

## **EXHIBIT “A”**

### **SCOPE OF SERVICES**

#### **FOR INFLOW AND INFILTRATION (I/I) REDUCTION ANALYSIS**

This scope of services describes the work elements to be performed by Burns & McDonnell Engineering Company, Inc. (hereinafter referred to as ENGINEER) in development of post construction inflow and infiltration (I/I) reduction analysis for basins CC 16 and CC 20 serving the City of Lee’s Summit (hereinafter referred to as OWNER). This scope includes detailed tasks that are anticipated for the work. The details of each task reflect a reasonable level of effort anticipated.

#### **Task 1: Project Management and Administration**

- a. Manage and administer project and allocate resources to complete the project within schedule and budget limitations. Prepare and submit a monthly invoice. Each invoice shall include the purchase order number, project number, unit rates/prices, and extended totals.
- b. Arrange and conduct a kickoff meeting with the OWNER. Discussions shall be held to review and confirm the project goals, objectives and scope of work. Prepare agenda and minutes for meeting and distribute to meeting attendees.
- c. Arrange and conduct two (2) project meetings as needed for reviews with the OWNER to discuss project progress and deliverables review. Prepare agenda and minutes for meeting and distribute to meeting attendees.

#### **Task 2: Flow and Rainfall Monitoring**

Development of a post construction I/I reduction analysis as described in Task 3 will first require data to be collected from existing data sources and/or field assessment. Flow and rainfall data monitoring activities will focus on meter locations where pre-construction flow monitoring was conducted by the OWNER and additional locations that encompass basins CC 16 and CC 20. The flow and rainfall monitoring task comprises a base period of ninety (90) days.

- a. Flow Meter Site Assessment/Installation:

ENGINEER shall recommend five (5) flow monitor locations for the OWNER to install with the assistance of ENGINEER for a period of up to ninety (90) days. Flow monitoring sites will be determined by evaluating the OWNER’s previous meter locations and choosing additional locations to isolate basins CC 16 and CC 20. A site assessment will be conducted by the OWNER with assistance from the ENGINEER of potential flow monitoring sites. The assessment will be made to determine, in general, the most suitable flow monitoring and rain gauge locations based on the following conditions:

  1. Suitability for Accurate Metering - The accuracy of open channel flow metering will depend on numerous variables that should be controlled as much as possible. For this reason, reconnaissance inspections will be performed to identify the best sites for metering and to minimize such error-causing factors as changes in pipe alignment

and size, interruption of channel flow by side inlets and turbulence caused by uneven channels.

2. Safety - It is equally important that the proposed sites conform to ENGINEER's requirements for safe operating conditions. If the site falls outside of these requirements, alternate sites that are suitable based on safety requirements will be selected upon further consultation with the OWNER.

OWNER shall provide information for the ENGINEER to complete site assessment forms for each flow monitoring location. The OWNER shall provide four flow monitors (4) and ENGINEER shall provide one (1) electronic depth/velocity flow monitor (ISCO 2150) for the duration of the monitoring periods described above.

b. Flow Monitoring (Day 0-90):

Four (4) flow monitors shall be maintained by the OWNER and one (1) flow monitor shall be maintained by the ENGINEER on a weekly basis. Weekly maintenance shall include the upload and interrogation of all flow data, meter calibration (as needed), weekly velocity profiling, and other diagnostic checks. Flow monitors shall remain in place for a base period of 90-days.

c. Rainfall Monitoring (Day 0-90):

ENGINEER shall furnish one (1) rain gauge. ENGINEER shall install, service, and maintain the one (1) continuous recording, electronic rain gauge within the study areas during the same 90-day monitoring period. The gauge will record rainfall to one-hundredths of inch increments. The instrument data will be checked weekly by ENGINEER. Data collected from rain gauges will be analyzed by ENGINEER to correlate peak system flows to total rainfall depth and duration as further discussed in this scope of work. ENGINEER shall complete a site assessment form for the rainfall monitoring location.

Deliverables:

1. Flow hydrographs and rainfall hyetographs for each flow monitoring location and each rain gauge in electronic copy format.

### **Task 3: Flow Data Analysis**

The flow and rainfall data collected in Task 2 shall be processed to develop a post construction I/I reduction analysis described in this task. Principal components of sanitary sewer system flows will be deconstructed from the flow meter hydrographs in the following general manner:

- a. Provide an analysis of flow monitoring data to estimate average dry weather flow (ADWF) and peak dry weather flow (PDWF).
- b. Develop and provide ADWF curves for each metering site. These curves will reflect 15-minute interval variations over time for weekdays and weekends.
- c. Identify rainfall events for evaluation, and determine wet weather flow vs. rain volumes by calculating wet flow volume (total flow, less ADWF, integrated over time during wet weather impact).

- d. Develop scatter graphs of flow depth (in feet) against velocity (in feet per second) for each flow meter.
- e. Develop normalized peak flow versus rainfall depth curves for each flow meter. Separate curves will be developed for I/I and will include projected peak flow for the design storm event. Indicate if the flow meter site is impacted by upstream flow split and/or downstream conveyance performance.
- f. Estimate groundwater induced infiltration and rainfall dependent inflow for each flow meter site.

#### **Task 4: Data Review and Reporting**

The flow and rainfall data analyzed in Task 3 shall be processed in combination with results from the OWNER's *I/I Assessment and Reduction Plan*, dated July 16, 2008, to develop an I/I Reduction Analysis Report.

- a. Review previous I/I reduction efforts for CC 16 and CC 20.
- b. Review results with the OWNER to address any issues as to data validity, missing data, or other problems.
- c. Compare results from new flow meter data to results from pre-construction I/I reduction metering to determine the effects that I/I removal efforts have had on the system.
- d. Compare results of I/I Assessment and Reduction Plan to assess effectiveness of building code changes and efforts to reduce I/I from private sources.
- e. Submit rough draft of I/I Reduction Analysis Report to OWNER for review and comments.
- f. Arrange and conduct one (1) Draft Report Meeting to discuss data analysis, draft reviews, and comments.
- g. Submit final draft of I/I Reduction Analysis Report to OWNER.
- h. Arrange and conduct one (1) Final Report Meeting to discuss findings, reviews, and comments.

#### Deliverables:

- 1. Raw Flow Monitoring Data, Final Flow Monitoring Data, Site Sheets and Photos – one (1) electronic format copy
- 2. I/I Analysis Draft Report– four (4) hardcopies and one (1) electronic format copy.
- 3. I/I Analysis Final Report – four (4) hardcopies and one (1) electronic format copy.

#### Method of Payment:

The above services are to be compensated in accordance with the attached Schedule of Hourly Professional Service Billing rates. The rates presented in this Schedule are effective for services through December 31, 2017, and are subject to revision thereafter.