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January 8, 2024

Mr. John Young, P.E.  
Receiver  
Prichard Water Works and Sewer Board  
125 East Clark Avenue  
Prichard, AL 36610

**Re: Prichard Water Works and Sewer Board – Water Source/Treatment and Asset Evaluation**

Dear Mr. Young:

Hazen and Sawyer (Hazen) is pleased to provide services for evaluation of the Water and Wastewater Systems owned by the Prichard Water Works and Sewer Board (PWW&SB). The purpose of this Water Source/Treatment and Asset Evaluation Scope of Services (Scope) is to determine the most cost effective and feasible water source and assess the existing condition of water and sewer infrastructure to develop a 20-year Capital Improvement Plan (20-year plan).

This evaluation will cover multiple water source and asset assessments including,

Water Source Assessments:

1. New surface water supply
2. New groundwater supply
3. Associated treatment and pumping facilities

Infrastructure Asset Evaluation:

1. Water storage system
2. Water distribution system
3. Wastewater gravity collection system and force mains
4. Wastewater pump stations
5. Carlos Morris Wastewater Treatment Plant
6. Stanley Brooks Wastewater Treatment Plant

The primary goal of the project is to ensure a sustainable, reliable, and cost-effective water supply and reliable water and sewer infrastructure for the communities served by PWW&SB.

## **Scope of Services**

### **TASK 1 PROJECT MANAGEMENT**

Hazen’s project manager will be responsible for managing and administering the project, including:

- Preparing and administering Hazen’s internal resources
- Coordinating activities and budgets of subconsultants
- Monitoring project activities, budgets, and schedule
- Communicating with PWW&SB’s project manager
- Scheduling and attending progress and review meetings.
- Communicating with PWW&SB’s departments and outside agencies, as needed.
- Ensuring that the Project Team follows Hazen’s quality assurance and control (QA/QC) policies and procedures throughout the project.

#### *Task 1 Deliverables:*

- Submit a monthly project status memorandum with invoice.

### **TASK 2 WATER SUPPLY AND TREATMENT ALTERNATIVES ANALYSIS**

#### **Task 2.1 Water Supply and Treatment Technical Assessment**

The technical assessment performed under this task will include the review and analysis of the following water supply related topics. This assessment will be conceptual in nature based on available data and information. All spreadsheets, graphics, and text appropriate for Task 2 will be prepared in a stand-alone Technical Memorandum.

##### **Task 2.1.1 Surface Water Supply**

Hazen will perform an assessment of up to two unidentified surface water supplies. At this time, Hazen is unaware of any preliminary review of available potable surface water supplies. As such, this assessment will begin with identifying all potential available surface water bodies (rivers, lakes, etc.) for consideration. Hazen will assess water quality and quantity, including seasonal variations, based on available existing data, information, or technical reports, to determine the suitability of the potential supplies including reliability and treatment requirements of the source. This scope of work does not include safe yield evaluations or sampling to determine water quality trends.

Hazen will include the following in the assessment:

- Location of the potential source water supplies
- Quantity believed to be available based on available flow
- Transmission requirements
- Quality of the potential source water supplies
- Proposed treatment schematic (e.g., coagulation, flocculation, settling, filtration, etc.)

## **Task 2.1.2 Groundwater Supply**

Hazen will perform an assessment of up to two groundwater supplies. At this time, Hazen is aware of some preliminary review of available potable groundwater supplies (see below). As such, this assessment will begin with reviewing all available groundwater sources that have been identified for consideration. Hazen will assess water quality and quantity, including seasonal variations to determine the suitability of the potential supplies including reliability and treatment requirements of the source.

Hazen will include the following in the assessment:

- Location of the potential groundwater water supplies
- Quantity believed to be available based on potential safe yield
- Transmission requirements
- Quality of the potential source water supplies
- Preliminary determination of the characterization of the groundwater with respect to direct influences of surface water.
- Proposed treatment schematic (e.g., coagulation, flocculation, settling, filtration, etc.)

As part of the groundwater assessment, Hazen will perform a review previously collected hydrogeological information (e.g., local information from other utilities, studies, reports, etc.) to assist the Team in efficiently understanding the quality and quantity of groundwater available.

Note: In 2020 and working for Hazen, Cook Hydrogeology completed an initial high-level hydrogeologic feasibility assessment to begin the assessment of whether a groundwater source could be developed to meet PWW&SB's water demands. The existing report evaluated six potential test well locations that had been identified by previous investigations. In 2021, Cook Hydrogeology also completed a pumping test analysis and water quality evaluation of the Chickasaw Housing Authority Well in Mobile County, Alabama. Results of the pump testing indicated that adequate water quantity and quality would be available to serve the PWW&SB's water demands from the local alluvial aquifer, assuming that multiple supply wells are installed. The sustained pumping rate was projected to be 651 gallons per minute (gpm) over a 20-year period. These reports and other existing literature regarding the local geology and hydrogeology will be reviewed as part of the proposed task.

### *Task 2.1 Deliverables:*

- Tabulation of all materials collected.

## **Task 2.2 Preliminary Environmental Impact Assessment**

Hazen will perform a preliminary environmental impact assessment of the viable, selected alternatives, including the following activities under this subtask:

### **Task 2.2.1 Surface Water Supply**

Hazen will evaluate potential environmental impacts of extracting surface water, including a preliminary assessment of the impact of the proposed diversion on aquatic ecosystems and

downstream users. Under this subtask, the Hazen Team will develop preliminary mitigation strategies to minimize potential adverse effects.

### **Task 2.2.2 Groundwater Supply**

Hazen will evaluate the environmental impact of groundwater extraction and assess potential environmental impacts of groundwater extraction including on wetlands. Hazen will identify preliminary measures to protect groundwater quality.

#### *Task 2.2 Deliverables:*

- Tabulation of all materials collected.

### **Task 2.3 Water Supply and Treatment Alternatives Capital and Operational Cost Estimates**

Hazen will perform capital and operational cost estimates for the water supply and treatment alternatives under this subtask. The cost estimates will include a Level 5 (AACEI) cost estimate for each viable, selected water source alternative. These estimates will include capital costs, operational expenses, and maintenance costs. The capital and operational cost estimates for each alternative will be compared to the continued costs of purchasing water from Mobile Area Water & Sewer System.

#### *Task 2.3 Deliverables:*

- Tabulation of all cost estimating materials collected.

### **Task 2.4 Regulatory Compliance**

Hazen will perform a review of the regulatory compliance issues related to each viable selected alternative. This review will include identifying permits required for each alternative from a water quality and treatment perspective, as well as disinfection and corrosion at the point of entry and at the ends of the distribution system. All current and near-term federal state and local regulations will be considered.

#### *Task 2.4 Deliverables:*

- Tabulation of all permitting and regulatory compliance materials collected and analyzed.

## **TASK 3 INFRASTRUCTURE ASSET EVALUATION**

Hazen understands that some water and sewer system due diligence and assessment has already been completed by PWW&SB's consultant, Waggoner, regarding the utility's water and sewer assets, as part of the PWW&SB Consent Order 22-121-CWP and the Water Utility Asset Management Plan submitted to the Alabama Department of Environmental Management (ADEM) in July 2023. All spreadsheets, tables, graphics, and text appropriate for Task 3 will be prepared in a stand-alone Technical Memorandum.

### **Task 3.1 Vertical Asset Evaluation**

Our asset evaluation will seek to validate the existing information relative to the water and wastewater systems' condition as a framework to conduct focused field investigations of the major systems' vertical assets (water storage tanks and associated valves and monitoring systems, wastewater pump stations, the Carlos Morris Wastewater Treatment Plant, and the Stanley Brooks Wastewater Treatment Plant) and serve as a foundation for asset data/information management relative to the potential procurement of a future computerized maintenance management system (CMMS).

Hazen will review the existing facilities and above-ground assets with PWW&SB operations and maintenance personnel and, based on field reviews, will develop an assessment of major equipment and unit processes. This assessment will include the following information:

- Equipment name
- Equipment tag number
- Location
- Year installed
- Condition of the equipment based on appearance, operation and maintenance records, and anecdotal evidence of PWW&SB operations staff
- Estimate of the expected useful life (EUL) of equipment based upon values in published literature and manufacturer's recommendations
- Estimate of the remaining useful life (RUL) of major equipment and facilities on the basis of age, observed condition, and industry standards

#### *Task 3.1 Deliverables:*

- Inventory of assessed vertical assets
- Overall condition and RUL of major equipment and facilities, along with a 20-year projection of in-kind renewal and replacement needs for vertical assets

### **Task 3.2 Linear Asset Evaluation**

For buried infrastructure such as water distribution mains, sanitary sewer collection systems, and force mains, Hazen will rely on published literature, manufacturer's recommendations, and relevant experience to determine pipeline EULs. Existing infrastructure reference material may include recently completed studies, available field inspection and maintenance information including any leak detection and correction programs, main break reports, low pressure reports, and other representative data, as available, to determine RULs for pipeline renewal and replacement projection purposes. Hazen will rely on available asset record information, property records, staff interviews, and construction drawings to determine approximate installation dates.

### *Task 3.2 Deliverables:*

- Inventory of assessed linear assets
- Overall condition and RUL estimations of linear assets, along with a 20-year projection of renewal and replacement needs

### **Task 3.3 Distribution System Hydraulic Evaluation**

As a first step, Hazen will assume the connection to MAWSS will be the recommended solution (an amendment to the agreement will be made if additional effort is needed if a different solution is recommended). The supply connections to MAWSS in conjunction with the asset evaluation for vertical and linear assets, the hydraulic model will be used to inform capital improvement projects and operational improvements to the system. PWW&SB's hydraulic model was updated and calibrated in 2020. This model will be updated with any additional information gained to date and used to identify deficiencies and improvements as described below.

#### **Task 3.3.1 Identify Existing Deficiencies**

Hazen will use the calibrated model to map high and low pressures and identify areas where pressures are outside the design criteria agreed upon with PWW&SB staff. Recommendations for reducing excessive pressures will be developed to help reduce non-revenue water. Areas with deficient pressures for current operations will be identified and considered when developing the capital improvement plan.

The model will map available fire flows to identify general areas with low levels of fire protection. Available flows will be compared to needed flows to quantify deficiencies at key locations. Needed flows in these areas will be estimated by Hazen or from information provided by the Fire Department considering building sizes and occupancy. Hydraulic modeling will then test and identify improvements to increase fire flows, including new pipes, pumps, or tanks, as needed.

Hazen will use the model to map water age for existing operation of the system. The model will predict water age based on extended period simulations of existing average daily demand using current pump and valve controls and operating procedures. The map will highlight areas where water age is excessive. The hydraulic model will test operational changes to reduce water age in problem areas.

It is our understanding that customers in Alabama Village will be relocated. Hazen will review the costs associated with replacing the water system in this area, if needed.

#### **Task 3.3.2 Estimate Future Water Demand and Water Supply Alternatives**

Hazen will review available population projections within system limits and other planning information made available by PWW&SB. Population and water demands will be projected in each pressure zone for the year 2040. Demand projections will include an evaluation of peaking factors and estimates of average day, maximum day and peak hour in each pressure zone.

Based on the results of prior tasks to evaluate supply, scenarios for two supply alternatives will be created in the model for both existing and future demand.

### **Task 3.3.3 Identify Future Deficiencies**

Modeling will simulate 2040 maximum day demand for two supply scenarios and identify deficiencies where predicted performance does not meet design criteria agreed upon with PWW&SB staff. Further modeling will test alternatives for improvements.

### **Task 3.3.4 Develop Capital Improvement Plan to Meet Hydraulic Design Criteria**

This subtask will include developing recommendations for pipes, control valves, pumps and/or tanks to meet hydraulic design criteria and maintain water quality. Recommendations will take full advantage of the existing distribution system to minimize costs.

Hazen will meet with PWW&SB staff to review preliminary recommendations considering costs, constructability, and community impacts. Final recommendations will be developed based on input from PWW&SB.

Hazen will develop a capital improvement plan (CIP) meeting hydraulic design criteria by prioritizing recommended pipes, control valves, tanks, and booster stations and estimating costs for near-term improvements to address existing deficiencies and long-term improvements for the year 2040. The CIP will tabulate recommended improvements with references to a color-coded map of the distribution system. Planning level cost estimates will include construction, land acquisition, contingencies, engineering, legal and administrative costs. CIP project sheets will summarize drivers for each project, demand triggers, and related projects.

#### *Task 3.3 Deliverables:*

- Updated hydraulic model
- 2040 water demand forecast
- Identification of future system deficiencies due to hydraulic limitations (Water Storage analysis to be finalized prior to March 1, 2024).
- 20-year CIP needs based on system deficiencies

### **Task 3.4 Collection System Evaluation to Locate Infiltration and Inflow Sources and Estimation Capital Improvement Needs**

Hazen proposes a rapid assessment approach to identify infiltration and inflow (I/I) sources with the goal of developing a plan for sanitary sewer overflow (SSO) reductions in the future by leveraging rapid assessment level sensor data. The study will focus on identifying and isolating locations of excessive I/I and direct stormwater sources so they can be cost-effectively eliminated in a future phase. It should be

noted that the success of the I-tracker sensors is dependent upon multiple rainfall events during the study period.

### *Initial Level Sensor Deployment*

#### I-tracker

I-tracker level sensors are used to measure flow depth inside manholes and are effective at rapidly identifying areas with elevated I/I and areas that may have upstream, direct stormwater connections. The collection system will be divided into approximately 35 sewersheds, each with an upstream pipe length of approximately 20,000 LF. Thirty-five (35) I-trackers will be installed to analyze the I/I response from each of these areas, with the goal of capturing enough data to identify the sewersheds that could have excessive I/I and are candidates for a more detailed analysis in Phase 2.

### *Review of Current CIP and High-Level CIP Needs Analysis*

Hazen will conduct a review of the ongoing and planned collection system CIP projects based on information provided and furnished by PWW&SB. Elements will include:

- Status and forecasted completion of ongoing projects. We understand that such thoroughly developed information will generally require a confirmatory review as part of this process. It is envisioned that the evaluation of the PWW&SB CIP will result in a confirmation of projects, schedules and costs.
- Hazen will develop high level 20-year estimates for capital spending needed to address capacity constraints in the current collection system to the extent feasible given the aggressive timeline and available data. Capital improvements may include removal of identified inflow sources, comprehensive rehabilitation (lining main line, laterals to the ROW, and MH rehabilitation), and pipe upsizing or relief sewers. Cost estimates will be considered AACE Level 5. The amount of inflow removed will be estimated based on the pervious and impervious area tributary to the inflow source. For areas assumed to be rehabilitated, the assumed I/I reduction will be based on previous experience and other available resources.

It is important to note that future phases and more refined CIP planning will include hydraulic model calibration, capacity assessments, and a Remedial Measures Plan (RMP) as well as post-rehabilitation monitoring to confirm reductions in peak flows from inflow removal and comprehensive rehabilitation.

## **Task 3.5 Comprehensive Asset Renewal and Replacement Capital Needs Identification**

Using the raw data and information gathered in the field, our approach to the identification of capital renewal and replacement needs is to assess each of the major facilities and asset systems with respect to the following:

- Asset condition (Mechanical, Structural, and Electrical/I/C)
- Remaining Useful Life (RUL)
- Risk Assessment Score inclusive of Probability of Failure and Consequence of Failure

For each major facility or asset system, we will prepare a table summarizing the field findings, RUL and Risk Score. A table of the current projected capital improvement plan (CIP) and schedule to address system deficiencies will be compared to the field findings and summarized as part of this task. Hazen will



also conduct a review of the ongoing and planned projects based on information not included in the CIP and furnished by PWW&SB. Elements will include:

- Overview of the CIP. This will summarize planned major capital projects, purpose (includes functionality and regulatory compliance, expansion, renewal/replacement), budget and schedule of planned expenditure to the extent information is available.
- Status and forecasted completion of ongoing projects. We understand that such thoroughly developed information will generally require a confirmatory review as part of this process. It is envisioned that the evaluation of the PWW&SB CIP will result in a confirmation of projects, schedules and costs.
- Recommendations for CIP projects for water distribution pipes, control valves, pumps and/or tanks to meet level of service criteria (pressure, fire flow, and water age), coupled with the capital needs identified under Task 3.4. Recommendations will take full advantage of the existing distribution system to minimize costs.
- Comparison of existing projected CIP to recommended renewal and replacements. This will identify any recommended modifications to the existing CIPs resulting from the focused infrastructure condition assessments and hydraulic modeling conducted and will outline an overall recommended CIP to address existing deficiencies and long-term improvements over the next 20 years to bring the water and sewer systems back into a reliable state of operations. Hazen will meet with PWW&SB staff to review preliminary recommendations considering costs, constructability, and community impacts. Final recommendations will be developed based on input from PWW&SB.

#### *Task 3.5 Deliverables:*

- Comparison of existing projected CIP to recommended renewal and replacements
- Comprehensive 20-year CIP
- Meeting with PWW&SB staff for preliminary recommendations review

#### **Task 4 Executed Summary Technical Memorandum**

Hazen will prepare an Executive Summary Technical Memorandum (TM) that will include a synopsis of the research, analytical, and evaluation efforts performed in the previous tasks. The TM will present a Summary of Findings and Recommendations for future action, including a discussion of the strengths and weaknesses of alternatives considered with corresponding ranking/selection criteria. A Projected 20-year CIP will be provided based on any proposed new facilities and R&R needs of existing assets and system deficiencies.

The TM will provide recommendations for the most viable and sustainable options for PWW&SB, and will include a phased implementation plan and potential timelines for major activities.

#### *Task 4 Deliverables:*

- Draft Final Technical Memorandum
- Final Technical Memorandum

## Assumptions

1. All water quality data will be available.
2. PWW&SB will provide documentation regarding the presence or absence of lead service lines, either public or private, in its service area. The testing approach does not include lead service lines. If lead service lines are identified, additional testing with harvested lead service lines, such as pipe loop testing, may be needed. If necessary, this can be provided in an amended or separate scope and fee.
3. Laboratory analysis of samples is not included in the budget.
4. Two meetings, one prior to work starting and one after work is completed, are anticipated to be conducted with ADEM.
5. Kickoff Meeting is to be determined if it is in person and/or over Microsoft Teams.
6. Assumed two (2) full 8-hour days for site visits, including travel and lodging that is not included with Kickoff Meeting.
7. No right of entry or public notification requirements or interactions are included. Hazen will not be required to provide support for public meetings or coordination for this project.
8. No topographic survey will be necessary.
9. No utility test pits, or geotechnical studies will be necessary.
10. Assumed 10 full 8-hr days for asset evaluation site visits covering all vertical assets/facilities
11. Hazen will use available data regarding install dates, diameter, and material for water and sewer pipe network segments and available in existing GIS or other documented (Waggoner Engineering) asset records.
12. Hazen will use available GIS data.
13. No water quality simulations will be performed for this Phase. Potential corrosion and disinfection approaches will be considered for each option by standard corrosion indices and typical disinfection information in industry standard literature.
14. Development of a wastewater collection system hydraulic model and/or evaluation of the system capacity and level of service is not included.
15. Evaluation of asset needs for upgrades or process improvements beyond R&R is not included.
16. Evaluation of potentially available parcels for test/supply wells will be limited to publicly available on-line GIS databases and/or existing reports. No surveying services or property/title search work is included in this proposal.
17. PWW&SB to attend monthly progress meetings for updates and general coordination on the program.
18. Hazen will assume the connection to MAWSS will remain for the Water Storage Analysis.

## Schedule

TASK	TASK DESCRIPTION	TASK DURATION (weeks from NTP)
1	Project Management	15
2	Water Supply and Treatment Alternatives Analysis	
2.1	Water Supply and Treatment Technical Assessment	8
2.2	Preliminary Environmental Impact Assessment	9
2.3	Water Supply and Treatment Alternatives Capital and Operational Cost Estimates	12
2.4	Regulatory Compliance	12
3	Infrastructure Asset Evaluation	
3.1	Vertical Asset Evaluation	8
3.2	Linear Asset Evaluation	10
3.2	Distribution System Hydraulic Evaluation	12
3.4	Collection System Evaluation and Replacement Capital Needs Identification	14
3.5	Comprehensive Asset Renewal and Replacement Capital Needs Identification	14
4	Final Technical Memorandum	15

This schedule assumes a two-week comment period for deliverables, beginning the first business day after the submittal of each deliverable. One week after the comment period commences, a review workshop will be held with all applicable PWW&SB stakeholders. Hazen will conduct the workshop(s) and will schedule workshop(s) at the commencement of the task to hold a date for each workshop. Once comments are received and addressed, Hazen will compile a comment log for the deliverables. The log shall include a summary of the comment, the individual providing the comment, and Hazen’s response to each comment.

## Compensation

Compensation for the scope of services described herein will be **\$740,500 lump sum** generally assigned by task, as listed below:

Task 1 – Project Management	\$17,600
Task 2 – Water Supply and Treatment Alternatives Analysis	
Task 2.1 – Water Supply and Treatment Technical Assessment	\$40,100
Task 2.2 – Environmental Impact Assessment	\$4,000
Task 2.3 – Capital and Operational Cost Estimates	\$ 26,400
Task 2.4 - Regulatory Compliance	\$5,000
Task 3 – Asset Evaluation	
Task 3.1 – Vertical Asset Evaluation	\$153,100
Task 3.2 – Linear Asset Evaluation	\$96,000
Task 3.3 – Distribution System Hydraulic Evaluation	\$90,000
Task 3.4 – Collection System Evaluation and Capital Needs Identification	\$186,250
Task 3.5 – Comprehensive Asset R&R Capital Needs Identification	\$98,900
Task 4 - Final Technical Memorandum	<u>\$23,200</u>
<b>Total</b>	<b>\$740,550</b>

## Supplemental Services (only as authorized)

### Collection System Evaluation to Locate Infiltration and Inflow Sources and Estimation Capital Improvement Needs

#### *Flow Monitoring*

The flow monitoring will include the installation of 25 temporary flow meters, five (5) rain gauges, and five (5) depth only meters to collect data for a period extending from the wet season to the dry season for a period of about 6 months. The purpose of this effort is to support both I/I evaluation and future hydraulic model calibration. The future calibrated hydraulic model will allow for the analysis of various scenarios to develop a remedial measure plan to address SSOs.

#### *I-tracker Deployment in Priority Areas Identified in Initial Phase*

Based on the results of the initial I-tracker deployment in the initial phase, additional I-trackers will be deployed in sewersheds with suspected excessive I/I. The I-tracker network will be installed such that each sensor is 800 LF to 1,000 LF apart, or approximately one for every 3-4 segments of pipe. This dense level sensor network will enable Hazen to isolate the sources of I/I in great detail, which will support the highly efficient allocation of capital dollars for I/I removal, especially where direct stormwater sources are clearly present. For budgeting purposes, it has been assumed that 50% of the collection system will be evaluated with the I-tracker during this phase of the work.

#### *Smoke Testing*

Smoke testing will be performed to identify and confirm direct stormwater connections or other sources of inflow in segments where the I-tracker network indicates such inflow sources are likely to exist.

#### *Deliverables*

Flow monitoring data, results from the I-tracker study, and the smoke testing will all be provided.

Additional detail for the high-level 20-year CIP in brief Tech Memo for addressing SSOs including maps showing inflow sources and areas recommended for comprehensive rehabilitation. Future modeling and evaluation will be needed to refine the CIP.

## Schedule

Task	Task Duration (weeks from NTP)
Flow monitoring	28*
I-tracker Network	14
Smoke Testing	14
Deliverables	18

\*Flow monitoring will need to cover both wet and dry season. The duration shown may change based on the NTP date.

## Compensation

Flow monitoring- (25 locations for 6 months allowance - cost plus 5%)	\$300,000
Engineering Evaluation for flow monitoring data (lump sum)	\$35,000
I-Tracker Network (approx 390 locations allowance - cost plus 5%)	\$400,000
Smoke Testing (approx 20% of system allowance – cost plus 5%)	\$100,000
20-Year CIP additional effort (lump sum)	\$15,000
Subconsultant markup	<u>\$40,000</u>
<b>Total Supplemental Services (only as authorized)</b>	<b>\$890,000</b>

We appreciate the opportunity to provide these services and look forward to your reply.

Very truly yours,  
**Hazen and Sawyer**



Stephen H. King, BCEE, P.E.  
Associate Vice President

cc: Ryan Nagel (Hazen)  
Roger Austin (Hazen)