

EXHIBIT "A"

CONSULTANT'S SCOPE OF SERVICES

DESIGN
MCBAINE WATER TREATMENT PLANT
IMPROVEMENT PROJECT

SCOPE OF SERVICES
July 2, 2020

PROJECT DESCRIPTION, TASK LIST, AND SCOPE OF SERVICES

PROJECT DESCRIPTION

The work will generally consist of the design of upgrades to the City's McBaine Water Treatment Plant, a 32MGD lime softening facility, located at 6851 W. Rte K, Columbia, MO 65203. Design of water treatment improvements is anticipated to include the following:

- A. Restoration of plant capacity including elimination of hydraulic restrictions
- B. Replacement of aerators
- C. Replacement of primary basin equipment
- D. Chemical feed improvements
- E. Addition of recarbonation
- F. Filter and high service pump modifications to establish constant rate filtration
- G. Electrical upgrades including a new service entrance
- H. SCADA upgrades including automation of the City's water system
- I. Replacement of instrumentation
- J. Replacement of HVAC
- K. Roof Replacement
- L. Other cosmetic improvements

TASK LIST

Basic Design Services

Task 1 – Project Administration, Management, and Quality
Task 2 – Field Surveys and Investigations
Task 4 – Easement Drawings and Encroachment Assistance
Task 5 – Design Document Preparation
Task 6 – Permitting
Task 7 - Bid Phase Services

Alternative Analysis & Public Outreach

Task 3 – Alternative Treatment Analysis
Task 8 – Stakeholder Involvement and Public Outreach

By Future Amendment

Task 9 – Construction Phase Services
Task 10 – Supplemental Services

SCOPE OF SERVICES

Task 1- Project Administration, Management, and Quality

The Engineer will provide project administration and management activities such as staffing, sub-consultant coordination, budget management, schedule management, and coordination with City staff. Engineer will provide the following:

- A. Project Initiation, Tracking, Scheduling, and Budgeting:
 - i. Engineer will prepare a Project Guide including our internal Project Management Plan, Quality Management Plan, and BIM Execution Plan. These documents define a clear roadmap for project execution and include an internal budgeting plan, staffing plan, safety plan, and schedule.
- B. Project Management
 - i. Engineer will prepare a Process Approach and Resource Review (PARR). This is a review of our project approach and internal resource plan by national experts to verify project delivery efficiencies and quality.
 - ii. Invoicing. The Engineer's Project Manager (PM) and accounting staff will prepare monthly invoices, through the project schedule duration.
 - iii. Prepare and submit monthly status reports including current status of project tasks and project financials, with percent complete for major scope tasks.
- C. Internal Meetings and Coordination
 - i. The Engineer's PM and design manager (DM) will coordinate with internal staff on a weekly basis.
- D. City Kickoff Meeting
 - i. Conduct a kickoff meeting in Columbia with City staff to discuss previous work and confirm project objectives, approach, goals, scope, schedule, communications, and deliverables; and identify potential risks to the project's success and develop mitigating strategies.

Task 2- Field Surveys and Investigations

A detailed field and boundary survey will be conducted on the site between State Highway K and Perche Creek.

- A. Boundary, Topographic and Planimetric Survey
 - i. Engineer will provide boundary, planimetric and topographic survey work and create a topographic base file for use in the project design, permitting, and contract document preparation. Surveying will generally encompass:
 - Field survey the project site.
 - Coordination for the location of underground utilities marked by a Missouri One Call utility locate and indication of the type and location of both underground and above ground utilities based on available information.
 - Obtain current title information from a local title company
 - Location of property corners adjacent to or within the survey site.
 - Location of drainage and sanitary sewer information (ditch bottoms, storm drain top elevations, invert elevations, sizes, and connections), including elevations of storm or sanitary

pipes extending to the opposite side of the road.

- Topographic survey of the site with two foot contour intervals.
- Establishment of right-of-way and property lines for the preparation of easements for land acquisition.
- Location of roadway features including, edge of pavement, curb and gutter and roadway centerline.
- Labeling of road names and property owners on drawing.
- Location of permanent structures within the survey site including above grade water treatment facility infrastructure.
- Location of below grade process piping and electrical/control duct banks as documented in existing water treatment plant record drawings.
- Location of trees > 8 inches in diameter indicating diameter and species.
- Location of driveways.
- Location of creek centerlines, waterline elevation and the bottom/top of banks within the survey site.

B. Geotechnical Investigations

- i. Engineer will conduct a geotechnical investigation at the treatment plant site. Geotechnical scope will be included in the proposal and generally consist of the following minimum requirements:
 - 5 Soil borings using hollow stem augers and mud rotary/wash boring techniques. Borings will extend to 80 feet or bedrock whichever is encountered first.
 - Geotechnical report for the treatment plant site as necessary for design of the treatment plant improvements.
 - Borings and geotechnical report for rock, ground water and other constructability concerns at locations of concern or critical nature.

C. Condition Assessment and Non-Destructive Testing

- i. Review existing studies and past recommendations to establish a baseline prior to conducting site visits.
- ii. Conduct site visits with Project Management and Multi-discipline Design Leads including process, structural, architectural, mechanical, plumbing, electrical, and instrumentation and controls. Discuss performance and condition issues with plant personnel in order to confirm necessary improvements.
- iii. Process survey will include an evaluation of water treatment unit processes and chemical feed systems and will give consideration to performance, age, condition, safety and operational history.
- iv. Structural Evaluation will include structural material integrity and cracking. Non-destructive structural testing includes site observations, chain drags, hammer tests, and other simple nondestructive testing that can be accomplished by HDR personnel. It excludes any third party testing required to determine strength of existing concrete below grade or that requires samples to be taken and tested by a 3rd party.
- v. Mechanical survey will include an evaluation of existing HVAC ventilation and duct work.
- vi. Electrical survey will include an evaluation of electrical components, switchgear, transformers, cabinets, control panels, PLCs, and associated electrical gear.
- vii. Plumbing survey will include an evaluation of water supply lines, valves, visible drain lines, and gas supply lines.

D. 3D LiDAR Scanning

- viii. Provide the necessary scanning services for scanning the existing water treatment components.
- ix. Engineer will visit the site to capture and digitally archive the as-built condition of the existing facilities. A scanning pattern will be planned and discussed prior to arriving on site and should have no impact to the operations of the facility. Laser scanning will capture onsite conditions in 3D format that will assist with the generation of a three-dimensional, computer generated BIM file for design.

E. Field Investigation Technical Memorandum

- i. Engineer to provide a Technical Memorandum summarizing the results of the field reconnaissance and other preliminary considerations for review and approval by City.

Task 3- Alternative Treatment Analysis

A. Background Data Collection and Review

- i. Review of background water quality data and prepare a summary.

B. Water Quality Goal Development

- i. Establish draft water quality goals.
- ii. Conduct workshop to select project water quality goals and candidate technologies identified in previous studies for additional analysis and testing at the bench, pilot scale and full-scale.
- iii. Develop detailed draft and final testing plan including description of bench, pilot and full-scale testing protocols, objectives, testing frequency, water quality analyses, safety plan and data management plan.

C. Bench scale testing will include:

- iv. Working with City staff to collect water for bench scale testing
- v. Ozone demand/decay testing of raw and softened water including bromate formation analysis
- vi. Granular Activated Carbon (GAC) Rapid Small-Scale Column Testing (RSSCT) testing of filter effluent to determine GAC performance with respect to TOC removal and DBP formation under simulated distribution system testing as well media change-out frequency.
- vii. Air stripping analysis of chlorinated filtered water to assess impact on Total Trihalomethane (TTHM) formation under simulated distribution testing.

D. Pilot-scale Testing

- i. Identify pilot testing location, equipment procurement needs, and specific site requirements (supply, waste, power). Anticipated pilot testing duration is six months with the following scenarios to be evaluated:
 - Post-filtration GAC
 - Ozone/biofiltration of aerated water and softened water.
 - Filter column testing to evaluate high-rate filtration rates.
- ii. Design and procure pilot facilities.
- iii. Provide field support associated with equipment delivery, installation and start-up
- iv. Engineer will provide day-to-day operation of the pilot facilities including sampling and coordination with an external laboratory for sample analysis with assistance from City operations staff.
- v. Provide analytical services associated with bench and pilot testing.
- vi. Analyze pilot data and provide operational and sampling adjustments.
- vii. Provide monthly pilot, bench and full-scale testing updates.
- viii. Prepare draft and final pilot report and conduct workshop to review results. Gain

regulatory approval of pilot results

E. Full-scale testing including:

- i. Develop testing protocol for evaluating full-scale testing of enhanced lime softening.
- ii. Work with City staff to conduct full-scale testing.
- iii. Conduct laboratory analysis of key water quality parameters associated with enhanced lime softening including pH, calcium hardness, magnesium hardness, total hardness, alkalinity, DBP Simulated Distribution System (SDS) testing.
- iv. Evaluate residuals generation impacts.
- v. Provide monthly updates of testing results.
- vi. Prepare draft and final report TM of full-scale testing results

F. Alternative Analysis

- i. Identify viable technologies and conduct conceptual design of each technology including developing the following for viable alternative:
 - Site plan layouts
 - Hydraulic analysis
 - Preliminary design data including sizing and loading rates, equipment requirements, preliminary electrical demands, anticipated performance relative to water quality goals, operational requirements and MOPO impacts.
 - Capital, operating and life cycle cost estimates
- ii. Conduct a workshop to review alternatives and identify options for implementation including implementation timeline.
- iii. Prepare draft and final report summarizing Alternatives Analysis including recommendations.

G. Water System Modeling

- i. Coordinate with City staff to verify typical system operations during winter and average demands.
- ii. Develop estimated water age and temperature in tanks and pipes within the water distribution system under current operational controls using the City's InfoWater hydraulic model.
- iii. HDR will coordinate a workshop with relevant City staff to verify current operation controls of the water distribution system under winter and average demands. This includes typical tank level targets, pump cycling, pump speeds and other controls typically used by City staff under normal (non-emergency) conditions.
- iv. Workshop will also discuss tank mixing assumptions of model and get feedback from City staff as to which types of mixing can be expected in each of the water distribution system tanks.
- v. HDR will use the City's existing InfoWater hydraulic model to develop estimated water age and temperature of the system under winter and average demand conditions using the operational controls discussed during the workshop. Output will consist of water age graphs for tanks (Stephens, Hillsdale, Shepard, Walnut, South Pump Station Reservoir and West Ash Pump Station Reservoir) and maximum age and estimated temperature maps of the systems water mains.
- vi. The model outputs will be used to identify parts of the system that have the highest estimated water age and temperature for current and one future climate scenarios.
- vii. Develop operational control alternatives to reduce water age within the water distribution system.
- viii. Analyze effectiveness of control alternatives on system water age and temperature.
- ix. HDR will coordinate a workshop with relevant City staff to develop up to four alternative operational control scenarios for water age and temperature analysis (up

to three current climate and one future climate scenarios). The intent of the alternative controls is to minimize water age in the areas identified as having the highest water age and/or temperature from the previous task. The operational controls may also include capital improvements to distribution system.

- x. HDR will use the City's InfoWater hydraulic model to develop estimated water age and temperature of the system under winter and average demand conditions for the four operational control scenarios developed during the workshop. Output will consist of water age graphs for tanks (Stephens, Hillsdale, Shepard, Walnut, South Pump Station Reservoir and West Ash Pump Station Reservoir) and maximum age map and estimated temperature of the systems water mains for up to one future climate scenario.
- xi. The model outputs will be used to evaluate effectiveness of the proposed operation changes on system water age.
- xii. HDR will develop summary report of the water age analysis with estimated capital cost of operational control alternatives if system improvements are required.

Task 4- Easement Drawings and Encroachment Assistance

Engineer will provide easement drawing exhibits for City use in obtaining necessary property and easements adjacent to the treatment plant site. Engineer will coordinate with City staff on project related questions during the easement procurement process. Engineer will prepare encroachment documentation as necessary for the City to obtain necessary MoDOT permits.

Task 5- Design Document Preparation

The detailed design will consist of the preparation of drawings and specifications for permitting and construction of the proposed treatment plant improvements in accordance with City standards and Missouri Department of Natural Resources requirements. The design will include the following:

- Replacement of primary basin equipment
- Replacement of aerators and flow meters
- Chemical feed improvements
- Addition of recarbonation
- Electrical upgrades including a new service entrance
- SCADA upgrades including automation of the City's water system
- Replacement of instrumentation
- Replacement of HVAC
- Roof Replacement
- Other cosmetic improvements
- Filter and high service pump modifications to establish constant rate filtration
- Additional Electrical upgrades
- Additional SCADA upgrades and instrumentation replacement

A. Preliminary Engineering Report.

- i. The Engineer will develop a Preliminary Engineering Report for approval by MDNR. The PER will include detailed cost estimates for total estimated construction costs.

Engineer will provide pdf's for review and coordinate and conduct workshop meetings at the 30%, 60% and 90% design milestones to review the design documents and City comments.

- A. The 30% Preliminary Engineering design will consist at a minimum of the following:
 - Base drawings utilizing field survey data
 - Preliminary Treatment Plant Layout
 - Preliminary opinion of probable construction cost
 - Permitting and easement requirements based on field delineation and survey results
- B. The 60% design will address comments received at the 30% phase and consist at a minimum of the following:
 - Treatment Plant Site Plan
 - Mechanical Plan
 - Electrical Plan
 - Erosion and sedimentation control plan and details
 - Technical specifications
 - Bid Form
 - Updated opinion of probable construction cost
- C. The 90% design will address comments received at the 60% phase and consist of a full set of plans, details, and specifications. It is anticipated 90% drawings will be utilized for project permitting.
- D. The 100% design will include the resolution of City review comments and incorporation of regulatory agency comments. The final design documents will be utilized for bidding the project for construction.

Task 6- Permitting

In preparation for bidding and construction of the project, Engineer will prepare and coordinate submittals, address comments, and obtain necessary permits including but not limited to the following:

- A. MoDOT right-of-way construction permit
- B. Missouri Department of Natural Resources coordination
 - i. The Engineer will coordinate MDNR meetings and design document reviews, comments, and responses to facilitate MDNR approvals.
 - ii. Participate in three (3) meetings at MDNR offices in Jefferson City, MO one at 30% deliverable; one at the Alternative Treatment Analysis deliverable, and one at Construction Permit.
- C. City of Columbia land disturbance permit
- D. City of Columbia construction permit
- E. Flood Plain Development Permit

Task 7- Bid Phase Services

- A. Bid Advertisement:
 - i. Excluded from Engineers Scope. City will prepare bid advertisement, establish the bid opening date, and distribute project contract drawings and specifications.
- B. Pre-Bid Conference:
 - i. Engineer will attend pre-bid conference. City will schedule and conduct the pre-bid conference. City will prepare and distribute meeting minutes and list of attendees.
- C. Respond to Bid Inquiries:

- i. Engineer will answer bidder questions as directed by the City. City will document all bid inquiries and incorporate Engineer responses as required.
- D. Issue Addenda:
 - i. Excluded from Engineers Scope. City will prepare and issue Addenda to MDNR and Bidders.
- E. Bid Opening and Tabulation:
 - i. Excluded from Engineers Scope. City will schedule and conduct the bid opening. City will prepare the bid tabulation.
- F. Review Contractor Bids and Recommend Award:
 - i. Engineer will assist the City in reviewing the bids for completeness, responsiveness, and acceptability. City will select recommended contractor or successful bidder.
- G. Assemble Conformed Contract Documents:
 - i. Engineer will incorporate addenda into contract documents and supply the city with fully conformed contract drawings and specifications.
- H. Process Contract Documents:
 - i. City will review the successful bidder's insurance certificates and bonds, compile the final set of conformed contract documents (front end, technical specifications, and drawings) for City and Contractor execution, and issue with the Notice of Award and Notice to Proceed.

Task 8 - Interested Parties Involvement and Public Outreach

- A. Community Outreach Program
 - i. Engineer will develop a draft and final Community Outreach Plan to outline the roles and responsibilities of the project team, including City staff, project messaging, stakeholder list and schedule. Engineer will schedule a one-hour conference call to review the draft Plan with the City. The Plan will include the Interested Party topics such as project updates, water quality goals, and alternative analysis cost and benefits. The Plan will be provided electronically.
- B. Project Website Content
 - i. Engineer will support the City by creating a draft and final project website content and providing supporting graphics to the City. The mock-up will be used by the City staff to update the City's website with the project information. Up to 3 content revisions are included.
- C. Social Media Campaign
 - i. Engineer will support the City by drafting up to six social media campaign recommendations documents – including messages, graphics and schedule strategy – to provide information to the Columbia residents and notify them of upcoming engagement opportunities. The existing City social media channels will be used to share messages. Analytics for the social media campaigns will be shared back to the Engineer. Engineer will provide a monthly snapshot of social media conversations.
- D. Interested Parties Meeting Assistance
 - i. Engineer will plan, lead and summarize up to three (3) interested parties meetings. Each meeting will include the following:
 - Notification materials
 - Meeting plan and summary
 - Up to three Engineer staff at each workshop

- E. Assist with City Council and Water & Light Advisory Committee Meetings
 - i. Engineer Assist with City Council and Water & Light Advisory Board Meetings including:
 - Up to two Engineer staff at up to four (4) meetings
 - Per meeting materials include one handout and PPT slides

Task 9 - Construction Phase Services – pending future contract amendment

Task 10 – Supplemental Services

An allowance in the amount of \$200,077 has been included and established for supplemental services not yet authorized by the City that may be required during the course of the work. This allowance amount shall not be utilized by the Engineer unless specifically authorized in writing by the City to perform supplemental design services. Supplemental design services that may be needed based on the decisions made during the design phase include, but are not limited to, those listed below. The allowance may be utilized for these tasks or other supplemental services requested by the City which may be required during the project.

- Additional Design Workshops
- Evaluate and pilot up to two (2) additional emerging technologies that were not included in previous studies.
- Pilot Operation Assistance
- Long Range Capital Planning Estimates

Assumptions and Exclusions:

- Structural scope includes rehabilitation and material patching work typical of a facility of this age. It does not include serious deficiencies or damage to existing structure or tankage that may be discovered during structure or tank inspections.
- Excludes hazardous material surveys, sampling and analysis.
- Assumes a single design phases with 30, 60, 90% design progress reviews with a total 12 months of design and preparation of on (1) set of bid packages
- Assumes 2 week review periods for City to review design documents.
- Assumes pilot will be operated for 6 months. ESS will operate pilot 1 day per week for 6 months. The City operations staff will provide assistance.
- Pilot study assumes two (2) skid rentals (1 filter skid and 1 ozone skid) for 28 weeks (26 weeks of operation 2 weeks for start-up and shutdown). The filter skid will include BAF and GAC.
- Environmental studies or impact statements, environmental clearances, cultural resource assessments, wetland mitigation, NEPA, and NPDES are excluded.
- Preparation of funding applications are excluded.
- Additional services not otherwise provided for in this scope.