EXHIBIT A TO THE AGREEMENT
BETWEEN OWNER AND ENGINEER
FOR PROFESSIONAL DESIGN AND BIDDING SERVICES
SSES AND REHABILITATION DESIGN ASSISTANCE

FURTHER DESCRIPTION OF ENGINEERING SERVICES AND RELATED MATTERS

This is an exhibit attached to and made part of the supplemental agreement to the On-Call Professional Services Agreement dated January 29, 2014 between the City of Greensboro (OWNER) and CDM Smith, Inc. (ENGINEER) for professional services.

1. **The Basic Services of the ENGINEER as described in the Agreement are amended and supplemented as follows, to be referred to as the PROJECT:**

PROJECT OBJECTIVES AND DESCRIPTION

The City of Greensboro wishes to perform Sanitary Sewer Evaluation Survey (SSES) and rehabilitation in priority sewersheds in the North Buffalo Basin. CDM Smith previously performed SSES and design assistance on the highest priority sewersheds identified in the 2012 study titled "North Buffalo Sanitary Sewer Evaluation". The study recommended sewersheds 1, 6, 9, 13, 14, 17, and 18 as the first priority and recommended sewersheds 2, 7, 8, 12,and 21 as the second priority based on high peaking factors and high infiltration and inflow (I/I). SSES and rehabilitation with the goal of reducing I/I will not be performed in the near future on the Priority 3 sewersheds from this study. The City has completed the rehabilitation of the Priority 1 sewersheds and wishes to proceed with SSES and rehabilitation of the Priority 2 sewersheds. SSES data will include CCTV inspection and smoke testing in the priority areas to determine the most cost effective rehabilitation approach. Based on GIS data, sewersheds 2, 7, 8, 12, and 21 contain a total of 77,000 lf of sewer, excluding sewers that have previously been rehabilitated or sewers installed after 1991. The sewersheds and sewer pipes in Priority 2 are shown on Figure 1 in orange. In addition, the City wishes to perform a post-rehabilitation flow monitoring analysis to assess the level of I/I reduction since the Priority 1 sewershed rehabilitation. An initial analysis will be performed using the 2015 temporary flow monitoring data as well as the prior 2010 data (both collected from another project for the Master Plan and model calibration. However, since only one meter can be evaluated as explained below, the City will also install additional temporary flow meters and rain gages just downstream of several of the rehabilitated areas in early 2016 to provide additional data to complete this analysis).

This scope of services consists of the following major tasks:

- Task 1 – SSES Data Collection
- Task 2 – Data Analysis
- Task 3 – Design Assistance & Memorandum
- Task 4 – Post Rehabilitation Flow Meter Analysis
- Task 5 – Training Allowance

In addition, it is anticipated that in Year 2 of this contract, when authorized in writing by the City, the City wishes to analyze the recent 2015 temporary flow meter data and evaluate the next highest priority area for SSES and rehabilitation. This scope of work assumes an area of up to 150,000 lf will be chosen for SSES and subsequent rehabilitation. Task 0 would evaluate the flow data and define the area and subsequently the same Tasks 1-3 as listed herein would be performed for this area.

The detailed scope of services for the basic services included under this Agreement follows:

Task 1. SSES Data Collection

This task includes a kickoff meeting, field reconnaissance, and SSES data collection. During the kickoff meeting, project goals, deliverables, schedule, and data collection coordination will be discussed This task includes field reconnaissance of the study area to observe surface conditions that could impact costs of open-excavation pipe replacement or excavation of insertion pits for slip-lining or pipe-bursting. This task also includes visual inspection of the aerial crossings to determine if there is any obvious deterioration of the piping or piers.

This scope of work assumes that the City will obtain CCTV inspection data through its annual services contract. To assist the City, CDM Smith will prepare sewershed level mapping for the City showing the sewer pipes to be inspected, manholes, and manhole IDs to be used by the CCTV subcontractor. It is assumed that the City will be responsible for subcontractor coordination and QA/QC of the CCTV inspections. This scope also assumes that the deliverables will be PACP coded digital CCTV inspections and logs. CDM Smith intends to subcontract the smoke testing to Hydrostructures, PA. Deliverables for the smoke testing shall include pictures of smoke locations (not including distance measurements for defects which can be easily located again using the photos (such as a broken clean-out cap or roof leader)) as well as sewershed level map showing the smoke locations.

Task 2. Sewershed SSES Data Analysis

This task includes review and analysis of all CCTV video and smoke testing inspection results. During this review, defect tabulations on the CCTV videos and logs shall be verified for accuracy and interpretations will be made related to necessary repairs according to the final design criteria. The final design criteria will be developed jointly with the City. Defects requiring point repairs shall be identified, including structurally defective pipes, defective lateral connections (hammer taps), root intrusion, offset joints, sags in pipes or joints, and major inflow sources such as stormwater connections. The most cost effective rehabilitation approach will be determined based on the CCTV and smoke testing information. In addition to the rehabilitation technique, a list of sags observed, stationing of required point repairs, and station of the service laterals will be provided in spreadsheet format. This task also includes re-prioritization of the subbasins for rehabilitation based on pipe condition, smoke testing results, and peak wet weather flows and volumes identified in the previous study titled "North Buffalo Sanitary Sewer Evaluation". Planning level cost estimates for rehabilitation of the sewer and manholes using the current rehabilitation contract unit prices will be prepared. Costs will be based on the City's annual services contract, as appropriate. This task includes a meeting to review the results of the SSES data evaluation.

Task 3. Design Assistance and Memorandum

CDM Smith will prepare GIS based design drawings of the rehabilitation and enter bid tab quantities in spreadsheets for each sewershed area, similar to what was done for the November 2013 CDM Smith report, "North Buffalo Sanitary Sewer Inspection and Evaluation."

This task includes development of a draft memorandum outlining proposed final design criteria and recommended rehabilitation technologies to be used. The report will outline the design approach and assumptions related to issues such as repairs to service laterals, replacement of pipe sags, pavement replacement, and criteria for making point repairs. The memorandum will include a GIS-based map/drawing of the rehabilitation and tables of estimated bid quantities based on the recommended rehabilitation.

A draft of the memorandum will be forwarded to the OWNER for review, and a meeting will be held to discuss comments on the draft memorandum. The final memorandum will incorporate comments on the draft.

Task 4. Post-Rehabilitation Flow Monitoring and Analysis

Under this task, CDM will analyze post-rehabilitation flow monitoring data to determine the effectiveness of the sewer rehabilitation in the Priority 1 sewersheds in reducing infiltration and inflow into the sewer system. This will be conducted in two phases. Although a flow monitoring study has not yet been conducted specifically for this purpose (and therefore the meters not placed in the ideal locations), as shown on Figure 1, there is one monitor (NB20) with 2015 data that should be adequate for this analysis (assuming quality data collection and enough rainfall for analysis). Approximately, 67,000 lf of sewer was rehabilitated out of 194,000 lf total upstream of this monitor (35%). Monitors 16, 17, and/or 18 could be used as control meters. Flow data collected from suitable rainfall events during the 2015 flow monitoring period will be analyzed and compared to flow data collected from rainfall events during the 2010 flow monitoring period. Flow data from at least three suitable rainfall events is required for the post-rehabilitation analysis. Based on the pre-rehabilitation and post-rehabilitation flow data, the percent reduction of infiltration and inflow will be estimated.

For Phase 2 of this analysis, 5 temporary flow monitors and 2 rain gages will be installed in early 2016 to obtain post-rehabilitation flow data that can be directly compared to the pre-rehabilitation meters. 3 meters will be used for the rehabilitation areas and 2 for controls.

The ENGINEER will prepare a memorandum summarizing the results of the post-rehabilitation monitoring, and meet with the City to discuss results and recommendations.

Should the City wish to extend the monitoring period additional authorization would be required at the rate of $500 per flow meter per week and $100 per rain gage per week.

Additional sub-basins can be added to this scope of work for an additional fee. Additional design of sub-basin rehabilitation can be added for additional fee.

Task 5. Training Allowance

CDM Smith will work with CriTek Engineering Group, P.C., a minority owned engineering firm, to provide training on Task 2 services above.

2. ADDITIONAL SERVICES

The OWNER reserves the right to amend this Agreement so that the ENGINEER may furnish services related to the project that are not currently part of the Basic Services, or services that are stated in this agreement as optional or add-on services. These additional services will be paid

for by the OWNER in an amount and by a method to be determined at the time the services are requested.

3. OWNER'S RESPONSIBILITIES

Furnish to ENGINEER, as requested by ENGINEER for performance of Services as required by the Contract Documents, the following:

A. Provide the ENGINEER with QA/QC'd PACP coded CCTV data. CCTV inspections shall be labeled with corresponding pipe or manhole IDs in the City's GIS system. Provide ENGINEER any changes in pipe layout or orientation identified as the result of the CCTV inspection. Provide ENGINEER a list of pipes with incomplete or reverse inspections.

B. Provide any public notification or assistance prior to or during smoke testing beyond what Hydrostructures provides as standard which includes door hangars and in-person notifications to schools and fire stations.

C. Arrange for access to sites as necessary.

D. Timely review and input of deliverables.

OWNER shall be responsible for, and ENGINEER may rely upon, the accuracy and completeness of all reports, data and other information furnished pursuant to this paragraph. ENGINEER may use such reports, data and information in performing or furnishing services under this Scope of Work.

E. Bear all costs incident to compliance with the requirements of the OWNER's Responsibilities.

4. TIME PERIOD FOR PERFORMANCE

The time periods for the performance of Engineering Team services as set forth in this Agreement are amended and supplemented as follows:

- All work described herein this Project Authorization will begin upon execution of this Task Authorization.
- The meeting to review the results of Task 2 Data Analysis will be held within 20 weeks of receipt of CCTV and smoke testing data. The draft memorandum will be delivered within 8 weeks of the meeting to review

results of Task 2. The final memorandum will be delivered within 2 weeks of receiving comments from the City on the draft report.

- The first phase Task 4 will be completed within 12 weeks of the date of receipt of required data. Flow monitors will be installed by mid-February of 2016. The second phase will be completed within 12 weeks of receipt of final flow monitoring data.

5. METHOD OF PAYMENT

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

For the Basic Services performed under Section 1 for Year 1 services, the OWNER agrees to pay the ENGINEER a lump sum amount of $231,500. The amounts listed in **Table 5-1** are estimated values for reference only and Engineer will not be held to upper limits by task.

Partial payments shall be made by the OWNER on a monthly basis in proportion to the percentage of work completed.

Table 5-1: Year 1 Payment Amounts by Task

Task	Payment Amount
1 – SSES Data Collection	$46,100
2 – Data Analysis	$62,100
3 – Design Assistance & Memorandum	$46,900
4 - Post Rehabilitation Flow Meter Analysis	$71,900
5 – Training Allowance	$4,500

Year 2: It is anticipated the Owner will extend services (scope, schedule, and budget) in this contract for Year 2 to include the tasks outlined in the project description above and approximate payment amounts (estimated for reference only as mentioned above) shown in Table 5-2 below. The estimated lump sum fee for Year 2 is $271,000.

Table 5-2: Year 2 Estimated Payment Amounts by Task

Task	Payment Amount
0 – Identification of Next Basin	$18,800
1 – SSES Data Collection	$75,250
2 – Data Analysis	$103,300
3 – Design Assistance & Memorandum	$68,650
5 – Training Allowance	$5,000

6. SPECIAL PROVISIONS

OWNER has established the following special provisions and/or other considerations or requirements in respect to the Assignment: None.