EXHIBIT D

(URBAN ENGINEERS SCOPE OF WORK AND FEE PROPOSAL)

Stamford Traffic Signal Optimization Project

Task 1 – Project Management

The selected Consultant shall provide all necessary project management for this project, including but not limited to, the following:

A. Project Meetings

Consultant shall schedule, coordinate, document, and provide all presentation material for all project meetings. City Project Manager will coordinate meeting space based on availability. The following meetings are anticipated for the project:

- Regular bi-weekly (every 2 weeks) project progress meetings
- Project kick-off meeting
- Three (3) public input meetings
- Semi-final report meeting

Based on City's estimated one (1) year project timeframe we are estimating 26 bi-weekly meetings. We are assuming that 20 of the 26 meetings will be completed via a conference call with six (6) in-person meetings. It is assumed the Project Meeting task will cover Urban's attendance at any Public Involvement meetings.

B. Documentation

Consultant shall be responsible for project documentation, including but not limited to, preparing meeting agendas, minutes of meeting, action report, design methodologies, projects reports, etc. All project material shall be available for inspection by the City during business hours.

Type and format of reports shall be approved by the City Project Manager prior to use. Use of electronic files (PDF, Excel, WORD) is required in addition to hard copy.

C. Project Schedule & Time-line

A tentative project schedule is included in the Appendix. Consultant may recommend alternative project schedule for consideration and approval by the City Project Manager.

Task 2 – Public Involvement & Participation

The City of Stamford will complete all Public Involvement & Participation tasks including setting up and attending any Public Involvement sessions. Urban assumes that as part of the project management task Urban will assist the City with preparing materials for the public information centers (assumed 4 hours per public involvement session). The City of Stamford will complete all Public Involvement & Participation tasks including setting up and attending any Public Involvement sessions.

Task 3 – Data Collection

A. Volumetric Data

Consultant shall collect all required traffic data for this project. The data shall include, but not limited to the following:

- Intersection turning movement counts (TMC) with pedestrian, bicycle, buses and heavy vehicles.
- Mid-block directional classification counts for weekdays and weekends.
- Travel time & delay studies for selected corridors.

Consultant shall propose the most efficient and non-intrusive methodology for the collection of the traffic data, in conformance with the requirements of the project. Use of proven non-intrusive devices is permitted for data collection upon approval by the City. Data collection will at minimum include intersections and mid-blocks within the corridors identified below (Route number added for identification purposes):

1. Washington Blvd – Pacific St to Long Ridge Rd
2. E Main St/Tresser Blvd/W Main St – Alvord Ln to Weed Ave
3. Bedford St/Atlantic St – High Ridge Rd to Washington Blvd
4. Summer St – Bedford St to Main St
5. Hope St – Bouton St to E Main St
6. Canal St/Greyrock Pl – Henry St to Broad St
7. Shippan Ave – Harbor Dr to Elm St/Cove Rd
8. Cove Rd – Elm St/Shippan Ave to Weed Ave
9. Strawberry Hill Ave/Newfield Ave/Grove Street/Elm St–Weed Hill Ave to Shippan Ave/Elm St
10. High Ridge Rd – Bedford St to Merritt Parkway
11. Long Ridge Rd – Bedford St to Merritt Parkway
12. Broad St – Stillwater Rd to E Main St
13. Courtland Ave/Glenbrook Rd – Oakdale Rd to E Main St
14. S State St – Greenwich Rd to Elm St
15. N State St – Elm St to Washington Blvd
16. Main St – Washington Blvd at Atlantic St
17. Stillwater Rd – Stillview Rd to W Main St
18. Greenwich Ave – Pulaski St to E Main St/Tresser Blvd
19. Selleck St – Greenwich Ave to Fairfield to Fairfield Ave
20. Palmers Hill Rd – Havemeyer Ln to Stillwater Rd
21. West Ave – Selleck St to E Main St
22. Harvard Ave – Selleck St to E Main St

Table 1 shows each data collection Route number, start and stop cross-streets, the total number of signals on the Route, and the unique number of intersections on the Route. The unique number of intersections is the total number of signalized intersections that will be included in the Task 4 System Modeling.

Table 1: Data Collection Routes and Number of Signals

Stamford Section #	Data Collection Route #	Road	Cross Streets		# Signals		
			Start	End	Unique	Overlap	Total
3/6	1	Washington Blvd	Pacific St	Long Ridge Rd	22	0	22
2/3/9	2	E. Main St/Tresser Blvd/W. Main Street (RT 1)	Alvord Ln	Weed Ave	25	1	26
1/3	3	Bedford St/Atlantic St	High Ridge Rd	Washington Blvd	19	2	21
1/3	4	Summer St	Bedford St	Main St	12	1	13
3/15/16	5	Hope St	Bouton St	E. Main St	16	1	17
3	6	Canal St/Greyrock Pl	Henry St	Broad St	8	1	9
11	7	Shippan Ave	Harbor Dr	Elm St/Cove Rd	3	0	3
11	8	Cove Rd	Elm St/Shippan Ave	Weed Ave	3	1	4
3/13/17	9	Strawberry Hill Ave/Newfield Ave/Grove St/Elm St	Weed Hill Ave	Shippan Ave/Elm St	16	2	18
6/7	10	High Ridge Rd	Bedford St	Merritt Pkwy	18	1	19
6/19	11	Long Ridge Rd	Bedford St	Merritt Pkwy	10	2	12
3	12	Broad St	Stillwater Rd	E. Main St	6	6	12
2/15	13	Courtland Ave/Glenbrook Rd	Oakdale Rd	E. Main St	5	1	6
3	14	South State St	Greenwich Ave	Elm St	2	4	6
3	15	North State St	Elm St	Washington Blvd	2	4	6
3	16	Main St	Washington Blvd	Atlantic St	0	3	3
12	17	Stillwater Rd	Stillview Rd	W. Main St	8	2	10
3	18	Greenwich Ave	Pulaski St	E. Main St/Tresser Blvd	2	2	4
10	19	Selleck St	Greenwich Ave	Fairfield Ave	2	0	2
12	20	Palmers Hill Rd	Havemeyer Ln	Stillwater Rd	3	1	4
9	21	West Ave	Selleck St	E. Main St	3	1	4
9	22	Harvard Ave	Selleck St	E. Main St	2	1	3
				Total	187	-	-
				Not Included in Data Collection	22	-	-
				Total in City	209	-	-

Notes:

Unique	Unique number of signal on the Route. If a signal was counted on a previous route it was not counted in this column.
Overal	Number of signals that overlap with a previously counted route.
Total	Total number of signals on the Route

Use of citizen volunteers for collection of travel data is encouraged. Consultant shall provide the methods and means of data collection and provide training when volunteers are used.

All data shall be collected while schools are in session and shall not occur immediately before, during and immediately after holidays. Specifically, data collection is not permitted from 11/23/2016 through 11/27/2016 and from 12/19/2016 to 1/9/2017.

All data shall be provided both in Excel and PDF formats. Mid-block counts shall be also presented in graphical format indicating the directional peaking characteristics.

Data Collection Plan

Prior to the actual data collection event, Urban will generate a Data Collection Plan (DCP). The DCP will include each data type to be collected, methods of collection, schedule, data formats, police and other authority contacts, and quality control and quality assurance plans.

Turning Movement Counts

The turning movement counts (TMC) will be conducted using non-intrusive Miovision Scout video collection units temporarily mounted off the roadway to signal, utility or lighting poles. The TMC will include the following classifications:

- Passenger cars;
- Motorcycles;
- Buses;

- Single-unit trucks;
- Articulated trucks;
- Bicycles on the roadway, and
- Pedestrians.

The TMC data will be submitted in Excel (.xls), PDF, and Petra Pro (.ppd) formats.

By using Miovision Scout video collection units we can process data on an as-needed basis. The main benefit of this is the ability to select the time periods you want analyzed. This is a highly efficient method for data processing. The Urban Team will leave the Scout units at an intersection for several days (e.g., Wednesday to Sunday) and can then select which weekday to be processed back in the office. This helps reduce "poor" data collection days that include weather events, traffic incidents, and any other events that could result in unusual traffic patterns. Note that video for all intersections is indefinitely saved and additional time period processing can occur any time during the project, or even after the project is complete.

Another benefit is the ability to process peak periods for key intersections (i.e., Full Count) within a sub-zone. The Project Team will determine the zone peak hour and then process just the zone peak hour for the remaining intersections (i.e., Partial Count) within the zone. Table 2 shows the video processing hours for Full Count and Partial Count intersections.

Table 2: TMC Full and Partial Count Intersections

		FULL COUNT INTERSECTIONS		PARTIAL COUNT INTERSECTIONS	
Day of Week	Period	Count Hours	# Hrs	Count Hours	# Hrs
Weekday (Tue-Thr)	AM	6:30a – 9:30a	3	Peak Hour	1
	MID	11:00a – 2:00p	3	Peak Hour	1
	PM	3:30p – 6:30p	3	Peak Hour	1
Saturday	SAT	10:00a – 6:00p	8	Peak Hour	1
Total			17		4

Full Count intersections are designed to determine the peak hour for a specific coordination zone. The following criteria was used to determine the Full Count locations:

- Minimum of one per Route (22 total routes identified above);
- If there are more than 10 intersections on a Route, add an additional Full Count intersection (e.g., 32 intersections = 3 Full Count intersections);
- If there is a long break (~0.75 miles) between signals add a Full Count intersection, and
- Select locations where Routes overlap as this will give us data for both routes

The Urban Team will assume 20 intersections for the Full Count data processing and 167 intersections for Partial Count processing.

For the 22 signalized intersections not included in data collection program, Partial Counts, pedestrian clearance distances and other intersection data will be collected as outlined in Task 3B, Intersection Inventories.

Mid-block Directional Classification Counts

The mid-block directional counts, also known as automatic traffic recorder (ATR) counts, help understand not only the types and quantities of vehicles on the roadway, but also the directional travel patterns throughout the day. The directional travel patterns from the classification counts

help to develop the amount of Time-Of-Day patterns and hours for each plan (e.g., AM Plan from 5:00-10:30 AM).

The Miovision Scout units discussed for the TMCs will also be used for the ATR counts. The Scout units will be temporarily mounted off the roadway at mid-block locations where traffic is generally free-flowing. The proposed ATR locations were based on the premise of one ATR for every Full Count intersection TMC location within a coordinated zone. The ATR data to be processed will include 24 hours of weekday data and 24 hours of Saturday data. ***Attachment 1*** is the proposed draft ATR location map.

Travel Time Data (Urban GPS-based)
Travel time data will be collected for use in system model calibration and Before/After study comparisons. The Urban Team will collect GPS-based travel time data using a laptop enabled with the Tru-Traffic software program connected to a GPS data logger. Travel time data will be collected at all data collection Routes listed in Table 1 with the exception of the following:

- Route #7 – Shippan Ave: 2 signals
- Route #16 – Main Street: 3 signals
- Route #19 – Selleck St: 3 signals
- Route #20 – Palmers Hill Rd: 3 signals

Travel time data will be collected during the AM, MID and PM peak periods for a total of 7.5 hours spread across the three periods. The SAT model will be calibrated, as needed, based on adjustments made for other time periods and Citizen GPS-based travel times as described below.

Travel Time Data (Citizen GPS-based)
The Urban Team will provide a method for citizens to participate in the travel time data collection process by using the project website and public involvement process to facilitate the information and instructions on how to participate. The citizen participants will download a free smartphone application from the Android and Apple application stores and instructions will be provided on how to download, install and use the application, as well as methods for getting the data back to the project team.

B. Intersection Inventories

Consultant shall field review all signalized intersection and perform a detailed inventory and condition of signal equipment, including but not limited to, controller, controller cabinet, detection system, communication lines and devices, signal support, signal and pedestrian display, and intersection signs. The inventory shall also include the geometric conditions, lane designations, pedestrian distances, and posted limits.

The product of this sub-task shall include intersection schematics and spreadsheet containing all relevant signal equipment and their condition. Photographs of each approach and conditions shall also be provided. All information must be presented in approved and legible format. Use of CAD is not required.

City shall provide a list of all signals and equipment to the Consultant prior to start of this Task.

The Urban Team will complete intersection inventories for all 187 signalized intersections identified in Table 1. The inventory will include the following information:

- Red line markup of City provided signal plan PDF's including just the Movement Diagram Box (not including Detector Box, Coordination Type/Program Box, Pre-emption Box, or the main Intersection/Signal box);
- Pedestrian clearances distances for all marked crosswalks;
- Posted speed limits for all approaches, and
- Photo's for each approach at each intersection organized in folders.

The Urban Team will collect pedestrian crossing distances, speed limits, and photos at the remaining 22 signals in the project area.

Existing signal timings will be provided by the City using their existing UTCS (STDWIN) and ATMS.now Central software programs, and the Urban Team will spot check signal timings (assumed to be 1 check per Route – total of 22) in the field as necessary.

Saturation flow rate studies will be completed at one intersection per coordinated route with more than 15 signalized intersections. This information will be used to update saturation flow rate values in the system model if necessary.

It should be noted that controllers are assumed to be new Trafficware/Naztec controllers or in the process of being replaced. Communication lines and devices are located underground and will not be verified as part of this task.

Deliverables for this task include partial Red line markups (as described above) for 187 intersections, a spreadsheet including speed limit and pedestrian crossing distances, one photo per approach organized in folders, and all collected field signal timings.

Task 4 – Data Analysis & Modeling

A. Data Analysis

Consultant shall analyze the data collected under Task 3 (A) & (B), to evaluate the operating characteristics of the corridors and/or signalized intersection and determine weekday and weekend peaking characteristics. In conjunction with the street network, the data should be used to determine the limits of sections or sub-sections for the coordinated signal systems.

Turning Movement Counts

The turning movement counts (TMC) collected as part of Task 3A will be processed to determine a peak hour for the coordinated zone. The zone peak hours will be based on intersections where Full Counts were completed (see Task 3A). Once a zone peak hour is determined at the Full Count intersection, the remaining intersections in the zone will be processed for only the zone peak hour (referred to as Partial Counts in Task 3A). Peak hour volume figures will be developed for each peak period (i.e., AM, MID, PM, and SAT) for all intersections where TMC are completed.

Mid-Block Directional Classification Counts

The mid-block directional counts, also known as automatic traffic recorder (ATR) counts, completed during Task 3A data collection will be processed. The processed ATR counts will include PDF's of the raw data, 24-hour graphs for weekday and Saturday counts, and any supplemental data used during the coordinated zone or Time-of-Day timing plan development.

Time-of-Day Plan Development

A brief memo will be provided on the Time-of-Day (TOD) plan development which will include a separate discussion for each coordinated zone. Details for each zone will include existing TOD schedule, ATR graphs, and any other items that impact how the TOD schedule was developed such as land use, speed limits, engineering judgement, and City/public input.

Before Travel Time Data
The GPS-based travel time data collected as part of Task 3A will be processed and include raw travel time data, peak period travel time, and summery sheets per zone.

B. System Modeling
Consultant shall select and recommend for approval, a modeling technique for simulation and optimization of the traffic signals and signal systems. The software (s) used for modeling shall appropriately be selected for application for isolated intersection, linear corridors, and crossing arterials, and networks. Consultant shall provide all input variables for the modeling, including but not limited to, distance between intersections, pedestrian crossing measurements, lane configurations, phasing, saturation flow rates, etc. The modeling shall include the following two (2) scenarios:

1. Existing operations simulation (base-line).
2. Optimum timings given existing geometry & phasing

4B-1a. Existing Base Operations
The operations analysis will be completed using the Synchro suite of products including Synchro for the macroscopic modeling and SimTraffic microsimulation for calibration to existing field conditions. The model will be developed in Synchro version 8 or 9 based on the City's preference. The Base Synchro model will include the 187 signalized intersections where TMC data was collected as defined in Task 3A and Table 1. Unsignalized mid-block locations will be added to the Base Synchro model as needed. The Base Synchro model development includes the following:

- Geometry based on aerial orthophotography;
- Node numbers matching Stamford's *Optimization Scope of Work* (RFQ Attachment #1);
- Street names;
- Speed limits;
- Lane widths;
- Approach grades;
- Right turn on red;
- Vehicle turning speeds;
- Field signal timings, and
- Detector settings.

4B-1b. Existing Conditions Synchro Models
Once the Base Synchro model is completed, Urban will develop four (4) peak hour Synchro models including the following:

- Weekday morning peak hour (AM);
- Weekday mid-day or off-peak (MID);
- Weekday evening (PM), and
- Saturday (SAT).

Each of the four (4) Existing Conditions peak hour Synchro models will include implementation of the following data:

- Turning movement counts;
- Pedestrian volumes;
- Heavy vehicle percentages (based on TMC data);
- Peak hour factors by approach;
- Vehicle turning speed adjustments;
- Saturation flow rate;
- Signal timing changes per existing TOD schedule.

4B-1c. Existing Conditions Synchro Models Calibration

Calibration is an iterative process where differences between field and model data are identified and resolved based on further investigation of the field data. Specific model parameters have an impact and can generate a more realistic driver behavior, including lane alignment through an intersection, turning speeds, lane change distances, headway factors and entering blocked intersections. Adjustment of these parameters helps bridge the gap between field and model data to enable model calibration. We follow Federal Highway Administrations' Guidelines for Applying Traffic Microsimulation Modeling Software for calibration and include three key targets:

- Modeled versus observed travel times within 15%;
- Modeled versus observed vehicles processed within 5%, and
- Visually acceptable queuing.

Urban will run 10 SimTraffic "seeds" and processed results will be an average of these 10 runs. The following measure of effectiveness (MOE) results will be provided from Synchro and SimTraffic:

- Average vehicle delay by approach and overall intersection;
- Level of Service (LOS) by approach and overall intersection;
- Travel time along major routes by coordinated zone, and
- Network-wide performance measures including Total Delay, Stops/Vehicle, Travel Time, Fuel Consumption, and emissions (HC, CO, NOx).

4B-2. No Build Conditions

Prior to the signal optimization alternatives, the vehicle and pedestrian clearance calculations will be completed based on the CTDOT process for clearance calculations for all 209 signalized intersections in the project area. Four (4) No Build Conditions models will be developed based on the calibrated Existing Conditions models from Task 4B-1c, where the clearance calculations will be updated in the four (4) Synchro models. Synchro and SimTraffic model MOE results will be processed for the No Build models as described in Task 4B-1c.

4B-3. Alternative 1 – Optimum Timings with Existing Geometry & Existing Phasing

Signal optimization is an iterative process of adjusting cycle, splits and offsets at the intersections within a coordinated zone to provide the desired results and achieve the goals for that specific zone. In addition to utilizing Synchro, our signal optimization process includes using the Tru-Traffic software program for cycle length optimization, offset optimization, and time-space and platoon-progression diagrams to visualize the traffic flows along the corridor.

Alternative 1 analysis will be completed based on starting with the four (4) No Build models. Synchro and SimTraffic model MOE results will be processed for the Alternative 1 models as described in Task 4B-1c. The Alternative 1 results will be compared to the No Build results.

4B-4. Summary Results Comparison
A master table comparing the Existing, No Build, and Alternative 1 results will be compiled and will include the MOE results as described in Tasks 4B.

C. Timing Intervals
Consultant shall provide the final local timing chart and system coordination values in electronic format for direct input into intersection and central control. A hard copy of the timing intervals shall also be provided.

The local timing chart shall include all variables by phase, including but not limited to min green, max green, gap, clearance intervals (yellow & all-red), walk & flashing don't walk, detector function, etc. Consultant shall provide the timing chart in the format required for the specific type of controller operating at the intersection at the time. The format of the timing chart and the methodology for calculation of the intervals shall be approved by City.

The synchronization values shall including all required variable, including but not limited to; cycle, splits, offsets, time-of-day, etc. The coordination values shall be provided in a format specific to the central control software and local controllers. Consultant shall develop as many patterns as necessary for the optimum operation of the coordinated section or sub-section. A minimum of 3 patterns are required for morning, off-peak, and afternoon peak.

The local timing chart and system coordination values will be submitted in the CTDOT Movement Diagram format using Excel to generate the "Program" and "Coordination Type" sections of the timing block. ***Attachment 2*** shows a sample signal timing submission. The effort required to develop this Movement Diagram box includes the following per intersection for 187 intersections:

- Add proposed clearance calculation timings for Y, R, WALK, FDW, DW
- Add proposed Time-of-Day (TOD) Program, cycle length, offset, phase splits, master intersection and coordinated intersection numbers.
- It is anticipated that five (5) signal timing programs will be developed. The AM, MID, PM, and SAT timing programs will be based on the results of the traffic modeling. An OFF PEAK plan will be developed based on the ATR traffic volumes and the MID timing plan.

Urban Team member New England Traffic Solutions verified this format will allow them to implement the timings locally in Trafficware/Naztec controllers and Trafficware's ATMS.now central system. The Urban Team will address any comments from the City on the Draft timings submission and re-submit the Final timings. The following assumptions are included as part of this effort:

- Urban is not updating the intersection signal plans,
- City of Stamford will provide PDF or DGN of 100% of the signal plans

Task 5 – Timing Implementation

Upon approval of the timing plans by the City, Consultant shall begin implementation of the newly designed timings at each intersection and at central ATMS software. Consultant shall only use experienced and qualified (IMSA Signals Level II or above) personnel for this activity. Implementation shall occur during an off-peak period as approved by the City.

Prior to implementation, Consultant shall provide an implementation plan, listing locations and times of implementation; for approval by the City. City will authorize implementation after public announcements and notification to law enforcement.

Consultant shall have qualified on-call personnel 24/7 to address issues and concerns during implementation. The response time shall be less than 2 hours.

The Urban Team will develop an Implementation Plan outlining when each corridor is to be implemented and during what day and hours of the week. The team will focus on implementing complete Routes together and during off-peak time periods. New England Traffic Solutions will complete the signal timing implementation under a separate task order directly through the City of Stamford.

Task 6 – Fine Tuning

Upon the implementation of the timings, Consultant shall field review each weekday and weekend timing pattern and note any and all in-efficiencies and provide and implement modifications as required. Consultant shall track and document all changes as they occur.

Consultant shall incorporate information provided during public input sessions regarding the system operations. City shall provide a list of reported in-efficiencies to the Consultant prior to or during fine-tuning task.

The Urban Team is under the assumption that all 187 signalized intersection where implementation will occur will have Naztec/Trafficware controllers and be connected to the ATMS.now central system. Once the timings are implemented the City and New England Traffic Solutions will electronically print the signal timings from the ATMS.now system, and provide them to Urban who will compare to the approved Movement Diagram blocks. The Urban Team will spot check signal timings (assumed to be 1 check per Route – total of 22) in the field as necessary.

Additionally, during the After Study (Task 7) travel time runs, the Urban Team will verify conditions and timing plans during the AM, MID and PM periods for all corridors shown in Table 1. For the SAT timing plan, the following locations will be investigated:

- Washington Blvd – Pulaski to Hoyt
- Tresser Blvd – Stillwater to E main
- Broad St – Adams to E Main
- Atlantic St/Bedford St – Henry to Hoyt
- Summer St – Main to 7th
- High Ridge – Bulls Head to Merritt
- Bulls Head confluence operation

Input received from the public and City, along with field review from the Urban Team, will be documented and signal timing fine tuning adjustments will be made accordingly. New England Traffic Solutions, contracted separately from this contract through the City, will implement the fine tuning adjusted signal timings prior to the After travel time study.

Task 7 – Before & After Study

Consultant shall provide a methodology for performing a "before" and "after" analysis for approval by the City. After completion of the fine-tuning Task, Consultant shall repeat the travel time for the selected corridors listed under Task IV (a); and perform a comparison between the "before" and "after" conditions.

In general, certain measures of effectiveness (MOE's) shall be measure for the operating base condition and after completion of the fine-tuning. The MOE's shall include:

- Travel time
- Delays
- Number of stops
- Cost to motorists
- Fuel consumption
- Air pollution

A "before" and "after" draft report shall be submitted to City for approval prior to Final Report.

The Before travel time study is described in detail in Task 3A including the following three sections for the three types of travel time data collection:

- Travel Time Data (Urban GPS-based)
- Travel Time Data (Citizen GPS-based)

The same travel time data collection methods and Routes as described in Task 3A will be completed for the After conditions. MOE's comparing the Before and After conditions for the data collection Routes will include travel time, delays, number of stops, fuel consumption and air pollution as determined from the Tru-Traffic software program. The requested cost to motorists will be a separate calculation.

Task 8 – Final Report

Consultant shall assemble a final report compiling the data, procedures, analysis and results of the project. The Final Report shall be provided in two (2) volumes. Volume 1 shall be the report and volume 2 shall be the project data.

Consultant shall provide the Final Report in PDF format on disks and hard copies. A minimum 10 disks and 5 paper copies are required.

All traffic volumes and timings shall also be provided in Excel format on a separate disk to the City.

RFQ No. 704
Stamford Traffic Signal System Optimization

DATE: October 24, 2016
CONSULTANT: Urban Engineers, Inc.
CLIENT: City of Stamford

I. SCOPE OF SERVICES BREAKDOWN BY MAN-HOURS & STAFFING BY CLASSIFICATION

TASK NO.	Description	DEPT. MANAGER PVII	PROJ. MANAGER PVII	SR. ENGR. PVI	SR. ENGR. PV	PROJ. ENGR. PIV	PROJ. ENGR. PIV	ENGR. PIII	JR. ENGR. PIII	JR. ENGR. PII	JR. ENGR. PI	TOTAL
1	**Project Management**											
	Project Kick-Off Meeting		8		8							16
	Bi-Weekly (every 2 weeks) progress meetings [20 Conference Calls]		20		20							40
	Bi-Weekly (every 2 weeks) progress meetings [In-Person -- Assume 6]		24		24							48
	Semi-Final Report Meeting		8		8							16
	Documentation (Meeting Agendas, Meeting Minutes, Action Reports, etc.)		24		48							72
	Project Management/Coordination (With Stamford and Sub-Consultants)		40		40							80
	Project Management Hour Totals		**124**		**148**							**272**
2	**Public Involvement & Participation**											
	(Stamford to complete PI tasks)											
	Public Involvement & Participation Hour Totals											
3A	**Data Collection - Volumetric Data**											
	Data Collection Plan (DCP) Preparation		4		24						40	68
	Turning Movement Counts (TMC)				24						20	44
	Mid-Block Direction Classification Counts				8						8	16
	Before Travel Time & Delay Field Runs (Urban GPS-based)				32						40	72
	Before Travel Time & Delay Field Runs (Citizen GPS based)				8						24	32
	Data Collection - Volumetric Data Hour Totals		**4**		**96**						**132**	**232**
3B	**Data Collection - Intersection Inventories**											
	Field Review for 209 signals		4		8							12
	Data Processing/Reduction (Spreadsheets for submission)		2		4							6
	Saturation Flow Rate Studies (1 per coordinated zone -- assume 22)		2		8						16	26
	Field Signal Timings (Spot Checks -- assume 22 checks 1 TOD check per int)				4						16	20
	Data Collection - Intersection Inventories Hour Totals		**8**		**24**						**32**	**64**
4A	**Data Analysis & Modeling - Data Analysis**											
	Turning Movement Count Data Processing/Reduction				24						80	104
	Coordinated Sub-Zone Development & Peak Hour Analysis		4		24						24	52
	Turning Movement Count (TMC) Volume Figures		2		16						80	98
	Mid-Block Directional Classification Counts Data Processing/Reduction (including Graphs)		2		16						80	98
	Time-Of-Day (TOD) Plan Development		2		16						24	42
	Before Travel Time & Delay Field Runs (Urban GPS-based) Data Processing/Reduction		2		16						80	98
	Before Travel Time & Delay Field Runs (Citizen GPS-based) Data Processing/Reduction		1		8						40	49
	Data Analysis & Modeling - Data Analysis Hour Totals		**13**		**120**						**408**	**541**

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I. SCOPE OF SERVICES BREAKDOWN BY MAN-HOURS & STAFFING BY CLASSIFICATION

TASK NO.	Description	DEPT. MANAGER PVII	PROJ. MANAGER PVII	SR. ENGR. PVI	SR. ENGR. PV	PROJ. ENGR. PIV	PROJ. ENGR. PIV	ENGR. PIII	JR. ENGR. PIII	JR. ENGR. PII	JR. ENGR. PI	TOTAL
4B	**Data Analysis & Modeling - System Modeling**											
4B-1	**EXISTING CONDITIONS**											
	Base Synchro Model for all 209 signals		30		140						370	540
	Existing Conditions Synchro Models (Assume 4 models)		30		190						370	590
	Existing Conditions Synchro Models (Assume 4 models) Calibration		40		360						370	770
	Synchro/SimTraffic Post-Processing Spreadsheet Development (For Results Summary)		8		40						120	168
	Synchro/SimTraffic Results Summary Processing		4		8						16	28
4B-2	**NO BUILD CONDITIONS**											
	Vehicle and Pedestrian Clearance Calculations (Review of FHI Calculations)				20						40	60
	No Build Synchro Models for 4 Peaks (Update Clearance Calcs in Models)				24						40	64
	No Build Synchro/SimTraffic Results Summary Processing		4		8						16	28
4B-3	**ALTERNATIVE 1 - Optimum Timings with Existing Geometry & Existing Phasing**											
	Cycle/Split/Offset for 4 Peak Hour Synchro Models		30		600							630
	Alternative 1 Synchro/SimTraffic Results Summary Processing		4		8						16	28
4B-4	**SUMMARY RESULTS COMPARISON**											
	Summary table comparing, Existing, No Build and the Three Alternatives		4		8						16	28
	Data Analysis & Modeling - System Modeling Hour Totals		**154**		**1406**						**1374**	**2934**
4C	**Data Analysis & Modeling - Timing Intervals**											
	Draft Local Timing Chart & System Coordination (198 Signals)		32		95						190	317
	Address Stamford Comments and Finalize Timing Charts		4		24							28
	Data Analysis & Modeling - Timing Intervals Hour Totals		**36**		**119**						**190**	**345**
5	**Timing Implementation**											
	Draft Implementation Plan Development		8		40							48
	Address Stamford Comments and Finalize Implementation Plan		4		8							12
	Field Signal Timing Implementation (Coordination with NETS)		16		48							64
	Timing Implementation Hour Totals		**28**		**96**							**124**
6	**Fine-Tuning**											
	Field Signal Timing Verification (assume 22 intersection checks)				4						16	20
	Signal Timing Fine-Tuning Adjustments (Public, City, Urban input)		4		40							44
	Fine-Tuning Adjustment Tracking and Documentation		16		60						60	136
	Final Local Timing Chart & System Coordination (Electronic & PDF) after Fine-Tuning		2		16						40	58
	Fine-Tuning Hour Totals		**22**		**120**						**116**	**258**
7	**After Study**											
	After Travel Time & Delay Field Runs (Urban GPS-based)				32						40	72
	After Travel Time & Delay Field Runs (Urban GPS-based) Data Processing/Reduction		2		16						40	58
	After Travel Time & Delay Field Runs (Citizen GPS-based)				8						24	32
	After Travel Time & Delay Field Runs (Citizen GPS-based) Data Processing/Reduction		1		8						40	49
	Before and After Travel Time & Delay Comparison Summary		1		8						24	33
	After Study Hour Totals		**4**		**72**						**168**	**244**
8	**Final Report**											
	Draft Final Report		12		32						40	84
	Address Stamford Comments		2		8						16	26
	Final Report Submission		1		4						8	13
	Final Report Hour Totals		**15**		**44**						**64**	**123**

RFQ No. 704
Stamford Traffic Signal System Optimization

DATE: October 24, 2016
CONSULTANT: Urban Engineers, Inc.
CLIENT: City of Stamford

II. PAYROLL SUMMARY

JOB CLASSIFICATION	HOURS	WAGE RATE	DIRECT LABOR
PROJECT MANAGER	408	$72.00	$ 29,376.00
PROJECT ENGINEER	2245	$50.00	$ 112,250.00
JUNIOR ENGINEER	2484	$28.00	$ 69,552.00
SUBTOTAL II	5,137		$ 211,178.00

III. SUBCONSULTANTS & DIRECT EXPENSES

Travel (Mileage and Lodging)	$ 1,925.00
Reproduction	$ 645.02
RBA/NV5 (Data Collection - TMC/ATR)	$ 88,468.00
RHS Consulting (Data Collection - Intersection Inventory)	$ 21,210.00
RHS Consulting (Data Collection - Travel Time)	$ 58,949.00
FHI (Clearance Calculations)	$ 39,432.75
NETS (Implementation & Fine Tuning)	$ -
SUBTOTAL III	$ 210,629.77

IV. FEE ESTIMATE

DIRECT LABOR		$ 211,178.00
OVERHEAD (OH Rate x DL)	OH Rate = 136.48%	$ 288,215.73
FIXED FEE (Fee Factor x (DL+OH))	Fee Factor = 8.00%	$ 39,951.50
SUBCONSULTANTS & DIRECT EXPENSES		$ 210,629.77
TOTAL FEE		$ 749,975.00

The RBA Group, Inc.
An NV5 Company

October 27, 2016

Scott J. Diehl, PE, PTOE
Chief Traffic Engineer
Urban Engineers
220 Lake Drive East, Suite 300
Cherry Hill, NJ 08002

Re: Traffic Data Collection - City of Stamford Traffic Signal Optimization

Dear Mr. Diehl:

As requested, The RBA Group is pleased to provide the following scope of services for the above referenced project:

Task 1 – Automatic Traffic Recorder Counts

This task incudes the installation of 65 Miovision traffic data collection cameras installed in ATR mode to count a total of 65 individual lanes each for a total of 48 hours (24 hours on a Tuesday, Wednesday, or Thursday, and 24 hours on a Saturday), resulting in a total of 3,120 hours of ATR processing. The cameras will be installed over seven weeks. The video will be uploaded to Miovision for processing and the results provided indicating the peak hours at each count location.

Task 2 – Intersection Turning Movement Counts

This task includes the installation of Miovision traffic data collection cameras at 209 signalized intersections in the City of Stamford, Connecticut. Video will be recorded at each intersection from 6:00 AM to 8:00 PM on a Tuesday, Wednesday, or Thursday and from 9:00 AM to 7:00 PM on Saturday. The cameras will be installed at various locations over seven weeks concurrent with the ATR cameras discussed in Task 1 above.

While the ATR and TMC videos will be recorded simultaneously, video collected from the intersection cameras will not be sent into Miovision for processing until after the video from the ATR counts in Task 1 above has been processed and reviewed, and exact hours for processing are determined. Once The RBA Group receives the confirmed processing times, we will process 20 intersections for a total of 17 hours each and 189 intersections for a total of 4 hours each, resulting in a total of 1,060 hours of intersection turning movement processing.

All resulting count information will be provided in excel format and access to the data will be made available via Miovision's online data platform, Miovision Central.

Cost and Schedule

The total cost for the above referenced tasks is **$88,468.00.** We anticipate that while some data collection may be completed in 2016. However it is our understanding that the majority of the data collection effort will occur beginning in March, 2017.

Thank you for the opportunity to provide this proposal and I look forward to working with you. If you have any questions or require any additional information, please do not hesitate to contact this office at 973-946-5600.

Sincerely,

Joseph A. Fishinger, Jr., PE, PP, PTOE
Supervising Engineer, Traffic

FITZGERALD & HALLIDAY, INC.
416 Asylum Street, Hartford, Connecticut 06103
Tel. (860) 247-7200
Fax (860) 247-7206

Fitzgerald & Halliday, Inc. is pleased to submit the following Scope of Services and fee proposal for technical services related to the City of Stamford Signal Optimization Project.

FHI will provide the following services under this agreement:

1. Utilizing GIS, FHI will prepare intersection vehicle turning path measurement figures for all project intersections. Figures will be developed on 8.5" x 11" figures or 11"x17" figures at a scale of 1" = 20'. Figures shall illustrate all vehicle turning paths from each approach lane into the intersection and label the distance along the path to all intersecting vehicle paths. In addition, the figures will notate the approach roadway grades when grade information is available. The figures will also identify when grade data is not available at a location.

2. Prepare intersection All Red, Yellow, and pedestrian (exclusive pedestrian phase or side-street green) clearance interval calculations for 209 intersections. Urban Engineers will provide FHI with the listing of the 209 required intersections. FHI will deliver to Urban the vehicle path figures prepared under Item 1 along with the completed Excel spreadsheets and a PDF of each of the calculation results.

Fee proposal is as follows:

Task #	Task Description	Assum	TP13	TP11	TP8	Total Hours
4B-2	Clearance Calcs		36.75	218.75	110.25	365.75
						0
	Total Hours		36.75	218.75	110.25	365.75
		Loaded Billing Rate	$ 67.03	$ 35.50	$ 32.75	
		Total Labor Cost	$ 2,463.35	$ 7,765.63	$ 3,610.69	$ 13,839.67
						$ 22,672.14
						$ 36,511.80
						$ 2,920.94
						$ 39,432.75

This scope of services and fee proposal is good for 90 days.

Sincerely,

Michael L. Morehouse, PE
Vice President
Fitzgerald & Halliday, Inc.

RHS CONSULTING DESIGN, LLC
ENGINEERS - DEVELOPERS - CONSTRUCTION MANAGERS

345 Highland Ave.
Cheshire, CT 06410
(203) 439 9340
(203) 439 9352 fax
ralch@rhsconsultingdesign.com

October 6, 2016
October 27, 2016 Revised

Mr. Scott Diehl, P.E., PTOE, AICP
Chief Traffic Engineer
Urban Engineers
220 Lake Drive East, Suite 300
Cherry Hill, NJ 08002

RE: Inventory of 209 Intersections and Travel Time Collection for 18 Corridors throughout the City of Stamford in Stamford, Connecticut

Scope Proposal

Dear Mr. Diehl:

Per your request, RHS is Pleased to provide Urban Engineers with traffic data collections for the subject project and for the following tasks:

Task1: Inventory of Two Hundred nine (209) Intersections
This Task shall consist of field review of all signalized 209 intersections as follows:

Inventory for 189 Signal Intersections

- Red line existing plans limited to the movement diagram box and a simple phase order sketch (e.g., 3->2->1->4). The inventory of Detection Box, Coordination Type/Program Box, Notes or Pre-emption Box are excluded from the scope assignment.
- Field data will be inputted into a sample spreadsheet (attached).
- Photos will be limited to 1 photo per approach per intersection. Photos will not be compiled nor will be logged in a word document. Photos will be filed electronically in a separate folder per each intersection.

Inventory for 21 Signal Intersections

- Pedestrian crossing distances.
- Speed Limits.
- Filed data will be inputted into a sample spreadsheet (attached)
- Photos will be limited to 1 photo per approach per intersection. Photos will not be compiled nor will be logged in a word document. Photos will be filed electronically in a separate folder per each intersection.

It is assumed the City of Stamford will supply Urban Engineers with all the intersection existing plans in pdf format. No field measurements will be taken to locate the exact

locations of equipment's, mast arm structures, signals, etc. The use of CAD is not required.

Deliverables

RHS will supply Urban with the following:

- A PDF file containing partial redlines (as stated above) for the 189 signals.
- Ped crossing distances and speed limits for remaining 21 signals in project area (209 total signals in project).
- A spreadsheet containing field inventory data.
- Photos will be filed electronically in a separate folder for each intersection.

Task 1 Fees

Professional Fees: $19,780
Direct Expenses (Mileage): $1,430

Subtotal: $21,210 (See attached Matrix)

Task 2: Travel Time Data Collection of Eighteen (18) Corridors

RHS will collect travel time data along the eighteen (18) corridors during the collection of TMC nine (7.5) hours data (2.5 am, 2.5 mid-days, 2.5 pm). One person is required for each corridor however; certain corridors will require two persons. Each person will be equipped with a laptop loaded with Tru-Traffic software, connected to hand held GPS equipment. Each vehicle will be equipped with a dash mounted video camera collecting video clips during the travel time collection. It is assumed that Urban will provide RHS with a second laptop equipped with Tru-Traffic and data logger for the second person.

Processing of Reports: It is assumed that RHS will download the raw data into Excel format for Urban to process the data. There will be no processing of data at RHS end, and excluded from our fees.

Task 2 Fees

Professional Fees: $55,434
Direct Expenses (Mileage): $3,515

Subtotal: $58,949 (See attached Matrix)

RHS Total Fees: $80,159

For further questions, please don't hesitate to call me at (203) 439 9340.

Sincerely,

Rifat H. Saleh, PE
President-Chief Engineer
RHS Consulting Design, LLC
345 Highland Ave
Cheshire, CT 06410
Ph.: (203) 439 9340. **F:** (203) 439 9342
rsaleh@rhsconsultingdesign.com

The above is understood and accepted

By _____ Date _____

Name and Title _____

RHS CONSULTING DESIGN, LLC

209 INTERSECTION INVENTORIES
STAMFORD, CONNECTICUT
FEE PROPOSAL
Revised 10-13-2016

Staff Classifications	PM			Engineer II			Technician		
	Hours	Hourly Rate	Amount	Hourly Rate	Hourly	Amount	Hours	Hourly Rate	Amount
Data Collection & Preparation	0	$192.00	$0.00	5	$97.00	$485.00	12	$70.00	$840.00
Field Condition Survey	0	$192.00	$0.00	40	$97.00	$3,880.00	115	$70.00	$8,050.00
Compiling Reports	0	$192.00	$0.00	15	$97.00	$1,455.00	45	$70.00	$3,150.00
Meeting	10	$192.00	$1,920.00	0	$97.00	$0.00	0	$70.00	$0.00
Review Reports	10	$192.00	$1,920.00	0	$97.00	$0.00	0	$70.00	$0.00
Subtotal	20		$1,920.00	60		$5,820.00	172		$12,040.00
Total Labor Fees	$19,780.00								

Mileage	130 Miles Roundtrip X 20 Trips = 2,600 Miles @ 0.55 Per Mile = $1,430

RHS Total Fees	$21,210

RHS CONSULTING DESIGN, LLC
TRAVEL TIME DATA COLLECTION FOR 18 CORRIDORS
7.5 HOURS OF DRIVING TIME PER EACH CORRIDOR
STAMFORD, CONNECTICUT
FEE PROPOSAL
Revised 10-21-2016

Staff Classifications	PM			Engineer II			Technician-Engineer I		
	Hours	Hourly Rate	Amount	Hours	Hourly Rate	Amount	Hours	Hourly Rate	Amount
Data Collection & Preparation	0	$192.00	$0.00	24	$97.00	$2,328.00	8	$70.00	$560.00
Travel Time Field Collection	0	$192.00	$0.00	56	$97.00	$5,432.00	169	$70.00	$11,830.00
download data	0	$192.00	$0.00	33	$97.00	$3,201.00	13	$70.00	$910.00
Coordination	18	$192.00	$3,456.00	0	$97.00	$0.00	0	$70.00	$0.00
Subtotal	18		$3,456.00	113		$10,961.00	190		$13,300.00

Total Labor Fees	$27,717.00	Per Each Occurrence X 2 (Before & After Signal Timing) = $55,434

Mileage	Assume 30 MPH X 7.5 hours Driving Per Corridor X 18 Corridors = 4,050 Miles Plus (18 X 130 Miles From Office & to Stamford=2,340 Miles) = 6,390 Miles @ $0.55 Per Mile = $3,515

Total RHS Fees	$58,949

Notes:

1-Data Processing will be done by URBAN. Raw data will be downloaded into the Tru-Traffic Program
3. RHS will use dash cameras during Travel time. RHS will download the video clips and forward to URBAN

PT/PM	Protected/Permitted Left Turn Phasing
PM	Permitted Left Turn Phasing
LAG	Lag left turn phase
SP	Split sidestreet phasing
RTOV	Right Turn Overlap
PM/PT	Protected/Permitted Left Turn Phasing

HD	Hand Display
CT	Countdown Display
N/A	No pedestrian signal heads
EXC	Exclusive Pedestrian Phase
CON	Concurrent Pedestrian Phase

N/A if no speed limit sign w/in proximity to intersection

NB = Crosswalk crossing NB approach
Measure center of crosswalk, curb to curb

Intersection		Approach Name					Speed Limit (mph)					Pedestrian Crossing Distance (ft)					Signal Phasing					Pedestrian Phasing				
Num	Name	NB	SB	EB	WB	5th Leg	NB	SB	EB	WB	5th Leg	NB	SB	EB	WB	5th Leg	NB	SB	EB	WB	5th Leg	NB	SB	EB	WB	5th Leg
1	RT 1 & First Ave	RT 1	RT 1	First Ave	First Ave	-	45	45	30	30	-	103'	99'	58'	61'	-	PM, RTOV	PM	PM/PT	PM/PT	-	EXC, HD				-
2	RT 1 & Second Ave/Ocean Dr	RT 1	RT 1	Second Ave	Ocean Dr		45	45	25	25	-	88'	84'	75'	73'	-	PM	PM	Split	Split	-	CON, CT				-

Red Line Plans

Movement Diagram Box on signal plans (not including Detector Box, Coordination Type/Program Box, Notes, or Pre-Emption Box)
Phasing diagram on plan (Add simple phasing order if missing from plan(e.g., 3–>2–>1–>4)
1 Photo per approach