June 22, 2018

MERRICK® & COMPANY

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City of Seguin Utilities
Water/Wastewater Utilities
P.O. Box 591,
Seguin, Texas 78156

Attn: Tim Howe, Director of Water/Wastewater Utilities
David Rabago, PE, CFM, Chief Water Engineer

Re: Analysis of the Seguin Surface Water Transmission System
Proposal to Provide Professional Engineering Services

Dear Mr. Rabago;

Thank you for the opportunity to submit our proposal to provide professional engineering services for the analysis of the City's Surface Water Transmission System. It is our understanding that the City desires an evaluation of this system to confirm its ability to meet current demand and delver up to 3,000 acre-feet per year to the City of New Braunfels. The project includes the following key components:

- Development of a new water distribution system model for the surface water distribution system using InfoWater©, a water system modeling computer program developed by Innovyze;
- Evaluation of existing water demands, and development of future water demands;
- Analysis of the impact of these demands on the existing water distribution system;
- Evaluation and development of an improvement program for the surface water distribution system.

In response to this need, we have developed a scope of services and an estimate of fee. The scope of work includes the development of a computer simulation to analyze conditions associated with three (3) demand scenarios that include constant demand, peak daily demand, and peak hourly demand. We propose to provide these services for a of $62,489.70. A complete description of the services we will provide in this assignment can be found in Attachment 1, Scope of Work. A breakdown of the fee is shown in Attachment 2. Please let us know if you have any questions regarding this proposal. If you do, we're ready to meet with you, at your convenience, to discuss your concerns.

Sincerely,

Richard M. Myrick

Rick Myrick, PE, CFM
Senior Project Manager
Merrick & Company

Attachment 1, Scope of Work
Attachment 2, Fee Breakdown

cc: File

Attachment 1
Work Scope

Task 1 – Project Management and Coordination

Task 1.1 – Project Setup and Kick-off Meeting

Merrick & Company (Merrick) will develop project documents and filing systems for the project that will include schedule, project management plan, hard and electronic file systems, and conduct an internal kickoff meeting with the project team and City of Seguin Water and Wastewater Department (City) staff to review project goals, scope of work, and schedule. Meeting notes will be prepared and distributed to all meeting attendees.

Task 1.2 – Project Meetings

Merrick will meet with City staff during the project to review progress and resolve issues. As a minimum, we propose to conduct the following meetings:

- Project Kickoff Meeting;
- Seguin Water and Wastewater Department (Plans & Records Department) meeting to obtain record information regarding configuration of the existing surface water distribution system;
- Seguin Water and Wastewater Department (Billing Department) meeting to obtain water consumption data from surface water customers to set system demands;
- Model Development meeting to discuss data findings and confirm system configuration;
- Evaluation of existing water demands meeting to review data findings and confirm surface water system demand profiles;
- Model Calibration meeting to review existing condition model runs and confirm model results are aligned with current operations;
- Future Water Demand meeting to confirm New Braunfels average annual demand (AAD), peak daily demand (PDD), and peak hourly demand (PHD);
- Initial Model Verification meeting to review early model results and discuss potential changes and revisions;
- Final Model Verification meeting to review final model results and confirm findings;
- Model meeting to discuss existing water distribution system needs to maintain current service;
- Model meeting to discuss future water distribution system needs to meet New Braunfels requirements;
- Formal presentation of project findings to senior water system staff.

A meeting memorandum will be prepared after each meeting to document the discussions and decisions. The meeting memoranda will be submitted to each attendee.

Task 2 – Hydraulic Model Development

Currently, the City does not have a hydraulic model of the surface water distribution system. Therefore, Merrick will develop a model that is representative of the surface water distribution system using record data.

Task 2.1 – Data Collection and Review

Merrick will work with City staff to coordinate gathering of required system information for model creation, development, and calibration. Merrick will provide City staff with a list of necessary data. Such data will include GIS data, if available, necessary for completion of the existing condition model. Other information needs include pump curves, tank elevations, record drawings of installed facilities, and water consumption records. Merrick will review received data and create a data log for tracking purposes. We will also identify apparent data deficiencies and coordinate the delivery of supplemental data to be provided by the City.

Task 2.2 – Hydraulic Model Development

Merrick will input received data (water mains, pumps, tanks, valves, etc.) into Innovyze InfoWater program. Pipeline material will be assigned to all pipelines as indicated in the plan information provided by the City. When the pipeline material is unavailable or unknown, a default value will be assigned as agreed upon with the City.

It is important that the existing surface water distribution system be modeled accurately. As such, Merrick will meet with the City to review the data used to create the existing conditions model to determine if there are pipelines (future lines, abandoned pipelines, etc.) and operational control components (isolation valves or control valves) that are incorrectly represented.

Task 2.3 – Connectivity

Once the data has been input into InfoWater, the model connectivity and continuity will be verified. Sometimes questions regarding network connectivity arise. Often, pipes are shown to cross each other and it my not be clear from the source document if they are connected or not. In these cases, Merrick will review the existing record drawings to clarify connectivity. If additional clarification is needed, Merrick will consult with City staff.

Task 2.4 – Facility Creation and Development

Model parameters for major facilities such as high service pumps, booster pumps, tanks, and control valves will be field-confirmed by Merrick and documented in a separate technical memorandum (TM).

Task 2.5 – Detailed Hydraulic Model Development

Task 2.5.1 – Elevation Assignment

Merrick will assign elevations to the model data from the United States Geographical Survey (USGS) digital terrain model (DTM) or, for elements such as pumps and tanks, from record drawings.

Task 2.5.2 – Initial Pipeline Roughness Coefficient Assignments

As a starting point, Merrick will assign roughness or "C-factors" based on pipe material and industry standards. A universal C-factor of 100 will be assigned to all pipes that do not have pipe material information. These values may be adjusted in the model during the calibration phase.

Task 2.5.3 – Pump Curves

Merrick will assign pump curves to each of the current pumps at the surface water distribution system high service pump station using data provided by the City. Such data may include the original manufacturer's curves or actual pump test data acquired during testing performed after construction. If the pumps are driven by variable frequency drives (VFDs), the City will need to provide the pump manufacturer's speed curves, as well.

Task 2.5.4 – Tank Configuration

The existing tank shape and configuration will be entered into database using data provided by the City. Merrick will check this information prior to entering it.

Task 2.5.5 – Motor Control Logic Assignments

Merrick will create model control logic to replicate current system conditions based on available data and conversations with City staff. This includes meeting with operations staff to discuss typical systems operations including pump control, speed control for VFDs, typical tank elevation ranges, control valve settings, etc.

Task 2.6 – Existing Demand Development, Loading, and Peaking

Task 2.6.1 – Evaluate Consumption, and Production Data

This task will create an Average Day Demand (ADD) loading dataset for the surface water system customers using billing meter data provided by the City. Merrick will analyze up to three (3) years of meter billing data provided by the City. Using state criteria, Merrick will apply appropriate peaking factors to obtain peak hourly flows (PHF).

Task 2.6.2 – Develop Diurnal Curve

Using data from the Surface Water Treatment Plant Pump Station, Merrick will generate a system-wide diurnal pattern to apply to the model demands for creating an extended period simulation model for the current condition.

Task 2.6.3 – Demand Assignment

Demands for each the surface water distribution system customers will be assigned in the model directly to a node located at each of their meter locations.

Task 2.7 – Hydraulic Model Calibration

The most important step to model calibration is the initial model setup. The more accurate the detail contained in the model is, the closer it represents reality which reduces the overall calibration effort.

Task 2.7.1 – Existing Fire Flow Data

Merrick will request the City conduct fire flow tests with the surface water distribution system. The results of these tests, fire flow data and resulting static pressures, will be used to perform an initial calibration check. A general model calibration will follow and will include possible revision of initial C-factors, operational data, water demand distribution, and detailed model construction.

Task 2.7.2 – Pump Characteristics

If existing information regarding existing pump curves is found to be unavailable or inaccurate, then a pump performance test will be needed to confirm pump operations. The pump performance tests will be performed by City staff with a Merrick representative present to document the results. The performance test will include operation of one or more pumps at the high service pump station at the Surface Water Treatment Plant to document flow and pressure under various operating conditions.

Task 2.7.3 – Operational Data

It is assumed that existing historical recorded pressure data is not available for the surface water distribution system. As such, Merrick will ask the City to install up to five (5) portable field-installed wireless hydrant pressure recorders to supply pressure data in order to assist with hydraulic grade line calibration. We anticipate the need to record field pressure data at up to five (5) points within the

surface water distribution system for one (1) week. During this same week, hydrant flow testing may also be performed to provide additional strain on the system by increasing pipeline velocities and allowing the pressure recorders to capture each of the flow events. During that period of time, it will be important for the City to collect key operational information such as tank levels, pump status, control valve operation, etc. and make that data available to the modeling team.

The hydraulic grade line data derived from the hydrant tests will be compared with the extended period results from the hydraulic model. If the measured results and the model results achieve similar rising and falling trends at the same location and similar magnitude, then the model can be considered to be calibrated. Hydraulic grade line profiles that have varying slopes may indicate incorrect C-factors, pipe diameters, or incorrect flow.

Task 2.8 – Model Development Documentation

Merrick will prepare a technical memorandum documenting development of the existing condition surface water distribution system model. The memorandum will detail the process and results of this activity.

Five (5) copies of this technical memorandum will be submitted to the City for review and comment. It is assumed that the City will take two (2) weeks to review the draft memoranda and provide comments. Merrick will schedule a review meeting with the City to review the comments. Afterwards, Merrick will finalize the memoranda and provide five (5) printed copies and one (1) electronic copy.

Task 3 – New Braunfels Service Modeling

Task 3.1 – Scenario Development

Following the creation of the existing condition surface water distribution system model and after the calibration is complete, Merrick will develop a modeling scenario to evaluate system performance under demands imposed by supplying potable water to the City of New Braunfels. Three (3) operational scenarios will be reviewed. The first scenario will assume a constant demand equal to an average annual demand of 3,000 acre-ft per year. The second scenario will assume that a peak daily demand will be imposed and a third scenario reviewing the impact of imposing a peak hourly demand will be analyzed. Determination of the peak daily flow rate and the peak hourly flow rate will follow Texas Commission on Environmental Quality (TCEQ) criteria.

Task 3.2 – Scenario Analysis

The results of each scenario will be analyzed to determine its impact on the existing distribution system. Merrick will develop recommendations to mitigate negative impacts and present those recommendations to City staff. Negative impacts may include high pipeline velocities, excessive pressures, and high headlosses.

Two (2) technical memoranda will be issued. The first technical memoranda will define negative impacts associated with providing service to New Braunfels. The second technical memoranda will provide recommendations to mitigate the negative impacts.

Five (5) copies of each technical memorandum will be submitted to the City for review and comment. It is assumed that the City will take two (2) weeks to review the draft memoranda and provide comments. Merrick will schedule a review meeting with the City to review the comments. Afterwards, Merrick will finalize the memoranda and provide five (5) printed copies and one (1) electronic copy.

Task 3.3 – Presentation of Results

Merrick will present the final results of the study to City staff.

Attachment 2
Fee Breakdown

Project Phase	Project Position (Personnel Work Class)	Merrick								
		Project Manager (Senior Project MGR)	Asst. PM (PROJ. ENG.)	Project Eng. (DES. ENG)	CADD Designer (SR. TECH.)	Administrative Asst. (CLERICAL)	Merrick Subtotal by Task	Merrick Expenses	Merrick Subtotal plus Expenses	Merrick Total
	Labor Rates	$204.00	$138.00	$96.00	$88.00	$82.00				
	Task Activity							Assumed at 5% of Labor		
1. Project Management										$18,746.70
1.1	Project setup									
	a. Prepare project management plan and schedule	4	16	2		8	$3,872.00	$193.60	$4,065.60	
	b. Internal setup (filing and accounting)	1	4	0		4	$1,084.00	$54.20	$1,138.20	
1.2	Project meetings									
	a. Kickoff meeting	2	6	2		3	$1,674.00	$83.70	$1,757.70	
	b. Seguin W&WW, plans and records	1	4	2		3	$1,194.00	$59.70	$1,253.70	
	c. Seguin W&WW, billing	1	4	2		3	$1,194.00	$59.70	$1,253.70	
	d. Seguin W&WW, model development	1	4	2		3	$1,194.00	$59.70	$1,253.70	
	e. Seguin W&WW, calibration	1	4	2		3	$1,194.00	$59.70	$1,253.70	
	f. NBU, future water demand	1	4	2		4	$1,276.00	$63.80	$1,339.80	
	g. Seguin W&WW, initial model verification	1	4	2		3	$1,194.00	$59.70	$1,253.70	
	g. Seguin W&WW, final model verificatior	1	4	2		3	$1,194.00	$59.70	$1,253.70	
	h. Seguin W&WW, discussion regarding	1	4	2		3	$1,194.00	$59.70	$1,253.70	
	i. Results presentation	2	4	4		3	$1,590.00	$79.50	$1,669.50	
2. Hydraulic Model Development										$26,012.70
2.1	Data collection									
	a. Data needs identification	1	2	4		4	$1,192.00	$59.60	$1,251.60	
	b. Data login and review	1	4	8		4	$1,852.00	$92.60	$1,944.60	
	c. Prepare TM documenting data collection	1	3			2	$782.00	$39.10	$821.10	
2.2	Hydraulic model development									
	a. Data input	2	8	24		4	$4,144.00	$207.20	$4,351.20	
	b. Connectivity and continuity review	2	4	16		2	$2,660.00	$133.00	$2,793.00	
2.3	Demand development									
	a. Evaluate and assign existing demands on surface water tranmission system (SWTS). Establish Average Daily Demand (ADD) and Peak Dailly Demand (PDD), and Peak Hourly Demand (PHD).	2	4	8		2	$1,892.00	$94.60	$1,986.60	
	b. Establish usage (diurnal) curve for SWTS for EPS model	1	2	4		2	$1,028.00	$51.40	$1,079.40	
	c. Prepare TM documenting demand development	2	8	4		4	$2,224.00	$111.20	$2,335.20	
2.4	Hydraulic model calibration									
	a. Fire flow testing	3	8	8		4	$2,812.00	$140.60	$2,952.60	
	b. Production pump performance testing	3	8	8		4	$2,812.00	$140.60	$2,952.60	
	c. Existing SWTS pressure monitoring	2	8	16		4	$3,376.00	$168.80	$3,544.80	
3. New Braunfels Service Modeling										$17,730.30
3.1	Scenario development and Analysis									
	a. Scenario 1 - AAD simulation									
	1. Existing system adequacy review	1	2	4			$864.00	$43.20	$907.20	

Attachment 2
Fee Breakdown

	2. Proposed system development and adequacy review	2	4	4			$1,344.00	$67.20	$1,411.20	
	b. Scenario 2 - PDD simulation									
	1. Existing system adquacy review	1	2	4			$864.00	$43.20	$907.20	
	2. Proposed system development and adequacy review	3	5	5			$1,782.00	$89.10	$1,871.10	
	c. Scenario 3 - PHD simulation									
	1. Existing system adequacy review	1	2	4			$864.00	$43.20	$907.20	
	2. Proposed system development and adequacy review	3	6	6			$2,016.00	$100.80	$2,116.80	
3.2	Documentation									
	a. Prepare TM to document findings	8	24	16	8	24	$9,152.00	$457.60	$9,609.60	
									Total Fee	**$62,489.70**