



May 8, 2017

Mr. Bobby Morrison
Senior Project Manager
City of League City
1505 Dickinson Ave.
League City, Texas 77573

Re: Proposal for Wastewater System Evaluation
City of League City

Dear Mr. Morrison:

As requested, ARKK Engineers, LLC (ARKK) is pleased to submit this proposal for performing Wastewater System Evaluation services for the City of League City. This proposal is based on our understanding of the project as discussed in our previous meetings and conversations.

ARKK will utilize the services of a subcontractor, RJN Group, to perform services associated with the following project elements:

1. Wastewater Flow Monitoring – Installation and monitoring of 28 flow meters and 5 rain gauges for a 60-day period.
2. Extended flow monitoring for 30-day period. A budget for extended flow monitoring for thirty (30) days is included.
3. Smoke Testing – Smoke testing will be performed on approximately 100,000 linear feet of gravity sanitary sewers. The areas designated for smoke testing will be identified from the flow monitoring results. Dyed water testing will be utilized to confirm suspected cross-connections with storm sewers and other waterways.
4. Television Inspection – A budget to clean and televise 10,000 LF of 6” through 10” sanitary sewers is provided in the proposal. The areas designated for television inspection will be identified from the smoke testing results.
5. Data Analysis and Reporting – The results of the field work and study will be compiled into a report and submitted to the City.

A detailed summary of the scope of work and fee for various tasks is presented in RJN Group’s attached Scope of Services, which is included as an attachment to this letter. The fee for the project is as follows:

Wastewater System Evaluation Services (RJN Group, at Cost):	\$359,517.94
Project Oversight & Coordination (ARKK, Lump Sum):	<u>\$ 58,450.00</u>
Total Not to Exceed Fee	\$417,967.94

ARKK will submit monthly progress invoices for all work completed to invoice date. The invoice will be based on the percent of the work completed for lump sum items; and based on units completed for unit price items. ARKK Engineers, LLC sincerely appreciates this opportunity to submit this proposal and we look forward to continuing our work with the City of League City.

Sincerely,

ARKK ENGINEERS, LLC



Madhu Kilambi, P.E.

Senior Project Manager / Principal

cc: Mr. Jody Hooks – City of League City



The Choice for Collection System Solutions

May 5, 2017

Mr. Madhu Kilambi, P.E.
Senior Project Manager / Principal
ARKK Engineers
7322 Southwest Fwy. Ste 1040
Houston, TX 77074

Subject: League City – City Wide Flow Monitoring & East Side of Highway 45 SSES

Dear Mr. Kilambi:

We appreciate the opportunity to submit this proposal to perform Flow Monitoring city wide and Sanitary Sewer Evaluation Services on the East Side of Highway 45 (I-45) in League City, TX. The proposed scope includes 28 flow meters and 5 rain gauges for a metering period of 60 days, with the option of additional 30 days of monitoring. Additionally, a limited amount of smoke testing, dye testing, and CCTV will be performed on the east side of the City.

The total base cost to perform this project is \$308,353.84. Should the City choose to extend monitoring for 30 days there would be an additional cost of \$51,164.10 for a total not to exceed amount of **\$359,517.94**

In acceptance of the agreed scope outlined in the attached, please execute and return one signed copy to us.

We appreciate the opportunity to work with ARKK Engineers on this project.

RJN GROUP, INC.

Daniel Jackson
Regional Vice President

For the ENGINEER:
ARKK Engineers

Name

Printed

Title

DHJ/lmb
Enclosure

CITY OF LEAGUE CITY WASTEWATER SYSTEM EVALUATION SCOPE OF SERVICES PROPOSAL

SECTION I – WASTEWATER FLOW MONITORING PROGRAM

The flow monitoring program shall be conducted in order to provide essential hydraulic performance information necessary to identify areas of hydraulic overloading, capacity restrictions and excessive inflow and infiltration (I/I) within the wastewater system. This program will include flow monitoring the eastern portion of the League City gravity sewer system as well as rainfall monitoring. The flow monitoring period will span 60 days. The type of meters, quantity and duration shall be defined in a Flow Monitoring Plan, described herein, and will be consistent with the quantities identified in the Compensation Table found in Section V.

1. *Site Selection*

- a. *Meter Locations.* Attached is a preliminary exhibit outlining the proposed meter locations along with the basin sewersheds. A total of 28 flow meters and 5 rain gauges are anticipated.
- b. *Site Selection Work Session.* The CONSULTANT shall conduct a work session with the City to discuss the targeted monitoring locations and intended purpose for each monitoring location and to determine if any support from the City is needed to install and maintain equipment at the proposed locations. The plan shall be presented on an overview map and approved by the City prior to investigating and installing the flow meters.
- c. *Site Investigations.* Upon approval of the targeted monitoring locations, the CONSULTANT shall perform site investigations for the purpose of determining the viability of each targeted location. The investigation includes an evaluation of the hydraulic conditions, access, safety and other issues that may affect the data quality or sensor survival.

If a location is identified as unsuitable, the CONSULTANT shall investigate up to two alternate sites (upstream or downstream) for consideration. The CONSULTANT shall also check for debris in the manhole that could impact data quality.

The CONSULTANT shall prepare and submit for approval an electronic Site Investigation Report. The Site Investigation Report shall include a general site location map, a sketch of the installation, and the physical characteristics including the pipe diameter, pipe material, manhole depth and other attribute information.

2. *Equipment and Installation*

- a. *Gravity Flow Meters.* Based on the results of the site investigations, the CONSULTANT shall select equipment suited for the site in order to provide accurate and reliable flow data. The CONSULTANT shall use flow meters designed to measure flow in sanitary sewer pipes under free-flow and surcharged conditions. The primary depth sensor shall be ultrasonic with a resolution to the nearest 0.01 foot. Each site shall also include level measurement redundancy by means of a pressure and ultrasonic sensor. The primary velocity sensor shall use Doppler technology.
- b. *Wireless Telemetry.* Remote Terminal Units (RTU) shall be provided at each flow monitoring and rain gauge location to remotely collect the data. In the event that certain sites are not conducive for remote telemetry, the CONSULTANT shall manually collect the data throughout the monitoring period.
- c. *Pipe Cleaning.* In the event that the monitoring location needs to be cleaned to facilitate quality monitoring and an alternate site is not suitable, the CONSULTANT shall request sewer cleaning to be performed by others.
- d. *Flow Monitor Installation.* The sensors shall be securely attached to the pipe by means of metal bands or anchoring hardware designed specifically for that purpose. A typical installation shall include the primary ultrasonic depth sensor mounted at the crown of the pipe, a redundant pressure transducer depth sensor mounted in the invert, and a Doppler velocity sensor mounted near the invert. The data logger and sensor cables shall be firmly secured to the manhole walls or steps.
- e. *Data Recording Interval.* All flow meters and rain gauges shall be synchronized in time to the same clock and shall be programmed to collect depth and velocity data at five (5) minute intervals.
- f. *Initial Depth and Velocity Confirmations.* Upon installation and activation of each flow meter, the CONSULTANT shall take manual depth and velocity readings using independent instrumentation to confirm that the in-situ monitor yields data representative of actual field conditions. Field crews shall also take manual velocity readings of the flow cross-section (velocity profile) in order to derive an average velocity. All measurements, adjustments and efforts undertaken during site visits shall be recorded on the maintenance log.

3. *Rainfall Monitoring*

- a. *Rainfall Measurement.* The CONSULTANT shall measure the contribution from rainfall using a network of rain gauges at an approximate coverage of one (1) rain gauge station per five (5) square miles.

The rain gauge equipment shall consist of a data logger and rain gauge tipping bucket. The equipment shall be able to measure 0.01 inches resolution. The tipping bucket shall be a corrosion resistant funnel collector with tipping bucket assembly. The CONSULTANT shall coordinate with the Owner any issues

related to gaining access to buildings for placement of gauges.

4. *Data Collection and Web Hosting*

- a. *Wireless Remote Data Collection.* The CONSULTANT shall utilize a host software support application program for remote wireless flow meter and rain gauge data collection. On a daily basis, all data recorded and stored in the remote RTU shall be collected by the host system. The CONSULTANT shall install, operate, maintain and remove the telemetry upon the completion of the monitoring period and shall repair any disturbed areas resulting from the wireless telemetry installations.
- b. *Web Server Data Availability.* The CONSULTANT shall use a system employing client/server architecture to store all project flow and rainfall data. Flow meter measurements shall be forwarded to the server immediately following collection by the field RTUs. The server shall immediately post the data to the web site for viewing by authorized parties.

The web module software shall allow any networked computer (with the appropriate access rights) access to the data stored using a common web browser (e.g., Microsoft Internet Explorer). The web module shall enable the user to view the data and download the data in Microsoft Excel format. Web module users will not have access to modify the database or any operational system configurations.

5. *Flow Monitor Service and Maintenance*

- a. *Flow Monitoring Period.* Flow monitoring shall be conducted for a period of 60 days. The goal of this program is to obtain representative dry weather information and between four to six rain events of varying intensities for use in understanding both dry and wet weather flows within the City. The monitoring period may be extended, upon request, on a daily basis as an Additional Service at the meter day rate defined in the Compensation Schedule. If the flow monitoring period is extended, then the project schedule will be extended by the same amount of time.
- b. *Equipment Operation and Maintenance (O&M).* The CONSULTANT's qualified field crews shall visit each monitor installation, as appropriate, to perform necessary maintenance to the equipment. Field crews shall be dispatched within 48 hours and any O&M issue shall be resolved within 72 hours from the time the issue was identified. All measurements, adjustments, and efforts undertaken during site visits shall be logged in a maintenance log specific to that site.
- c. *Uptime Requirement.* The CONSULTANT shall collect useable flow data a minimum of 90 percent of the time throughout the monitoring period. The CONSULTANT shall submit an uptime table each month demonstrating compliance with the uptime requirement, including a thorough explanation of the reasons for not meeting the up-time requirement at any site.

Monitor uptime shall be defined as the number of five (5) minute measurement

intervals where a flow value can be calculated from a measured depth and a measured or inferred velocity for a common time interval divided by the total number of measurement intervals in the reporting period. The CONSULTANT shall clearly identify all inferred velocity data or other data derived from inferred data in all reports and other deliverables.

In the event the uptime requirement has not been met, the CONSULTANT shall extend the monitoring period for an equivalent period of time at no extra cost to the Owner.

- d. *Flow Monitor Field Confirmation.* During scheduled field service visits, the CONSULTANT shall perform independent depth and velocity measurements for comparison against the meter depth and velocity readings. The field service crew shall also obtain hydraulic profiles by measuring velocity at predetermined locations and integrating the measurements to derive an average velocity. Four (4) to six (6) independent confirmations with hydraulic profile measurements shall be obtained within the 60 days. All measurements, adjustments, and efforts undertaken during site visits shall be logged on the maintenance logs.
- e. *Rain Gauge Field Confirmation.* During scheduled field service visits, the CONSULTANT shall perform test tips to ensure the rain gauge equipment is operating to manufacturer's standards. All measurements, adjustments, and efforts undertaken during site visits shall be logged on maintenance logs.

6. *Equipment Removal*

- a. *Notification.* The CONSULTANT shall be provided at least a two week notice prior to the scheduled end of the flow monitoring period to remove or extend the monitoring period.
- b. *Site Restoration.* The CONSULTANT shall remove all the flow meters at the completion of the flow monitoring period and shall repair any damage or disturbance from the installation and operation of the flow meters or rain gauges.

SECTION II – SMOKE TESTING & DYED WATER FLOODING

1. *Smoke Testing*

- a. Smoke testing will be conducted using dual axial blowers. Smoke testing lengths shall be limited to two line segments between the upstream and downstream blower locations. Each 12-inch diameter and smaller segment shall be isolated by sandbagging. Smoke candles shall be used to generate smoke for the smoke testing. Smoke testing will be performed during dry ground periods.
- b. Flags shall be placed at observed smoke locations and digital images shall be captured. All defects identified by smoke testing shall be flagged and photographed. Smoke defect locations shall be recorded on sketches or by

obtaining GPS coordinates. All private sector smoke defect images shall be entered into the field inspection database.

- c. Main line defects and service lateral defects shall be carefully scrutinized to ensure that a conservative determination of public vs. private side defects is made. If necessary the line shall be earmarked for television inspection.
- d. Smoke testing information collected during the field investigations will include:
 - Upstream/downstream manhole number
 - GIS pipe identifier (from the City's GIS data)
 - Length of sewer line in linear feet
 - Predominant ground cover over line segment
 - Leak location using GPS coordinates, addresses, and digital photographs
 - Degree of smoke observed
 - Number and size of pick holes in the upstream manhole
 - Location of the leak in relation to drainage path and ponding areas, storm sewer crossings, and other potential sources of inflow
 - Predominant ground cover over the leak
 - Classification of defects as to:
 - Main Line
 - Manhole
 - Public service line
 - Private Service line

2. *Dyed Water Flooding:*

- a. Dyed water flooding shall be conducted prior to CCTV inspection to verify the existence of inflow and infiltration sources. Dyed water flooding will also be conducted in conjunction with televised inspection to quantify the magnitude of I/I sources.
- b. Dyed water flooding shall be performed at suspected storm sewer cross-connections, streams, creeks, ditches, and other ponding areas that may be contributing to inflow. Estimated leakage rates shall be provided for each positive dye test. Water for the dyed water flooding will be provided by League City at no charge to the CONSULTANT.

SECTION III – Television Inspection and Review

Engineer will perform cleaning and television inspection only to maintain the project schedule, and only after the approval of the CITY.

1. *Television Inspection:*

- a. Television inspections shall be performed on line segments which show evidence of deterioration, tested positive during smoke testing, or are critical to the collection system.
- b. Television inspection will be performed using high quality color equipment and coded using NASSCO's PACP standards.

2. *Sewer Cleaning:*

- a. Sanitary sewer lines will be cleaned in order to facilitate the televised inspection activities. Standard cleaning rates are based on three passes with a jet cleaner.
- b. During cleaning operations, all sludge, debris, etc. shall be removed from the sewer and disposed of at a location provided by the CITY. The CITY shall provide water for the cleaning operation at no charge to the ENGINEER. All data shall be provided in digital format.
- c. If light cleaning proves inadequate, heavy cleaning shall be recommended to THE CITY. Lines approved for heavy cleaning shall be cleaned with mechanical cleaning equipment.

SECTION IV – Data Analysis and Reporting

1. *Data Review.*

- a. The CONSULTANT shall review the flow and rainfall monitoring data at least twice a week. Trained data analysts experienced in processing and analyzing flow and rainfall data shall use various analytical tools, such as hydrographs, scattergraphs, and flow balancing methods to verify the accuracy and precision of the flow data.

The analysis of the data shall include the identification of data gaps, anomalies and monitor performance issues. Any equipment service needs shall be immediately conveyed to the field service crews.

The data shall be processed and edited in accordance with the field confirmations to produce final data sets for each site. All data processing efforts shall ensure that the raw data is preserved.

2. *Rainfall Data.*

- a. Experienced data analysts shall review rainfall data from the rain gauges upon receipt. The data from the rain gauges shall be used to calibrate the Doppler radar rainfall estimations.

3. *Monthly Data Delivery.*

- a. The following shall be submitted to the Owner on a monthly basis:
- Monthly hydrographs including depth, velocity, continuity-derived flow and rainfall
 - Approximate Return Period (Frequency) of each storm event
 - Scattergraphs of processed depth-velocity readings with discernable calibration measurements overlain
 - An Uptime Report of all sites, including the basis for failure in meeting uptime requirements and any data quality issues
 - Five-minute flow, depth, velocity, and rainfall data in a tabular format

4. *Data Analysis and Reporting.*

- a. A Wastewater Flow Monitoring Report shall be submitted to the City including summaries of methods utilized during the data collection; site investigation reports; scattergraphs of depth and velocity; monthly hydrographs including depth, velocity, flow, and rainfall; tabular flow summaries showing daily max, min, average flow and rainfall data; and final data in Microsoft Excel format. Additionally, a thorough analysis of the dry and wet weather flows shall be performed. This will include dry-weather analysis, infiltration analysis, and inflow analysis. The engineering analysis will provide the City with information on how much inflow and infiltration is occurring per 1,000 linear feet of pipe, allowing the City to understand where within the system are areas to prioritize additional study. Smoke defect analysis and source defect analysis will be completed, prioritized, and included as part of the report. Additionally, line segments televised will be prioritized in severity from both a structural and I/I standpoint. Conceptual construction methods based upon the review of the data will be provided.

Three copies of the Wastewater Flow Monitoring Report shall be submitted to Owner within sixty days after the end of the sanitary sewer assessment program.

SECTION V - COMPENSATION

Owner shall compensate CONSULTANT for providing the services set forth herein in accordance with the terms of the Agreement. Total payment for Scope of Services described herein shall be Three hundred fifty nine thousand five hundred seventeen dollars and ninty four cents (**\$359,517.94**) without written approval of Owner.

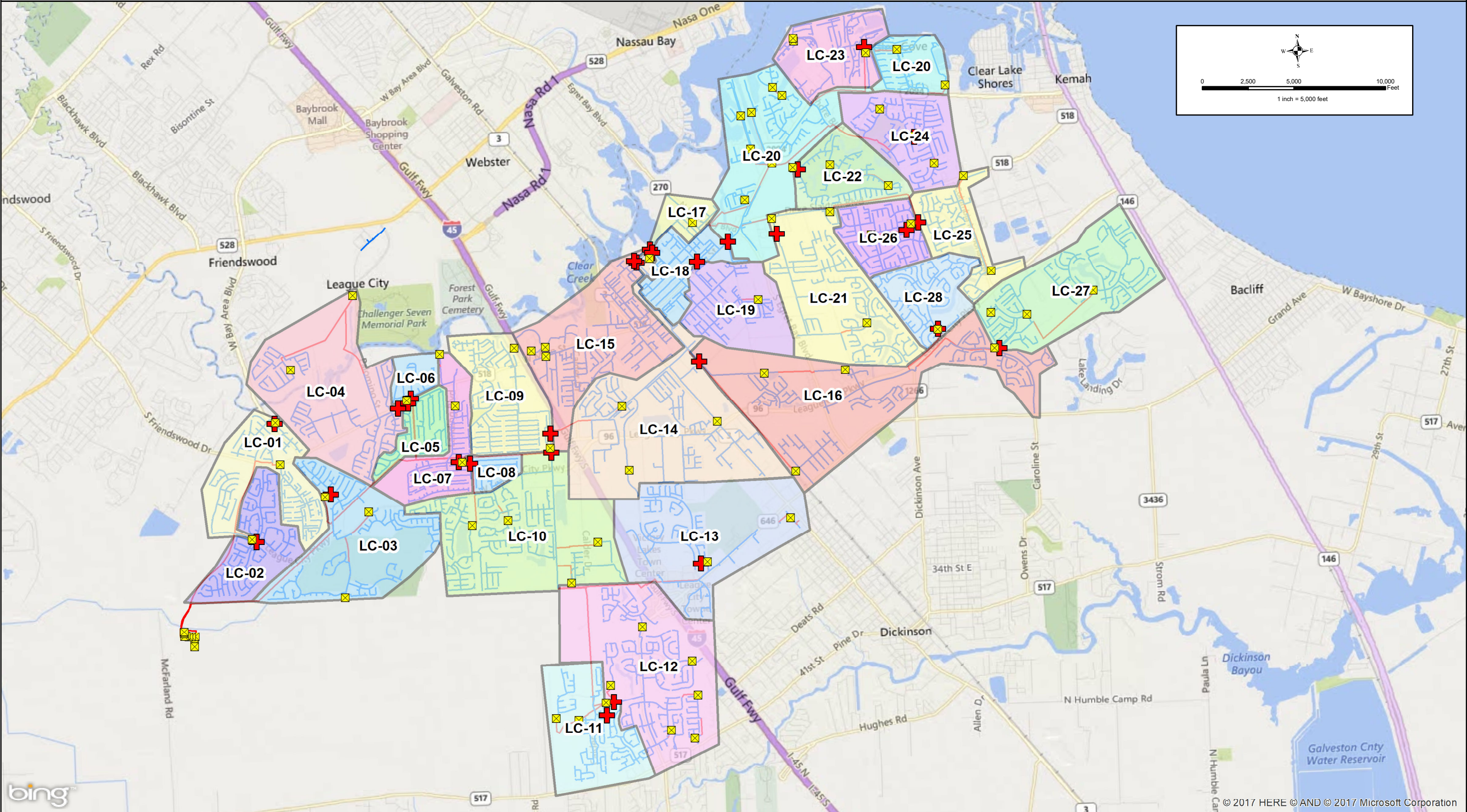
Compensation Table					
	Activity	Units		Rate	Total
1	Management and Supervision	1	LS	\$16,356.00	\$16,356.00
2	Flow Meter Investigation	28	EA	\$696.88	\$19,512.64
3	Flow Meter Installation	28	EA	\$875.25	\$24,507.00
4	Rain Gauge Investigation/Installation	5	EA	\$600.00	\$3,000.00
5	Flow Monitoring Period	1,680	MD	\$57.24	\$96,163.20
6	RG Monitoring Period	300	MD	\$20.55	\$6,165.00
7	I/I Analysis and Report	1	LS	\$24,690.00	\$24,690.00
8	Smoke Testing	100,000	LF	\$0.45	\$45,000.00
9	CCTV Inspection	10,000	LF	\$4.20	\$42,000.00
10	CCTV Review	10,000	LF	\$0.35	\$3,500.00
11	Dyed Water Flooding	6	EA	\$685.00	\$4,110.00
12	Data Management	1	LS	\$8,738.00	\$8,738.00
13	Defect Report	1	LS	\$14,612.00	\$14,612.00
Total Base Contact					\$308,353.84

Should an extension of the flow monitoring be needed, the same meter rate per day will apply. The cost for flow monitoring is \$1,717.20 and the cost for rain gauge monitoring is \$616.50.

Additional 30 Days Monitoring					
	Activity	Units		Rate	Total
14	Flow Monitoring Period	840	MD	\$57.24	\$48,081.60
15	RG Monitoring Period	150	MD	\$20.55	\$3,082.50
Total Additional Services					\$51,164.10

Base Contract & Additional 30 Days Monitoring	
Total Contract Amount	\$359,517.94

League City, TX



bing

rjngroup
The Choice for Collection System Solutions

- ✦ Lift Station
- ✦ Gravity Main
- ✦ RJN Meters
- ✦ Force Main



Proposed Meter Locations
& Basin Boundaries
League City, TX
Produced by RJN Group, Inc.

EXHIBIT 'B' - FEE

Compensation Table					
	Activity	Units		Rate	Total
ARKK Engineers					
1	Project Oversight & Coordination	1	LS	\$58,450.00	\$ 58,450.00
RJN Group					
2	Management and Supervision of Field Services	1	LS	\$16,356.00	\$ 16,356.00
3	Flow Meter Investigation	28	EA	\$696.88	\$ 19,512.64
4	Flow Meter Installation	28	EA	\$875.25	\$ 24,507.00
5	Rain Gauge Investigation/Installation	5	EA	\$600.00	\$ 3,000.00
6	Flow Monitoring Period	1680	MD	\$57.24	\$ 96,163.20
7	RG Monitoring Period	300	MD	\$20.55	\$ 6,165.00
8	I/I Analysis and Report	1	LS	\$24,690.00	\$ 24,690.00
9	Smoke Testing	100,000	LF	\$0.45	\$ 45,000.00
10	CCTV Inspection	10,000	LF	\$4.20	\$ 42,000.00
11	CCTV Review	10,000	LF	\$0.35	\$ 3,500.00
12	Dyed Water Flooding	6	EA	\$685.00	\$ 4,110.00
13	Data Management	1	LS	\$8,738.00	\$ 8,738.00
14	Defect Report	1	LS	\$14,612.00	\$ 14,612.00
15	Additional Flow Monitoring Period, if Required	840	MD	\$57.24	\$48,081.60
16	Additional Rain Gauge Monitoring Period, if Required	150	MD	\$20.55	\$3,082.50
Total Fee (not to exceed)					\$417,967.94

EXHIBIT 'C'

RATE SCHEDULE

<u>Employee Classification</u>	<u>Billing Rate per hr.</u>
Principal	\$175.00
Project Manager	\$140.00 – \$165.00
Project Engineer	\$100.00 – \$125.00
CADD Operator	\$ 85.00 – \$110.00
Site Representative/Construction Administrator	\$ 90.00 – \$115.00
Clerical	\$ 45.00 – \$75.00

Hourly billed services will be invoiced based on direct labor cost times a multiplier of 2.99. Reimbursable Expenses will be charged at cost plus 10%. Mileage will be charged at the prevailing federal rate.

EXHIBIT 'D'

SUBMITTAL SCHEDULE

Due to the nature of work and its dependence on weather conditions, the work is anticipated to be completed in 12 months from the date of notice to proceed.