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May 11, 2026

Timothy A. Welch, PE
Utilities Director
City of Pembroke Pines
8300 South Palm Drive
Pembroke Pines, FL 33025

**Re: Pembroke Pines Wastewater Collection System
Work Order 18 – Infiltration and Inflow Analysis**

Dear Mr. Welch:

As requested, Hazen and Sawyer, D.P.C. (Hazen) is pleased to offer engineering services for the performance of an Infiltration and Inflow (I&I) Analysis, representing Phase 1 of a comprehensive I&I reduction program.

Background

The City of Pembroke Pines (City) operates and maintains its own wastewater collection system and wastewater treatment facility. The wastewater collection system consists of a gravity collection system and a transmission system composed of pressurized force mains and lift stations. This system conveys wastewater flows generated east of Flamingo Road to the City of Hollywood’s Southern Regional Wastewater Treatment Plant (WWTP). The remainder of the wastewater flows are directed to the City’s WWTP.

The City has performed studies and rehabilitation work to reduce I&I throughout its wastewater collection system, and plans to continue these efforts with the following primary goals:

- Lower the costs of collection, pumping, treatment, and disposal.
- Reduce the potential that excessive I&I may lead to sanitary sewer overflows.
- Increase service reliability and system capacity for the benefit of current and future customers.
- Establish a methodology that will allow current and future utility personnel to successfully continue collection system condition assessment and rehabilitation efforts on a long-term basis.

To support those goals, the City and Hazen have discussed implementation of a phased process as follows:

1. Analyze basin-level wastewater flows to prioritize basins for I&I reduction and establish a protocol to measure the outcomes of rehabilitation work.
2. Conduct a Sanitary Sewer Evaluation Survey (SSES) for priority basins, including field investigation methods such as manhole inspection, video inspection, and smoke testing.

Job no. 04800-017

3. Develop a corrective action plan for the reduction of I&I by specialty sewer rehabilitation contractors and/or City forces. Coordinate contractor procurement via competitive bid or “piggyback” method. Provide as-needed engineering services during construction.
4. Outline an implementation plan for a sustainable, cost-effective I&I reduction program to be managed by City personnel. Identify program requirements related to personnel, ancillary needs such as data management, and estimated funding levels.

A detailed scope of services for I&I reduction would commonly include the following tasks:

- Task 1. Baseline and system-level I&I analysis
- Task 2. Basin-level analysis and prioritization
- Task 3. Basin prioritization memorandum
- Task 4. Inspection of priority basins
 - a. Night flow isolation
 - b. Manhole inspection
 - c. Smoke testing
 - d. Video inspection
- Task 5. Inspection data review and development of recommendations
- Task 6. Final report with corrective action plan
- Task 7. Technical specifications for corrective action contract documents
- Task 8. Construction-phase engineering and management

This Work Order addresses Tasks 1, 2, and 3. Each task is described in sequence below. Pending the results of the initial work under Tasks 1 through 3, the City may elect to proceed with the remaining tasks in a separate authorization.

Scope of Services

Task 1 – Baseline and System-Level I&I Analysis

- Characterize historical and current I&I reduction activities including completed rehabilitation work, and system-wide flow reductions achieved to date if previously documented.
- Use WWTP flows, rainfall records, and groundwater levels to characterize the overall severity of I&I and the approximate proportions of infiltration, inflow, and wastewater. The best available on-line sources (e.g. United States Geological Survey, South Florida Water Management District) will be used for groundwater and rainfall data.
- Estimate an annual treatment and disposal cost for the non-wastewater flow determined in Task 1.
- Meet with City to review findings.

Task 2 – Basin-Level Analysis and Prioritization

- Conduct detailed analysis on pump stations selected by the City.
- Develop a wastewater flow database for each selected pump station using wet well fill volumes along with date-and-time-stamped pump status data and/or wet well level data as available. Data will be analyzed over the most recent 12-month period for which data are available.
- Analyze pump station data considering selected wet weather events, dry weather periods of differing ground water elevations, and the so-called “night flow” time period between 1:00 AM and 5:00 AM when actual wastewater flow is minimal and the majority of flow is infiltration. This analysis will be conducted to the extent permitted by the time interval of available data (hourly, daily, etc.).
- Develop representative values for dry weather minimum flow, dry weather average flow, and wet weather peak flow for each basin. Characterize inflow by presenting wet weather peak flow in contrast to dry weather average flow and dry weather minimum flow. Characterize infiltration by presenting dry weather minimum flow in units of gallons per day per inch-mile of gravity mains.
- Prioritize basins by I&I severity so that follow-up inspection and rehabilitation work can be focused on those areas where the greatest I&I reduction potential exists. Develop an estimate as to the amount of I&I that might be cost-effectively removed and the order-of-magnitude inspection and rehabilitation cost, based on Hazen’s previous experience in similar systems.
- Meet with City to review findings.

Task 3 – Basin Prioritization Memorandum

- Develop a brief memorandum to document the work performed in Tasks 1 and 2. The intent of the memorandum is to provide a timely basis for initiating field investigation tasks along with recommendations for continuation of the program.
- Provide draft memorandum (PDF format) for review by the City.
- Meet with City to review draft memorandum.
- Provide final memorandum (PDF format).

Assumptions

The following assumptions were made in the preparation of this scope of work:

1. This proposal has been developed in coordination with the separate *Wastewater Hydraulic Modeling* proposal to minimize duplication of effort and be as cost effective as possible. Accordingly, specific assumptions about project interdependence include the below-listed data inputs with hydraulic modeling tasks as noted. This anticipated interdependence will also affect the project schedule.
 - a. Task 1.1 – Development of Hydraulic Model
 - i. System schematic with repump relationships
 - b. Task 1.2 – Desktop Data Collection

- i. WWTP and master pump station flow data
 - ii. Pump run time, on-off events, pump speed when applicable, and time series of wet well levels
 - iii. Wet well dimensions and pump on/off set points (elevation or distance below finished floor)
 - iv. Wet well influent pipe invert (elevation or distance below finished floor)
 - v. Latest sewer geodatabase
 - vi. Historical SSO database
 - c. Task 1.3 – Field Data Collection (Gravity Flow Monitoring)
 - i. Basin-level flow data (combination of temporary third-party flow meters and SCADA-based or data logger-based flow data). It is anticipated that data will be provided for up to 18 basins.
 - d. Task 2 – Calibration of the Hydraulic Model
 - i. Basin-level determination of BSF/GWI/RDII (Base Sanitary Flow/Groundwater Infiltration/Rainfall-Dependent Infiltration and Inflow)
 - ii. Basin-level characterization of population, land use, water consumption, groundwater levels, pipe age
2. It is assumed that the City will generally provide access throughout the project to engineering and operations staff for field visit accompaniment when required, requests for information, and reviews of deliverables. Some specific areas of support are as described below for the baseline evaluation and system- and basin-level analyses. It is noted that a majority of these data are expected to be available through the Hydraulic Modeling Project as outlined previously.
 - a. Provide general information, including written reports and records if available, concerning the extent of the City's I&I reduction program to date.
 - b. Provide daily flows to the WWTP for a minimum 12-month period to be determined based on data availability. Provide potable water consumption for the same 12-month period. Data are to be provided electronically in MS Excel format.
 - c. Provide daily rainfall data for the same 12-month period, if available from City sources. Data are to be provided electronically in MS Excel format.
 - d. Specify treatment and disposal costs for the WWTP in \$/1,000 gallons.
 - e. Specify, as applicable, the approximate percentage of potable water demand associated with customers who are not also served by the City's wastewater system, and the approximate percentage of wastewater production associated with customers who are not also served by the City's potable water system.
 - f. Provide hourly SCADA data for each selected basin for a minimum 12-month period to be determined based on data availability. Data are to be provided in the form of date-and-time-stamped pump status and/or wet well levels so that a flow calculation algorithm can be developed. Data are to be provided electronically in MS Excel format.

- g. Accompany Hazen and provide pump station access for installation of field monitoring devices.
- h. Provide wet well fill volumes (wet well cross-sectional areas and pump start and stop elevations) for use in the development of a flow calculation algorithm.
- i. Provide hourly rainfall data, flow data available from any existing meters, and pump run hours for the same 12-month period as available from City sources. Data are to be provided electronically in MS Excel format.
- j. Provide GIS data containing a breakdown of piping lengths and diameters for each basin, if available, so that a collection system inventory can be developed and analyzed. Data are to be provided electronically in MS Excel format (if not provided from Wastewater Hydraulic modeling project).

Compensation

The engineering services for this project will be performed on a Not-to-Exceed basis for \$171,480. It is noted that \$19,920 of this amount represents a project allowance that would be used only with explicit authorization from the City, if expansion of the scope of work is desired. A fee schedule is attached.

Schedule of Completion

The services outlined in this Task Order will be completed in accordance with the below schedule. Engineering services for the project will be performed under our Continuing Professional Services Contract dated January 13, 2021. Services provided by Hazen are limited to those specifically identified in this work authorization.

Note that several factors affecting the project involve work by others and the delivery of information to be supplied by others. Consequently, the completion time presented herein will be updated if appropriate.

Hazen will submit to the City a request for necessary data within three weeks from receipt of a Notice to Proceed, the draft deliverable within fourteen weeks from receipt of all requested data, and the final deliverable within three weeks from receipt of comments on the draft deliverable. The below table summarizes the overall project timeline.

Task / Description	Task/Completion (Weeks)
Tasks 1 and 2 – Request for data	3 ^a
Task 3 – Draft memorandum	17 ^b
Task 3 – Final memorandum	20 ^c

^a Assumes availability of specified data inputs from Hydraulic Modeling Project

^b Assumes City provides data within two weeks of request

^c Assumes City issues comments two weeks after receipt of draft deliverables

We look forward to your reply. Should you have any questions or require further information, please contact us.

Sincerely,

A handwritten signature in blue ink, appearing to read "Jennifer McMahon".

Jennifer McMahon, PE
Vice President

Enclosure

c: E. Heijn
A. Kelly