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October 31, 2024

Mr. Travis Foley, Utilities Director
City of Independence Utilities Department
2018 Three Elms Park Road
Independence, IA 50644

Re: Engineering Services – Water System Plan

Dear Travis,

On behalf of Strand Associates, Inc.®, thank you for the opportunity to submit this letter proposal to assist the City of Independence with water system planning. Also, thank you and Matt Schmitz for meeting with me and Brad Lake to discuss this important project. We understand the City has several water system challenges that would benefit from a water system plan and hydraulic model. Below is our understanding of system needs followed by a summary of the benefits of a water system study and hydraulic model towards addressing these challenges.

Project Understanding

The City of Independence water system consists of five wells, three water towers, and more than 2,800 water service connections. The City continues to expand its water distribution system with ongoing development and is facing challenges meeting its goal to efficiently produce and reliably distribute safe, high-quality water. In addition to keeping pace with current development, the City needs to plan for system upgrades to account for future needs. Some of the challenges and improvements recently completed are listed below.

- The City is experiencing growth with development and has installed new water infrastructure to support that growth.
- The City is experiencing pressure issues in the northeast quadrant of the city as well as in other areas of the system.
- There are a significant number of old water mains in the distribution system, leading to failures and water quality issues.
- Current system flushing does not adequately remove iron solids from the water mains.
- The wells operate based on two pressure sensors located in the distribution system. One pressure sensor is located at the courthouse and second by Independence Premium Food. There are no level sensors in the water towers, making it more challenging to maintain proper pressures throughout the system.
- The three water towers have all been rehabilitated in recent years.
- The wells and well houses have all been rehabilitated in recent years.

The City would benefit from a water system plan and hydraulic model to provide it a road map to face these challenges head on and meet production and distribution goals. Benefits of the water system plan and hydraulic model are summarized below, followed by a scope of services, project team, project experience, schedule, and compensation. The scope of services is broken down into individual tasks that can be tailored to the City's goals and budget.

A water system plan and hydraulic model provide the City with the following:

- An understanding of the current and potential future water system demands based on anticipated growth over the planning period.
- A review of existing supply and storage capacity to meet current and future demands.
- A review of system operations and controls to improve system performance.
- An evaluation of 'what-if' scenarios, such as system expansion, new facilities, well outages, main breaks and other simulations.

- An evaluation of system-wide operating pressures and available fire flows to identify deficiencies and improvements.
- A prioritized pipeline replacement plan to address aging infrastructure in an organized program.
- A flushing program that implements unidirectional flushing into the City's normal flushing operations to improve cleaning of the distribution system.
- An inventory of existing water supply components in a single location.
- A prioritized capital improvements plan and implementation schedule for replacing aging infrastructure and related water infrastructure improvements.

Scope of Services

The following scope of services was developed based on the City's needs and recent projects completed for similar water systems.

Water System Plan – Basic Services

- Conduct a kickoff meeting with the City to review objectives, schedule, current and future service boundaries, and areas of potential future development within those boundaries. Obtain the following information from the City:
    - A copy of the latest comprehensive plan, including future population estimates
    - Previous water system studies and reports
    - Raw and treated water quality data, by month, for each well for the past 3 years
    - Monthly water sales by billing category for the past 15 years
    - Monthly pumpage for the past 15 years
    - Recently completed rehabilitation scope at each well, well facility, and water tower over the past 10 years
- Prepare an inventory and summarize the existing water system supply and storage components. Review existing well pumping records and storage information and identify firm pumping capacity and effective storage for the system. Review water quality and past maintenance performed at each water facility.
- Tabulate water use data for the past 15 years.
- Estimate future system demands for current year and future year 2045. Future demands will be estimated using population estimates prepared by others and City-provided growth plans. Provide draft demand projections for review and attend one virtual meeting with the City to discuss.
- Perform a water supply and storage capacity evaluation. Estimate the amount of reserve or deficient supply and storage capacity in the system to meet present-day and 2045 requirements.
- Prepare draft report sections summarizing the water system supply and storage components, historic water use, future system demand estimates, and supply and storage capacity needs.
- Submit draft report sections to the City for review. Attend one in-person meeting to review draft report sections and City comments.
- Prepare a capital improvement plan with implementation schedule for potential modifications and additions. Finalize report and submit copies to the City.

Water System Plan – Optional Services

- Prioritized Pipeline Replacement Plan
    - Conduct a virtual meeting with the City to present a quantitative, risk-based assessment of its existing water distribution system using probability of failure (POF) and consequence of failure (COF) criteria.
    - Review City-provided information that may include water main age, break history, material, size, and soil characteristics, if available.

- Prepare a draft risk assessment matrix based on POF and COF criteria and submit to the City for review. Attend one virtual meeting with the City to review draft water main risk matrix, scoring breakdowns, and weighting factors prior to the initial risk score calculation. Incorporate City comments as appropriate.
- Develop initial water main prioritization ranking list and color-coded figure based on matrix scoring criteria, weightings, and non-water projects established by the City.
- Conduct a workshop with the City to discuss initial prioritization figure. Up to two additional iterations of ranking, prioritization, and figure development are included.
- Prepare draft report section with a summary of the risk-based assessment and plan for the prioritized replacement of pipeline and submit to the City for review as part of the *Water System Plan.* Finalize report section within the *Water System Plan.*

Water System Model – Basic Services

- Collect the following information from the City:
    - Electronic water system distribution mapping files, in geographical information system (GIS) format. Water main and distribution system information to include pipe diameter, material, hydrant and valve locations; and, if available, age and break history. Locations of wells, water storage tanks, and pressure recorders shall also be provided.
    - Historical records of the five largest water customers over the last 5 years
    - Storage facilities drawings showing physical dimensions
    - Existing water system facility record drawings
    - Well pump design points and pump curves
    - Supervisory control and data acquisition (SCADA) control set points
    - Two-foot ground elevation contour and aerial maps in GIS format
    - Water sales information by metered physical address for the years 2023 and 2024
    - A copy of the latest Insurance Services Office (ISO) fire flow data/report and needed fire flow demands from the fire department by zoning or occupancy designation

- Prepare a water system hydraulic model in WaterGEMS software from City-provided electronic files. Incorporate storage facility, pump, and SCADA control information into the water model. Allocate demands using metered sales information, if available.
- Assist the City in conducting up to 12 field hydrant flow tests throughout the system. The City shall be responsible for operating valves and hydrants, for providing traffic control, as needed, and for providing well pump flows and storage facility water levels during testing. Pressure recorders can be provided and installed on hydrants near each water storage facility, as needed, to assist with recording tank water levels.
- Perform a steady-state calibration of the water model to +/- 5 pounds per square inch using the field hydrant flow testing results and City-provided SCADA and tank level information.
- Evaluate existing water system performance using calibrated model for current and future maximum-day demands. Generate maps of pressure and available fire flow from steady-state simulations.
- Evaluate modifications to the water distribution system to address pressure and flow deficiencies. Evaluation will include modifications to controls, water main upsizing or looping, and potential zone creation.
- Prepare draft report sections summarizing the model and calibration, existing water system performance with pressures and available fire flow under current and future maximum-day demands, and water system modifications to address pressure and flow deficiencies under current and future maximum-day demands.
- Submit draft report sections to the City for review. Attend one in-person meeting to review draft report sections and City comments. Finalize report sections for inclusion in the *Water System Plan.*

Water System Model – Optional Services

- Item 1 – Additional Simulations
  - Evaluate up to five 'what-if' scenarios as desired by the City. These evaluations may include simulating new development areas for appropriate water main sizing and expansion, loss of a specific well, or a significant water main break.

- Item 2 – Unidirectional Flushing Plan (UDF)
  - Conduct a review of existing water main mapping and develop an initial plan for the sequence of flushing activities. Review the initial plan with the City via a virtual meeting and discuss staffing levels for flushing activities.
  - Use the calibrated hydraulic water model to develop a steady-state scenario to generate and simulate each UDF sequence.
  - Create a map illustrating each UDF sequence, including pipe segments to be flushed, hydrant to flush; isolation valves to open, reopen, and close, and valves that remain closed from previous sequences.
  - Create a field log form for each UDF flushing sequence that documents the hydrants to flow, pipe segments to be flushed, valves to reopen and close, target flushing flow, and residual pressure, and provide space to document observed conditions.
  - Prepare a *UDF Flushing Plan* report to sequentially include maps and field logs for each sequence.

Project Team

Project Manager

Steven Kluesner, P.E., Senior Associate, will serve as the Project Manager and primary point of contact during development of the water system plan and model. Steve will be responsible for meeting the needs of the City, while providing effective communication and project administration. Steve has been the project manager for many water system studies and modeling projects, including one recently completed for the City of Iowa City, Iowa.

Steve has been with our firm since 1999 and serves as the Water Supply Discipline Coordinator in our Madison and Milwaukee, Wisconsin, offices. He graduated from the University of Iowa with a B.S. degree in Civil/ Environmental Engineering, where he worked as a certified Grade 2 Water Treatment Plant Operator at the University of Iowa Surface Water Treatment Plant.

Steve is currently the project manager for water treatment, well supply, water storage, and planning projects in Cedar Rapids, Iowa City, and Dubuque, Iowa. Steve has also managed water modeling projects for Park View Sanitary District, Iowa City, Iowa, along with Fond du Lac and Fitchburg, Wisconsin.

Quality Control Engineer

Justin R. Bilskemper, P.E., will serve as the quality control engineer and technical advisor for this project. Justin has a B.S. degree in Civil Engineering from the University of Wisconsin-Platteville and has gained considerable experience in computerized water system modeling and water system master planning in his 18 years with our firm. Corporate wide, Justin is considered the 'go to' engineer when there is a distribution model question. Justin has worked on many of our water distribution modeling and system evaluation projects, including more than 50 full-scale studies and evaluations and dozens of smaller modeling projects.

Justin has created numerous water system models from scratch using AutoCAD and GIS files and has updated existing models created for clients by other consultants. His extensive experience includes steady state, extended period, available fire flow, water age, and chlorine residual modeling to evaluate distribution system hydraulics and improvements needed for current demands and future growth scenarios. Justin has provided on-demand hydraulic modeling services for more than a dozen municipalities across Wisconsin, Illinois, Kentucky, and Ohio, and has assisted with water system modeling for Iowa City, Iowa.

Justin has also managed, worked on, or completed quality control for more than 40 full water system master plans and studies. Several of these, including those for Romeoville, Glencoe, Niles, and Lincolnshire, Illinois, Ashland and Stoughton, Wisconsin, and Worthington, Ohio, included preparing water main replacement programs using quantitative, risk-based prioritization scoring. The prioritization project in Lincolnshire was prepared by analyzing criteria such as main break history, useful life remaining, operating pressure, diameter, soil corrosivity, road type, redundancy, proximity to streams, and type of emergency service, sharing several of the same criteria proposed in the approach for this project.

Project Engineer

Connor T. O'Rourke, P.E., will serve as a Project Engineer on the hydraulic model and water system plan. Connor has quickly gained valuable water supply experience since joining our firm 5 years ago. During his time as a student at the University of Wisconsin-Madison, Connor interned with the Village of Waunakee, where he worked closely with water system operators. Since joining our firm, Connor has become the go-to water modeler by creating, calibrating, and analyzing models for several communities. Experience in water studies include those for Fond du Lac, Platteville, Neenah, Watertown, Wisconsin Rapids, and Prairie du Sac, Wisconsin, and Lake Forest, Lincolnshire, and Buffalo Grove, Illinois, as well as Plattsmouth, Nebraska.

Similar Project Experience

The following summary table provides a listing of similar projects completed over the past 5 years. We have extensive experience when it comes to water system studies and modeling. This experience will bring many proven solutions to the City of Independence. Following the table are a few detailed project descriptions further highlighting our project experience.

Water System and Model Analysis Experience	
Project	**Year**
Fitchburg, WI – Unidirectional Flushing Plan	2024
Wisconsin Rapids, WI – Unidirectional Flushing Plan	2024
Wisconsin Rapids, WI – Water Model Update and Evaluation	2024
Streamwood, IL – Water Model Updates and Calibration	2024
Iowa City, IA – Water Storage Evaluation	2024
Campbellsport, WI – Water System Evaluation	2024
East Moline, IL – Hydraulic Model and Water System Master Plan	2024
Decatur, IL – NE Zone Water System Modeling and Development Plan	2023
Lancaster, WI – Water System Study	2023
Cottage Grove, WI – Utility Master Plan	2023
East Troy, WI – Water System Master Plan	2023
Morgantown Utility Board, WV – PER High Service Pump Station	2023
Onalaska, WI – Water System Evaluation	2023

Water System and Model Analysis Experience	
Project	**Year**
Pewaukee, WI – Water System Study	2023
River Falls, WI – Sewer and Water Plan Update	2023
Platteville, WI – Water System Comprehensive Plan	2022
Fredonia, WI – Water System Capacity Evaluation	2022
Beloit, WI – 2022 Utility Extension Study – Water Supply	2022
Fitchburg, WI – Well No. 7 Operation and Equipment Review	2022
Lincolnshire, IL – Hydraulic Water Study and Water System CIP	2021
Winnetka, IL – Water System Study	2021
Park View Water and Sanitary District, IA – Water System Modeling	2021
Delavan, WI – Comprehensive Water Study	2021
Romeoville, IL – Water Model Development, Calibration, and Alternative Water Supply Evaluation	2021
Belvidere, IL – Southwest Area Water System Study	2020
Decatur, IL – Water System Chlorine Residual Modeling	2020
Lockport, IL – Lockport Township Joliet Interconnect Study	2020
Prairie du Sac, WI – Water System Study Update	2020
Fond du Lac, WI – Water Model Creation and Calibration and Chlorine Residual Modeling	2020
Neenah, WI – Water Distribution Capacity and Growth Study	2020
Buffalo Grove, IL – Water System Study	2020
Watertown, WI – Water Model Creation and Calibration	2020
Flossmoor, IL – Distribution System Modeling and Chicago Supply Connection Assessment	2020
Lannon, WI – Water System Study	2019
Middleton, WI – Utility Master Plan Update	2019
Grayslake, IL – Water Model and Storage Evaluation	2019

Hydraulic Water Study and Water System Capital Improvement Plan – Lincolnshire, IL

The Village of Lincolnshire hired us to complete a computerized water model and water system master plan for its water distribution system that consisted of 71 miles of water main, two below-grade reservoirs, two booster pumping stations, and two emergency water system interconnects. Both existing and future water demand conditions were evaluated for storage and supply capacity needs. Visual observation walkthroughs were conducted for the booster pumping stations to develop a list of short and long-term improvements. As part of this capital improvements plan, a robust water main replacement program was developed using risk-based pipeline prioritization methodology. Probability and consequence of failure criteria for this methodology included pipe diameter, age, breaks, street classification, accessibility, and proximity to critical customers or noteworthy areas, such as non-looped neighborhoods or stream crossings. ArcPython scripting language was developed and used in the scoring iteration process to provide efficiency and transparency for the Village. The resulting risk map was used in conjunction with upcoming street improvement projects to develop a 0 to 5 and 5- to 10-year water main replacement CIP.

Reference:
Maxwell Geib
Utilities Superintendent
847-913-2383

Project Team:
- Justin Bilskemper, P.E. – Project Manager
- Chris Ulm, P.E. – Client Liaison
- Steve Kluesner – Quality Control Engineer
- Connor O'Rourke – Project Engineer

Completed: 2021

Equipment, Programs, and Software Used:
WaterGEMs, ArcGIS, Excel

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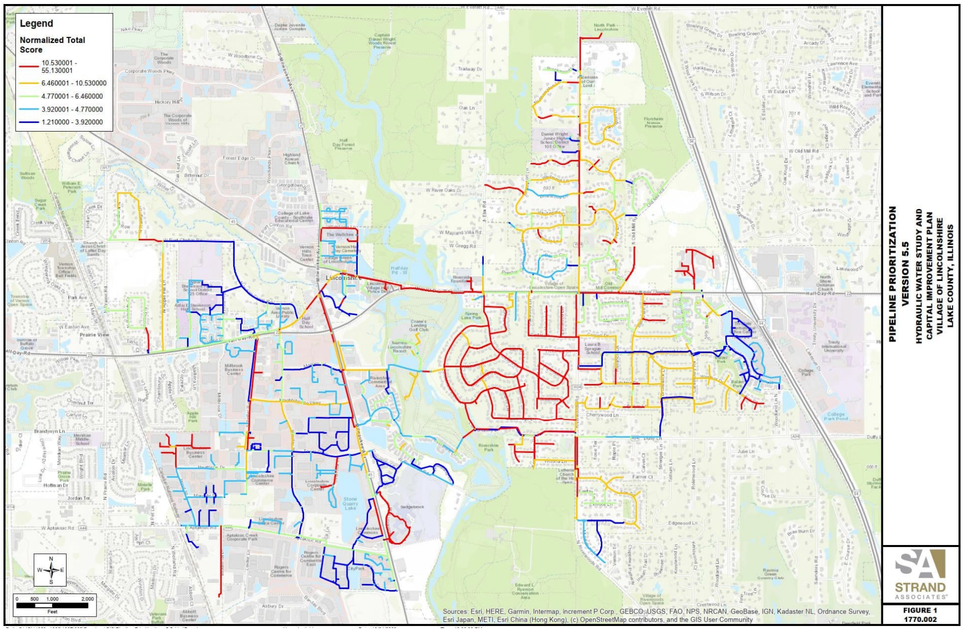


An easy-to-understand, color-coded risk scoring map was developed for Village buy-in of proposed water main replacement projects.

Unidirectional Flushing Plan – Fitchburg, WI

We were hired to create a new WaterGEMS water model and use it to develop a UFP. Unidirectional flushing in lieu of conventional flushing improves water quality, hydraulics, and reduces water loss. Using a water model to create a plan demonstrates it meets industry recommendations and minimizes system issues encountered during flushing.

A WaterGEMS water model was created using GIS information. System demands were allocated using automated infrastructure meter data, allowing for accurate placement of water demands within the model. The water system was initially modeled to evaluate base levels of service and identify areas in the system not capable of being unidirectionally flushed. The model was used to confirm the hydraulics observed in the field will be similar to the hydraulic parameters required to properly flush and clean the pipeline. Flushing methods and devices used by the City were also considered and accommodated in the model. Flushing events were properly flushed by confirming pressures were not compromised during the test – scour velocities to remove sediment were reached, while confirming damaging velocities that increase risk of water main breaks were not obtained.

A set of plans was created for each flushing event with intuitive instructions and visuals that were easy to follow. Instructions included hydrants to be flowed, hydrant outlets to use, valves to be open and closed, recommended flushing times, and flush volumes, so water losses can easily be reported. Plans were efficiently created that minimized valve and hydrant operations while cleaning the entire distribution system pipeline in a timely fashion.

Reference:
Tracy Foss
Assistant Public Works Director
608-270-4272

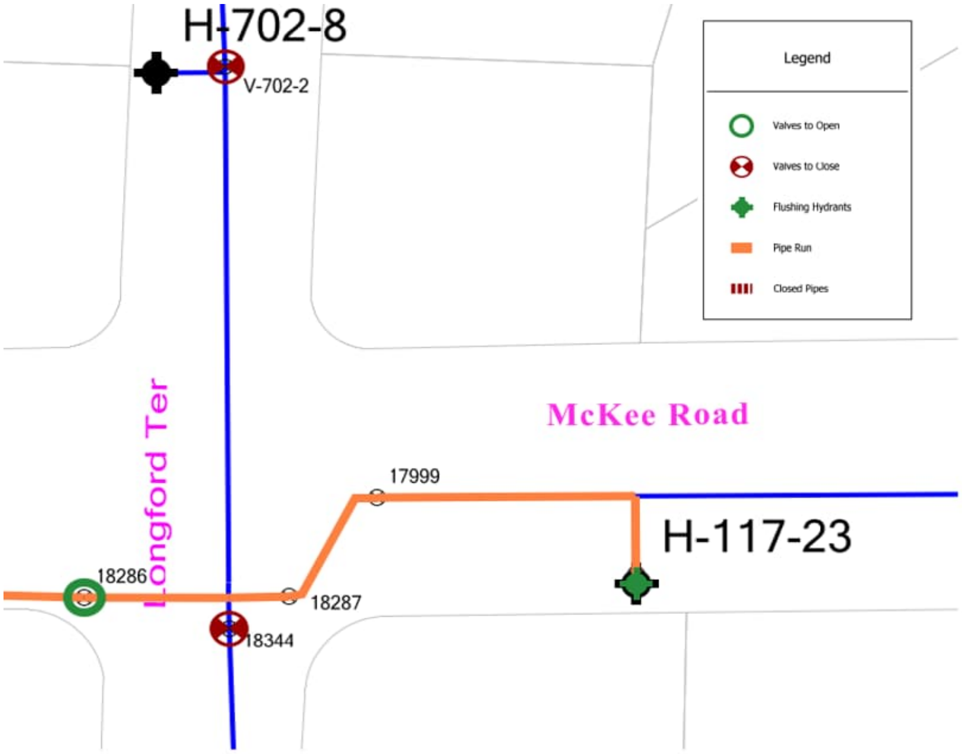
Project Team:
Steve Kluesner – Project Manager

Jayson Jones – Project Engineer

Connor O'Rourke – Technical Advisor

Start: Spring 2024
Completion: Fall 2024

Equipment, Programs, and Software Used:
WaterGEMs, ArcGIS



An easy-to-follow map book and field log is provided for each flushing sequence.

Water Storage Evaluation – Iowa City, IA

We were hired to create a water model and use it to recommend new pressure zones and storage and distribution system improvements. New zones were developed to allow the system to reduce the pressure gradient for areas across Iowa City with significantly lower elevation and to provide appropriate service pressures and fire flows to future developments as the city expands. The lower pressure gradient allowed for the City to reduce its pumping and energy costs.

A WaterGEMS water model was created using GIS information. System demands were allocated using AMI data, allowing for accurate placement of water demands within the model. The water system was initially modeled to evaluate base levels of service, including pressure and available fire flows.

Several zone boundaries were developed using extended period simulations under current and future conditions. Lists of storage and distribution system improvements to create a new zone and maintain or exceed the City's fire flow and service pressure goal were generated. Distribution system improvements included pressure reducing valve stations, check valves, transmission main, pumping station, and upsizing existing water main. Opinions of probable costs to create the zone boundaries and construct the storage and distribution system were developed and used by the City to select the improvements.

Reference:
Jon Durst
Water Superintendent
319-356-5169

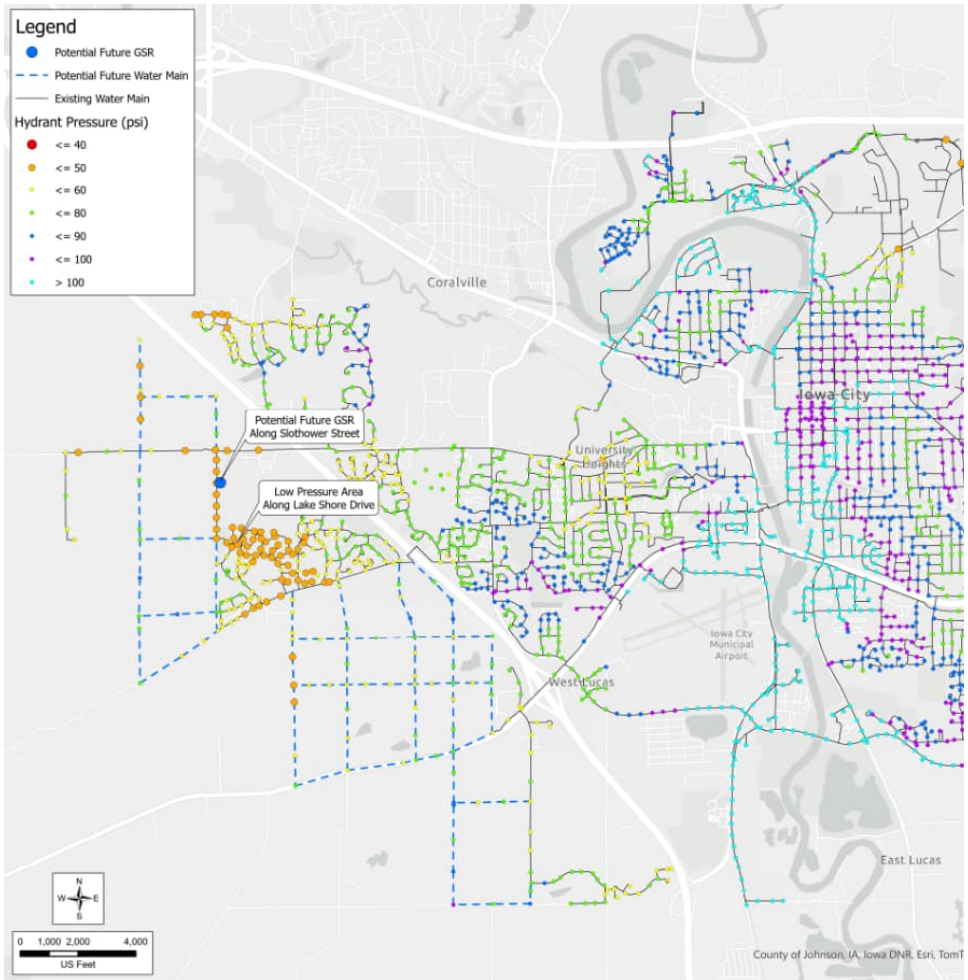
Project Team:
Steve Kluesner – Project Manager

Jayson Jones – Project Engineer

Justin Bilskemper – Quality Control

Start: Fall 2023
Completion: Fall 2024

Equipment, Programs, and Software Used:
WaterGEMs, ArcGIS



A color-coded pressure map highlights deficiencies through the water system.

After the City selected its preferred alternatives, we performed the siting and sizing study for the new water storage facility based on the new pressure zones demands and hydraulics. Preliminary designs of the new tanks were also prepared.

Schedule

We understand the water system plan will be included in the fiscal year 2026 budget that begins on July 1, 2025. We will be prepared to begin immediately in July with a kickoff meeting and data collection. We can schedule the field hydrant testing in the fall of 2025 to avoid the higher water demand summer months. We anticipate it will take approximately 4 months to complete the water model and simulations once field testing is complete. The water system plan portion can begin immediately and be completed within 6 months of the kickoff meeting. During our initial meeting it was mentioned that the City may be able to get the project started prior to fiscal year 2026. If the project can start earlier, we are prepared to complete the field hydrant testing in the spring of 2025, pulling the entire schedule forward by several months.

Compensation

We propose completing the services described above on an hourly rate basis plus expenses for a total estimated fee as shown in the following table.

Task	Fee
Water System Plan – Basic Services	$34,000
Water System Plan – Optional Services	
Prioritized Pipeline Replacement Plan	$35,200
Water System Model – Basic Services	$33,700
Water System Model – Optional Services	
Item 1 – Additional Simulations	$6,300
Item 2 – Unidirectional Flushing Plan	$38,500
Total	**$147,700**

Sincerely,

STRAND ASSOCIATES, INC.®

Steve B. Kluesner, P.E.
Project Manager

Bradley J. Lake, P.E.
Client Liaison

P240.896/SBK:ksn