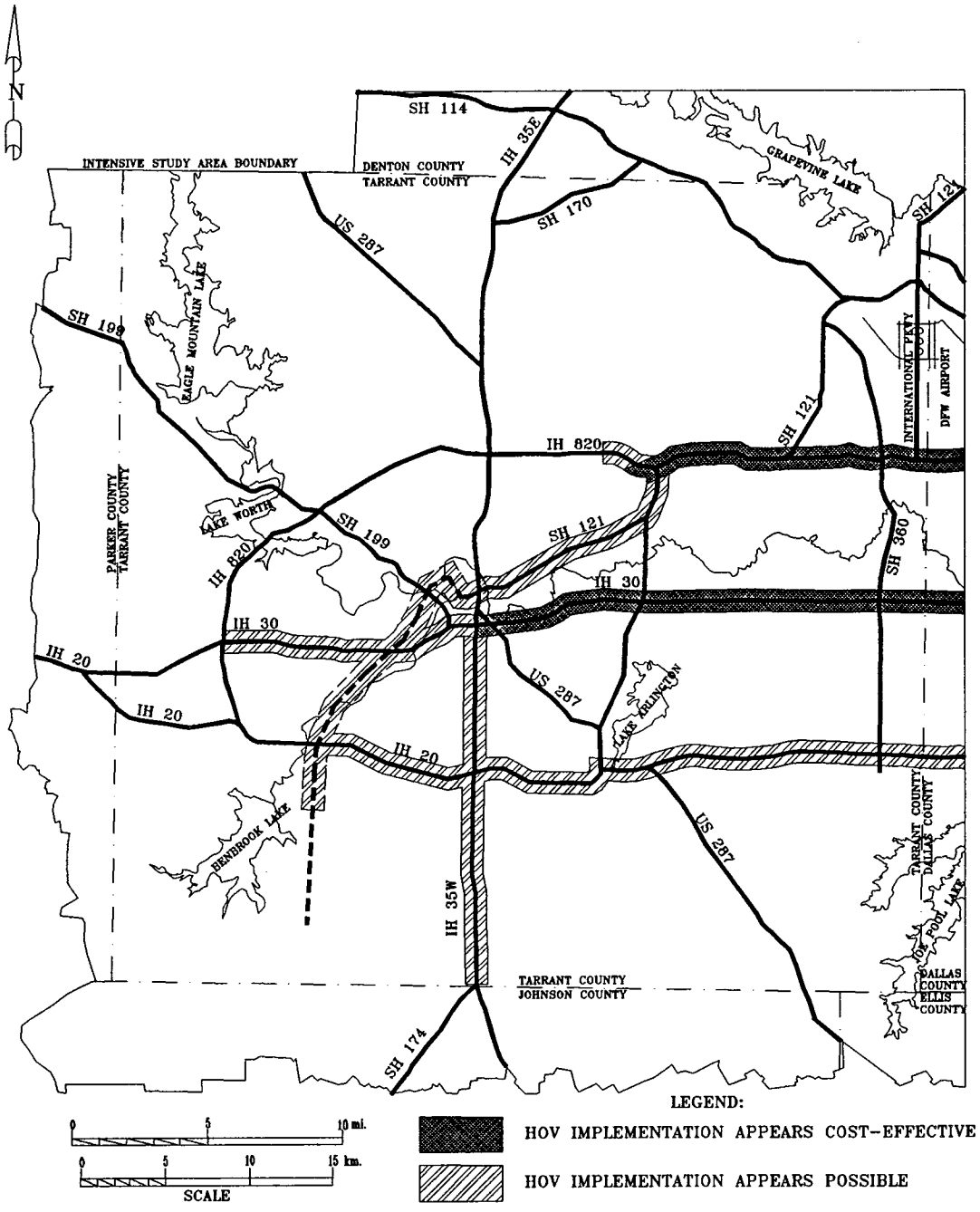

Figure 9. Long-Term HOV Assessment (Year 2010)

summarizes the HOV assessment for the Year 2010. Discussion of HOV treatments in each corridor follows.

S.H. 183 / S.H. 121

The segment which merits study of HOV improvements is the 20.3 km. (12.6 miles) from I.H. 820 to the Dallas County Line. The suggested HOV improvement for this corridor is a two-lane reversible HOV lane. The peak direction of traffic in this corridor is toward Dallas in the morning peak period and toward Fort Worth in the evening peak period.

The implementation of Railtran in this corridor could affect the viability of HOV improvements in this corridor, but more detailed study will be required to address that issue.

East I.H. 30

There are two segments on East I.H. 30 which merit consideration of HOV improvements. The eastern segment (between the Dallas County Line and I.H. 820) has high directional traffic toward Dallas in the morning peak period (toward Fort Worth in the evening peak period) and could be a continuation of the HOV improvements suggested for I.H. 30 in Dallas County. The western segment (between I.H. 820 and I.H. 35W) of I.H. 30 has a 50/50 directional split in both the morning and evening peak periods. Because of this, an HOV lane operating full-time in each direction may be necessary to adequately handle the anticipated demand in this corridor.

West I.H. 30

A reversible HOV lane is suggested for the segments between West I.H. 820 and I.H. 35W. The existing median in the recently reconstructed section of I.H. 30W is wide enough for an HOV lane. This HOV lane could also provide a connection to and from the proposed S.H. 121 Freeway. This would allow those vehicles that are destined for the Fort Worth CBD or regions beyond the CBD, such as DFW Airport and the Mid-Cities region to bypass the CBD area.

South I.H. 35W

This corridor has recently been reconstructed; therefore the construction of a reversible HOV lane in the median is not cost-effective. However, enough congestion is projected, along with a significant imbalance in the directional distribution that might justify the implementation of a contraflow lane. The movable barrier concept currently being used on I.H.30 (East R.L. Thornton) in Dallas could be used to provide the travel time savings needed to make this HOV improvement successful.

East I.H. 820 North

This corridor exhibits traffic patterns such that the traffic peaks toward Dallas (eastbound) during the morning peak period and toward Fort Worth (westbound) during the evening peak period. Because of these traffic patterns, a reversible HOV lane could be connected to the suggested HOV lane on the S.H. 121/183 freeway.

North I.H. 820 East

This corridor is projected to have moderate levels of congestion in Year 2010. The distance of this corridor is just under 3.2 km. (2.0 miles); therefore, an HOV

improvement alone is probably not justified at this time. However, an HOV improvement in this corridor could be justified in order to connect the HOV improvements from the adjoining freeways (S.H. 121/183, East I.H. 820 North, and S.H. 121).

S.H. 121

This corridor is projected to have moderate levels of congestion in the segment from I.H. 35W to approximately Midway Road. Therefore, a reversible HOV lane could be implemented that would connect into the Fort Worth CBD. In the vicinity of the I.H. 820 East and S.H. 121 interchange, the directional distribution shifts from peaking towards Fort Worth to Dallas, at this location, a reversible HOV lane could be implemented and tied into the suggested HOV lane(s) on I.H. 820 and S.H. 121/183 (basically, an extension through the interchange for operational purposes).

Proposed S.H. 121

This corridor is still in the planning stage; therefore, efforts should be made to provide for adequate median width to include a possible reversible HOV lane in the median. Congestion levels are projected to be sufficient enough to provide for the implementation of an HOV lane between I.H. 30 West and I.H. 20 with a continuation south of I.H. 20. This HOV lane could be tied into the HOV lane suggested on I.H. 30 west of the Fort Worth CBD.

East I.H. 20

HOV improvements are possible on the segment of this corridor from I.H. 35W to the Dallas County Line. Between I.H. 820 and I.H. 35W, two one-way HOV lanes could be implemented and between I.H. 820 and the Dallas County Line, a reversible HOV

lane could function with operations toward Dallas in the morning and Fort Worth in the evening.

SUMMARY OF RECOMMENDATIONS

HOV improvements have become an important part of the future transportation system in some cities in Texas. Houston currently operates an extensive system of HOV facilities, with plans to expand the system in the future. A system of HOV facilities has been proposed for Dallas; one HOV lane is operating and others may open in the near future. This report describes a macroscopic assessment of HOV feasibility in selected freeway corridors in the Fort Worth area.

The role that HOV facilities will serve in addressing the overall mobility problem in Fort Worth would appear to be less than the role they may play in some other Texas cities. However, the results of this study indicate that HOV improvements should receive consideration in some corridors. HOV lanes which warrant further study are indicated on S.H. 183, I.H. 30, I.H. 20, I.H. 820 North, S.H. 121 and the Proposed S.H. 121. Obviously, important questions remain to be answered, including who will operate, direction of HOV lane, etc. By anticipating the need for HOV improvements, the implementation of these improvements can be made less complicated in the future.