RESOLUTION 16-83

A RESOLUTION TO AUTHORIZE FUNDING FOR THE SPRING HILL WATER AND SEWER CAPACITY STUDY

WHEREAS, the City of Spring Hill desires to provide for the health, safety, and welfare of its citizens; and

WHEREAS, the City of Spring Hill desires to prepare for utility expansion to support rapid, future growth that is projected for the area; and

WHEREAS, the City currently has a professional services agreement with Dempsey Dilling and Associates; and

WHEREAS, the capacity study is to be funded over a two year period in the amount of $500,000; and

WHEREAS, the first half of the project is funded in the fiscal year 2016-2017 budget in the amount of $250,000.

NOW, THEREFORE BE IT RESOLVED, that the Board of Mayor and Aldermen authorizes the funding of the water and sewer capacity study in an amount not to exceed $500,000. Funds shall be expended over FY 2016-2017 and FY 2017-2018 in the amount $250,000 per year.

Passed and adopted by the Board of Mayor and Aldermen of the City of Spring Hill, Tennessee, this 18th day of July, 2016.

Rick Graham, Mayor

ATTEST:

April Goad, City Recorder

LEGAL FORM APPROVED:

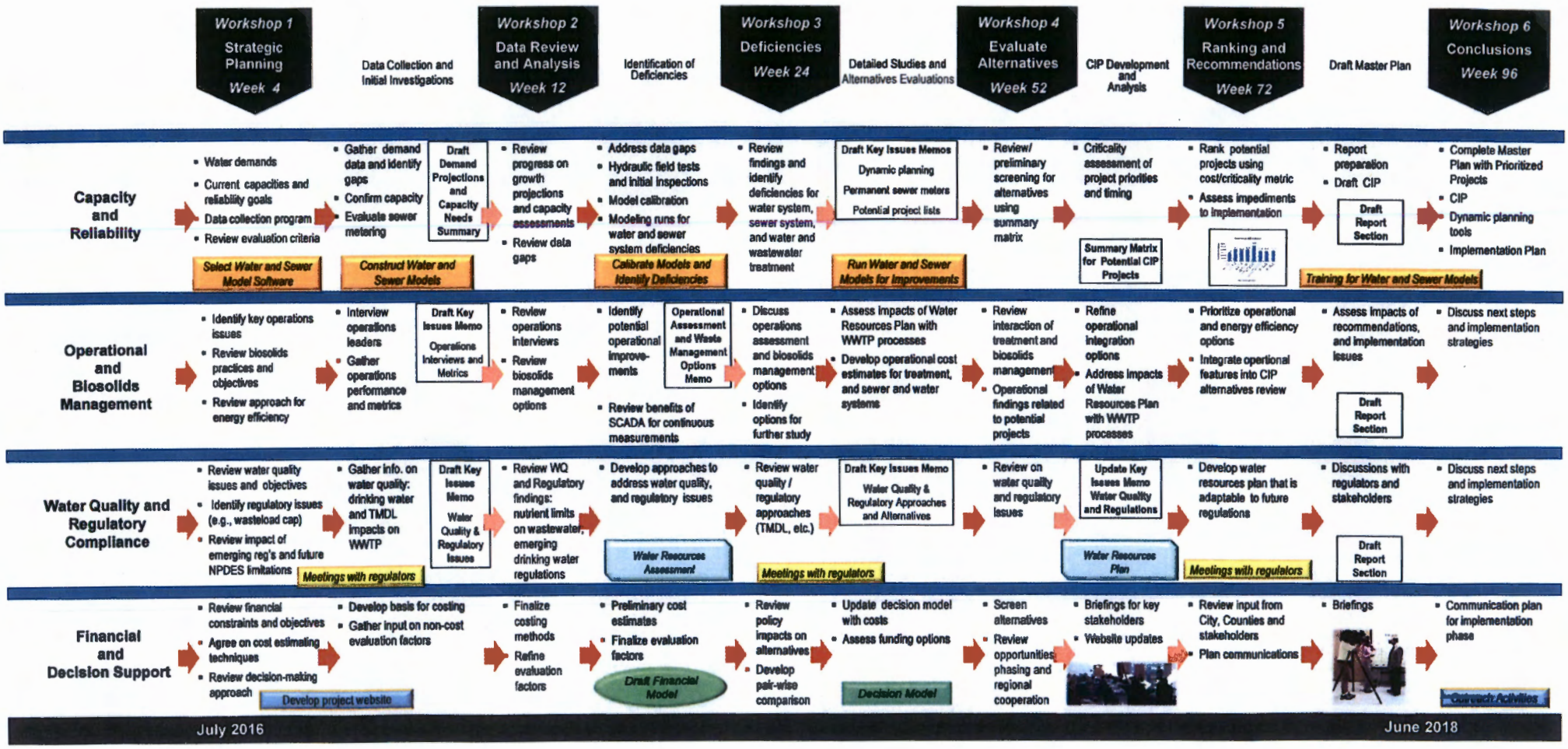
Patrick Carter, City Attorney

O'BRIEN & GERE

Project Approach and Decision Making Process

Water and Sewer Capacity Study

City of Spring Hill, TN



SCOPE OF WORK

INTRODUCTION

The City of Spring Hill has identified the need for a water and sewer capacity study in three broad areas: water distribution systems, sanitary sewer collection systems, and water and wastewater treatment plants. Many utilities throughout the United States are undertaking similar water and sewer studies in order to gain a better understanding of how the existing systems and facilities meet the needs of future growth and regulatory compliance, what capital improvements are needed, and how these improvements will be funded.

Integrated Project Approach – The cornerstone of this approach is a series of workshops. The workshops provide an effective forum for collaboration with the City and invited stakeholders, communicating findings, screening alternatives and decision making. This approach accomplishes the work on schedule, while avoiding "re-do's" that could arise if technical work is conducted without timely input from the City or others. Decision makers and stakeholders will be apprised of work throughout the study, across the three study areas so that there is continuous, incremental progress in all three areas.

- ***Water Distribution System*** - Projecting future water demands, identifying water supply capabilities, defining water service areas, developing and calibrating a water distribution system model, assessing the capacity and reliability of each major component of the water supply delivery system (i.e., intake, treatment, pumping, and transmission/distribution systems), identifying system deficiencies, and developing a prioritized capital improvements program.
- ***Sanitary Sewer Collection System*** – Projecting future sewer flows, delineating sewer service area, developing and calibrating a sewer system model, assessing the capacity and reliability of each major component of the sewer conveyance system (i.e., conveyance piping and pumping stations), identifying system deficiencies, and developing a prioritized capital improvements program.
- ***Water and Wastewater Treatment Plants*** – Using the projected water demands and sewer flows to determine the need for additional capacity at the water and wastewater treatment plants. This also includes defining current and available capacity of major plant components, identifying remaining life of assets, and identifying capital and operational improvements that may be required to meet future regulations under the Safe Drinking Water Act and Clean Water Act.

SCOPE OF WORK

TASK 1 – DATA COLLECTION

Readily available data and information will be collected at the kickoff meeting in each of the three study areas. Prior to the kickoff meeting, a memorandum will be provided to the City identifying specific information in each of the three study areas and site visits will be conducted to key facilities in concert with the kickoff meeting. Interviews with City staff and operators will be conducted. Existing documentation will be requested and may include previous studies, GIS maps and shapefiles for water and sewer systems, service area maps, site drawings of facilities, water billing data, operation (SCADA) records, pump curves, loss of head information, fire hydrant flow tests, sewer system monitoring, water production and wastewater flow records, water distribution and sewer system collection system models (if available), and cost data based on recent bids and operating records.

It will be important to establish the objectives of each of the stakeholders at the kickoff meeting and their roles and responsibilities in the study. We will also clarify who will make decisions and how they will be made during the course of the study.

The guidelines and criteria that will be used in the study to assess the adequacy of water supply, water treatment, pumping, water storage, water distribution, wastewater collection, wastewater pumping and wastewater treatment will be reviewed with meeting participants. We recommend that the guidelines and criteria typically used to assess the adequacy of water supply, water treatment, water distribution, sewer

collection, and wastewater treatment be established for this study in accordance with City requirements, TDEC regulations, AWWA recommendations, ISO requirements, and other pertinent federal, state and local regulations. This information will be presented to the City for concurrence.

Financial constraints and objectives will be discussed at the kickoff meeting along with techniques for cost estimating. Cost information, data and agreements will be obtained from the City. Non-cost factors will be discussed with meeting participants.

TASK 2 - WATER DEMANDS AND SEWER FLOW PROJECTIONS

To establish overall system water use and demands for Spring Hill, daily water production records will be obtained and compared with the detailed water use information recently developed by the Duck River Agency for Spring Hill. The allocation of that water use across the City's water system will be established using the individual customer water meter records. For the existing water use, a multi-step process will be used to allocate annual average water use for each node in the City. First, the annual usage will be estimated for each customer meter based on information provided by the City. The meter locations will be imported into the water model and the demands at the meters will be assigned to nodes using the model's features. The average day water usage for each meter will be assigned (*i.e.*, linked) to the parcel centroid using address data from the billing system and parcel data available from the City. Usage assignments will be checked to confirm that the assignments are correctly applied to the nodes or pipes at any locations that are questionable (*e.g.*, multiple meters). Unmetered water will be obtained from the Duck River Agency's work on water demands for Spring Hill and globally allocated to all junctions in the model.

For future water use, GIS mapping provided by the City's Planning Department will be used to assess the number of parcels currently served and unserved by the potable water system. This information will be used to identify the number and acreage of non-metered parcels in order to gain some insight into the potential future water demand of the City under buildout conditions. This information will be compared with data developed by the Duck River Agency. Particular attention will be given to the development of water demands for the area east of I-65.

Water balance flow schematics showing the water demand for each pressure zone and flow transfers between zones will be developed to illustrate the change in water demands over time. Water demands in the water model will be allocated to the model nodes based on the water usage projected for each parcel. Sanitary sewer flows in the sewer model will computed based on a percentage of water demands and these sewer flows will be allocated to manholes in the sewer model.

Diurnal demand curves will be developed for the water system and used in extended period simulation (EPS) runs. Hourly production data and tank level data from a typical day will be used to perform a mass balance in the water system and to generate the diurnal demand curve.

Base sanitary flows for the sewer system will be established using water demand and sanitary sewer flow data during dry weather flow conditions. Inflow / Infiltration (I/I) will be added to the base sanitary flows for modeling alternative design storm events. Sanitary sewer flows in the sewer model will be computed for future conditions based on a percentage of water demands and these sewer flows will be updated and allocated to manholes in the model. Sewershed boundaries will be defined and mapping will be developed.

TASK 3 – SOFTWARE SELECTION

O'Brien & Gere will assist the City in selecting the hydraulic modeling software for analyzing the water and sewer systems. Based on experience, the following provides a general description of the most powerful and applicable modeling software packages for this project which will include WaterGEMS and SewerGEMS by Bentley Systems, Inc. and InfoWater and Info Sewer by Innovyze.

The evaluation criteria defined below can be used to generally differentiate between models.

- *Capabilities and Limitations* – This criterion addresses the ability of the software to allocate demands or flows, model water distribution system water quality, calculate water system fire flow, link to SCADA, and link to GIS.
- *Portability and System Requirements* – Computer software should be adaptable to changing computing environments. This criterion also addresses use of the software on single computer verses networking multiple workstations.
- *Purchase Price* – This criterion addresses the initial purchase price for the software.
- *Annual Cost* – This criterion addresses the annual cost for license and maintenance support.
- *Software User Support* – Privately developed programs have software license agreements that contain provisions for software support. Software support can include answering general modeling questions and repairing encountered software bugs.
- *Ease of Use* – This criterion includes data editing, documentation quality, diagnostic messages, and graphics capabilities (*e.g.,* annotation of model components, contour plots of model results).

Both software packages described above will meet the City's project objectives. Based on our discussions with the City, the capabilities and successful operating experience that O'Brien & Gere has had with the Innovyze and Bentley products, cost, as well as software being used by neighboring jurisdictions to Spring Hill, our preliminary recommendation is to develop the City's water and sewer models using InfoWater (water distribution) and InfoSewer (sewer collection) software from Innovyze.

TASK 4 - WATER DISTRIBUTION SYSTEM MODEL DEVELOPMENT

A water distribution system model is critical to understanding the system and making decisions regarding sizing of water mains, system operation, water quality, criticality of piping, rehabilitation versus replacement of piping, system operations, etc. The water distribution system model will be developed using the City's GIS and working with City personnel (GIS, Engineering, Operations, etc.) in an interactive work session environment. Information from the City's GIS will be used to initiate development of the water model. Connectivity of the water piping system will be verified using software tools. Any issues with connectivity will be reconciled with the GIS and Operations personnel at the City.

Information needed for model configuration includes: record drawings (or latest revision available) of pumping stations, storage tanks, piping and any wholesale meter locations; GIS shapefiles or geodatabase for piping; locations of any closed valves; pump curves (factory certified if available) for existing pumps; hydraulic configuration for all water storage tanks (*e.g.,* overflow elevation, ground elevation, operating range, diameter; current pressure/level settings for any control (*e.g.,* altitude, pressure reducing) valves in the water system; any current capital improvement and rehabilitation/replacement plans; water billing meter data compiled for at least one year; hourly data (SCADA) and boundary conditions (*e.g.,* pumping pressure and flow, and tank levels) for a seven-day period encompassing the maximum day demand; water supply contracts between the City and other municipalities/districts; any other reports or documentation related to system operation and control.

Initial assignment of C-factors for pipes in the model will be made based on evaluation of the pipe material and age. Pipe C-factors will be adjusted during model calibration.

Elevation data for each node in the water system model will be generated using contour mapping available from the City. Spot checks will be performed to verify accuracy.

TASK 5 - SANITARY SEWER COLLECTION SYSTEM MODEL DEVELOPMENT

To effectively develop a list of recommended improvements for the City's sewer collection system, the City will need to fully integrate the condition of the assets and the flow conveyance capabilities of the piping network. Developing a sanitary sewer system hydraulic model is a fundamental first step in the planning process. Similar to the water system model development, data that resides in the City's GIS will be used to assign flows and configure the network. Connectivity of the sewer piping system will be verified using software tools.

Information needed for model configuration includes: record drawings (or latest revision available) of pumping stations, GIS shapefiles or geodatabase for piping, pump curves (factory certified if available) for existing pumps, any current capital improvement and rehabilitation/replacement plans, sewer flow data, SCADA, any other reports or documentation related to system operation and control.

Collection system piping less than 8 inches in diameter and force main piping less than 4 inches in diameter will not be included in the model unless it is needed to provide connectivity or accurately simulate field conditions. Manhole invert data will be collected as described under Field Services.

TASK 6 – FIELD SERVICES

Field-testing is a key component of the water and sewer system model calibration process. A summary of the field data collection activities for the water and sewer systems follows.

Water distribution system – For a City the size of Spring Hill, approximately 50 fire flow tests will be performed while the boundary conditions (i.e., water levels in storage tanks, pumping rates, etc.) are being monitored. At select locations throughout the water system, pressures monitors will be installed and data recorded for approximately five (5) days corresponding to the dates of the fire hydrant flow tests. Pressure monitors will be installed on fire hydrants. The field-testing program to be utilized in calibrating the water model (i.e., hydrant locations, tank levels to be monitored, etc.) will be developed and provided to the City for review and comments. Hydrant flow tests will be conducted at various locations throughout the City's system. It is assumed that City's personnel will operate the fire hydrants. Data collected during fire hyrant testing will be recorded and the predicted pressure at 20 psi will be computed. Maps showing the results of the fire hydrant flow tests will be developed and provided to the City for review and comments.

Sewer collection system – Field services are needed to collect data for the sewer collection system model in two areas: manhole inverts and flow monitoring. For manhole invert data collection, it is assumed that a majority of the manhole inverts will be in the GIS or available from as-built drawings and that data for approximately 50 manholes (1 percent of the total number of manholes) will be collected in the field to reflect the overall condition of sewer piping for the developments within the sewer system. Ground (rim) elevations will be generated from the contour file and invert elevations will be calculated from rim elevations and depth of manhole measurements. Spot checks will be performed in the office using the GIS aerials with contours to verify accuracy.

The City has requested that an evaluation be performed to assess whether temporary or permanent flow meters should be installed in the sewer collection system. The evaluation will document the cost and benefits of the flow monitoring alternatives. The primary tasks associated with the field services for collection of flow data for the sewer system are as follows.

- *Traffic Control and Safety* - Traffic control conforming to local and State requirements will be provided while working within or affecting any city or State right-of-ways. Applicable Occupational Safety and Health Administration (OSHA) regulations for confined space entry will be followed.
- *Site Investigations* – Anticipated flow monitoring sites in the sewer system will be preliminarily investigated to determine the adequacy of the proposed flow monitoring sites for equipment installation and proper data collection. Prior to the installation of the gauging equipment, a thorough site investigation at each of the selected monitoring manholes will be conducted to determine hydraulic suitability. This will require

descending the manhole to perform an inspection. Pipe size verification will also be performed at this time. Consideration of any site specific problems and general conditions, as well as safety issues will also be analyzed (low-level flows, turbulent and/or non-ideal hydraulic conditions, silting or sedimentation in the pipe, high velocities causing turbulent flows, drop manholes, high traffic areas and difficult or poor accessibility, etc.). The recommend type of flow meter equipment will be identified based on suitability of each site.

A preliminary site report will be prepared for each flow meter site and submitted to the City for approval. Once the selected monitoring locations have been evaluated, a site report detailing all relevant site information, including but not limited to: site address and GPS coordinates; pipe geometry, condition and material; manhole depth, condition and material; hydraulic conditions; and safety issues and concerns.

- *Monitoring Duration* – It is assumed that temporary flow monitoring will be selected and the duration of the flow monitoring is assumed to be two (2) months. No guarantee is made regarding the total number or duration of flow monitoring events that will occur at any site. Continuation of the monitoring period beyond two (2) months can only be authorized in writing by the City.
- *Number of Meters* – Approximately eleven (11) meters will be located within three (3) basins (roughly 1 meter per 50,000 lf of pipe). These meters will remain for a period of approximately two (2) months or until sufficient rainfall for hydrologic parameters is received.
- *Contract Obligation During Metering Period* – The City will immediately be notified of any major problems or emergency situations encountered in the field such as, surcharging, pipe blockages, severely damaged pipe, severely damaged structure/manhole, sewer overflows, and/or equipment stuck in the pipe that cannot be removed.
- *Review and Analysis of Data* – Data collected during the flow monitoring period will be reviewed and analyzed to document the average dry weather flow (i.e., base sanitary flow plus groundwater infiltration) and the peak wet weather flow (average dry weather flow plus rainfall-dependent I/I). Locations with I/I greater than 3,000 gallons per day per inch-diameter per mile (gpdim) is considered excessive and will be identified. Tables and graphs showing the results of the flow monitoring will be provided to the City for review and comment.

TASK 7 – WATER AND SEWER MODEL CALIBRATION

Water model calibration - The water model will be calibrated with the goal of predicting fire flow tests to within 5 psi of the measured static and residual pressures. For tests where modeled pressures are not within 5 psi of measured residuals, the boundary conditions and hydrant elevations will be verified and the potential for closed valves will be discussed with the City.

SCADA data will be collected to compare water storage tank levels (i.e., actual vs. modeled) for an extended period simulation (EPS) runs. The model will be considered to be calibrated for the EPS condition when the "modeled" tank levels tracks the "actual" tank levels are within 2 feet over a 24-hour period. Interviews with the City's Operators will be performed to fully understand how the Operators run the water system.

Calibration results will be entered into a spreadsheet with information on the test location, model pipe/junction label, pipe size, flow magnitude, node demand, measured and modeled static and residual pressures, and difference between modeled and measured values.

Sewer model calibration – The I/I data collected in the Field Services task will be used for calibration of the sewer collection system model under dry weather and wet weather conditions. Operating data from the SCADA system will be used (if necessary) to assist with calibration of the model. The model will be considered to be calibrated when the "modeled" flows track the "actual" flows closely over a 24-hour period.

TASK 8 - IDENTIFICATION OF WATER AND SEWER SYSTEM DEFICIENCIES

Water and sewer system modeling analyses will be conducted using the calibrated models to identify deficiencies (i.e., "trouble spots" or "bottlenecks") in the system that do not meet the City's policies and criteria. Modified versions of the calibrated base year models will be used to reflect the impact of projected system changes in the near-term and long-term target years. The base year and target year models will be used to

analyze pumping, storage, distribution and collection system piping deficiencies. Overall average day demand and flow projections will be generated for the target years. Diurnal demand curves and flow curves will be reviewed, and their applicability to future conditions will be ascertained and adjusted, as needed. The water and sewer models will then be used to evaluate the ability of the systems to meet the established guidelines and criteria under current and future conditions. Water age and source trace analyses will be conducted for the water system to identify problems for targeted solutions, such as mixing and turnover of water in storage tanks.

As part of the assessment of system deficiencies, interviews with City staff will be conducted to develop a comprehensive list of concerns related to system performance.

A list of water and sewer system deficiencies will be developed, which will include the following information:

- General nature of the deficiency; i.e., inadequate pressure and extent of problem.
- Model conditions under which problem was identified; i.e., maximum day, peak hour, etc.
- Operating condition under which problem occurs; i.e., number of pumps operating, pumping station shutdown, etc.
- Model results for deficient facility.
- Whether the deficiency is an operational problem or regulatory issue.

Maps showing water and sewer system deficiencies will be developed and presented to the City for review and discussion.

TASK 9 - WATER AND WASTEWATER TREATMENT PLANTS

Facility Assessments - Site visits will be performed to visually inspect and assess the general condition of the City's water and wastewater treatment plants. Operations manager and plant superintendent interviews will be part of the site visits process. The condition assessment by the lead engineer will be limited to visual inspection and documentation of the hydraulic capacity of pumping units based on nameplate data and electrical load capabilities (i.e., condition assessment will not include HVAC, corrosion, structural testing, etc.). Data collected in the field will be documented electronically and will include the location, facility type, date of construction (if available), nameplate information (capacity, head, horsepower), and photographs. It is assumed that at least one employee of the City will be available on the site visits to provide access to the facilities.

Information from previous studies will be used as a starting point for the inventory and evaluation. Interviews with City's staff (i.e., Operations, Maintenance and other personnel) will be key with respect to defining current capabilities and deficiencies of facilities. This assessment will provide the information needed for the City to form the baseline for making decisions regarding use of the existing facilities in the near-term and long-term.

Water Treatment – Alternatives investigated as part of the Duck River Agency's regional water supply study will be documented including expansion of the City's existing water treatment plant with a new raw water pipeline, purchasing additional finished water from CPWS, and producing finished water from a regional plant in Maury County. Alternatives will be evaluated based on capacity, water quality, facility condition, and major risks for each of the alternatives. Life-cycle costs will be reviewed to confirm that Spring Hill could minimize their costs by utilizing the existing pipeline connection to CPWS and establishing a wholesale contract through approximately 2025. The terms of the contract negotiated with CPWS will be reviewed to define the benefits to Spring Hill. The ability to expand the existing intake on the Duck River and construct a new pipeline in proximity to the existing pipeline from the intake to the water treatment plant will be investigated. A preliminary alignment study will be performed to identify potential obstacles for implementation.

Site visits will be conducted to the water treatment plant to confirm capacity requirements to meet future water demands and to assess potential treatment options that may be needed in the future to meet regulatory requirements.

Wastewater Treatment – The next increment of wastewater treatment capacity and the ability to further expand the existing plant or the need to construct a new plant will be the focus of this study effort. The timing for the next increment of capacity will be highly dependent on the rate of population growth and will be confirmed in this study. Previous studies (i.e., such as the Dempsey, Dilling & Associates study in 2008) conducted in support of the expansion of the City's wastewater treatment plant will be reviewed and updated. Nutrient loading to Rutherford Creek and alternatives to discharge to the Duck River will be investigated in order to assess the ability to further expand the existing wastewater treatment plant. Of note, TDEC has begun to implement its Nutrient Reduction Strategy and promulgate rulemaking associated with revised Fresh Water Nutrient Criteria / Ammonia toxicity rule, responding to USEPA initiatives. Both regulatory programs could affect the Spring Hill POTW due to its plant size and discharge stream classification, within the master planning horizon. No specific water quality or process modeling is proposed as part of initial master planning efforts, however, recent discharge monitoring reports (DMRs) – last 12-36 months – will be reviewed for general performance trends with commentary regarding the ability of the treatment processes to meet lower tiered TN and TP removal levels.

Solids processing at the City's wastewater treatment plant will be investigated. Sewer flows will be used to project the increase in volume of solids processing. The City's current terms of the contract which includes hauling sludge to a landfill will be reviewed. The City cost for disposal will be addressed to identify if other alternatives exist for further processing of the sludge to lower the disposal cost. Further processing options might include adding additional dewatering capability or further processing to Class B or Class A biosolids that would allow land disposal options to be selected at a significantly lower tipping fee. Additionally, nutrient re-

release can occur in certain solids processing environments, the initial assessment will include qualitative review of this issue, reviewing in-plant nutrient data if made available.

TASK 10 - DEVELOPMENT AND EVALUATION OF IMPROVEMENTS

Improvement recommendations will be developed to address the water and sewer system deficiencies as well as deficiencies at the water and wastewater treatment plants. Opportunities to integrate near-term projects into the long-range plan will be a key consideration in the analysis and recommendation of improvements.

Water and sewer system improvements (new facilities, replacement, rehabilitation and upgrades) will be identified using hydraulic model simulations to demonstrate the effect of the project and the ability to satisfy basic design criteria (storage tank overflow elevation, pump sizing, sewer system capacity, etc.).

Separate project descriptions will be prepared for each recommended improvement. Project recommendations will include the justification (nature of deficiency and impact on system), the benefits of the project improvement, a discussion of alternatives considered and the timing of implementation. With input from the City, the criteria used to evaluate improvements will be reviewed. These criteria may include documentation of the technical feasibility, benefits, present worth, capital and operating costs and environmental and community impacts. Improvements that satisfy multiple objectives will be given a higher ranking. Near-term improvements will be compared to long-term (build-out) improvements for compatibility. A map showing the existing system and proposed improvements will be developed to identify the location of each recommended project. This map along with a spreadsheet listing the timing of the improvements will be provided to the City for review.

TASK 11 - OPINIONS OF PROBABLE COST

A *Cost Model* will be developed to provide an "apples to apples" comparison of improvement alternatives from a financial standpoint using life-cycle costs. The cost model used for the Duck River Agency's Maury County Regional Water Supply Feasibility Study will be used to develop cost comparisons and summary figures for capital, operating, and life-cycle costs. As with the cost model for the Maury County Regional Water Supply Feasibility Study, a copy of the completed model will be provided to the City for use without restrictions.

Recommend improvements will be identified in each of the three study areas (water system, wastewater collection system, and water and wastewater plants). The improvements will be ranked within each subject area based on priority and a proposed schedule will be provided. Opinions of probable cost will be developed for each recommendation, if applicable.

TASK 12 - DECISION SUPPORT SERVICES

A *Decision Support Model*, will be developed to compare economic and non-economic factors in the alternatives selection process. Metrics used for the comparison will be developed in collaboration with the City early in the study and may include:

- Reliability - adequate to meet or exceed the near term and future goals for reliability with a critical component out of service, etc.
- Capacity – ability to deliver or treat desired flows
- Water Quality – ability to meet current and anticipated future regulations
- Flexibility – ability to change course or retain options for further consideration
- Cost - construction, operating and present worth costs, as appropriate
- Ease of Implementation - the relative ease of implementing the proposed improvements on the desired schedule. This criterion would consider the potential that regulatory permitting, public acceptance, property acquisition, agreements with neighboring utilities, or constructability issues could delay implementation.

A summary matrix will be developed to compare alternatives based on the evaluation criteria. The comparison process will be used to develop a single score upon which to prioritize the projects or alternatives.

TASK 13 – PREPARE DRAFT REPORT

At the conclusion of the City's Water and Sewer Capacity Study project, a comprehensive report will be completed which will include maps, charts, graphs, details and discussion on the various components of each applicable task and the findings. In general, the report shall list and give background information on the City's water system, sewer collection system, and water and wastewater treatment plants.

TASK 14 - PROGRESS MEETINGS AND WORK SESSIONS

A combination of progress meetings, work sessions and briefings will be held to facilitate decision making during the project. Work sessions will be conducted at the following key points in the project to reach consensus from the City and the project team before proceeding:

- Work Session No. 1 – Strategic Planning
- Work Session No. 2 – Data Review
- Work Session No. 3 – Phase 1 Results/Phase 2 Scoping
- Work Session No. 4 – Evaluating Alternatives
- Work Session No. 5 – Ranking and Recommendations
- Work Session No. 6 – Conclusions

The above-mentioned meetings will provide step-by-step decisions, allowing ample communication with the City and well-informed decisions.

TASK 15 – FINAL REPORT AND DELIVERABLES

The deliverables to be submitted to the City include the following:

- Meeting minutes – Minutes from meetings with the City or other agencies will be prepared and submitted to the City within ten (10) days. The minutes will document meeting discussions as well as action items.
- Final Report – The final report will incorporate the City's comments on the draft report and will clearly present the criteria used to evaluate the water and sewer system needs; current and future water demands and wastewater flows; and proposed water and sewer improvements (location, capacity, design considerations, and cost). The estimated cost for design and construction of the improvements will be identified.
- Data Binder – An indexed data binder will be submitted and will include the Final Report as well as information used to develop input data for the models, calibration results and other relevant calculations, tables and figures, pump curves, final computer output, reproducible note diagrams, and balance-loss work sheets.
- Other Work Products – Digital copies of work products will be provided to the City, including Excel spreadsheets, GIS products, and water and sewer models.

TASK 16 – WATER AND SEWER MODEL TRAINING

Training for City staff will be provided and will include 16 hours of onsite classroom training on both the water model software and the sewer model software (16 hours total) at the City's desired training location. The following outline is proposed for a 16 hour training program:

- Four (4) hours of training to cover "how to push the buttons" for both water and sewer systems.
- Four (4) hours of training on the "model build" process to cover both water and sewer systems.
- Four (4) hours of training on field services and model calibration.
- Two (2) hours on scenario management and model maintenance.
- Two (2) hours on modules and other features.

It is assumed that computers and facilities will be provided by the training participants and that training will occur subsequent to calibration of the water and sewer models.

TASK 17 - PROJECT MANAGEMENT AND ADMINISTRATION

General project management and administrative duties associated with the project may include the following:

- Monitoring progress, scheduling, general correspondences, and administrative support
- Maintaining a secure project website
- Preparing for and conducting meetings
- Preparing and submitting progress reports to the City on a monthly basis
- Scheduling and presiding over progress meetings with City personnel held on a monthly basis by conference call and in person (assume three (3) progress meetings will be held during the periods between the work sessions)
- Preparing agendas and distributing minutes of the meeting.

DRAFT - June 6, 2016

Water and Sewer Capacity Study
Spring Hill, Tennessee

Tasks	Officer, Program Director	Managing Engineer, Managing Scientist, Project Manager 2, Sr. Technical Director	Managing Engineer, Managing Scientist, Project Manager 1, Technical Director	Managing Associate, Project Associate, Technical Associate, Engr/Sci/Arch 3	Sr. Project Engineer, Sr. Project Design, Sr. Project Scientist, Sr. Scientist, Sr. Designer, Sr. Engineer	Project Engineer, Project Scientist, Project Designer, Engr/Sci/Arch 2	Design Engineer, Designer, Scientist, Eng Tech 3	Staff Engineer, Staff Scientist, Staff Designer, Engr/Sci/Arch 1, Admin 3	Design Drafter, Technician, Sr. Division Secretary, Office Administrator	Technical Drafter, Regional Office Secretary, Project Controls Admin	Total Hours	Total Labor Cost	Expenses	Total Labor Plus Expenses	Task Totals	Year 1	Year 2
Task 1 - Data Collection															$ 6,471		
Prepare memorandum documenting data request to City and coordinate data collection	1	1	1		6						11	$ 1,839		$ 1,839		$ 1,839	
Conduct interviews with City staff at kickoff meeting and prepare minutes from interviews	4	4	4		6						20	$ 3,636		$ 3,636		$ 3,636	
Review planning and design criteria and guidelines		2	2		12						16	$ 2,616		$ 2,616		$ 2,616	
Define techniques for cost estimates		2	2		4						8	$ 1,376		$ 1,376		$ 1,376	
Task 2 - Water Demand and Sewer Flow Projections															$ 5,887		
Develop water demands and scales water demands to scales using meter shapefile data			2		2	16					20	$ 2,832		$ 2,832		$ 2,832	
Develop water and sewer flow schematics for current and future conditions			1		1	4				4	10	$ 1,140		$ 1,140		$ 1,140	
Develop diurnal demand curves			1		2	4					7	$ 1,031		$ 1,031		$ 1,031	
Define unmetered boundaries and prepare maps/es					4					4	8	$ 884		$ 884		$ 884	
Task 3 - Software Selection															$ 2,480		
Prepare matrix comparing software alternatives					4						4	$ 620		$ 620		$ 620	
Coordinate meeting with software vendors and assist City with recommendation					12						12	$ 1,860		$ 1,860		$ 1,860	
Task 4 - Water Distribution System Model Development															$ 7,491		
Develop water system model		2	4			32			2		40	$ 5,600		$ 5,600		$ 5,600	
Check and resolve connectivity of water model						8					8	$ 1,080		$ 1,080		$ 1,080	
C-factor assignments for piping			1			2					3	$ 451		$ 451		$ 451	
Elevation and data checks						2					2	$ 270		$ 270		$ 270	
Task 5 - Sanitary Sewer System Model Development															$ 6,480		
Develop sewer system model			4			32					36	$ 5,044		$ 5,044		$ 5,044	
Check and resolve connectivity of sewer model			2			8					10	$ 1,442		$ 1,442		$ 1,442	
Task 6 - Field Services															$ 148,340		
Identify sites and prepare maps/es for fire hydrant flow tests (50 sites) and pressure monitors (8 sites)			1			8					9	$ 1,261		$ 1,261		$ 1,261	
Install pressure monitors on fire hydrants (assume 8 sites for 5 days)								16			16	$ 1,520		$ 1,520		$ 1,520	
Conduct fire hydrant flow tests (50 sites)								80			80	$ 7,600	$ 1,000	$ 8,600		$ 8,600	
Prepare tables and figures for fire hydrant flow tests			1					16			17	$ 1,701		$ 1,701		$ 1,701	
Review as-built drawings for manhole inverts not included in GIS				2				24			26	$ 2,804		$ 2,804		$ 2,804	
Identify manholes for collection of invert data and conflict assessment				1				8			9	$ 922		$ 922		$ 922	
Conduct site visits to manholes to collect data (assume approximately 50 manholes or 1% of total)								80			80	$ 7,600	$ 1,000	$ 8,600		$ 8,600	
Tabulate invert and conflict assessment results of site visits to manholes								8			8	$ 788		$ 788		$ 788	
Conduct spot checks on rim elevations								2			2	$ 190		$ 190		$ 190	
Review GIS mapping and identify locations for flow meters (assume 11 sites)		2		2				28	28		60	$ 5,620		$ 5,620		$ 5,620	
Evaluate temporary versus permanent flow meters		2		16							18	$ 2,966		$ 2,966		$ 2,966	
Install flow meters (ensure temporary meters at 11 sites for 2 months)		2		4				36	36		82	$ 7,694	$ 30,000	$ 37,694		$ 37,694	
Conduct flow monitoring (ensure temporary meters at 11 sites for 2 months)				16				144	144		304	$ 27,792	$ 2,000	$ 29,792		$ 29,792	
Review and analyze data				4	88			40			132	$ 18,068		$ 18,068		$ 18,068	
Task 7 - Water and Sewer Model Calibration	-														$ 19,332		
Set up model calibration runs		2		40							42	$ 5,676		$ 5,676		$ 5,676	
Conduct model calibration runs and review results		2		40							42	$ 5,676		$ 5,676		$ 5,676	
Prepare tables and figures showing results of model calibration		2		32							34	$ 5,980		$ 5,980		$ 5,980	
Task 8 - Identification of Water and Sewer System Deficiencies															$ 13,166		
Conduct modeling runs to identify system deficiencies			2	40							42	$ 6,842		$ 6,842		$ 6,842	
Prepare descriptions of system deficiencies			2	32							34	$ 5,946		$ 5,946		$ 5,946	
Prepare mapping to identify the location of system deficiencies				4						2	6	$ 780		$ 780		$ 780	
Task 9 - Water and Wastewater Treatment Plants															$ 71,713		
Conduct facility assessments to water and wastewater treatment plants	8	8	16		16						48	$ 6,720		$ 6,720		$ 6,720	
Water supply and treatment alternatives analysis	8	8	16		40						72	$ 12,440		$ 12,440			$ 12,440
Review process studies and investigate nutrient loading		24		80	40			40			184	$ 27,712		$ 27,712		$ 4,500	$ 23,212
Investigate solids processing alternatives		24		64	40			16			144	$ 22,840		$ 22,840		$ 4,500	$ 18,340
Task 10 - Development and Evaluation of Improvements															$ 84,774		
Develop alternatives to address identified deficiencies		8	8	8	80						104	$ 16,728		$ 16,728			$ 16,728
Conduct analyses to demonstrate ability of improvements to relieve criteria		8	8	8	80						104	$ 16,728		$ 16,728			$ 16,728
Develop project description for each improvement		8	8	8	64						88	$ 14,248		$ 14,248			$ 14,248
Prepare mapping to identify location of improvements			2		12					8	22	$ 2,700		$ 2,700			$ 2,700
Define timing for implementation of improvements based on deficiency		4	4	2	16						26	$ 4,320		$ 4,320			$ 4,320
Task 11 - Quickcost of Probable Cost															$ 18,848		
Develop cost model for evaluating alternatives		2	4		16						22	$ 3,600		$ 3,600			$ 3,600
Develop capital costs for improvements	2	4	8	4	64						82	$ 13,248		$ 13,248			$ 13,248
Task 12 - Decision Support Services															$ 10,724		
Develop criteria for evaluation of alternatives	1	1	2		4						8	$ 1,400		$ 1,400			$ 1,400
Prepare evaluation matrix for comparison of alternatives		8	8		32					2	60	$ 8,124		$ 8,124			$ 8,124
Prioritize projects based on scoring		2	2		2					2	8	$ 1,200		$ 1,200			$ 1,200
Task 13 - Prepare Draft Report															$ 21,490		
Prepare draft report	4	28	24		84					24	140	$ 21,490		$ 21,490			$ 21,490
Task 14 - Progress Meetings and Work Sessions															$ 37,898		
Work Session No. 1 - Strategic Planning	8		16								24	$ 4,656		$ 4,656		$ 4,656	
Work Session No. 2 - Data Review	8		16							4	28	$ 4,920		$ 4,920		$ 4,920	
Work Session No. 3 - Deficiencies	8		24		8					4	44	$ 7,908		$ 7,908		$ 7,908	
Work Session No. 4 - Evaluating Alternatives	8		24		8					4	44	$ 7,908		$ 7,908			$ 7,908
Work Session No. 5 - Reviews and Recommendations	8		24		8					4	44	$ 7,908		$ 7,908			$ 7,908
Work Session No. 6 - Conclusions	8		16								24	$ 4,656		$ 4,656			$ 4,656
Task 15 - Final Report and Deliverables															$ 10,899		
Prepare meeting minutes			16		16						32	$ 5,376		$ 5,376			$ 5,376
Revise draft report based on comments from City		4	4		16					4	28	$ 4,260		$ 4,260			$ 4,260
Prepare final report			2		8					4	14	$ 1,866		$ 1,866			$ 1,866
Prepare data binder			4		40					4	48	$ 7,188		$ 7,188			$ 7,188
Task 16 - Water and Sewer Model Training															$ 9,223		
Preparation for training, travel and training logistics, coordination with City			2		16						18	$ 2,842	$ 800	$ 3,642			$ 3,642
Model introduction					8						8	$ 1,240		$ 1,240			$ 1,240
Model build process					8						8	$ 1,240		$ 1,240			$ 1,240
Field services and model calibration					8						8	$ 1,240		$ 1,240			$ 1,240
Scenario management and model maintenance					8						8	$ 1,240		$ 1,240			$ 1,240
Discussion of modeling and other features					4						4	$ 620		$ 620			$ 620
Task 17 - Program management and administration															$ 39,308		
General program management services (subs&/inv. process reports, etc.)		40	40								80	$ 15,160		$ 15,160		$ 7,580	$ 7,580
Attend meetings (3) with City and stakeholders		12	12								24	$ 4,548	$ 600	$ 5,148		$ 2,574	$ 2,574
Project Totals	78	312	340	497	971	110	0	540	212	74	2644	$ 400,070	$ 35,400	$ 435,370	$ 435,370	$ 240,823	$ 215,790
Hourly Billing Rates (2016)	$220	$190	$161	$162	$165	$135	$110	$99	$90	$86							

Note: Estimate based on Hourly Billing Rates for 2016