SCOPE OF SERVICES

Stage 1: Establish Baseline Validated Audit

Objective Statement: Establish baseline auditing practice, conduct advanced validation to determine levels of uncertainty and any impacts that will affect Non-Revenue Water (NRW) reduction strategy in subsequent phases of work.

Kick-off & Orientation Meeting

Water Audit Compilation and Level 1 Validation – Calendar Year 2025 or Fiscal Year FY 2025/26 (July 1 – June 30)

- Discovery
  - Conduct kickoff meeting with utility staff
  - Compilation and review of all immediately available records regarding water production, consumption, billing, finance, distribution and storage operations.
  - Conduct interviews with all pertinent staff regarding same
- Top-Down Analysis
  - Synthesize all records and water system data into AWWA M36 Standard Water Audit format:
  - Calculation of water balance inputs from detailed data discovery
  - Top-down validation of detailed input calculations:
    - Basic Lag-Time Adjustments on Annual Consumption Data
    - Master Meter Error Adjustment
    - Composite Customer Metering Inaccuracies
    - Average System Operating Pressure
    - Composite Customer Retail Unit Cost
    - Variable Production Cost
  - Review of Data Validity Scoring
    - Staff interviews regarding operational and data management practices
    - Assessment of data confidence grades for all Water Audit inputs
    - Determination of global Data Validity Score
- Top-Down Assessment of Key Performance Indicators for system efficiency
- Perform Level 1 Validation per WRF 5057 specifications
- Development of Level 1 validation basis documentation
- Team and Leadership Presentation of Results

Stage 2: Level 2 Validation of Water Balance with Uncertainty Analysis

Objective Statement: To validate the source data from the originating data systems feeding the water balance inputs and establish statistical confidence levels on the water balance outputs.

- Advanced Supply and Consumption Data Analysis: We will extract high-resolution SCADA flow data to analyze historical supply volumes for trends, anomalies, and "data gaps," such as null or zero values that contribute unseen errors to the water audit. For consumption data, we will extract raw, account-level billing data from the Customer Information System (CIS) to investigate zero values, negative consumption, and high/low outliers.
- Customer and Meter Profiling: We will develop detailed customer and meter profiles to validate consumption totals globally, as well as by account, customer class, and rate code. To address Customer Metering Inaccuracies (CMI), we will leverage existing meter accuracy data, purchase records, and complaint histories to calculate composite accuracy across minimum, intermediate, and maximum flow rates. Additionally, flow profiling and data logging can be utilized to evaluate whether meters are properly sized for their applications.
- Business Process Mapping and Lag-Time Adjustments: We will flowchart the City's existing business processes from initial meter reading to customer billing. This helps identify systematic data handling errors (such as transcription or multiplier errors). We will also apply critical lag-time adjustments to prorate metered consumption, ensuring it aligns perfectly with the exact 12-month water balance period.
- Uncertainty Analysis and 95% Confidence Intervals: Utilizing the results of our raw data analysis, we will calculate the 95% statistical confidence limits for both aggregate and individual NRW components. This establishes a clear uncertainty band (+/-) on the audit results and provides a prioritized ranking of which volume inputs to focus on to achieve the greatest improvement in data confidence.
- Real Loss Component Analysis (Break Data Analysis): To thoroughly understand physical losses, we will perform a Real Loss Component Analysis (RLCA) using Water Research Foundation (WRF) standards. By deeply analyzing the City's historical main and service line break data, we will disaggregate total physical water loss into three subcomponents: reported leakage, unreported leakage, and background leakage.

Stage 3: Economic Analysis

Objective Statement: Assess the magnitude of volumes and costs between the current and target non-revenue water at the component and aggregate levels to establish NRW targets.

- NRW Gap Analysis
  - Evaluation of current practices and policies against best-practices detailed in the M36 Manual
  - Preliminary analysis of current NRW program versus optimized NRW program, to establish reduction potential and prioritization of NRW components
  - Development of NRW component mapping and analysis for preliminary target setting:
    - Unbilled Consumption components
    - Apparent Loss components with emphasis on optimizing metering losses
    - Real Loss components with emphasis on reduction of unreported losses
    - Aggregated NRW target setting
- Summary of findings
  - Analysis of NRW reduction potential
  - Recommended targets

Stage 4: Non-Revenue Water Program Design

Objective Statement: Design system-specific activities for NRW reduction pursuant to established targets.

- Design of near and long-term NRW Program recommendations for the management and reduction of Non-Revenue Water, and improvements in system efficiency benchmarking and Data Validity
- Evaluation of existing demand management program, and gap analysis for long-term conservation objectives
- Incorporation of long-term water loss management (supply side conservation) objectives into overall utility demand forecasting
- Development of Program implementation plan, with prioritization and benefit/cost estimations

Reporting

- Internal Report for Town of Boone
    - Includes all technical details & program designs

Fee & Estimated Schedule

Description	Fee
Stage 1: Water Audit Validation	**$ 15,000.00**
Water Audit Data Request & Fulfillment	
Validated CY 2025 Water Audit completed	
Stage 2: Level 2 Validation	**$ 94,000.00**
Billing Data Request & Fulfillment	
Consumption/Billing Data Analysis	**$ 18,500.00**
Billing Department Meeting	
Business Process Mapping	**$ 7,500.00**
Supply Data Request & Fulfillment	
Supply Data Analysis	**$ 18,500.00**
Customer Meter Data Request & Fulfillment	
Customer Meter Profiling	**$ 18,500.00**
Leak Data Request & Fulfillment	
Real Loss Component Analysis	**$ 18,500.00**
Uncertainty Analysis	**$ 12,500.00**
Stage 3: Economic Analysis	**$ 21,000.00**
Economic Analysis	
Stage 4: Program Design/Reporting	**$ 20,000.00**
Program Design/Report	
Scope of Services Lump Sum Fee	**$ 150,000.00**

Project Stage	Timeline
Stage 1: Water Audit Validation	Weeks 1 – 3
Stage 2: Level 2 Validation	Weeks 4 – 10
Stage 3: Economic Analysis	Week 11
Stage 4: Program Design, Reporting & Close-out	Weeks 12 – 13

Terms and Conditions

Consulting Engineer (CE) shall perform the services outlined in this Exhibit for the stated fee agreement.

Fee

Fee shall be lump sum as described in this exhibit. Any direct costs for CE's travel are included in the lump sum fee. CE shall invoice monthly based upon percent complete of scope. Additional services, if requested by the Client, may be provided as negotiated and agreed by CE and Client.

Billings/Payment

Invoices will be submitted monthly for services and are due when rendered. Invoices shall be considered PAST DUE if not paid within 30 days after the invoice date and the CE may, without waiving any claim or right against the Client, and without liability whatsoever to the Client, terminate the performance of the service. Retainer (If applicable) shall be credited on the final invoice. Interest will be charged at 1.5% (or the legal rate) per month on any unpaid and past-due balance. In the event any portion or all of an account remains unpaid for 90 days after billing, the client shall pay the cost of collection, including the attorney's fees.

Professional Liability

As set forth in the attached certificate of insurance, CE maintains professional liability coverage of $2,000,000.00 occurrence/ $2,000,000.00 total for damages as a result of our negligent acts, errors or omissions and shall maintain such coverage throughout the term of this agreement. CE's liability for this project for its negligent acts, errors or omissions will be limited to the amount of said insurance. Upon request, a current certificate of insurance will be provided as proof of coverage.

Other insurance

CE maintains the additional insurance coverages set forth in the attached Certificate of Insurance, and shall maintain such coverages throughout the term of this agreement.

Termination of Services

This agreement may be terminated upon 10 days written notice by either party should the other fail to perform his obligations hereunder after receiving written notice and a reasonable period of time, not to exceed 15 days, to come into compliance with said obligations. In the event of termination, the Client shall pay the CE for all services rendered to the date of the termination.

This Agreement is respectfully submitted by:

Drew Blackwell



Managing Partner, Director of Water Efficiency
Cavanaugh

Signed: September 3, 2026

Authorization

Printed Name: _____
Date: _____

Billing Information
Address: _____
_____
_____

Contact Name: _____
Contact Email: _____

CAVA&AS-01 AHARRISON

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 9/3/2026

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
Davidson, NC-Wade Associates-Hub International Carolinas PO BOX 1209 Davidson, NC 28036	PHONE (A/C, No, Ext): (704) 892-9297	FAX (A/C, No):
	E-MAIL ADDRESS:	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Cavanaugh & Associates, PA PO Box 11197 Winston Salem, NC 27116	INSURER A : Selective Insurance Company of America	12572
	INSURER B : Selective Insurance Company of the Southeast	39926
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: POLICY X PRO-JECT LOC OTHER:			S 2003177	12/1/2025	12/1/2026	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 2,000,000 $ 500,000 $ 10,000 $ 2,000,000 $ 4,000,000 $ 4,000,000
A	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY X SCHEDULED AUTOS X HIRED AUTOS ONLY NON-OWNED AUTOS ONLY			S 2003177	12/1/2025	12/1/2026	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
A	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED RETENTION $			S 2003177	12/1/2025	12/1/2026	EACH OCCURRENCE AGGREGATE	$ 4,000,000 $ 4,000,000
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		WC 7978836	12/1/2025	12/1/2026	X PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 500,000 $ 500,000 $ 500,000
A	Cyber Liability			S 2003177	12/1/2025	12/1/2026		100,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

Town of Boone
321 East King Street
Boone, NC 28607

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE



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