Executive Summary
Regional Traffic Signal Retiming Program
Phase II

Prepared for:

North Central Texas Council of Governments

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Prepared in cooperation with the Regional Transportation Council, NCTCOG, and the Texas Department of Transportation.

The contents of this report reflect the views of the authors who are responsible for the opinions, findings, and conclusions presented herein. The contents do not necessarily reflect the views or policies of the Regional Transportation Council, NCTCOG, and the Texas Department of Transportation.

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REGIONAL TRAFFIC SIGNAL RETIMING PROGRAM PHASE II
EXECUTIVE SUMMARY

Introduction

In 2010, the North Central Texas Council of Governments (NCTCOG) launched the Regional Traffic Signal Retiming Program (RTSRP), the goal of which is to maximize the capacity of the existing roadway system by improving traffic operations through signal retiming along selected corridors, in addition to reducing mobile source emissions, improving mobility, and enhancing safety. Phase II of RTSRP started in May 2014 and included corridors in Mansfield, Allen, Plano, McKinney, Dallas, Carrollton, Rowlett, and Coppell. A team of consultants led by Kimley-Horn and Associates, Inc. was selected to complete all 706 RTSRP Phase II signalized intersections. **Figure 4** through **Figure 12** illustrate the locations of these traffic signals. This project has achieved interlocking, seamless progression along 276 miles of arterial streets without regard to jurisdictional boundaries.

Project Scope

The assigned intersections were grouped into designated corridors that ranged in size from 14 to 128 intersections. For each corridor, the scope included the following tasks:

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

Data Collection

The project included extensive data collection:

- For intersections, peak-hour turning movement counts were made. Human observers 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). Video data collection methods were also used, with post-processing of count data.

- Approximately 156 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 51 seven-day counts, 53 24-hour counts, and 52 vehicle classification counts.

- As one means of measuring benefits of the project, approximately 9,000 miles of travel time runs were made with an instrumented vehicle. Software electronically recorded the vehicle's speed, distance traveled, and the number and elapsed time of each stop.

Signal Timing Plans

For all corridors, new timing plans were developed for four (4) time periods – the weekday AM, Midday and PM peaks plus the Saturday peak. In many cases, separate versions of the AM and midday plans were required for times when school speed zones are in operation. After new timing plans were operational, extensive "fine-tuning" was performed to improve actual on-street performance.

Corridor Recommendations

The following signal control equipment improvements and signing, striping, or geometric modifications were recommended in the final reports for each project corridor or group of corridors. Some of the improvements have been implemented. Future timing plan updates should be scheduled at intervals of three to five years for all project corridors.

Mansfield Corridors

The City of Mansfield is planning to upgrade the signal communications infrastructure, including a new traffic management center (TMC). Recommended components included fiber optic and/or wireless communications to all intersections, with enough bandwidth to bring video (from VIVD detection, CCTV cameras, etc.) back to the TMC for remote monitoring.

No recommendations were made for these corridors, as any modifications related to minor improvements were made prior to the implementation of new timing.

Allen Corridors

As of the beginning of the project, all of the project intersections already had communications equipment installed to communicate between the intersection controllers and the central control facility of the City's Siemens TACTICS™ computerized signal system. Fifteen project intersections did not have working communications; beyond repairs to restore functionality, no signal control equipment upgrades were recommended.

No recommendations were made for these corridors, as any modifications related to minor improvements were made prior to the implementation of new timing.

Six (6) intersections were recommended for signing and striping modifications to eliminate the need for split-phase operations:

- Main St & Fountain Gate Drive;
- Main St & Malone Drive;
- Bethany Drive & Cheyenne Drive;
- Bethany Drive & Whitman Drive/Aylesbury Drive;
- Alma Rd & Bel Air Drive; and
- McDermott Drive & Allen Drive.

Plano Corridors

No recommendations were made for these corridors, as any modifications related to minor improvements were made prior to the implementation of new timing.

McKinney Corridors

Custer Road north of US 380 has a two-lane undivided cross-section (i.e. just one lane per direction). As such, a transition must occur because Custer south of US 380 has a six-lane divided cross-section. As currently signed and striped, the northbound transition is affected as follows:

- Approximately 850 feet south of US 380, all traffic in the center lane is forced to merge into the

left lane; that left-most lane then splits into separate left-only and straight-only lanes
- The right-most lane becomes a right-only lane at US 380.

This existing northbound transition is shown in Figure 1.

Figure 1. Custer & US 380 Existing Northbound Transition

Having the right-most lane become a right-only lane is a logical and conventional way to terminate one of the three northbound lanes. However, forcing all traffic in the center lane to merge left causes several thousand unnecessary lane changes per day. A recommended improvement was to revise the striping such that the center lane remains open and transitions smoothly to become the straight-only lane at the signal. The left-most lane would then remain as it is, aligning with the right-hand of the two left-only lanes at the signal.

Dallas – Harry Hines Corridor

No recommendations were made for this corridor, as any modifications related to minor improvements were made prior to the implementation of new timing.

Dallas – Greenville Central and Mockingbird East Corridors

No recommendations were made for these corridors, as any modifications related to minor improvements were made prior to the implementation of new timing.

Dallas – Bus System Corridor

No recommendations were made for this corridor, as any modifications related to minor improvements were made prior to the implementation of new timing.

Dallas – East Dallas Corridor

No recommendations were made for this corridor, as any modifications related to minor improvements were made prior to the implementation of new timing.

Dallas – Northwest Highway Corridor

No recommendations were made for this corridor, as any modifications related to minor improvements were made prior to the implementation of new timing.

Dallas – Oak Lawn Corridor

Figure 2 is an aerial view of the Capitol & Haskell intersection. The wide median on Haskell creates several operational challenges:

- Because the turning paths overlap, Phases 1 and 5 (the left turns from Haskell onto Capitol) must be operated in protected-only mode, with one leading and the other lagging.
- The turning paths of the left-turn movements from Capitol onto Haskell also overlap. As such, the cross-street vehicular movements must be split-phased (as Phases 3 and 4).
- Because of the wide median, the pedestrian crossing distance (across Haskell) is about 135 feet. This requires over 40 seconds of split time to accommodate those pedestrian crossings.

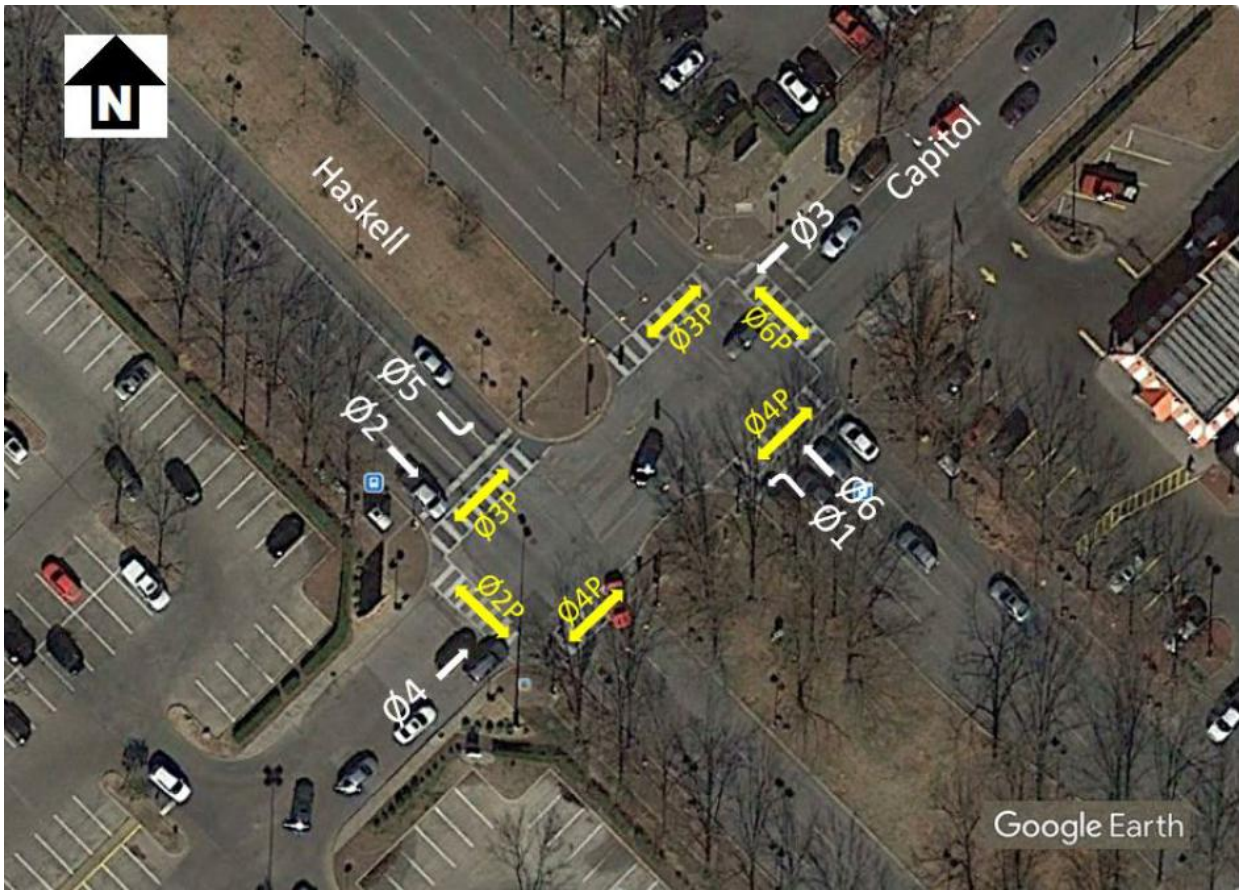

Figure 2. Aerial View of Capitol & Haskell (Showing the Existing Signal Phasing)

Figure 2 also shows the existing phase numbers. Each pedestrian movement is currently associated with only one vehicular phase. Therefore, the nominally east-west pedestrian crossing on the north side of Capitol is associated only with Phase 3, and the east-west pedestrian crossing on the south side of Capitol is associated only with Phase 4. With the current flashing don't walk times, some pedestrians must wait in the median to complete the crossing during the next cycle.

The previous Type 170 controllers were replaced during the project with new Intelight controllers. One of the available new features is the ability to have pedestrian overlaps. With this capability, the required pedestrian time (i.e. walk plus flashing don't walk plus yellow plus all-red) can make use of the combined

split times of all phases that are included in the overlap. Figure 3 shows the recommended pedestrian phasing, which makes use of such overlaps.

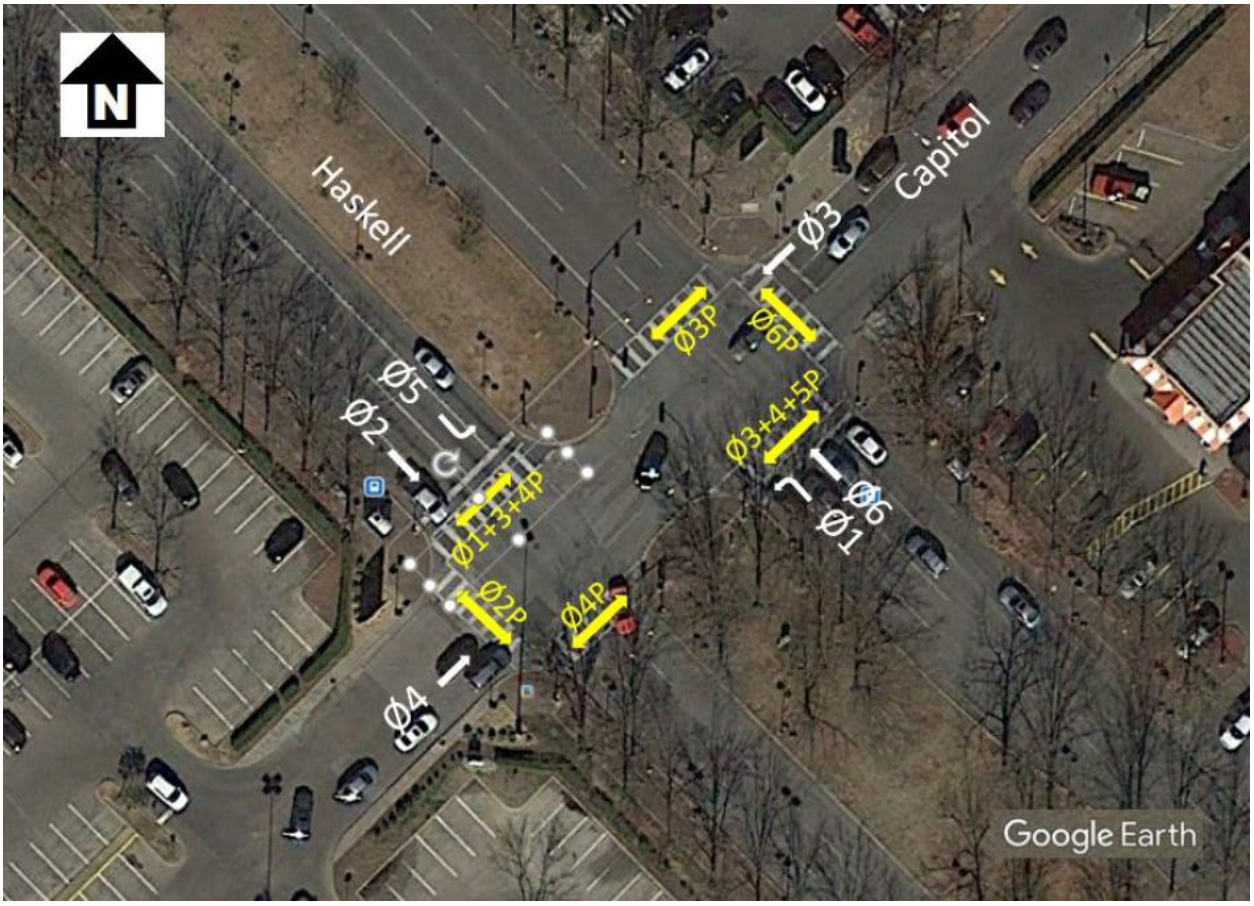

Figure 3. Recommended Capitol & Haskell Phasing

The vehicular movements associated with Phases 1, 3 and 4 do not conflict with pedestrians on the western segment of the north crosswalk. Therefore, that pedestrian movement can be the overlap of Phases 1, 3 and 4. Similarly, the vehicular movements associated with Phases 3, 4 and 5 do not conflict with pedestrians on the eastern segment of the south crosswalk. Therefore, that pedestrian movement can be the overlap of Phases 3, 4 and 5.

Because of the turning path overlaps, Phase 1 must be leading if Phase 5 is lagging (or vice versa). The decision as to which is leading will depend on progression needs along Haskell. On the other hand, the phase order of the split EB and WB vehicular movements should be based on which option best accommodates the pedestrians. For example:

- If Phase 1 is leading and Phase 5 is lagging, the east-west phase order should be Phase 4 followed by Phase 3. As such:
    - An EB pedestrian on the north crosswalk can start during 4 and complete the crossing during Phases 3 and 1;
    - A WB pedestrian on the north crosswalk can start during Phase 3 and complete the crossing during Phase 1;
    - An EB pedestrian on the south crosswalk can start during 4 and complete the crossing during Phase 3; and
    - A WB pedestrian on the south crosswalk can start during Phase 5 and complete the crossing during Phases 4 and 3.
- If Phase 5 is leading and Phase 1 is lagging, the east-west phase order should be Phase 3 followed by Phase 4. As such:
    - An EB pedestrian on the north crosswalk can start during 1 and complete the crossing during Phases 3 and 4;
    - A WB pedestrian on the north crosswalk can start during Phase 3 and complete the crossing during Phase 4;
    - An EB pedestrian on the south crosswalk can start during 4 and complete the crossing during Phase 5; and
    - A WB pedestrian on the south crosswalk can start during Phase 3 and complete the crossing during Phases 4 and 5.

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In summary, the recommended phasing will have the following advantages:

- "Progression" will be provided for all pedestrians who need to cross Haskell – in both directions on both crosswalks, the crossing can begin during one phase but be completed during at least one of the following phases. Therefore, any pedestrian who starts his or her crossing during the walk interval will have adequate clearance time (flashing don't walk plus yellow plus all-red) to complete the crossing without having to wait in the median for the next cycle.
- This intersection's pedestrian timing needs can be fully accommodated using relatively short cycle lengths. As such, it may be appropriate at some times of the day for the Capitol & Haskell signal and the Lemmon & Haskell signal to become part of the Bus System corridor.

Carrollton Corridors

There were a few locations where Flashing Yellow Arrow (FYA) left-turn displays were recommended to improve opportunities for two-way progression. These displays were installed by the City at Frankford & Rosemeade/Dickerson and at Keller Springs & Kelly. Additional recommended locations for future implementation include:

- Old Denton Road & MacArthur Drive/Raiford Road
- Keller Springs Road & Marsh Lane
- Keller Springs Road & Willowgate Lane

Rowlett Corridors

It was recommended that the City implement flashing yellow arrows for all protected-permitted left-turn movements in the future, and that these changes include adjustments to timing to recognize benefits that can be achieved through the modified operations.

Coppell Corridors

For T-intersections where u-turns are not allowed, the opposing protected left turn movement can be lagged to better fit the progression scheme. Subsequently, installation of "no u-turn" signs was recommended at the T-intersections listed below and completed by the city prior to implementing new timing plans:

- Belt Line & Lakeshore
- Belt Line & Saintsbury

Several locations had left-turn queue spillbacks, so it is recommended to extend the turn bays at the locations listed below, to increase capacity as traffic volumes continue to grow in the project area:

- Belt Line & Saintsbury – southbound left turn
- Denton Tap & Southwestern/Belt Line – southbound left turn
- Belt Line & Dividend – southbound left turn

The interchange of Belt Line & IH-635 also experiences queue spillback for the southbound left turn. This interchange is not a project intersection, and is not located in Coppell, but affects operations on the study corridor. There are currently two left turn lanes for the southbound interior of the interchange, striped with approximately 240 feet of storage, leaving the remaining 330 feet across the bridge striped out. Demand for the southbound left turn movement is greater than the storage space provided, causing queue spillback from those lanes to stack all the way across the diamond and back up on Belt Line. However, there is storage space available on the bridge for the two left turn lanes, so it was recommended to restripe the bridge to allow the left turn storage to extend across the bridge. This would require coordination with City of Irving and TxDOT.

Project Results

Travel Time Runs

Project results were measured quantitatively through travel time runs performed 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, "after" runs were performed. Averaging both directions for all corridors and all peak periods (275 miles of test routes), a comparison of the before and after travel time runs determined that the following improvements had been attained:

- Average travel time savings of 6 percent
- Average reduction in stops of more than 22 percent
- Average speed increase of 7.5 percent
- Average reduction in delay of nearly 17 percent.

The following rationale was used to estimate the annual reduction in delay from the new timing plans, based on travel time runs:

- Total reduction in delay in both directions
- Average peak period bidirectional traffic volume
- 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
- On each Saturday, there will be five hours of benefit from the Saturday 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 calculations, 5 weekdays and 1 Saturday per week were used, with 52 weeks per year, resulting in 260 weekdays per year and 52 Saturdays per year.

Based on measured travel time results and the assumptions listed above, RTSRP Phase II has resulted in delay savings of more than **4 million vehicle hours per year** (or more than 462 years of vehicle delay annually). In terms of delay savings, this translates to more than **$84 million annually** in driver delay savings. For the purpose of economic analysis of transportation improvements, the cost of delay was assumed to be $20.75 per vehicle-hour (as reflected in NCDOT's Mobility 2045 value of time).

Synchro™ Measures of Effectiveness

Project results were also estimated from the Synchro™ models used in the development of 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. 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 travel time was reduced by 7 percent
- Total signal delay was reduced by 16.8 percent
- Fuel consumption was reduced by 5.2 percent
    - Reduction of 4.5 million gallons annually
- Emissions were reduced by 5.2 percent
    - CO reduction of 315,544 kilograms annually
    - NOx reduction of 61,389 kilograms annually
    - VOC reduction of 73,112 kilograms annually

The attached **Table 1** shows project benefits based on collected travel time data. Data provided include the following statistics per travel time route: route limits, number of signals, route length (miles), average reduction in delay (vehicle-hours), peak hour annual delay savings, average daily traffic volume, and project benefits (reductions in travel time, stops, and delay). Values are detailed for each corridor and summarized by municipality. Dallas's corridors are summarized individually, as most corridors were networks more than linear corridors.

Table 2 details the annual benefits calculated from Synchro™ Version 10, including Total Signal Delay (veh-hrs), stops, Total Travel Time (veh-hrs), Fuel Consumed (gal), CO Emissions (kg), NOx Emissions (kg). and VOC Emissions (kg). Values are summarized by municipality.

The goal of the Regional Traffic Signal Retiming Program is to maximize the capacity of the existing roadway system by improving traffic operations through signal retiming along selected corridors, in addition to reducing mobile source emissions, improving mobility, and enhancing safety.

Overall, the new timing plans have successfully achieved the overall goals of the RTSRP.

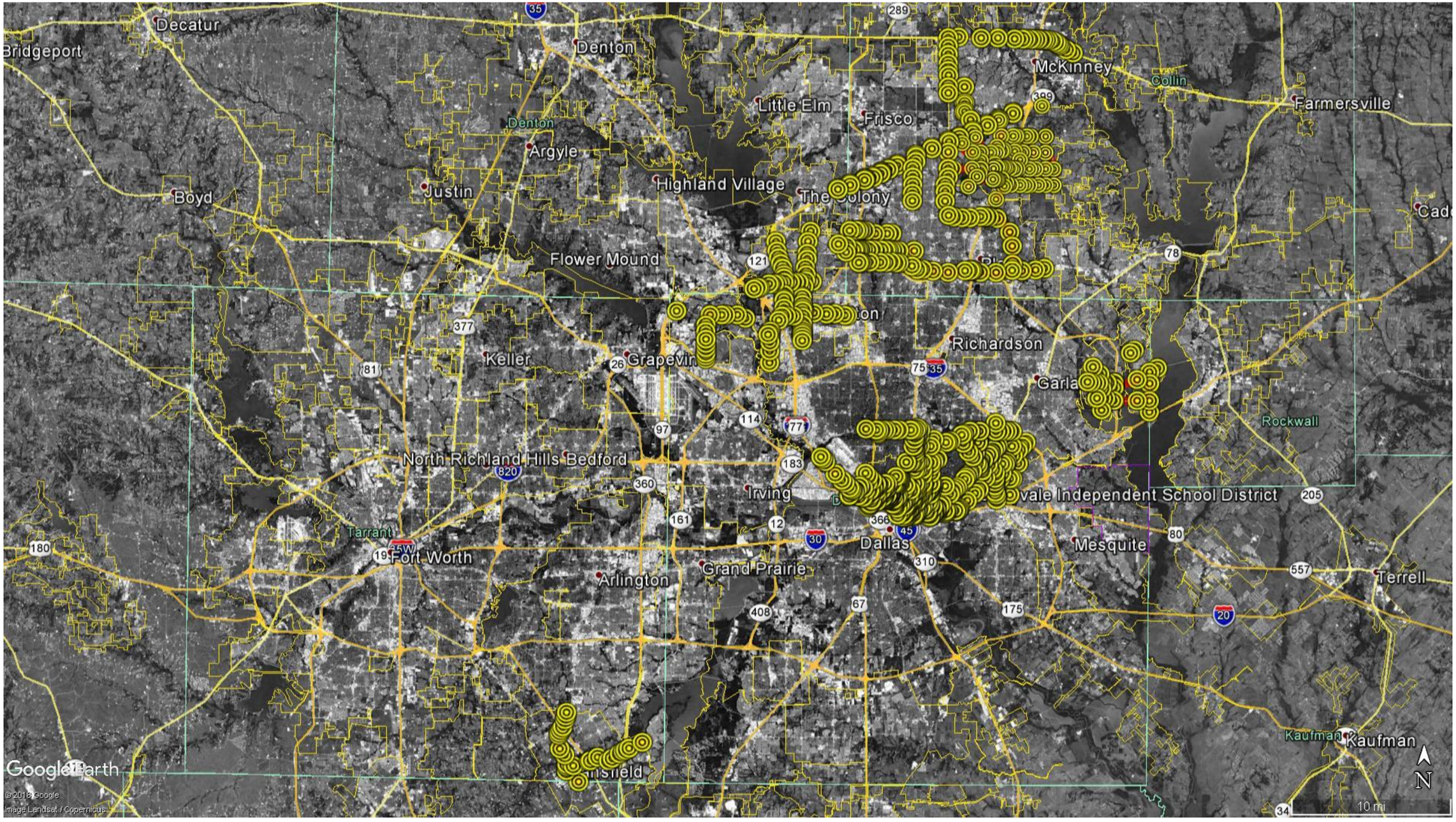

Figure 4. RTSRP II Signalized Intersections

Figure 5. RTSRP II Mansfield Corridors

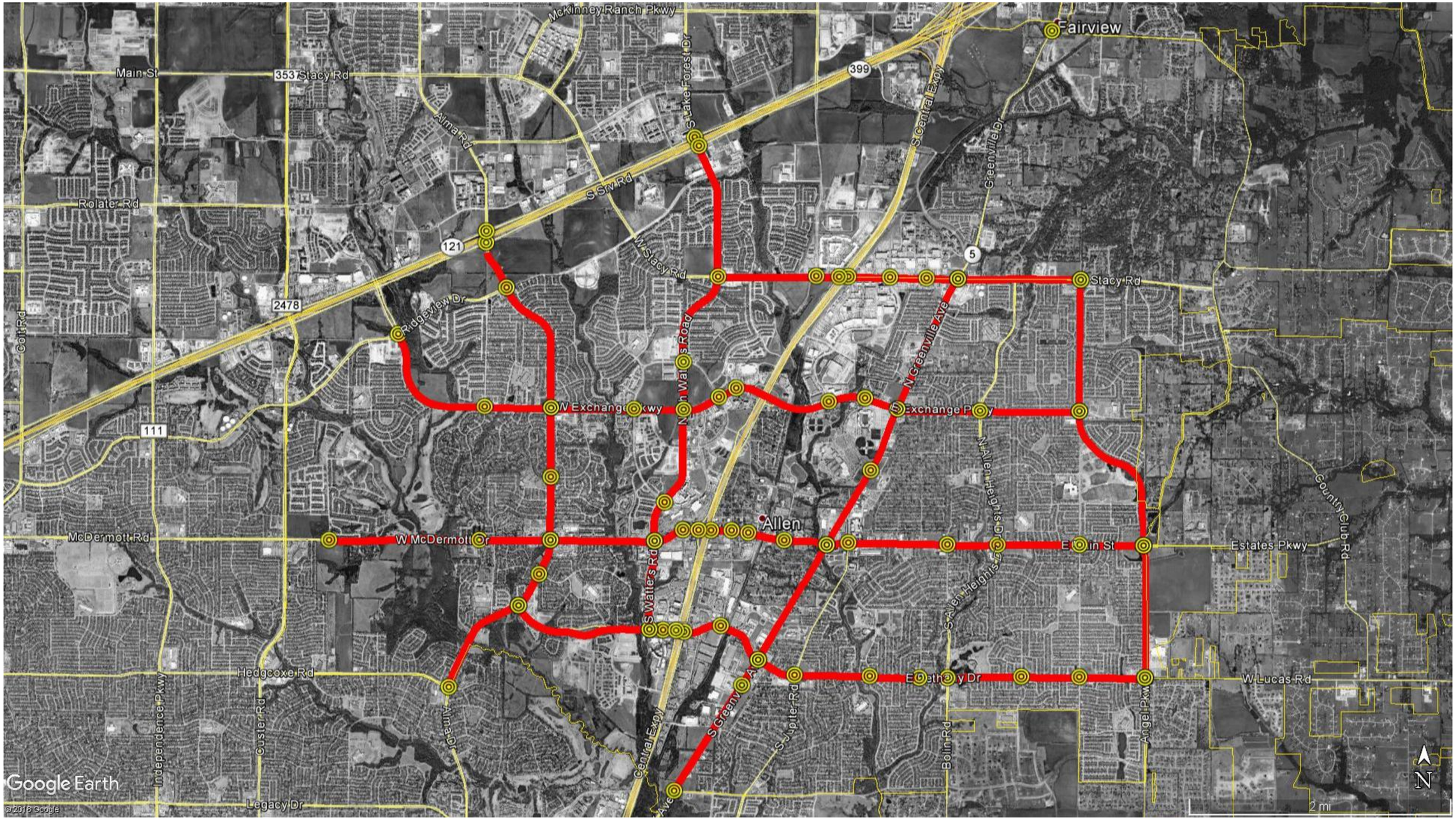

Figure 6. RTSRP II Allen Corridors

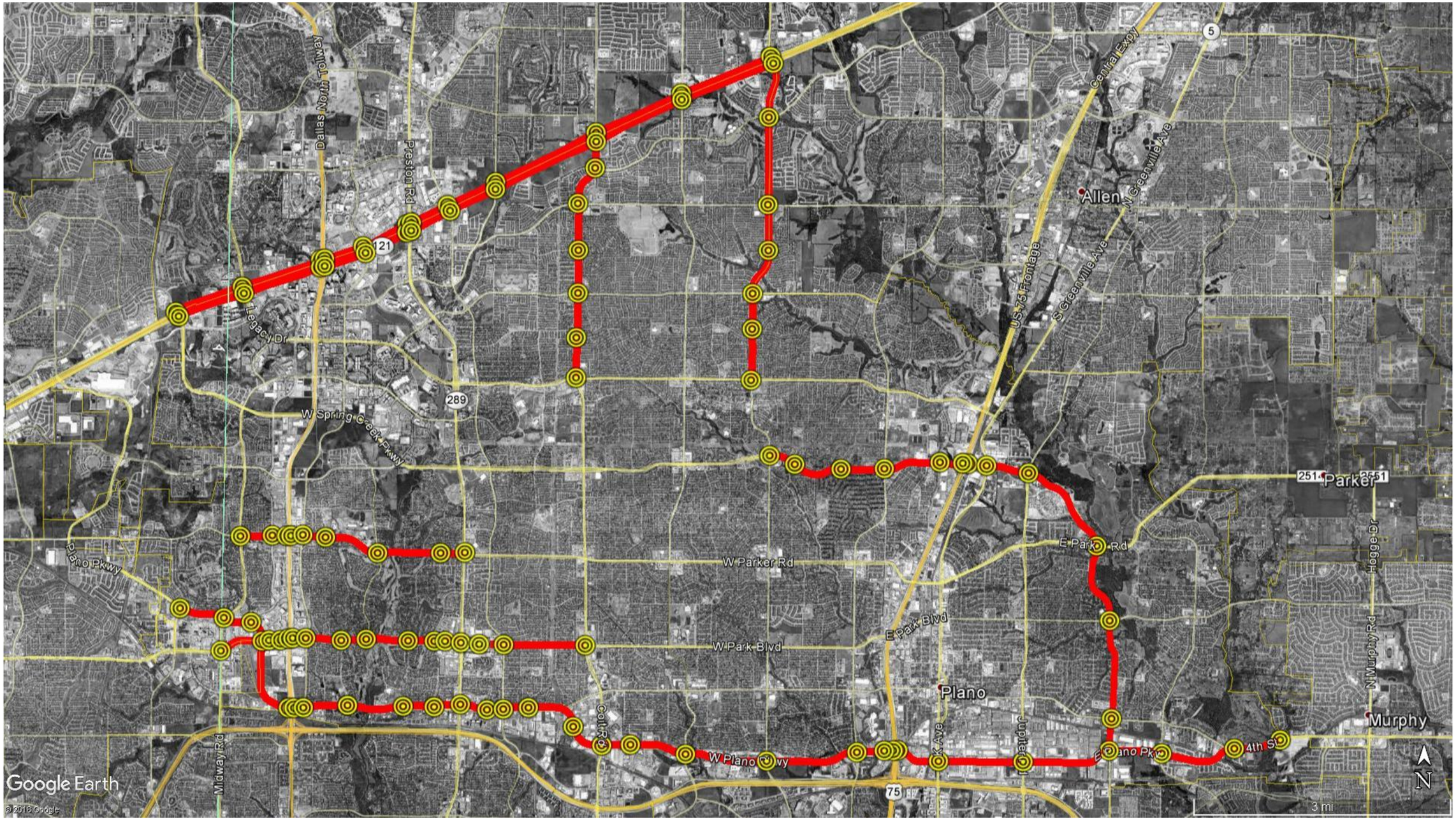

Figure 7. RTSRP II Plano Corridors

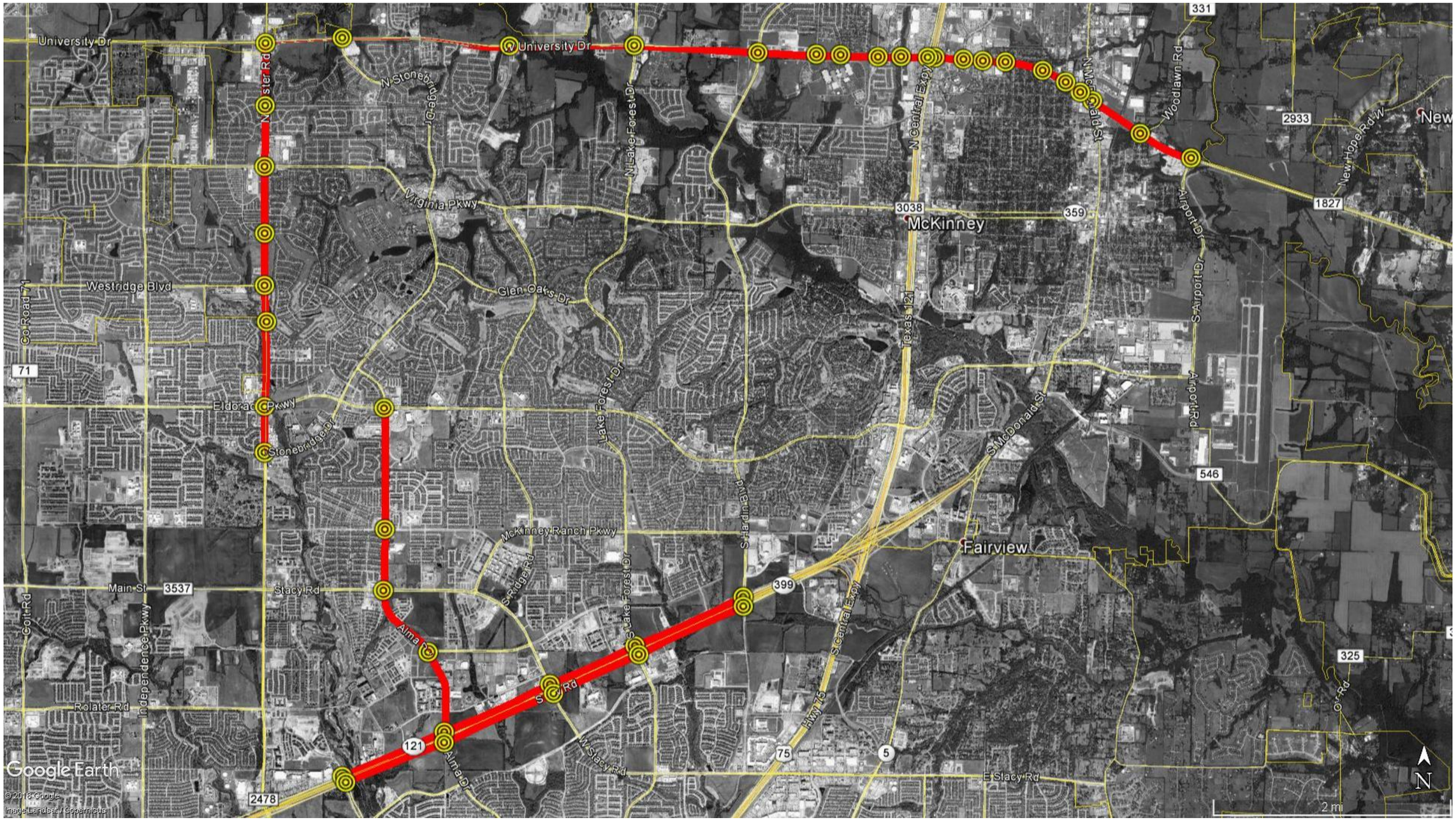

Figure 8. RTSRP II McKinney Corridors

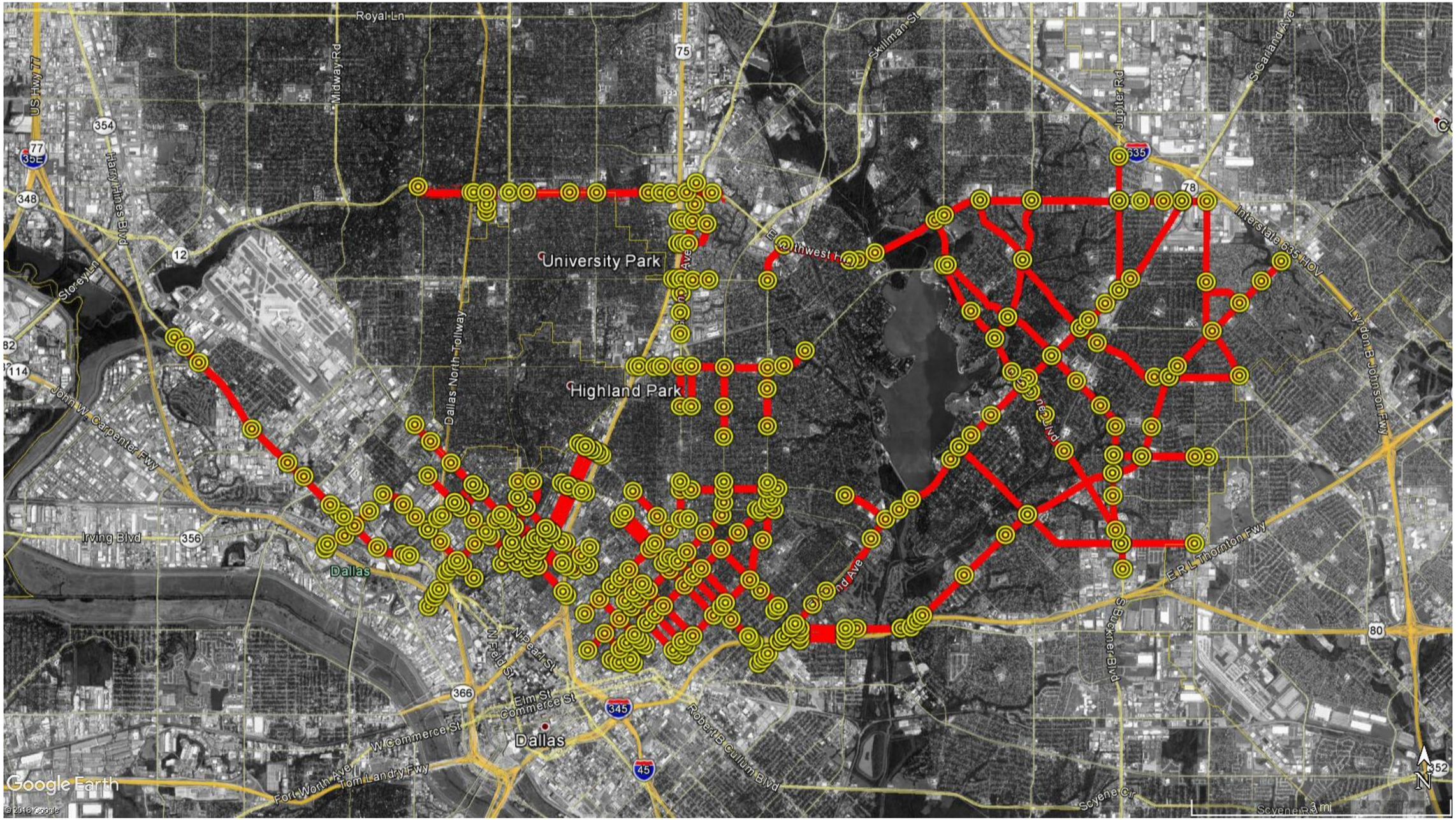

Figure 9. RTSRP II Dallas Corridors

Figure 10. RTSRP II Carrollton Corridors

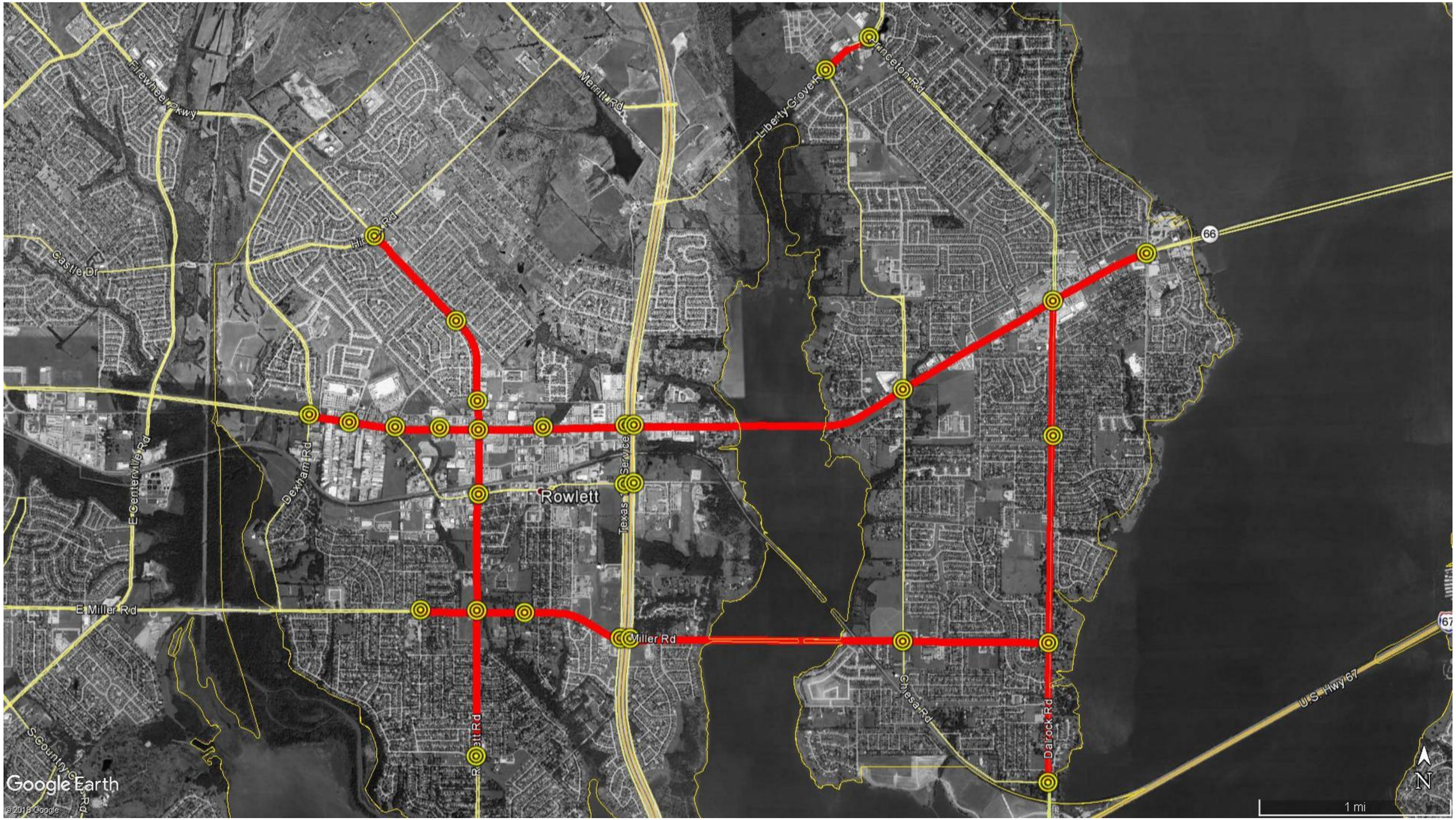

Figure 11. RTSRP II Rowlett Corridors

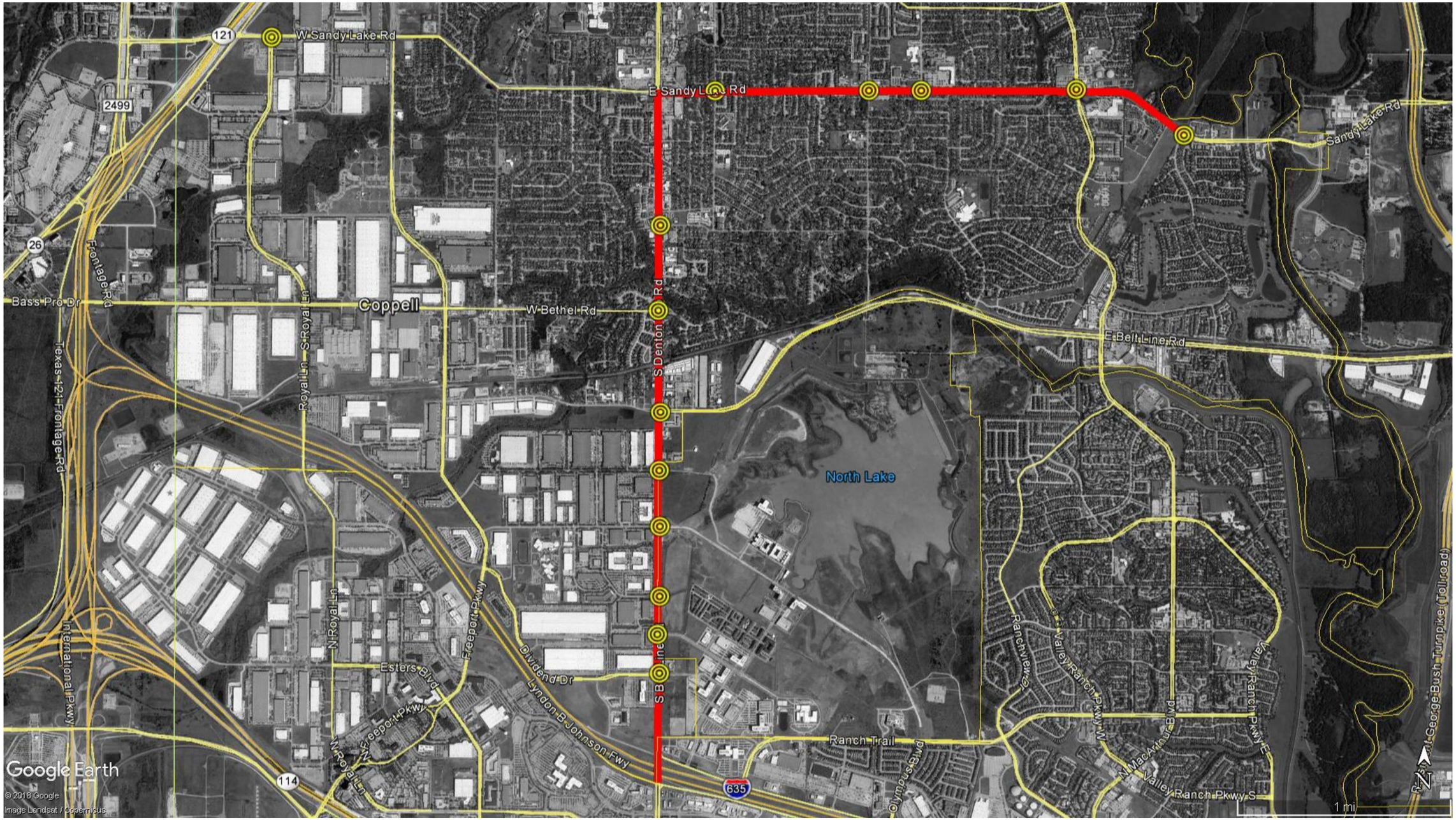

Figure 12. RTSRP II Coppell Corridors

Table 1. Measured Travel Time Benefits

Corridor Information							Annual Benefits	
							From Travel Times	
City	Corridor	Travel Time Route(s)	From	To	Signals	Length (mi)	Annual Reduction in Delay (veh-hr) [A]	Peak Hour Annual Delay Savings [B]
Mansfield	FM 157	FM 157	Hunt St	Turner Warnell Rd	12	5.6	57,040	$1,183,580.00
	Broad Street	Broad Street	Day Miar Rd	Walnut Creek Dr	12	5.2	125,468	$2,603,461.00
				Total	24	10.9	182,508	$3,787,041.00
Allen	Stacy Road	Stacy Road	Watters Rd	Angel Pkwy	8	2.8	133,675	$2,773,756.25
	Exchange Parkway	Exchange Parkway	Ridgeview Dr	Angel Pkwy	12	5.7	127,071	$2,636,723.25
	McDermott Drive	McDermott Drive	Shallowater Dr	Angel Pkwy	14	6.3	214,766	$4,456,394.50
	Bethany Drive	Bethany Drive	Alma Rd	Angel Pkwy	12	5.1	140,706	$2,919,649.50
	Greenville Road	Greenville Road	Stacy Rd	Chaparral Rd	6	4.5	12,167	$252,465.25
	Alma Road	Alma Road	Sam Rayburn Tollway	Hedgcoxe Rd	6	3.8	-12,439	-$258,109.25
	Watters Road	Watters Road	Sam Rayburn Tollway	Bethany Dr	4	4.0	53,628	$1,112,781.00
				Total	62	32.1	669,574	$13,893,660.50
Plano	Spring Creek Parkway	Spring Creek Parkway	Custer Rd	14th Street	13	6.8	34,397	$713,737.75
	Parker Road	Parker Road	Midway Rd	Preston Rd	9	2.7	86,404	$1,792,883.00
	Custer Road	Custer Road	Sam Rayburn Tollway	Legacy Dr	8	3.8	46,301	$960,745.75
	Coit Road	Coit Road	Sam Rayburn Tollway	Legacy Dr	8	2.9	61,672	$1,279,694.00
	Park Boulevard	Park Boulevard	Midway Rd	Coit Rd	16	4.3	34,275	$711,206.25
	Plano Parkway	Plano Parkway	Marsh Rd	Dublin Rd	29	14.2	255,427	$5,300,110.25
	Sam Rayburn Tollway	Sam Rayburn Tollway	Spring Creek Pkwy	Custer Rd	20	7.6	-150,320	-$3,119,140.00
				Total	103	42.3	368,156	$7,639,237.00
McKinney	Custer Road	Custer Road	US 380	Stonebridge Dr	8	3.4	394,624	$8,188,448.00
	US 380	US 380	Custer Rd	Airport Dr	20	8.0	298,255	$6,188,791.25
	Alma Road	Alma Road	Eldorado Pkwy	Sam Rayburn Tollway	6	3.0	109,272	$2,267,394.00
	SH 121	SH 121	Exchange Pkwy	Hardin Rd	10	3.7	327,676	$6,799,277.00
				Total	44	18.1	1,129,827	$23,443,910.25
Dallas	Bus System	Gaston Avenue	Malcom X Blvd	Richmond Ave	18	2.8	84,665	$1,756,798.75
		Columbia/Main/Abrams	Haskell Ave	Belmont Ave	11	2.4	109,542	$2,272,996.50
		Haskell Avenue	Ross Ave	Elm St	8	1.1	102,473	$2,126,314.75
		Live Oak Street	Belmont Ave	Texas Ave	14	2.6	76,162	$1,580,361.50
		Ross Avenue	Belmont Ave	Hall St	13	2.0	2,067	$42,890.25
		Other/No TTR	N/A	N/A	64	10.0	N/A	N/A
				Total	128	20.8	374,909	$7,779,361.75
	Greenville Central - Mockingbird East	Mockingbird East	US 75	Williamson Rd	10	2.1	-79,298	-$1,645,433.50
		Greenville Central	Blackwell St	SMU Blvd	8	1.8	58,591	$1,215,763.25
		Other/No TTR	N/A	N/A	15	3.7	N/A	N/A
				Total	33	7.6	-20,707	-$429,670.25
	Harry Hines	Harry Hines Boulevard	Shorecrest Dr	Vagas St	14	3.8	129,625	$2,689,718.75
		Medical District Drive	Bengal St	IH 35	4	0.7	N/A	N/A
				Total	18	4.5	129,625	$2,689,718.75
	Northwest Highway	Northwest Highway	Inwood Rd	Shady Brook Ln	15	3.4	-56,330	-$1,168,847.50
				Total	15	3.4	-56,330	-$1,168,847.50
	Oak Lawn	Oak Lawn Avenue	Avondale Ave	Hi Line Dr	11	2.0	153,625	$3,187,718.75
		Lemmon Avenue	Hudnall St	Haskell Ave	16	2.7	227,758	$4,725,978.50
		Maple Avenue	Kings Rd	Wycliff Ave	8	1.5	N/A	N/A
		Other/No TTR	N/A	N/A	22	10.1	N/A	N/A
				Total	87	23.1	268,723	$5,576,002.25
	East Dallas	Ferguson Road	Samuell	Woodmeadow	21	8.8	233,652	$4,848,279.00
		Buckner Boulevard	Northwest Hwy	John West	12	4.7	110,055	$2,283,641.25
		Garland Road/Grand Avenue	Fitzhugh	Northwest Hwy	27	7.9	43,519	$903,019.25
		Northwest Highway	Buckner	Shiloh	14	5.6	-163,855	-$3,399,991.25
		Other/No TTR	N/A	N/A	16	18.5	N/A	N/A
				Total	90	45.5	223,371	$4,634,948.25
Carrollton	Josey Lane	Josey Lane	Parker Rd (FM 544)	Fyke Rd	20	7.0	174,115	$3,612,886.25
	Luna Road	Luna Road	PGBT	Diplomat Dr	6	3.5	-68,492	-$1,421,209.00
	Frankford Road	Frankford Road	IH 35	Furneaux Ln	10	3.8	52,754	$1,094,645.50
	Keller Springs Road	Keller Springs Road	Denton Dr	Midway Rd	8	4.1	38,552	$799,954.00
	Misc	Other/No TTR	N/A	N/A	15	5.4	N/A	N/A
					59	23.7	196,929	$4,086,276.75
Rowlett	Lakeview Parkway	Lakeview Parkway	Dexham Rd	Scenic Drive	11	4.6	303,053	$6,288,349.75
	Miller Road	Miller Road	Carla Dr	Dalrock Rd	7	3.3	28,659	$594,674.25
	Rowlett Road	Rowlett Road	Hickox Rd	Chaha Rd	5	2.9	124,554	$2,584,495.50
	Misc	Other/No TTR	N/A	N/A	6	2.8	N/A	N/A
				Total	29	37.3	653,195	$13,553,796.25
Coppell	Sandy Lake Road	Sandy Lake Road	Denton Tap Rd	Riverchase Dr	6	2.5	-123,208	-$2,556,566.00
	Denton Tap Road	Denton Tap Road	IH 635	Sandy Lake Road	8	3.9	52,147	$1,082,050.25
				Total	14	6.4	-71,061	-$1,474,515.75
RTSRP II Total					706	275.56	4,048,719	$84,010,919.25

Note A: Based on the following:
- Bidirectional Delay Reduction
- Average Peak Period Bidirectional Volume
- 2 hours per AM peak period per weekday
- 5 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday
- 5 weekdays and 1 Saturday per week
- 52 weeks per year
- 260 weekdays per year
- 52 Saturdays per year
Note B: Based on NCTCOG's Mobility 2045 value of time of $20.75 per passenger car hour

Table 2. Modeled Synchro Benefits (Annual Values)

Corridor Information		Annual Benefits From Synchro™ A						
City	Corridor	Total Signal Delay (veh-hrs)	Stops	Total Travel Time (veh-hrs)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
Mansfield	FM 157	226,460	5,926,180	121,420	159,120	11,115	2,158	2,579
	Broad Street							
Allen	Stacy Road	430,040	16,596,840	264,680	247,780	17,233	3,354	3,993
	Exchange Parkway							
	McDermott Drive							
	Bethany Drive							
	Greenville Road							
	Alma Road							
	Watters Road							
Plano	Spring Creek Parkway	1,225,380	29,155,360	968,500	925,600	64,706	12,589	14,989
	Parker Road							
	Custer Road							
	Coit Road							
	Park Boulevard							
	Plano Parkway							
	Sam Rayburn Tollway							
McKinney	Custer Road	577,460	3,043,300	282,620	152,100	10,595	2,054	2,447
	US 380							
	Alma Road							
	SH 121							
Dallas	Bus System	88,140	3,933,540	-22,620	224,380	15,676	3,048	3,632
	Greenville Central - Mockingbird East	1,201,460	1,698,580	1,131,780	821,600	57,414	11,172	13,314
	Harry Hines	146,120	138,580	139,620	110,500	7,696	1,500	1,796
	Northwest Highway	22,360	5,664,100	-63,440	-69,940	-4,934	-956	-1,152
	Oak Lawn	243,100	13,763,360	139,880	135,460	9,493	1,846	2,197
	East Dallas	30,160	12,558,000	277,940	424,320	29,627	5,775	6,869
Carrollton	Josey Lane	706,680	5,453,760	784,940	492,960	34,450	6,703	7,982
	Luna Road							
	Frankford Road							
	Keller Springs Road							
Rowlett	Lakeview Parkway	672,100	14,773,200	724,880	728,000	50,869	9,900	11,786
	Miller Road							
	Rowlett Road							
Coppell	Sandy Lake Road	85,020	8,649,940	84,500	165,100	11,604	2,246	2,680
	Denton Tap Road							
RTSRP II Total		*5,654,480*	*121,354,740*	*4,834,700*	*4,516,980*	*315,544*	*61,389*	*73,112*

Note A: Based on the following:
- 2 hours per AM peak period per weekday
- 5 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday
- 5 weekdays and 1 Saturday per week
- 52 weeks per year
- 260 weekdays per year
- 52 Saturdays per year