Executive Summary
Thoroughfare Assessment Program Phase 3.2

Prepared for:

North Central Texas Council of Governments

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TAP PHASE 3.2
EXECUTIVE SUMMARY

Introduction

In 2002 the North Central Texas Council of Governments (NCTCOG) launched the Thoroughfare Assessment Program (TAP), the goal of which has been to reduce vehicular emissions and improve mobility through traffic signal retiming. The program's third phase – TAP Phase 3.2 – began in 2006 and a team of consultants led by Kimley-Horn and Associates, Inc. was selected to complete approximately half of its intersections. This summary covers 297 traffic signals operated by three cities – Carrollton, Dallas, and Fort Worth -- and the Fort Worth District of the Texas Department of Transportation (TxDOT). **Figure 1** illustrates the locations of these traffic signals. This project has achieved seamless progression along 100 miles of arterial streets without regard to jurisdictional boundaries.

Project Scope

The assigned intersections were grouped into designated corridors that ranged in size from four to 35 intersections. For each corridor, the scope included the following tasks:

- A baseline assessment to document the conditions as of the beginning of the project.
- Development, implementation, and fine-tuning of the new signal timing plans.
- An after assessment to quantify and document the project results.

The major focus of the program has been traffic signal retiming. However, a limited pool of funds was available to procure GPS clocks for intersections that did not otherwise have a reliable time base. These clocks, which are automatically reset by satellite, were installed at approximately 90 intersections in Fort Worth.

Data Collection

The project included extensive data collection:

- For all 297 intersections, peak-hour turning movement counts were made by human observers who used electronic count boards to record the number of vehicles by approach direction and by movement (i.e., left turn, straight through, or right turn).

- Approximately 82 bi-directional machine counts were made with pneumatic tube-type counters that digitally record the number of vehicles in 15-minute increments, totaled on an hourly basis. These included 22 seven-day counts, 42 24-hour counts, and 18 vehicle classification counts.

- As one means of measuring the benefits of the project, approximately 3,400 miles of travel time runs were made with an instrumented vehicle. The software electronically recorded the vehicle's speed, the distance traveled, and the number and elapsed time of each stop.

Signal Timing Plans

For the Corridor 686 (E. Lancaster Ave.) in Fort Worth, new timing plans were developed only for the weekday AM and PM peaks. For all other corridors, new timing plans were developed for those peaks plus the weekday midday peak. In many cases, separate versions of the AM and midday plans were

required for times when school speed zones are in operation. Some corridors required timing plans for other periods such as the Saturday afternoon peak or the late evening off-peak. After the new timing plans were operational, extensive "fine-tuning" was performed to improve actual on-street performance.

Project Results

Travel Time Runs

The project results were measured quantitatively through the travel time runs made with an instrumented vehicle traveling at the pace set by other traffic. The "before" runs were made at the start of the project, prior to any changes in the previous signal timing. Later, after the new signal timing plans had been installed and fine-tuned, the "after" runs were made. Averaging all corridors (total of 88 miles of test routes), a comparison of the before and after travel time runs determined that the following reductions had been attained in travel time, stops, and delay:

- Average travel time savings:
  - 11.4 percent overall reduction in travel time.
  - 187 vehicle-minutes or 3.1 vehicle-hours reduction per weekday.
- Reduction in stops:
  - 40.3 percent overall reduction in number of stops.
  - Over 290 vehicle-stops reduced per weekday

Synchro™ Measures of Effectiveness

The project results were also estimated from the Synchro™ models that were used to develop the new traffic signal timing plans. For each corridor, the calibrated model of the before timing was compared with the calibrated model of the final timing. The measures of effectiveness (MOEs) that were compared included total signal delay and fuel consumption along with three categories of emissions (CO, NOx, and VOC). Averaging all corridors, the following improvement percentages were estimated by the Synchro™ comparison:

- Total signal delay was reduced by 13.7 percent
- Fuel consumption was reduced by 6.1 percent
  - Reduction of 2,542 gallons per weekday
- Emissions were reduced by 5.7 percent
  - CO reduction of over 178 kilograms per weekday
  - NOx reduction of over 35 kilograms per weekday
  - VOC reduction of over 41 kilograms per weekday

Estimated Economic Benefits

The following rationale was used to estimate the daily user savings from the new timing plans:

- On each weekday there will be:
  - Two hours of benefit from the AM peak timing plan
  - Two hours of benefit from the PM peak timing plan
  - Five hours of benefit from the midday timing plan
  - To be conservative, no benefit is assumed from other hours of the day even though most of the corridors operate the new timing plans for at least 12 hours per day.

- For the purpose of economic analysis of transportation improvements, NCTCOG's current value is $12.50 per vehicle-hour of delay as reflected in Mobility 2030 – 2009 Amendment.

For each corridor, the before and after Synchro™ models were compared for each of the three timing plans. Considering the composite total signal delay for all corridors and using the above-described rationale, the estimated user benefit is $82,675 per weekday. Assuming 248 weekdays per year, this equates to an annual savings of just over $20.5 million.

The attached **Table 1** provides a summary of the project benefits. The data provided include the following statistics per travel time route: route limits, number of signals, average daily traffic volume, and project benefits (reductions in travel time, stops, and delay). Also provided were the following statistics per corridor: number of signals, project benefits as derived from the Synchro™ models (reductions in total signal delay, stops, travel time, fuel consumed, and emissions), and daily user savings.

Based on total signal delay as modeled in Synchro™ Version 6, the greatest per-intersection improvements were attained in Corridor 642 (Josey), Corridor 685 (Altamesa-McCart), Corridor 645 (Northwest West), and Corridor 643 (Industrial). These corridors all saw delay reductions of more than 50 vehicle-hours per day per intersection. These benefits were realized through improved phasing, adjusted cycle lengths, and improved coordination between intersections.

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Figure 1: Thoroughfare Assessment Program (TAP) - Phase 3.2

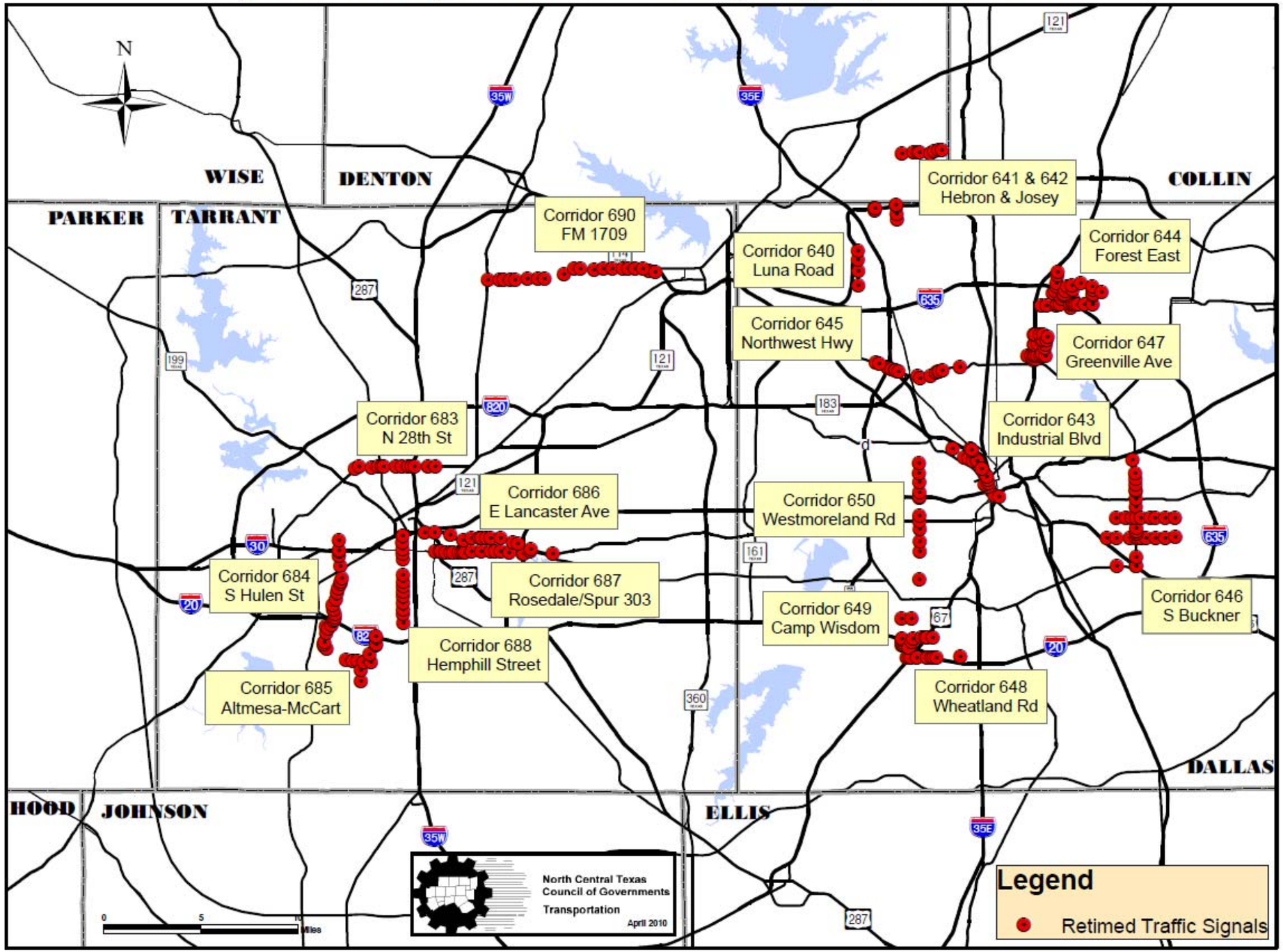

Table 1
Summary of Project Benefits

Corridor		Travel Time Route(s)	From	To	Number of Signals: Along Travel Time Route	Number of Signals: Corridor Total	Average Daily Traffic	Benefits: From Travel Time Runs [A]: Travel Time (seconds)	Stops	Delay (veh-sec)	From Synchro™ [A D]: Total Signal Delay (veh-hours)	Stops	Total Travel Time (veh-hours)	Fuel Consumed (gallons)	CO Emissions (kilograms)	NOx Emissions (kilograms)	VOC Emissions (kilograms)	Daily User Savings [B]: Corridor Total	Per Intersection
640	Luna Road	Luna Road	PGBT SB Off-NB On	Diplomat Dr	6	6	17,700	-192	-3	-153	-57	-5,944	-51	-125	-8.75	-1.70	-1.97	$713	$119
641	Hebron	Hebron Pkwy	Josey	International	7	7	39,100	-448	-10	-432	-173	-8,474	-125	-166	-11.65	-2.24	-2.70	$2,163	$309
642	Josey	Josey	Jackson	Tinity Mills WB (SH 190 WBFR)	4	4	34,000	-136	-3	-133	-354	-1,238	-366	-262	-18.10	-3.50	-4.21	$4,425	$1,106
643	Industrial Blvd	Industrial Blvd	Motor St	Cadiz St	15	15	36,800	-772	-22	-778	-760	-13,382	-720	-607	-42.46	-8.26	-9.88	$9,500	$633
644	Forest East	Abrams Rd	Meadowknoll	Walnut	7		29,600	-397	-8	-373	-633	-27,702	-377	-981	-68.70	-13.38	-15.93	$7,913	$226
		Audelia Rd	Walnut	Forest Lane	5		25,200	-47	-1	-39									
		Forest Lane	Audelia Road	Schroeder	11		26,900	-316	-12	-287									
		Greenville Ave	Forest Lane	Walnut	6		21,200	-382	-9	-350									
		Walnut St/Restland Rd	TI Blvd	Whispering Hills	6		15,300	-407	-8	-391									
			Total Signals in Corridor 644			35													
645	Northwest West	Northwest Hwy	Spangler Road	Midway Road	17	17	23,700	-259	-9	-278	-884	-19,215	-951	-823	-57.68	-11.22	-13.39	$11,050	$650
646	S Buckner	Buckner Blvd	Samuell Blvd	US Hwy 175 EBFR	16		31,400	-15	-10	-35	-98	2,045	-528	155	11	2	3	$1,225	$35
		Bruton Rd	Jim Miller Rd	Masters Dr	9		21,400	-143	-2	-129									
		Lake June Rd	Gillette St	Masters Dr	10		20,200	-241	-2	-145									
			Total Signals in Corridor 646			35													
647	Greenville Ave	Greenville Ave	Meadow Rd	Park Ln	6		28,000	-33	0	-33	-876	-12,249	-673	-749	-52	-10	-12	$10,950	$438
		Meadow Rd	Greenville Ave	N Central Expy SBFR	5		8,400	-127	-2	-114									
		Park Lane	Boedecker St	Fair Oaks Ave	8		31,600	-476	-9	-467									
		Walnut Hill Ln	US 75 SBFR	Greenville Ave	6		32,000	-30	2	-27									
			Total Signals in Corridor 647			25													
648	Wheatland Rd	Wheatland Rd	Westmoreland Ave	Polk St	10	10	22,000	-288	-5	-295	-147	-5,827	-210	-152	-10.45	-2.06	-2.45	$1,838	$184
649	Camp Wisdom Rd	Camp Wisdom Rd	Bainbridge Ave	Cockrell Hill Rd	6		18,300	-577	-13	-586	-19	2,554	-16	-33	-2	0	-1	$238	$20
		Cockrell Hill Rd	Red Bird Lane	Gannon Ln	6		24,800	-41	-2	-50									
			Total Signals in Corridor 649			12	28,300												
650	Westmoreland Rd	Westmoreland Rd	Canada Dr	Gannon Ln	18	18	28,300	-831	-39.4	-872	-243	-20,829	-702	-412	-28.81	-5.57	-6.71	$3,038	$169
683	N 28th St	N 28th St	Azle Ave	Riverside Dr	13	13	45,100	-260	-14.2	-269	-30	-17,901	6	-399	-27.88	-5.46	-6.46	$375	$29
684	S Hulen St	S Hulen St	IH 30 WBFR	Old Granbury Rd	23	23	40,800	-686	-25.7	-1,161	-870	-41,145	-876	-1,019	-71.51	-13.89	-16.58	$10,875	$473
685	Altamesa-McCart	Altamesa Blvd	Westcreek Dr	Welch Ave	5		26,800	-555	-0.6	141	-1,051	-16,683	-1,042	-883	-61.67	-12.03	-14.30	$13,138	$1,095
		McCart Ave	IH 20 WBFR	Cleburne Rd	7		29,400	-644	-14.1	-611									
			Total Signals in Corridor 685			12													
686	Lancaster/US 180 [C]	E Lancaster Avenue	Pine Street	Handley Drive	13	13	27,100	-453	-8	-318	0	0	0	0	0.00	0.00	0.00	$0	$0
687	Rosedale/SPUR 303	E Rosedale Street	Riverside Drive	Handley Drive	19	19	36,800	-573	-27	-560	0	0	0	0	0.00	0.00	0.00	$0	$0
688	Hemphill	Hemphill Street	Pennsylvania Avenue	Felix Street/Fuller Avenue	13	13	34,300	-1,360	-22	-1,283	0	0	0	0	0.00	0.00	0.00	$0	$0
690	FM 1709	FM 1709	US 377	Commerce	20	20	27,600	-567	-14	-576	-419	-11,703	-401	-456	-31.83	-6.19	-7.35	$5,238	$262
GRAND TOTAL FOR TAP PHASE 3.2					297	297	832,100	-11,255	-290.8	-10,604	-6,614	-197,693	-7,032	-6,912	-482.96	-93.74	-112.26	$82,675	$278

Note A: Based on the following hours of benefit per weekday from the three timing plans: 2 hours per weekday for AM Peak plan; 5 hours per weekday for the Midday plan; and 2 hours per weekday for PM Peak plan

Note B: Based on $12.50 per hour of Synchro™ total signal delay

Note C: A Midday timing plan was not developed for Corridor 686 (Lancaster); therefore, its travel time run MOEs are based on AM and PM peaks only

Note D: Excluding Corridors 686 (Lancaster), 687 (Rosedale), and 688 (Hemphill), which were done by the City of Fort Worth under a separate contract