SCHEDULE A

SCOPE OF SERVICES

City of Hendersonville, North Carolina

Engineering Services for the Hendersonville Water Treatment Facility Master Plan

The scope of work provided by Hazen and Sawyer, D.P.C. (hereinafter, the "Engineer") for the City of Hendersonville, North Carolina (hereinafter, the "Owner") shall include professional services for the Work Items A – R listed and detailed below. Work Items shall be advanced concurrently unless a particular evaluation must be completed first to inform the effort of another. As Work Items are completed, documentation of these efforts shall be provided to the Owner. For the purposes of the assessment efforts defined below, the Engineer shall use the facility's rated capacity to evaluate the adequacy of the existing facilities and demand projections provided by the Water Distribution System Master Plan Consultant (DSMPC) to determine needed facility upgrades/expansion to accommodate any imminent and long-term system demands (out to Year 2050). Once the timing of the first recommended facility expansion is identified, subsequent expansions shall be scheduled on a 20-year horizon. Consistent with regulatory and industry guidance, the previous expansion shall support up to 90% of the projected Maximum Day Demand (MDD) in the twentieth year when planned construction begins for the next expansion.

A. Data Collection and Organization

1. The Engineer shall obtain from the Owner all relevant facility records and operational and monitoring data including but not limited to, the following:

    a. Drawings and specifications available for the original construction and subsequent upgrades to the facility. The Engineer shall review these records and prepare any questions regarding interpretation of the drawings.
    b. Documentation associated with previous inspection, evaluation, assessment efforts for the facilities that would prove beneficial in the completion of the proposed planning efforts.
    c. Three (3) years of monthly operating data to assess historical water quality trends and process performance.
    d. Historical raw water quality data from all potential raw water sources supplying the facility.
    e. Occurrence data collected from Round 4 of the Unregulated Contaminant Monitoring Rule (UCMR), or any other special sampling to assess concerns with emerging contaminants and treatability options.
    f. Three (3) years of electrical billing data for facility operations and any remote facilities associated with raw water pumping.

    The Engineer shall establish a file transfer site to allow for the electronic transfer of these requested data resources.

2. The Engineer shall compile this data into usable graphics (dashboards, tables, graphs, etc.) for interpretative purposes.

B. Site Visits

1. The Engineer shall conduct three (3) site visits for assessment of the facility's existing infrastructure with the following themes:

   a. Process and Site Plan
   b. Structural Systems
   c. Electrical and Control Systems

   Where feasible, the Engineer shall conduct visual inspections of process units during planned outages by the Owner. All other facilities will be visually inspected to the extent that can be observed with the units in service. If deemed necessary from the findings of the visual inspection, the Engineer may recommend that the Owner remove additional process units or facilities from service to allow a full inspection to be completed.

C. Treatment Process Assessment

1. The Engineer shall develop a full hydraulic model from the water supplies through the finished water pump station. The Engineer shall assess existing capacity of each unit process (rapid mix, flocculation, sedimentation, filtration, and disinfection/finished water storage). The Engineer shall acquire the services of a licensed surveyor to shoot critical elevations (top of concrete, weir and overflow elevations, etc.) to the hydraulic evaluation of the existing facilities. The Engineer shall evaluate the hydraulic profile to assess the maximum flowrate that can be conveyed through the existing facilities without any modifications. The Engineer shall identify deficiencies or bottlenecks to achieving an incremental capacity increase without major process modifications and provide recommendations for improvements to address noted deficiencies.

2. The Engineer shall discuss with the Owner historical operations, compliance, reliability, and maintenance concerns. A list of finished water quality goals will be developed with City staff and will serve as a benchmark for treatment objectives.

3. The Engineer shall conduct an evaluation of each existing unit process to evaluate design criteria in conformance with current NC DEQ – DWR – PWS requirements and other industry standards or recommended criteria. For any existing process(es) that are defined with capacity less than the facility's rated capacity, the Engineer shall recommend improvements to address these noted deficiencies as well as any reliability/redundancy concerns. Any feasible, alternative concepts identified shall be vetted with the Owner considering both economic factors (i.e. capital and O&M costs) and non-economic factors (i.e. adaptability, personnel requirements, constructability, etc.) The Engineer shall prepare concept-level design and layouts for any proposed process upgrades

to support current facility capacity. The Engineer shall also evaluate current performance of each unit process and offer operational strategy recommendations to improve plant performance.

4. The Engineer shall evaluate and define the capacity and performance of each process unit to support future, expanded facility capacity. Where feasible, the Engineer shall also define process upgrades to achieve additional capacity (i.e. re-rating) within existing processes. The Engineer shall prepare concept-level design and unit process and site plan layouts for any proposed process upgrades to support future, expanded facility capacity.

D. Finished Water Storage Assessment

1. The Engineer shall evaluate the condition, capacity, and configuration of the existing clearwell to support current facility capacity. Consideration shall be given to redundancy for inspection/maintenance activities, disinfection requirements based on previously defined or theoretical baffle factors, hydraulics to optimize water quality, and equalization storage to support in-house and distribution system operations. Preliminary layouts for proposed upgrades including any new finished water storage shall be prepared by the Engineer.

2. The Engineer shall perform a similar evaluation to support the planned future, expanded facility capacity.

E. Pumping Facilities (Raw and Finished) and Transmission Assessment

1. Engineer shall conduct field testing of Mills River raw water pumping facilities to understand current pump performance relative to their factory-tested performance.

2. The Engineer shall evaluate the condition of the existing pumping infrastructure including service life and historical operational and maintenance concerns. The Engineer shall evaluate the raw water pumping stations' ability to meet the current facility capacity. The Engineer shall assess the existing facilities for compliance with Hydraulic Institute Standards and other industry best practices. Pumping capacities and drive configurations shall be evaluated to support a range of anticipated operations conditions to define the optimum, most efficient pumping combinations. The Engineer shall evaluate and develop conceptual layouts for upgrades to the pumping facilities to support current facility capacity.

3. Through record drawing review, site visit observations, and discussions with the Owner, the Engineer shall evaluate transmission condition assessment alternatives and develop an inspection plan for future evaluation of the aging raw water transmission lines. Engineer shall recommend the appropriate inspection technology and extents of the inspection effort considering multiple factors, including but not limited to, the existing access inside the pipelines, installation conditions, degree of data resolution, pipe material, and cost constraints. As necessary, the Engineer shall identify any recommended pipeline access improvements to support the selected inspection technology.

F. Chemical Systems Assessment

1. The Engineer shall assess existing chemical storage and feed systems and develop recommendations for chemical systems improvements needed to support the current facility capacity. Assessment efforts shall include evaluation of chemical usage, adequate bulk chemical storage volumes, condition of existing tank and pumps, and pump quantities and sizing to support current and future needs. The Engineer shall prepare concept-level design and layouts for any proposed chemical systems upgrades to support the existing facility.

2. The Engineer shall perform a similar evaluation to Work Item G.1 for the future, expanded facility capacity.

3. The Engineer shall assess the chemical application points and recommend any improvements to consolidate chemical feed points, improve mixing and distribution, provide additional flexibility, and subsequently optimize WTP performance.

4. The Engineer shall assess the improvements needed to enhance the reliability, safety, and operability of the chemical systems. Assessment efforts shall include evaluating materials of construction, chemical delivery methods, availability and location of emergency eyewashes/showers, and secondary containment.

G. Regulatory Assessment

1. Upon review of existing performance data, the Engineer shall identify any current regulatory compliance challenges with primary and secondary standards including currently regulated contaminants with MCLs as well as contaminants with a Heath Advisory Level (HAL).

2. Upon review of existing performance and other water quality data, the Engineer shall further prepare an overview of anticipated future Federal and State drinking water regulations and identify any potential compliance concerns including contaminants identified in Rounds 4 (previous) and 5 (future) of the UCMR. The Engineer shall identify other treatment schemes that may be required in the future to address future regulated contaminants and incorporate accommodations for the future treatment in recommended improvements, where possible, if not required in the near-term. The Engineer shall consider future treatment schemes in long-term site planning and shall advise the Owner when practical and cost-effective accommodations can be made for future treatment processes.

J. Structural Condition Assessment

1. The Engineer shall identify any deficiencies in structural condition observed such as spalled areas, joint deficiencies, cracks, areas where leakage is likely occurring, efflorescence, freeze-thaw damage, honeycomb, pop-outs, scaling, delamination, soundness, evidence of corrosion,

evidence of chemical attack of concrete, areas of exposed reinforcing, condition of previous patches or repairs, and other visual evidence of deterioration, etc. Engineer shall develop repair recommendations and define specific techniques to address any degrading conditions.

2. The assessment shall also include inspection and evaluation of metal appurtenances located in the structures, including access hatches and covers, ladder accesses, manhole rungs, gates, valves, any exposed piping, and any other items present in the interior of the structure. Condition assessment shall not be completed within inaccessible areas due to safety concerns or facility operational constraints. Again, the Engineer shall prepare recommendations to address degrading or failing metal appurtenances.

3. In addition to visual observation, techniques such as hammer sounding, and optical aids such as photographs, shall be used to aid in the structural evaluation. If deemed necessary from the findings of the visual inspection, The Engineer may recommend further non-destructive and possible destructive testing of certain areas of the basins. This additional investigation will be needed if the visual assessment reveals concrete has suffered structural distress and/or deterioration to the extent the structure is compromised.

4. A subsurface geotechnical investigation shall be performed for new facility structures planned to support the existing and future, expanded facility capacity. The Engineer shall subcontract with a qualified, third-party geotechnical engineering firm to complete the analysis, including site investigation/soil boring collection (up to 5 borings), lab analysis, and report preparation documenting the findings of the evaluation. The Engineer shall use these findings to inform location and capital costs for these planned structures.

K. Electrical and Control Systems Assessments

1. The Engineer shall assess capacity and reliability of the existing electrical systems to support the proposed upgrades to the existing facility. The Engineer shall develop an overall electrical load list for the facility. The load list shall incorporate all existing electrical equipment as well as any proposed equipment additions and/or equipment replacements. The results of the mechanical equipment evaluation work herein shall be incorporated into the load list. The Engineer shall use the load list to develop recommended replacement electrical distribution equipment sizes and capacities. The Engineer shall develop an updated single line diagram of the electrical distribution system, including all ratings, protective devices, and other pertinent information.

2. Engineer shall provide the services of a 3rd party independent electrical testing company as recommended to perform electrical testing for any of the existing electrical distribution equipment that is determined from the electrical evaluations to remain in place for more than 5 years. The electrical tests to be performed shall further help substantiate the condition of the existing

equipment and if that equipment can be relied upon for the time that is expected to remain in service. All testing shall be coordinated with the Owner and will be performed in accordance with the International Electrical Testing Association (NETA) Maintenance Testing Specifications. Testing may include insulation resistance testing and other similar tests that may be needed to verify the reliability of existing equipment planned to remain in service. Testing shall be contingent upon the mechanical equipment assessment and evaluation efforts considering the ability of the existing electrical infrastructure to accommodate new or upsized electrical loads.

3. The Engineer shall conduct a similar evaluation defined in Work Item K.1 for the electrical distribution system to support the future, expanded facility capacity.

4. Specific loads to be served by the generator shall be discussed and agreed upon with the Owner. The generator analysis shall also include evaluation of fuel type, quantity, and fuel storage location.

5. The Engineer shall develop a preliminary design for improvements to the existing instrumentation and control systems required to support the existing facility. The system shall incorporate additional automation of the WTP treatment process as warranted. Consideration shall be given to expandability for anticipated future expansions. Preferences shall be reviewed with the Owner including star or ring configurations, local control stations, and mobile or other wireless access and control capabilities.

L. CIP Development

1. The Engineer shall develop capital cost opinions for all improvements projects, comprised of Feasibility Study Level Opinions of Probable Cost, commensurate with a Class 5 Cost Estimate Levels based on the definition provided by the Association for the Advancement of Cost Engineering (AACE) International Recommended Practice No. 18R-97.

2. Engineer shall develop a spreadsheet model for prioritization of improvement projects; prioritization will be based on multiple criteria including, but not limited to, required timing to meet projected performance shortfalls; required timing for renewal or replacement projects based on risk factors and anticipated useful life of existing infrastructure; available revenues; and timing of optimization improvements to maximize life-cycle cost savings. The spreadsheet model will be dynamic to allow for adjustments to performance goals, remaining useful life, risk scores and available revenues, to establish a CIP that can be implemented within available revenues.

3. The Engineer shall develop a Capital Improvements Plan (CIP) comprised of a list of these improvement projects. Project detail shall address operation and routine maintenance plans to support the water infrastructure. The Engineer shall develop implementation schedules for the recommended CIP projects and combine all project schedules into a master CIP schedule. This schedule shall include programming future, capacity expansion projects through the year 2050. CIP development shall consider anticipated design, permitting, funding, bidding, and construction schedules to inform cash flow appropriations to specific fiscal years. Based on the prioritization evaluation effort, The Owner and Engineer shall collaboratively identify adjustments to the

current 10-year CIP, including identification of new projects; changes in project scope, cost and/or schedule of currently planned projects; and identify changes in sequencing of currently planned projects. Project costs shall be adjusted to future values to reflect anticipated costs at the time the project is anticipated to commence.

M. Meetings

1. The Engineer shall organize and conduct up to six (6) virtual meetings utilizing the Microsoft Teams platform. An initial project kick-off meeting will be held shortly after Notice to Proceed to review project team members and roles, coordination protocol, project scope, and key scheduling items. Afterwards, the Engineer shall schedule with the Owner a progress meeting every two (2) months to update the City on the status of on-going evaluation and planning efforts associated with the work activities identified above. The Engineer shall provide the presentation materials and prepare minutes of each meeting to document discussions and decisions made. Draft minutes shall be distributed electronically to the Owner in Microsoft Word for review and comment. Engineer shall then incorporate any edits received and finalize the minutes distributing electronically in Adobe PDF.

2. The Engineer shall participate in two (2) in-person meetings to review the findings and recommendations from the planning effort with the Owner's City Council and Water and Sewer Advisory Board. A draft presentation shall be prepared for the Owner's review and comment and revisions incorporated prior to finalizing the meeting materials.

N. Deliverables

1. The Engineer shall prepare an asset inventory of all major process and electrical system infrastructure to support Owner's asset management initiatives. Equipment inventory details shall include the following applicable data:
   a. Process Area
   b. Equipment Type
   c. Manufacturer
   d. Model
   e. Head
   f. Design Flow
   g. Horsepower
   h. Voltage
   i. RPM
   j. Drive
   k. Installation or Replacement Year
   l. Expected useful life remaining
   m. Equipment cutsheets
   n. Equipment capacity curves

Inventory exclusions include: (1) manually operated valves, 4-inch and smaller (2) warranty information, any (3) maintenance-related data. It is understood that the Owner shall input the inventoried data into their asset management software and that Engineer will provide the asset data in a Microsoft Excel format. The Owner shall provide further direction on the acceptable format for delivery of the compiled asset data spreadsheet.

2. The Engineer shall develop up to six (6) Technical Memoranda (TM) for Work Items C through N documenting the objectives, methodology, findings, and recommendations for each assessment and planning effort. Planned TMs include the following:

   a. Water Treatment Facilities Assessment
   b. Finished Water Storage Assessment
   c. Structural Assessment
   d. Electrical and Control Systems Assessment
   e. CIP Development

   The TMs shall be developed and submitted separately as the work activities for a particular effort are completed. The Engineer shall furnish an electronic copy of the draft TM in both Microsoft Word and Adobe PDF for Owner review and comment. The Engineer shall revise the document in response to the Owner's comments finalizing the TM.

3. Following completion of all TMs, an Executive Summary shall be prepared documenting the comprehensive assessment and planning effort. An electronic copy of the Executive Summary (ES) shall be provided in both Microsoft Word and Adobe PDF for Owner review and comment. The Engineer shall revise the document in response to the Owner's comments finalizing the ES. The Engineer shall then compile the final, comprehensive master plan report consisting of the ES and individual TMs. The Engineer shall provide both electronic (in Adobe PDF) and hard copies of the report memorializing the planning efforts.

O. <u>Project Administration</u>

1. The Engineer shall manage the efforts of its project team members and subconsultants by assigning manpower, delegating responsibilities, reviewing work progress, monitoring budget and schedule, and directing the progress of the work.

2. Engineer shall submit monthly invoices, including amounts invoiced by sub-consultants in a timely manner and in accordance with the Owner's invoicing procedures.

3. The Engineer shall develop a detailed project schedule and provide updates as warranted to reflect schedule changes.

4. The Engineer shall develop a quality control plan for the project. Engineer shall assign technical experts to various advisor and/or review roles and ensure that project procedures and

deliverables are checked at defined intervals in accordance with the Engineer's established corporate quality assurance program requirements.

P. Project Schedule

1. The Engineer proposes a twelve (12) month project duration from Notice-to-Proceed to delivery of the finalized master plan document. As previously noted, progress meetings will be held at two (2) month intervals to report findings and next steps for the various assessment efforts identified above.

2. The Engineer shall develop an anticipated project schedule for the Owner and update regularly to reflect completed project tasks. Schedule updates shall be provided at the progress meetings.

Q. Rate Schedule and Invoicing

1. The following engineering staff categorial rate schedule shall be utilized over the duration of the project:

Engineering Staff Position	**Hourly Rate**
Associate Vice President	$250
Senior Associate	$220
Associate	$180
Senior Principal Engineer	$160
Principal Engineer	$140
Assistant Engineer	$125
Principal Designer	$120

2. The Engineer shall be compensated on a time and materials basis with a not-to-exceed fee of $379,000, unless otherwise authorized by the Owner. Labor costs shall be billed using the categorical rate multiplied by the hours worked. Subconsultants and expenses shall be compensated with no additional markup. Invoices shall be submitted monthly for approval.