

EXHIBIT A

Water Treatment Plant Residuals Master Plan and Design City of Durham, North Carolina (Project No. 9265)

Scope of Work

Introduction

The City of Durham owns and operates two water treatment plants (WTP): the Brown WTP and Williams WTP. Through this project, the City plans to improve its WTP residuals program to meet immediate and long-term goals for regulatory compliance, capacity expansion, and cost-effectiveness. Faced with a State directive to make improvements to the backwash water recycle systems at its two WTPs, as well as provide long-term affordability to its rate payers, the City wants to evaluate all reasonable options for managing residuals from both WTPs.

The overall project includes the following Phases:

1. Master Planning
 - a. Backwash handling and treatment
 - b. Long-term residuals management
2. Preliminary Engineering/Conceptual Design
 - a. Backwash handling and treatment
 - b. Long-term residuals management
3. Final Design
 - a. Backwash handling and treatment
 - b. Long-term residuals management
4. Permitting
5. Construction Services/Inspection
6. Start-up, Testing, Record Drawings and Closeout

This initial Scope authorization includes Phases 1 and 2. At their conclusion, the City intends to amend this Agreement to authorize the Consultant to perform Phases 3, 4, 5, and 6.

A Data Request List is provided as **Attachment A**.

PHASE 1: MASTER PLANNING

Task 1.1 – Conduct Regulatory Review and Coordination with NCDENR

The Consultant will conduct a review of pertinent regulations related to filter backwash waste recycling and WTP residuals reuse and disposal. Meetings with NCDENR Public Water Supply (PWS) will be conducted as necessary to discuss the treatment requirements and timeframes for the City of Durham's WTPs. The initial coordination meeting was held on September 8, 2011. Discussions at the initial meeting related to options for meeting the immediate needs for

backwash recycle, including clarification of treatment requirements for filter backwash at Brown WTP and relation of the discharge location within the reservoir at Williams WTP.

A second meeting with PWS will be conducted following completion of the draft Residuals Management Plan described in Task 1.7. The purpose of this meeting will be to present the management plan to NCDENR as requested during the initial coordination meeting.

Following each meeting, the Consultant will prepare a meeting summary for distribution to all attendees.

Task 1.2 – Management, Meetings, and Coordination

Task 1.2.1: Conduct Kick-off Meeting and Site Visits

Upon authorization to proceed the Consultant will schedule a kick-off meeting and conduct site visits to both the Williams and Brown WTPs. The primary purpose of the meeting will be to finalize the project schedule, outline communications protocols and overall project coordination efforts.

Included in the site visits, the Consultant shall interview appropriate City staff from engineering, administration, operations and maintenance departments to document and understand historical issues and key concerns for future improvements.

The Consultant shall review, in coordination with the City, other design and construction projects that may be occurring during the course of this project, to help ensure minimal disruption and facilitate contractor coordination.

Task 1.2.2: Monthly Meetings

The Consultant shall hold regular monthly meetings with City staff to maintain project progress and obtain regular feedback on key issues. Appropriate Consultant and City staff shall attend each meeting.

Task 1.2.3: Workshops

It is anticipated that up to 5 workshops will be required during the master planning phase of the project. Where appropriate, a workshop may be scheduled to coincide with a monthly meeting. Workshops are anticipated to be topic specific and will be held when key decisions are required. Potential workshop topics and agendas include:

- ***Residuals Projections and Backwash Management***
 - Review flow projections and residuals production estimates for each facility
 - Discuss backwash collection and equalization options
 - Discuss treatment options (equalization and clarification vs. decant tanks)
 - Discuss reuse/disposal options
- ***Consolidated vs. Individual Residuals Management Facilities***
 - Review assessment of existing facilities
 - Discuss recommended renovation and/ or rehabilitation

- Discuss transportation options for residuals (pump vs. haul)
- Discuss location of residuals dewatering
- ***Dewatering Technologies and Reuse/ Disposal Practices***
 - Discuss dewatering technology options
 - Review required dewatering performance
 - Discuss reuse/ disposal alternatives: monofilling, blending with biosolids, landfill disposal, land application, others
 - Select up to six alternatives for detailed analysis
 - Select criteria for analysis
- ***Long-Term Residuals Management Alternatives Review***
 - Review process flow and mass balance diagrams
 - Review design criteria and facility sizing for each alternative
 - Review layout and arrangement drawings
 - Review site plans, including phasing
 - Review Financial analysis: capital costs, operating costs, maintenance costs, disposal costs
 - Select preferred alternative
- ***Draft Residuals Management Plan Review***

At the conclusion of each workshop, the Consultant will prepare a meeting summary memorandum to document the substantive decisions of the meeting and document the action items required.

Task 1.2.4 Coordination with Other Projects

The Brown WTP and Williams WTP are existing treatment plants with multiple projects being completed in parallel. Coordination of work between projects is required to avoid conflicts that could affect plant operations or construction schedules. As part of this project, the Consultant will review documents, including plans for the expansion of the Brown WTP, and develop a work plan that is coordinated with the other projects.

Task 1.3 –Residuals Quantities and Characteristics

The Consultant will collect, review and evaluate historical operating records and water flow projections to develop a 20-year forecast of residuals production quantities for both the Williams and Brown WTPs. Raw water quality data, water demand, along with all chemical usages, and historical residuals production at the plants will be reviewed. Upon completion of the data collection and analysis effort, the Consultant will prepare a forecast of residuals production quantities for a 20-year planning period for the City’s water system. The forecast will consider increased treatment flows at the WTP’s as well as changes in water quality and method of treatment that would impact residuals production. The forecast will also consider the option that Williams WTP may be taken out of service at some point within the project’s 20-year planning horizon, in which case supply would be met by a potential Jordan Lake WTP and/or potential expansion of the Brown WTP. The Consultant will consider the impacts on residuals with the potential mixing of Lake Michie, Little River and Teer Quarry source waters.

Residuals production forecasts will be presented in 5-year increments from 2012 to 2032 for annual average, maximum week and maximum month residuals production. The projections will be referenced when selecting equipment technologies and when developing the phasing and implementation component of the plan.

If necessary, residuals characteristics will be determined by outside laboratory analysis. An allowance of \$3,000 has been included for this testing, which would include key parameters, such as metals.

Task 1.4 – Assess Existing Residuals Facilities and Management Practice

The Consultant will conduct site visits and meetings with plant operators to assess the existing conditions of the residuals processing facilities at each WTP. A review of existing management practices will be conducted to identify issues, constraints, and areas of concerns the City may have. The review will also cover recent improvements the City has undertaken as well as any planned changes at each WTP.

The Consultant will review current backwash practices and planned automation for filter backwashing. The Consultant will also review available data to document compliance with existing backwash and recycling requirements and to document sizing requirements for proposed infrastructure improvements.

The Consultant will have a certified Operations and Maintenance Specialist perform a review of the residuals equipment and their operation.

Existing structures such as the alum tanks and the residuals building at the Williams WTP shall be evaluated for their value in use for future residuals management. The Consultant will recommend a course of action for the evaluated equipment and include any renovation and rehabilitation work needed as part of the preliminary engineering and construction tasks identified below. Results from this evaluation will be presented in a workshop with the City.

Task 1.5 – Identify Alternative Residuals Management Strategies

The Consultant will schedule a workshop with City staff to review and discuss the treatment technologies and reuse/disposal practices available for the City to consider. The workshop will aim to screen out alternatives not likely to be applicable for the City. A number of alternatives will be identified and shortlisted for detailed analyses. A total of six alternatives are budgeted. The evaluation of alternatives will also include an analysis of final disposal options including, but not limited to, monofilling, blending with biosolids or landfill disposal. Appropriate analysis of existing and projected residuals chemical and metals content will be conducted to assess the feasibility of final disposal options.

The development of alternative management strategies will involve combining treatment technologies and beneficial reuse/disposal practices to create diversified residuals management programs that are efficient and effective, maximize flexibility to adapt to changing conditions (economic, regulatory, environmental, social, technical, etc.), and allow the City to have a reliable outlet for the residuals.

Task 1.6 – Conduct Evaluation of Alternatives and Technologies

The Consultant will conduct more detailed engineering and financial analyses for the shortlisted alternatives that will also identify permitting implications of each alternative, including local site plan issues. Based on Task 1.4 and 1.5 results, it may be determined that pilot testing of equipment is warranted before making further decisions on equipment selection. Pilot testing is included as an Additional Service, Task 2.2, which can be authorized by the City.

Under this task, the Consultant will prepare the following information and data for each alternative:

- 1) Design criteria used for facility sizing
- 2) Process flow diagrams and mass balance diagrams
- 3) Facility site plans
- 4) Layout and arrangement drawings
- 5) Preparation of a phasing plan based on residuals production quantities prepared in Task 1.3.
- 6) Preparation of life-cycle cost estimates for the specified planning period (20 years) considering capital, operating, maintenance, and disposal costs

Facility site plans and layout and arrangement drawings will be coordinated with the layouts included with the Site Master Plan for each facility prepared in December 2010.

To complete the life-cycle cost analysis, the City will provide to the Consultant for review annual O&M budget details for all functions associated with the City's residuals management program. The Consultant will collect cost information for labor, chemical, power, and third-party contracts the City may use for residuals management.

The results of this task will be submitted to the City in the form of a technical memorandum. Thirty days after submitting the technical memorandum, the Consultant will convene a full-day workshop with City staff to review the results of the engineering and financial evaluation. It is anticipated that at the conclusion of the workshop, the City will select a preferred residuals management strategy. Once the preferred residuals management strategy has been selected, this will serve as the basis for preparing the Residuals Management Plan. The strategy may include multiple phases of work with different technologies implemented at different phases.

Task 1.7 – Prepare Residuals Management Plan

Based on the results and recommendations of Tasks 1.1-1.6, the Consultant shall prepare a Draft Residuals Management Plan report and provide 8 hard copies and 1 electronic copy to the City. The emphasis of the Plan will be the final disposal option and the equipment requirements to meet the disposal needs. The Consultant shall subsequently meet with the City to discuss comments and final recommendations to be carried into Phase 2, and shall also provide 8 hard

copies and 1 electronic copy of the Final Report to the City. Consultant will allow a 30 day City review period before scheduling meeting to discuss comments.

PHASE 2: PRELIMINARY ENGINEERING/CONCEPTUAL DESIGN

Based on the results of Phase 1, Phase 2 will further refine the design concepts and requirements of the selected WTP backwash handling and residuals management option.

Task 2.1 - Preliminary Engineering

The Consultant will prepare a Preliminary Engineering Report (PER) including the alternate site layouts, conceptual design for the selected alternative, and opinion of probable construction cost. The conceptual design will include design criteria tables, equipment sizing, process flow diagrams, schematic layouts, sizes of structures, and preliminary electrical distribution diagram (single line diagram).

The anticipated facilities to be included in the conceptual design include

- Williams WTP
 - New Backwash Equalization Tank
 - New Backwash Clarifiers
 - New Residuals Thickeners
 - Residuals Pump Station
 - Residuals Holding Tanks
 - Demolition of Dewatered Sludge Storage Shed
- Brown WTP
 - Converted Backwash Equalization Tank
 - New Backwash Clarifiers
 - New Residuals Thickeners
 - Residuals Pump Station
 - Residuals Holding Tanks
 - New Residuals Dewatering Building
 - New Dewatered Cake Storage

Task 2.1.1 - Alternatives Evaluation and Site Layouts

The Consultant will perform an alternatives analysis to assist the City with the development of the preferred equipment and facility plan for the development of the preliminary and final design. One project meeting will be dedicated to discussing equipment and basic site layout alternatives. The consultant shall provide up to three site layout alternatives, including phasing up to the master plan buildout. The Consultant will take the feedback from this meeting into account when finalizing the sizes of structures and incorporating new facilities into the site plan(s).

The Consultant will review and use previously conducted site survey and geotechnical analyses performed at both sites. If it is determined that additional survey or geotechnical

assessment(s) is required, the City will authorize consultant to perform these services to the extent necessary, as described in Additional Services, Tasks 2.2.2 and 2.2.3.

This task shall include a review of other design or construction projects on both WTP sites being performed by the City and other consultants, including the planned expansion at the Brown WTP, to coordinate the construction aspects of the projects and ensure minimal disruptions.

Task 2.1.2 - Design Criteria

The Consultant will prepare process design criteria for each unit process and major piece of equipment required for the City's proposed residuals management facilities. The quantity of duty and standby units will be defined and compared to regulatory requirements. Power requirements will be updated for the facility.

Task 2.1.3 - Opinion of Probable Construction Cost

The Consultant will develop and document preliminary engineering-level opinions of probable cost for the facilities. Upon review, the City will confirm the facilities to be included in the Contract Documents for the Final Design phase.

Task 2.1.4 - Construction Permitting

A brief regulatory assessment will be conducted to determine if any regulatory issues exist which could hinder the project or significantly affect its economics. This assessment will include a review of permit requirements related to implementation of the plan. Examples include sediment and erosion control permitting, NPDES permitting for construction, wetland impacts, and local site plan requirements. With the City approval, the Consultant envisions this task would consist of contacting the local approval agencies to determine what steps would be required by them to secure the ultimate approvals and permits for the project. A list of the necessary permits will be included in the PER.

Task 2.1.5 - Preliminary Engineering Report

The results of Task 2.1.1 – 2.1.4 will be collected into a draft PER. Eight (8) copies of the draft PER will be provided to the City for review and comment. It is anticipated that the City's review time will be 30 days. After receipt of all comments, the ENGINEER will revise the report and will submit 8 copies to the City. Electronic versions (in PDF format) of both the draft and final PER will also be provided to the City.

Additional Services

The Owner may approve the Consultant to proceed with Additional Services tasks via written authorization, specifying the additional services task scope of services, schedule and fee amount. This Agreement includes budget allowances for each additional services task, as described in paragraph 2 (Method of Payment).

Task 2.2.1 Equipment Evaluation including Pilot Testing and Site Visits

Under this task, the Consultant will coordinate completion of pilot testing of equipment and coordinate site-visits to regional facilities using similar equipment. This task is an optional task that can be authorized by the City in order to obtain the more detailed data the team may need prior to making final determinations. Work under this will be completed as a 'Not to Exceed' task as noted in Section 2, Payment for Services.

Under this task, the Consultant will prepare pilot testing protocols, coordinate pilot testing with equipment providers, and prepare a memorandum summarizing the results of pilot testing. The Consultant will contract with equipment providers to lease equipment and pilot plant operators for the duration of testing and will contract for any lab testing or third-party verification of results. The City will provide space, water, drain connection, electrical power, and sludge disposal at each water treatment site for the duration of the pilot test. It is anticipated that equipment will require a 2-inch water connection, a gravity drain, and a 480 V power supply. The Consultant will provide the City with a list of requirements in advance of proceeding with pilot testing. Pilot testing for up to 3 technologies is included in this task with an anticipated test duration of 1-week at each of the water treatment plants.

Additionally under this task, up to 3 site visits to regional facilities may be conducted with appropriate City and Consultant personnel. Each site visit, including travel, is assumed to take 1 day.

Task 2.2.2: Site Survey

The Consultant will provide field survey services to obtain information pertinent to the design including exposed physical features in the general location of the proposed work. This information, along with existing drawings, will be used as the basis for new facilities and site improvements. Field surveys will also include subsurface borings required to located key utilities, including potential tie-in locations.

Task 2.2.3: Geotechnical Investigations

The Consultant will review available geotechnical information for both WTP sites and develop a geotechnical exploration program based upon the selected site layout from the alternatives evaluation. Where appropriate, existing geotechnical information will be utilized. For planning purposes, up to 8 total geotechnical borings have been included to cover both WTP sites. The Consultant will engage a drilling subcontractor, but will remain responsible for observing and logging subsurface conditions, selecting laboratory testing, performing geotechnical engineering analyses, and prepare a geotechnical design report. The geotechnical design report will provide geotechnical design recommendations and construction-related considerations for the proposed facilities and will contain all of the data gathered as part of the geotechnical investigation.

Task 2.2.4 Design of Backwash Pump Improvements

The existing backwash pumps at the Williams WTP have had severe operational and maintenance issues, and are currently being rehabilitated by City staff. If the current rehabilitation efforts do not provide the desired level of improved service, the City may opt to begin design of improvements to the backwash pumps in the near term. The exact requirements of those improvements will be determined. The Consultant is carrying a design allowance of based on the City’s construction cost estimate, as shown in Table 2.

2. Payment for Services

The method of payment for services rendered by the Consultant shall be as set forth below:

The method of payment will be on a lump sum basis for all Phase 1 and Phase 2 tasks.

Lump Sum Method of Payment

For the Phase 1 and Phase 2 Basic Services performed under Section 1, the OWNER agrees to pay the ENGINEER the lump sum fee of \$339,100, partial payments to be made on a monthly basis in proportion to the percentage of work completed and the balance of payment made when the Basic Services are completed. The estimated fee amounts by task are listed in Table 1 and an estimated task breakdown in Attachment B.

Table 1 Fee Estimate by Task	
Task	Estimated Fee
<i>Phase 1: Master Planning</i>	
1.1 – Conduct Regulatory Review and Coordination with NCDENR	\$ 12,100
1.2 – Management, Meetings, and Coordination	\$ 32,000
1.3 – Residuals Quantities and Characteristics	\$ 19,500
1.4 – Assess Existing Residuals Facilities and Management Practice	\$ 16,200
1.5 – Identify Alternative Residuals Management Strategies	\$ 16,200
1.6 – Conduct Evaluation of Alternatives and Technologies	\$ 68,700
1.7 – Prepare Residuals Management Plan	\$ 52,400
PHASE 1 SUBTOTAL	\$ 217,100
<i>Phase 2: Preliminary Engineering / Conceptual Design</i>	
2.1 – Preliminary Engineering	\$ 122,000
PHASE 2 SUBTOTAL	\$ 122,000
TOTAL ENGINEERING SERVICES	\$ 339,100

The amounts listed in Table 1 do not represent individual task lump sum amounts, as the actual level of effort and costs may vary. The Consultant may alter the distribution of payment amounts between individual tasks noted herein (e.g., payment amounts) to be consistent with services actually rendered, but shall not exceed the total lump sum amount unless approved by the OWNER.

Payment for Additional Services (Tasks 2.2.1 – 2.2.4)

Payment for Tasks 2.2.1 – 2.2.4 will be at amounts that will be authorized by the Owner via written authorization prior to the Consultant starting work. Estimated lump sum fee amounts by subtask are listed in Table 2. The amounts for each subtask may be changed in the written authorization, but the cost of all Additional Services tasks provided under Task 2.2 shall not exceed the total amounts listed in Table 2, unless authorized via Amendment to this Agreement.

Estimated Lump Sum Amount for Additional Services	
Task	Estimated Fee
2.2.1 – Equipment Evaluation Including Pilot Testing and Site Visits	\$ 55,000
2.2.2 – Site Survey	\$ 11,000
2.2.3 – Geotechnical Investigations	\$ 46,000
2.2.4 – Design of Backwash Pump Improvements	\$ 45,000

3. Estimated Time Period of Performance

Master Planning (Phase 1) is to be completed within 32-weeks from notice-to-proceed and the Preliminary Engineering (Phase 2) is anticipated to require 18-weeks, subsequent to Phase 1, assuming timely reviews and input. Additional time may be required for Additional Services, which will be agreed upon between the City and Consultant. Consultant shall begin to develop Scope and fee for Phases 3-6 upon delivery of Draft PER (Task 2.1.5).

Attachment A
City of Durham
WTPs Residuals Master Plan and Design
DRAFT - Data Request List
(Prefer electronic form, when available)

Brown and Williams WTPs: Monthly reports/Operating data for past 5-10 years (as available) including:

- Daily flow processed
- Raw Water Turbidity
- Coagulant dose (and type)
- Polymer dose (and type)
- PAC added
- Caustic dose
- Chlorine dose
- Other chemicals added: Fluoride, phosphate, ammonia, etc.
- Volume of residuals removed from sed. Basins
- Concentration of residuals removed from sed. Basis
- # Filters in Service
- # Filters Backwashed
- Backwash water flow
- Filter-to-waste flow

Data collected on residuals thickeners at Brown WTP

Data collected on residuals transport from Williams WTP

Hauling costs

Synagro operating data, costs, feed to belt press, cake solids, polymer dose, truck to landfill, etc.

Correspondence from State related to City's residuals

Copies of relevant plant O&M manuals – Brown and Williams WTPs

As-built drawings of past construction – Brown and Williams WTPs

Planning drawings of future expansions – Brown and Williams WTPs

Survey data in electronic format of most recent site surveys – Brown and Williams WTPs

Geotechnical information (boring logs and reports) – Brown and Williams WTPs

