SCHEDULE A

SCOPE OF SERVICES

City of Hendersonville, North Carolina

Engineering Services to Support the Hendersonville Water Treatment Facility Filter Expansion Project

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 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.

A. Design of New Filter

1. The Engineer shall design one (1) new dual-cell gravity filter with accompanying piping in the existing filter gallery to allow the total plant capacity to be increased by approximately 3 MGD. The previous design effort (circa 2007) will be reviewed thoroughly and modified as required. The previously constructed concrete filter basin cells shall be equipped with anthracite and sand filter media, support gravel, Wheeler style underdrains, and FRP wash troughs, to provide a design that is consistent with the facility's existing filters.

2. Filter piping for the new filter shall be designed to match the existing facilities. Filter process piping/connections be designed to include, minimally, the following:
    a. Filter influent
    b. Filter effluent
    c. Filter backwash supply
    d. Backwash drain
    e. Filter-to-waste/rewash and air gap
    f. Air scour

3. All filter valves shall be provided with electric actuators with 480/3/60 service.

4. One filter console shall be provided above the filter gallery, to match the existing consoles serving the filter facilities. The following instruments shall be dedicated to each new filter for filter controls:
    a. Ultrasonic level sensors and transmitters
    b. Loss-of-head analyzers
    c. Venturi flow meter
    d. Turbidimeter
    e. Free chlorine analyzer
    f. Particle counter

5. The Engineer shall assess the capacity and reliability of the existing electrical systems to support the new filter as well as future filter facilities. This assessment, including load list development, shall be conducted in accordance with the concurrent Master Plan project. The Engineer shall develop a single-line diagram, power plan, panel schedule, conduit/wire schedule, and riser diagram as required to illustrate the scope of electrical improvements related to the new filter.

6. The Engineer shall design instrumentation for monitoring and control of the system. The Engineer shall develop a process and instrumentation diagram (P&ID) drawing for the new filter, and review existing hardware and identify updates needed to provide I/O. The Engineer shall coordinate SCADA programming updates by a third-party integrator. These activities shall be conducted in accordance with the concurrent Master Plan project.

B. Deliverables

1. Engineer shall prepare Construction Drawings, including, but not limited to, Drawings for all pertinent general, mechanical, structural, electrical, instrumentation and control disciplines and relevant details. All Drawings shall be prepared using 3D CAD (i.e. Revit) software.
    a. Process mechanical Drawings shall be provided at the 30% design milestone.
    b. Process mechanical, structural, electrical, and instrumentation/control Drawings shall be provided at the 90% design milestone.
    c. Bid-ready process mechanical, structural, electrical, and instrumentation/control Drawings shall be provided at the 100% design milestone.

2. Engineer shall prepare Technical Specifications (using 50-Division CSI format) as may be required for bidding. Documents shall include a construction sequence identifying necessary shutdown events and limitations to construction activities to maintain plant operations during construction.
    a. A Table of Contents and draft Technical Specifications for key design components shall be provided at the 30% design milestone, as requested by the Owner.
    b. A full set of draft Technical Specifications, including Owner-provided front-end documents, shall be provided at the 90% design milestone.
    c. A bid-ready full set of Technical Specifications, including Owner-provided front-end documents, shall be provided at the 100% design milestone.

3. Engineer shall prepare opinions of probable construction cost (OPCCs) at the 30% and 90% design milestones.
    a. The 30% OPCC shall be commensurate with a Class 3 Cost Estimate Level based on the definition provided by the Association for the Advancement of Cost Engineering (AACE) International Recommended Practice No. 18R-97.
    b. The 90% OPCC shall be commensurate with a Class 1 Cost Estimate Level based on the definition provided by the Association for the Advancement of Cost Engineering (AACE) International Recommended Practice No. 18R-97.

4. Engineer shall Perform QA/QC reviews on designs and concepts at the 30% and 90% design milestones.

5. The Engineer agrees to deliver to the Owner in a timely and proper manner the items set forth above, which shall become the property of the Owner and may be used by the Owner without restriction or limitation and at no additional cost to the Owner. These items shall be delivered to the Owner electronically in PDF format.

C. Condition Assessment

1. In concert with the concurrent Master Plan project, the Engineer shall conduct a site visit for assessment of the facility's existing filter infrastructure. The Engineer shall identify any deficiencies in the structural condition of the existing filter basin cells.

    a. The structural condition assessment shall include a review of the failing coating product that was previously applied to the interior walls of the existing concrete filter basin. The Engineer shall identify and specify a replacement coating system, leveraging previous project experience and conducting a literature review as required. Technical documentation for the specified coating product(s), including project references, will be provided to the Owner for review and approval prior to finalization of the specification.

D. Meetings

1. The Engineer shall organize and conduct up to four (4) virtual meetings utilizing the Microsoft Teams platform, along with one (1) in-person meeting.
    a. 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.
    b. A 30% design review workshop will be conducted to receive City feedback on the conceptual design and discuss maintenance of plant operations (MOPO) during construction.
    c. A 90% design review workshop will be conducted to receive City feedback on the advanced design, finalize plans for MOPO during construction, and to coordinate with the systems integrator.
    d. If scoped to conduct filter surveillance, a meeting to review findings and recommendations will be conducted (see Filter Surveillance Services).
    e. A pre-bid meeting shall be conducted following advertisement of the project (see Bid Phase Services).

2. For each meeting, the Engineer shall provide the presentation materials and prepare minutes 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 PDF format.

E. Permitting Services

1. The Engineer shall provide technical criteria, written descriptions, and design data for use in filing applications for regulatory approvals as may be required for the project and file such applications and supporting documentation required for agency approvals.

2. The Engineer shall assist the Owner in consultations with such authorities and revise the Drawings and Technical Specifications in response to directives from such authorities.

3. This scope of services assumes that up to two (2) permitting submittals will be required. The following permitting submittals are anticipated to be required for this project:
    a. NCDEQ - Public Water Supply – Authorization to Construction
    b. Henderson County Permits and Inspections Department – Courtesy Review

4. Application fee costs (based on current fee schedules) are included.

F. Bid Phase Services

1. The Engineer shall coordinate with the Owner to prepare complete Bidding Documents including, but not limited to, notice to bidders, instructions to bidders, bid form, agreement, general and supplementary conditions, etc.

2. The Engineer shall assist the Owner with preparation of an Invitation to Bid for the project. The Owner shall advertise on their web-based service.

3. Contract Documents will be made available electronically upon email or written notification from prospective bidders.

    a. The Engineer shall maintain a record of prospective bidders and suppliers (i.e., a plan holders list) to whom Contract Documents have been made available for review.

4. The Engineer shall prepare documents for and lead a pre-bid meeting on site.

5. The Engineer shall receive comments and questions from prospective bidders on the project, and prepare addenda as necessary to interpret, clarify, or expand the Contract Documents. Addenda will be distributed electronically to all prospective bidders.

6. The Engineer shall consult and advise the Owner concerning acceptability of substitute materials and equipment proposed by prospective bidders when substitution prior to award of the contract is allowed by the Contract Documents.

7. The Engineer shall assist the Owner in evaluation of received bids. The Engineer shall prepare a tabulation of bids received, review bids for completeness, and evaluate the qualifications of the apparent successful bidder and major subcontractors. The Engineer shall submit a written recommendation to the Owner regarding the award of construction contract.

8. The Engineer shall issue a Notice of Award to the selected contractor, and review and distribute executed construction Contract Documents.

9. The Engineer shall prepare conformed Construction Contract Documents that incorporate and integrate the changes per the Addenda issued during the Bid Phase.

G. Filter Surveillance Services (Optional Additional Service)

1. The Engineer shall conduct on-site filter surveillance for one (1) existing filter (to be selected by the Owner) to assess current condition and performance.

2. The Engineer shall conduct training for Owner's staff on filter surveillance techniques to support efforts to conduct filter surveillance as a routine maintenance and facility optimization procedure. The training session will include classroom type instruction as well as hands-on training as part of conducting surveillance on the selected filter. The Engineer has a two-day training program approved by NC Operator Certification Program for up to 9 hours of continuing education credit.

3. The Engineer shall collect filter core depth samples (before backwash cycle) for filter media analyses and solids retention analyses for determining backwash effectiveness.

4. The Engineer shall observe filter backwash and acquire samples of spent filter backwash water for backwash turbidity profile analysis.

5. The Engineer shall collect filter core depth samples after backwash cycle and process samples to evaluate solids capture of filter media throughout filter depth (before backwash) and effectiveness of filter backwash for cleaning media (after backwash).

6. The Engineer shall ship samples for filter media analyses (sieve analysis, effective size, uniformity coefficient, specific gravity, and acid solubility).

7. The Engineer shall collect data and information regarding current filter backwash sequence (flowrates, durations, filter levels, etc. for each step). The Engineer shall observe the filter

backwash sequence for the selected filter to assess distribution of air and backwash water and test media expansion.

8. The Engineer shall evaluate results from filter surveillance, prepare a presentation summarizing the results and review with Owner, and provide recommendations for enhancements to filter operations and/or backwash efficiency.

H. Project Administration

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.

I. Project Schedule

1. The Engineer proposes an approximate project duration of eight (8) months from Notice-to-Proceed to delivery of the finalized contract documents.

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 workshops. The preliminary schedule consists of the following tasks and anticipated timeline:

30% Design Submittal	70 days from NTP
90% Design Submittal	140 days from NTP
Final Design Submittal	220 days from NTP
Pre-Bid Meeting	230 days from NTP
Bid Opening	250 days from NTP

J. 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	$270
Senior Associate	$245
Associate	$210
Senior Principal Engineer	$180
Principal Engineer	$165
Assistant Engineer	$140
Principal Designer	$150

2. The Engineer shall be compensated on a time and materials basis with a not-to-exceed fee of $287,000 for the baseline scope of services and $22,000 for the filter surveillance services, 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.

SCHEDULE B
ENGINEERING FEE DERIVATION
City of Hendersonville, North Carolina
Engineering Services for the Hendersonville Water Treatment Plant Master Plan

TASK DESCRIPTION	Scope Item BL = Baseline AL = Additional	Billing Type LS = Lump Sum CC = Cost Ceiling	STAFFING HOURS Employee Classification and Average Hourly Rate As. Vice President $270	Sr. Associate $245	Associate $210	Sr. Principal Engineer $180	Principal Engineer $165	Assist. Engineer $140	Principal Designer $150	Subtotal Hours	Labor Costs	Other Direct Costs	Totals Baseline Services Lump Sum	Cost Ceiling	Hours	Additional Services Lump Sum	Cost Ceiling	Hours
Tasks A & B - Design of New Filter and Associated Deliverables																		
1 General Design - Drawings, Specs, and QA/QC	BL	CC	0	7	0	10	0	4	44	65	$10,675		$0	$10,675	65	$0	$0	0
2 Site / Civil - Drawings, Specs, and QA/QC	BL	CC	10	0	0	16	0	24	32	82	$13,740		$0	$13,740	82	$0	$0	0
3 Process Mechanical - Drawings, Specs, and QA/QC	BL	CC	12	32	0	68	0	176	144	432	$69,560		$0	$69,560	432	$0	$0	0
4 Structural Design - Drawings, Specs, and QA/QC	BL	CC	16	24	0	0	48	0	32	120	$22,920		$0	$22,920	120	$0	$0	0
5 Electrical Design - Drawings, Specs, and QA/QC	BL	CC	16	56	0	56	0	112	112	352	$60,600		$0	$60,600	352	$0	$0	0
6 Instrumentation Design - Drawings, Specs, and QA/QC	BL	CC	16	17	0	56	0	0	0	89	$18,565		$0	$18,565	89	$0	$0	0
7 Cost Estimates - 30% and 90%	BL	CC	12			36		60		108	$18,120		$0	$18,120	108	$0	$0	0
		Subtotal	**82**	**136**	**0**	**242**	**48**	**376**	**364**	**1,248**	**$214,180**	**$0**	**$0**	**$214,180**	**1248**	**$0**	**$0**	**0**
Task C - Site Visit / Condition Assessment																		
1 Concrete condition assessment	BL	CC		2		2				4	$850		$0	$850	4	$0	$0	0
2 Metals condition assessment	BL	CC		2		2				4	$850		$0	$850	4	$0	$0	0
3 Coating evaluation	BL	CC		6		8				14	$2,910		$0	$2,910	14	$0	$0	0
		Subtotal	**0**	**10**	**0**	**12**	**0**	**0**	**0**	**22**	**$4,610**	**$0**	**$0**	**$4,610**	**22**	**$0**	**$0**	**0**
Task D - Meetings																		
1 Virtual meetings - four (4) total	BL	CC	8	12		20		48		88	$15,420		$0	$15,420	88	$0	$0	0
		Subtotal	**8**	**12**	**0**	**20**	**0**	**48**	**0**	**88**	**$15,420**	**$0**	**$0**	**$15,420**	**88**	**$0**	**$0**	**0**
Task E - Permitting Services																		
1 NCDEQ Public Water Supply - Authorization to Construct	BL	CC		4		16		32	8	60	$9,540	$150	$0	$9,690	60	$0	$0	0
2 Henderson County Permits and Inspections Department – Courtesy Review	BL	CC		4		8		16		28	$4,660		$0	$4,660	28	$0	$0	0
		Subtotal	**0**	**8**	**0**	**24**	**0**	**48**	**8**	**88**	**$14,200**	**$150**	**$0**	**$14,350**	**88**	**$0**	**$0**	**0**
Task F - Bid Phase Services																		
1 Pre-bid meeting	BL	CC		2		16		16		34	$5,610	$800	$0	$6,410	34	$0	$0	0
2 Prepare invitation to bid and documents	BL	CC		2		8		8		18	$3,050		$0	$3,050	18	$0	$0	0
3 Prepare addenda	BL	CC		2		20		40		62	$9,690		$0	$9,690	62	$0	$0	0
4 Bid review and bid tab	BL	CC		2		4		8		14	$2,330		$0	$2,330	14	$0	$0	0
5 Prepare conformed set	BL	CC		2		4		8	16	30	$4,730		$0	$5,530	30	$0	$0	0
		Subtotal	**0**	**10**	**0**	**52**	**0**	**80**	**16**	**158**	**$25,410**	**$800**	**$0**	**$27,010**	**158**	**$0**	**$0**	**0**
Task G - Filter Surveillance																		
1 Filter surveillance preparations	AL	CC	2		8	8				18	$3,660		$0	$0	0	$0	$3,660	18
2 On-site filter surveillance - 1 filter, 2 cells	AL	CC			16	16				32	$6,240	$1,400	$0	$0	0	$0	$7,640	32
3 Filter surveillance training	AL	CC			8	8				16	$3,120		$0	$0	0	$0	$3,120	16
4 Filter surveillance data analysis	AL	CC	2		8	8				18	$3,660		$0	$0	0	$0	$3,660	18
5 Prepare presentation	AL	CC	2		8	8				18	$3,660		$0	$0	0	$0	$3,660	18
		Subtotal	**6**	**0**	**48**	**48**	**0**	**0**	**0**	**102**	**$20,340**	**$1,400**	**$0**	**$0**	**0**	**$0**	**$21,740**	**102**
Task H - Project Administration																		
1 Project team coordination	BL	CC		2		18				20	$3,730		$0	$3,730	20	$0	$0	0
2 Invoice preparation	BL	CC		2		8				10	$1,930		$0	$1,930	10	$0	$0	0

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3 Project schedule updates	BL	CC		2		8				10	$1,930		$0	$1,930	10	$0	$0	0
4 Quality control plan/execution	BL	CC		2		16				18	$3,370		$0	$3,370	18	$0	$0	0
		Subtotal	**0**	**8**	**0**	**50**	**0**	**0**	**0**	**58**	**$10,960**	**$0**	**$0**	**$10,960**	**58**	**$0**	**$0**	**0**

TOTAL HOURS AND COSTS	STAFFING HOURS As. Vice President	Sr. Associate	Associate	Sr. Principal Engineer	Principal Engineer	Assist. Engineer	Principal Designer	Subtotal Hours	Labor Costs	Other Direct Costs	Baseline Service Totals Lump Sum	Cost Ceiling	Hours	Additional Service Totals Lump Sum	Cost Ceiling	Hours
	96	**184**	**48**	**448**	**48**	**552**	**388**	**1,764**	**$305,120**	**$2,350**	**$0**	**$286,530**	**1,662**	**$0**	**$21,740**	**102**

Total Baseline Service Cost =	**$287,000**
Total Additional Service Cost =	**$22,000**
Total Project Cost =	**$309,000**
Total Project Hours =	**1,764**