AMENDMENT SUMMARY
BROKEN ARROW MUNICIPAL AUTHORITY
WATER AGE AND NEW SOUTHERN RESERVOIR HYDRAULIC ANALYSIS
PROJECT NO. 185438
PROFESSIONAL CONSULTANT AMENDMENT

1.0 Professional Consulting Firm:

1.1 Name: Carollo Engineering, Inc.

1.2 Telephone No.: 405-840-7785

1.3 Address: 211 N. Robinson, Suite 1300 North Tower, Oklahoma City, OK 73112

2.0 Project Name/Location: Water Age and Southern Reservoir Hydraulic Analysis. Located throughout the water distribution system.

3.0 Statement of Purpose: Provide professional engineering services to include a water age and water quality assessment of the existing distribution system to determine areas of concern and develop a capital and operational improvements plan to improve overall system water quality. Additionally, provide hydraulic modeling to evaluate proposed new elevated finished water storage tank and develop an operational strategy to allow for rehabilitation of the elevated water storage tank located in the high pressure zone.

4.0 Agreement Summary:

4.1	Original Agreement Amount:	$99,459.00
4.2	Agreement Time:	150 calendar days
4.3	Amendment No. 1 Amount:	$163,500.00
4.4	Amendment No. 1 Time:	336 calendar days
4.5	Revised Total Contract Amount:	$262,959.00

5.0 Contract Documents and Priority: The Broken Arrow Municipal Authority (OWNER), represented by the City Manager, and the Professional Consulting firm, (CONSULTANT), identified in paragraph 1.0 agree to perform this AGREEMENT in strict accordance with the clauses, provisions, and the documents identified as below, all of which are made part of this Contract. In the event of conflict, these documents shall be interpreted in the following order:

5.1 AGREEMENT with corresponding Attachments;
5.2 Duly authorized Amendments to the AGREEMENT;
5.3 AGREEMENT Summary;
5.4 Specific project written correspondence mutually recognized; and
5.5 Specific project verbal instructions mutually recognized.

6.0 Agreement Approved by the Owner on: _____

AMENDMENT NO. 1
TO
PROFESSIONAL CONSULTANT AGREEMENT
BETWEEN
BROKEN ARROW MUNICIPAL AUTHORITY (OWNER)
AND
CAROLLO ENGINEERING, INC. (CONSULTANT)
FOR
WATER AGE AND NEW SOUTHERN RESERVOIR HYDRAULIC ANALYSIS
PROJECT NO. 185438

THIS **AMENDMENT NO. 1** made and entered into this 7th day of May, 2019, by and between the BROKEN ARROW MUNICIPAL AUTHORITY, a municipal corporation of the State of Oklahoma, hereinafter referred to as "OWNER", and Carollo Engineering, Inc., hereinafter referred to as "CONSULTANT";

WITNESSETH:

WHEREAS, OWNER and CONSULTANT entered into an Agreement dated February 20, 2018, for design, bidding, and construction services as set forth in said Agreement; and

WHEREAS, OWNER and CONSULTANT propose to amend said Agreement to expand the project scope and compensation per Attachments A-1, B-1, D-1 and E-1; and

WHEREAS, the 2018 Agreement and First Amendment shall hereinafter collectively be referred to as the "Agreement"; and

WHEREAS, funding is now available for said additional services in Account Number 185438; and

WHEREAS, CONSULTANT is prepared to provide said additional services identified in this Amendment No. 1.

NOW THEREFORE, in consideration of the promises contained herein, the parties hereto agree to amend the Agreement as follows:

1. **SCOPE OF SERVICES.**
   An amended Scope of Services as specified in Attachment A-1 is hereby incorporated by reference as part of this agreement.
2. **ORGANIZATION OF SUBMITTAL DOCUMENTS.**
   The Organization of Submittal Documents as specified in Attachment B-1 related to this Amendment No. 1 is amended to add the letter-format engineering report to the documents listed in the original Agreement.

OWNER's responsibilities related to this Amendment No. 1 are the same as defined in the original Agreement. No Special conditions exist to this Amendment No. 1.

3. CHANGE IN CONTRACT AMOUNT.

As compensation for the additional work, OWNER shall pay CONSULTANT in accordance with the terms specified in Attachment D-1, Amended Compensation and Additional Services, as a change in the contract amount as follows:

Original Agreement Amount	$ 99,459.00
Amendment No. 1	$ 163,500.00
Revised Total Contract Amount	$ 262,959.00

4. PROJECT SCHEDULE.

a. The project schedule related to this Amendment No. 1 is amended by Attachment E-1 is hereby incorporated by reference as part of this agreement.

5. EFFECTIVE DATE AND AUTHORIZATION TO PROCEED.

a. This Amendment No. 1 is effective upon signature by both parties.

Except as amended hereby, all terms of the 2018 Agreement shall remain in full force and effect without modification or change.

IN WITNESS WHEREOF, the City Manager of the City of Broken Arrow, Oklahoma has hereunto set his hand, for and on behalf of the City of Broken Arrow and Carollo Engineering, Inc. has signed, or caused his name to be signed, and seal affixed by proper authority, the day and year first above written and these presents have been executed in triplicate counterparts.

OWNER:
City of Broken Arrow, a Municipal Corporation

Approved as to form:

By _____
Assistant City Attorney

By _____
Michael L. Spurgeon, City Manager

Date _____

Attest:

_____
Curtis Green, City Clerk

Date _____

CONSULTANT
Carollo Engineering, Inc.:

By _____
Thomas O. Crowley, Vice-President

Date 04/24/19

(CORPORATE SEAL) if applicable

Attest:

By _____
(Wayne Miller, Vice-President)

Date 4/24/2019

VERIFICATION

State of Missouri)
) §
County of Jackson)

Before me, a Notary Public, on this 24 day of April, 2019, personally appeared Thomas O. Crowley, known to be to be the Vice-President of Carollo Engineering, Inc., and to be the identical person who executed the within and foregoing instrument, and acknowledged to me that he executed the same as his free and voluntary act and deed for the uses and purposes therein set forth.

My Commission Expires:

Feb 13, 2021

_____
Notary Public

BONNEY BOYD
Notary Public – Notary Seal
Jackson County – State of Missouri
Commission Number 17785569
My Commission Expires Feb 13, 2021

ATTACHMENT A-1

TO
AMENDMENT NO. 1
TO PROFESSIONAL CONSULTANT AGREEMENT
BETWEEN BROKEN ARROW MUNICIPAL AUTHORITY (OWNER)
AND
CAROLLO ENGINEERING, INC. (CONSULTANT)
FOR WATER AGE AND NEW SOUTHERN RESERVOIR HYDRAULIC ANALYSIS
PROJECT NO. 185438

SCOPE OF SERVICES

The following scope of services shall be made a part of the Amendment No. 1 to the Original AGREEMENT dated the 20th day of February, 2018.

1.0 BACKGROUND

The City of Broken Arrow/Broken Arrow Municipal Authority (OWNER) retained the professional services of Carollo Engineers, Inc. to conduct an evaluation of the Battle Creek Water Storage Tank to determine recommendations to improve cycling within the tank and prevention of disinfectant residual losses.

As an amendment to the previous engineering agreement, OWNER would like to conduct a water age and water quality assessment of the existing distribution system to determine areas of concern and develop a capital and operational improvements plan to improve overall system water quality. Hydraulic modeling will provide information on water age and data necessary to determine water quality parameters such as chloramine decay, and develop a water quality sampling map to be used for OWNER's long-term monitoring plan in the future.

Additionally, the OWNER has determined that a new, elevated finished water storage tank is necessary in the southern portion of the OWNER's distribution system to improve emergency storage and fire flow. Final design of the tank is progressing with two different sizes of elevated tank being considered for installation: 2.0 Million Gallon (MG), and 2.5 MG.

Finally, the OWNER would like to decommission the elevated water storage tank in the high pressure zone for rehabilitation. The OWNER would like to assess the available time window for rehabilitation and determine the capital improvements (if any) necessary to reliably maintain minimum pressures in the high pressure zone during rehabilitation activities.

2.0 PURPOSE

The purpose of this study is as follows:

1. Compare the current model with current system-wide GIS information provided by the OWNER and develop a data gap analysis summarizing discrepancies (if any). It is assumed that the existing GIS data is sufficient and field verification of data in the GIS will not be required. It is also assumed that OWNER will be responsible for verification of data gaps between Model and GIS. CONSULTANT will update model with missing GIS based information prior to calibration.

2. Develop detailed buildout demands (Average Day Demand (ADD) and Maximum Day Demand (MDD)) for the southern portion of the distribution system (northern portion is already complete) utilizing existing and proposed land use maps, projected area demands for each type of land use, and calibrate projected annual average day demand nodes with actual geocoded meter information. Current projected ADD/MDD and MDD/PHD (Diurnal curve) ratios will be utilized to project these factors for buildout conditions. This analysis will not include fire flow demands.

3. Update the existing Innovyze water model with specific information regarding the proposed elevated water storage tank under Average Day Demand (ADD) and Maximum Day Demand (MDD) conditions as defined in Task 200 to verify proposed storage tank volume and evaluate effect of tank on surrounding distribution system at current demands and anticipated demands at system buildout.

4. Hydraulic Model Pressure Calibration
   Calibration of the computer generated hydraulic model to be accomplished through temporary installation of pressure loggers within the area of the distribution system proposed for the elevated tank, and field testing for source tracing.

5. Water Age Calibration
   A tracer study involves the observation of how a substance moves within the distribution system to characterize travel times and water source blending. Substances used as tracers in drinking water are typically constituents that occur naturally, are normally added to the distribution system but can be turned off for some period of time, are non-toxic, and are conservative (no reactions occur other than dilution and dispersion). The constituent selected for the Tracer Study is hydrofluorosilicic acid (fluoride).

6. Water Age Analysis
   Additional hydraulic modeling will be conducted to evaluate the anticipated age of water within the distribution system under existing condition.

7. Water Age Confirmation: Utilizing the data from the water age calibration, water quality sampling, and general staff knowledge, CONSULTANT will develop water age maps illustrating the locations of concern for water ages that could contribute to loss of residual

below OWNER action level values. Water age model will only be conducted for current conditions.

8. Updated Water Quality Sampling Map: Utilizing the water age map, OWNER data regarding chloramine decay rates, and general knowledge of the system, CONSULTANT will generate a sampling map and table indicating the existing and proposed new sampling locations, sampling parameters, and sampling frequency to begin a long term water sampling program based upon model results and to track impact of recommended short term and long term improvements on overall system water quality.

9. Water Age distribution system Capital Improvements Plan: Utilizing the water age map, CONSULTANT will prioritize areas of highest to lowest concern regarding water age and develop recommended short term (0-2 years) and long term (2 plus years) operational and capital improvements to reduce water age in prioritized areas.

10. Water Age Analysis Technical Memorandum: Develop an Technical memorandum to summarize methodology utilized in investigations, water age analysis results, and recommended prioritized projects in the short term and long term that will have the greatest impacts on reducing water age and potential water quality concerns resulting from water age. Cost opinions will be developed for each of the capital and operational improvements recommended.

11. Baptist Tank Painting Technical Memorandum; Utilizing the water model and current demands for the high pressure zone, CONSULTANT will develop a technical memorandum to:
    a. Determine the minimum pressure and fire flow requirements for the high pressure zone during Baptist Elevated Tank decommissioning.
    b. Determine the length of time the Baptist Tank can be out of service for painting.
    c. Assess the length of time tank will be required to be off line to conduct a full coating (interior) rehabilitation and exterior surface coat.
    d. Determine capital improvements (if any) necessary to permit decommissioning of the Baptist Tank while maintaining minimum pressures in the high pressure zone.

3.0 SCOPE OF SERVICES

TASK 100 – PROJECT COORDINATION AND COMMUNICATION

Task 100 includes the tasks and subtasks associated with the project delivery and communication for this project.

Task 100.1 – Project Delivery and Communication

General:

CONSULTANT will provide project delivery services necessary for the administration of the Project, including efforts required for proper resource allocation, schedule development and

monitoring, budget review and control, client correspondence and coordination, internal quality assurance/quality control (QA/QC) activities and other project administrative and customary activities required for timely completion of the work. CONSULTANT will prepare and submit invoices in a form that is acceptable to the OWNER.

Task 100.1.1 – Monthly Progress Status Reports

Prepare and submit to OWNER monthly project progress status reports for Task 3 services that identify:

- The work that has been performed in the period.
- Work activities anticipated in the next month.
- Action items required of the OWNER for an efficient and effective delivery of CONSULTANT's services.
- Potential project scope variances with corrective actions suggested by CONSULTANT.
- A general assessment of CONSULTANT's ability to meet project schedule milestones, including identification of any delays beyond its control, and an estimate of the work percent completion for each task series in the Scope of Services based on earned value of the work completed.

Task 100.2 – Project Meetings and Workshops

Task 100.2.1 – Kickoff Meeting No.1

CONSULTANT will conduct a Kickoff meeting with OWNER to review scope, schedule, budget and general decision and action logs regarding the project planning.

Task 100.2.2 – Hydraulic Model Calibration Review Workshop No.2

CONSULTANT will conduct a workshop with OWNER Staff to review data and hydraulic modeling calibration results. This workshop will be used to present results for Tasks 200, 300 and 400, and use Staff knowledge to confirm model results before starting hydraulic and water age analyses.

Task 100.2.3 – Modeling and Water Age Results and CIP Review Workshop No.3

CONSULTANT will conduct a workshop with OWNER Staff to review modeling and water age results, and conclusion. This workshop will be used to present results for Tasks 500 and 600.

Task 100.2.4 – Draft Technical Memorandum Review Workshop No.4

CONSULTANT will conduct a workshop with OWNER Staff to review the findings and recommendations presented in the draft Technical Memorandum developed for Task 700.

Deliverables:

Major Deliverables associated with Task 100.2 are as follows:

- Monthly Progress Reports.
- Monthly Updates to Action/Decision Logs.
- Meeting Minutes and Agendas.

Assumptions:

Assumptions associated with Task 100.1 are listed below:

- Project duration as indicated in Task 700 and Attachment E-1.
- OWNER will provide CONSULTANT with the proposed design information for the elevated tank(s) under consideration, including elevation of sphere and overflow elevation.

TASK 200 – HYDRAULIC MODEL UPDATE

Task 200 includes the tasks and subtasks associated with updating the OWNER's hydraulic model.

Task 200.1 – Data Collection

General:

CONSULTANT will prepare and distribute a comprehensive list of data required to update the hydraulic model with the new reservoir. The CONSULTANT will compare the current model with current GIS information provided by the City system-wide and develop a data gap analysis summarizing discrepancies (if any). The OWNER will be responsible for providing any available data in electronic format to update the hydraulic model with the latest data available.

Task 200.2 – Update Hydraulic Model

General:

The updated hydraulic model will be updated to confirm hydraulic model matches latest GIS data since last update in 2018 and confirm location for the new reservoir. Operations will be confirmed with OWNER staff to represent latest operation scheme.

Task 200.3 – Refine Build-out Demands Allocation

General:

The CONSULTANT will also develop detailed buildout demands allocation (Average Day Demand (ADD) and Maximum Day Demand (MDD)) for the southern portion of the distribution system (northern portion is already complete) utilizing existing and proposed land use maps,

projected area demands for each type of land use, and calibrate projected annual average day demand nodes with actual geocoded meter information. Current projected ADD/MDD and MDD/PHD (Diurnal curve) ratios will be utilized to project these factors for buildout conditions.

Deliverables:

- Updated Innovyze hydraulic model will be provided to OWNER.

Assumptions:

- No new demand projection will be performed as part of this effort.
- No fire flow requirements will be developed or analysis will be conducted.

TASK 300 – CALIBRATION OF HYDRAULIC MODEL FOR FLOWS AND PRESSURES

General:

CONSULTANT will provide and ship to OWNER up to eight pressure logger devices for monitoring of the distribution system with the southern portion of the distribution system. OWNER staff will be responsible for installing the pressure logger devices within the areas designated by the CONSULTANT in the main pressure zone. OWNER will be responsible for maintaining the devices for a period of no more than two (2) months. At the end of this period, OWNER will also be responsible to ship the pressure logger devices back to the CONSULTANT for purposes of water model calibration.

CONSULTANT will calibrate the hydraulic model for pump flows, and for pressure/head levels at tanks and pressure loggers locations for a period of 24-hour.

Deliverables:

- An EPS calibration plan (Report No. 1) will be provided to OWNER highlighting installation procedures and detailed locations for the pressure logger devices.
- Data collected during Hydraulic Model Calibration will be incorporated into the Draft and Final Technical Memorandum (TM), as described in Task 700.

Assumptions:

- OWNER will install and remove pressure loggers at select key locations.

TASK 400 – CALIBRATION OF HYDRAULIC MODEL FOR WATER AGE

General:

The objective of the calibration for water age is to collect field data on travel time in pipes; and to calibrate the hydraulic model for these parameters. CONSULTANT will prepare a water age calibration plan, identify locations for chemical injection and sampling points, identify sampling

points in the distribution system to generate data on 1) time of flow in pipelines, 2) residence time in reservoirs, 3) system anomalies.

Utilizing the data from the water age calibration, water quality sampling, and general staff knowledge, CONSULTANT will develop water age maps illustrating the locations of concern for water ages that could contribute to loss of residual below OWNER action level values. Water age model will only be conducted for current conditions.

Deliverables:

- A water age calibration plan (Report No. 2) will be provided to OWNER highlighting installation procedures and detailed locations for chemical injection and sampling points.
- Extended period simulations will be limited to 14 days.
- No fire flow analysis will be conducted.

Assumptions:

- OWNER staff will conduct field work for tracer feed and for sampling. No CONSULTANT staff. No more than 20 sample locations on major transmission mains and at the extremities of each pressure zones will be taken.
- CONSULTANT will not provide sample bottles, nor provide lab services to perform the analysis on fluoride concentrations.

TASK 500 – PERFORM HYDRAULIC MODELING

General:

The newly calibrated hydraulic model will be used to perform several analyses, from pressure and velocity during normal conditions to looking at redundancy when the First Baptiste Church is offline. The subtasks below identify the modeling analyses:

- It is assumed that tank sizes of 2.0 and 2.5 mg will be studied and that tank sizes included the required equalization and fire flow volume. CONSULTANT will not be responsible for commenting on tank size.

Task 500.1 – Perform Pressure and Velocity Analysis

The updated and calibrated hydraulic model (from Task 200 and 300) will be run for both existing and build-out conditions Average Day Demand (ADD) and Maximum Day Demand (MDD) conditions with and without the new reservoir. Hydraulic parameters, such as minimum and maximum pressures, maximum velocities, will be reported to understand the impact of adding the new reservoir to the distribution system operation and customer's level of service. The hydraulic model will be used to confirm new reservoir volume. A workshop will be held as part of this task to review methodology and results with OWNER Staff.

CONSULTANT will use the hydraulic model to evaluate pressure and velocity for the following operating scenarios:

- Existing ADD with new reservoir for both 2.0 and 2.5 MG size.
- Buildout ADD with new reservoir for both 2.0 and 2.5 MG size.
- Existing MDD with new reservoir for both 2.0 and 2.5 MG size.
- Buildout MDD with new reservoir for both 2.0 and 2.5 MG size.

Based on the modeling results, CONSULTANT will evaluate and recommend the following:

- Improvements necessary within the distribution system for proper functioning of the new southern elevated tank.
- Short term (0-5) improvement necessary within the distribution system (with the tank in place) to alleviate pressure and/or hydraulic issues identified by the current system model under normal operation. No fire flow scenario will be run with the hydraulic model.
- Long term (5 plus) improvements recommended to alleviate any issues in the distribution system.

Task 500.2 – First Baptist Church (FBC) Tank Painting and Redundancy

CONSULTANT will use the hydraulic model to evaluate the impact of taking the First Baptiste Church tank for painting and maintenance. The OWNER wishes to take the tank offline and identify solutions for reliability and redundancy in the high pressure zone. Critical customers such as hotels, hospitals, or other critical facilities are only served by this tank. CONSULTANT will work with OWNER to develop pressure and fire flow criteria for this pressure zone. Up to three options will be recommended by CONSULTANT to ensure reliability and redundancy within the High Pressure Zone.

Utilizing the water model and current demands for the high pressure zone, CONSULTANT will develop a technical memorandum to:

- Determine the minimum pressure and fire flow requirements for the high pressure zone during Baptist Elevated Tank decommissioning.
- Determine the length of time the Baptist Tank can be out of service for painting.
- Assess the length of time tank will be required to be off line to conduct a full coating (interior) rehabilitation and exterior surface coat.
- Determine capital improvements (if any) necessary to permit decommissioning of the Baptist Tank while maintaining minimum pressures in the high pressure zone.

Deliverables:

- A workshop will be held with CONSULTANT AND OWNER to present recommendations.
- FBC Draft and Final Technical Memorandum.

Assumptions:

- It is assumed that tank sizes of 2.0 and 2.5 mg will be studied and that tank sizes included the required equalization and fire flow volume. CONSULTANT will not be responsible for commenting on tank size.

TASK 600 – PERFORM WATER AGE ANALYSIS AND DEVELOP CIP

600.1 – Perform Water Age Analysis

The Extended Period Simulation (EPS) model will be used to determine system-wide water ages. Special attention will be given to areas and facilities that have experienced water quality problems within the distribution system. Water age analyses will be performed for two demand conditions – typical winter day demand and typical summer day demand, developed from the previous effort in 2018. The objectives of the water age analyses are:

- Predict water age in distribution system pipes.
- Predict water age in reservoirs.
- Determine maximum water age limits below which chloramine residual problems are not expected, except for localized causes.
- Evaluate potential short term hydraulic improvements recommended in Task 500 and determine potential impacts on water age.

600.2 – Develop Short Term and Long Term Capital and Operational Improvements Plan:

Utilizing the water age map, CONSULTANT will prioritize areas of highest to lowest concern regarding water age and develop recommended short term (0-2 years) and long term (2 plus years) operational and capital improvements to reduce water age in prioritized areas.

600.3 – Update Water Quality Sampling Map

Utilizing the water age map, OWNER data regarding chloramine decay rates, and general knowledge of the system, CONSULTANT will generate a sampling map and table indicating the existing and proposed new sampling locations, sampling parameters, and sampling frequency to begin a long term water sampling program based upon model results and to track impact of recommended short term and long term improvements on overall system water quality.

Deliverables:

- Maximum water age in the distribution system under the above scenarios will be reported on figures and discussion will be incorporated into the Draft and Final TM, as described in Task 300. Water age will be grouped in age range categories (e.g., < 2 days, 2-7 days, 7-12 days) to be determined by CONSULTANT.
- Extended period simulations will be limited to 14 days.

Assumptions:

- Only four scenarios will be run in the hydraulic model (existing ADD and MDD with and without recommended improvements).

TASK 700 – DRAFT AND FINAL WATER AGE TECHNICAL MEMORANDUM

General:

CONSULTANT will develop a draft outline for OWNER's review, and complete a draft TM summarizing assumptions, methodology, and modeling results. Draft TM will be submitted to OWNER staff for review and comments. It is anticipated that this TM will include results and discussion from both Tasks 500 and 600, if selected.

CONSULTANT will conduct a workshop with OWNER Staff to review the findings and recommendations presented in the draft Technical Memorandum developed for Task 700. CONSULTANT will incorporate OWNER staff comments into a final TM.

Deliverables:

- Draft Outline.
- Draft and Final Technical Memorandum.

Assumptions:

- Draft TM will be provided electronically.
- Eight (8) bound copies and one (1) electronic copy of the Final TM will be provided to OWNER staff.

Project Duration:

Basic Services: A draft TM will be provided within 44 weeks from Notice to Proceed.

A final TM will be provided within three (3) weeks following receipt of comments.

4.0 FINAL DESIGN PHASE

Not Included.

5.0 BID ASSISTANCE PHASE

Not Included.

6.0 CONSTRUCTION SERVICES PHASE

Not Included.

7.0 PROJECT CLOSE-OUT

Not Included.

ATTACHMENT B-1
TO
AMENDMENT NO. 1
TO PROFESSIONAL CONSULTANT AGREEMENT
BETWEEN BROKEN ARROW MUNICIPAL AUTHORITY (OWNER)
AND
CAROLLO ENGINEERING, INC. (CONSULTANT)
FOR WATER AGE AND NEW SOUTHERN RESERVOIR HYDRAULIC ANALYSIS
PROJECT NO. 185438

ORGANIZATION OF SUBMITTAL DOCUMENTS

The following list of submittal documents for Amendment No. 1 shall be made a part of the AGREEMENT:

The following documents shall be submitted as deliverables for the project:

- EPS Calibration Plan (Report No.1)
- Water Age Calibration Plan (Report No.2)
- Draft / Final First Baptist Church Tank Technical Memorandum
- Draft / Final Water Age Technical Memorandum
- Updated Hydraulic Model

ATTACHMENT D-1
TO
AMENDMENT NO. 1
TO PROFESSIONAL CONSULTANT AGREEMENT
BETWEEN BROKEN ARROW MUNICIPAL AUTHORITY (OWNER)
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CAROLLO ENGINEERING, INC. (CONSULTANT)
FOR WATER AGE AND NEW SOUTHERN RESERVOIR HYDRAULIC ANALYSIS
PROJECT NO. 185438

COMPENSATION AND ADDITIONAL SERVICES

The following compensation shall apply as described in Attachment D-1 and shall be made a part of the AGREEMENT dated the 20th day of February, 2018 for Amendment 1 scope of work.

1.0 BASIC COMPENSATION

1.1 The OWNER shall pay the CONSULTANT a Lump Sum amount of $163,500 for the completion of the Scope of Work in Amendment No. 1. This amount includes all labor, material, overhead, and profit associated with the Scope of Services.

Breakdown of Payment shall be as follows:

Task 100	Project Coordination and Communication	$18,000
Task 200	Hydraulic Model Update	$6,500
Task 300	Calibrate Hydraulic Model for Flows and Pressure	$10,500
Task 400	Calibrate Hydraulic Model for Water Age	$25,000
Task 500	Hydraulic Modeling of System	
	500.1 Pressure and Velocity Analysis	$7,500
	500.2 First Baptist Tank TM	$18,000
Task 600	Perform Water Age Analysis and Develop CIP	$40,000
Task 700	Draft and Final Water Age TM	$38,000
	Total for AMENDMENT NO. 1	**$163,500**

Total Compensation for AGREEMENT and Amendment No. 1 $262,959

3.0 REPRODUCTION

All charges for reproduction shall be included in Basic Compensation Fee of the Professional Consultant. No separate payment will be made for these expenses.

4.0 MILEAGE

All direct costs shall be included in the Basic Compensation of the Professional Consultant. No separate payment will be made for these expenses.

5.0 DIRECT COSTS

All direct costs shall be included in the Basic Compensation of the Professional Consultant. No separate payment will be made for these expenses.

6.0 ADJUSTMENT CLAUSE

The rates and costs described in this AGREEMENT shall not be revised annually, unless mutually agreed upon by both parties.

ATTACHMENT E-1
TO
AMENDMENT NO. 1
TO PROFESSIONAL CONSULTANT AGREEMENT
BETWEEN BROKEN ARROW MUNICIPAL AUTHORITY (OWNER)
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FOR WATER AGE AND NEW SOUTHERN RESERVOIR HYDRAULIC ANALYSIS
PROJECT NO. 185438

PROJECT SCHEDULE

The following schedule shall be made a part of the AGREEMENT dated the 20th day of February, 2018.

1.0 EVALUATION PHASE: 336 Calendar Days

Submit the final Technical Memorandum within 46 weeks after Notice to Proceed.

Task	Description	Duration	Total Duration from Notice to Proceed (NTP)	Notes:
100	Data Collection	4 weeks	4 weeks	
200	Hydraulic Model Update	4 weeks	8 weeks	
300	Calibrate Hydraulic Model for Flows and Pressures	15 weeks	23 weeks	Assumes 3 months for Pressure Logging
400	Calibrate Hydraulic Model for Water Age	6 weeks	29 weeks	Assumes 14 day fluoride tracer study.
500	Hydraulic Modeling of System	4 weeks	33 weeks	
600	Perform Water Age Analysis and Develop CIP	8 weeks	41 weeks	
700	Draft TM	3 weeks	44 weeks	
	Final TM	2 weeks from receipt of comments	48 weeks	Assumes 2 weeks for comments on Draft TM