

June 9, 2025

Jeff Jiang, P.E.
CITY OF HOLLYWOOD
Department of Public Utilities
Engineering and Construction Services Division
Post Office Box 229045
Hollywood, Florida 33022

City of Hollywood
PFAS Removal Phase 2B -
Corrosion Control Study
City Project No. TBD

Dear Mr. Jiang:

As requested, Hazen and Sawyer, D.P.C. (HAZEN) is pleased to offer assistance for a corrosion control study for additional membrane softening (MS) trains for the City of Hollywood (CITY) Water Treatment Plant (WTP).

BACKGROUND

The CITY owns and operates a series of potable water supply wells and treats the Biscayne Aquifer well water through lime softening and nanofiltration treatment plus treats the Floridan Aquifer well water through reverse osmosis treatment. The CITY also treats Biscayne Aquifer well water from the Broward County South Regional Wellfield (SRW) at Brian Piccolo Park through the MS plant. These three treatment process streams blend together to provide high quality drinking water to the residents of Hollywood and adjacent areas outside the City (parts of Town of Davie, City of Dania Beach and the Seminole Tribe of Florida).

However, PFAS has recently been detected in the CITY's wells. PFAS are a group of manufactured chemicals used to make coatings that resist heat, oils, stains, grease, and water. Throughout production and use, PFAS can migrate into soil and water, eventually entering drinking water sources. PFAS do not break down naturally in the environment, making them a persistent contaminant that can accumulate over time.

The final regulations require those compounds be removed to below the regulatory limits (4 parts per trillion) prior to the deadline (March 2031). While MS and reverse osmosis (RO) treatment processes are viable methods to remove PFAS, treatment through lime softening is not. The CITY selected in the first phase of this project to construct additional MS trains at the Hollywood WTP to maintain water treatment plant capacity while meeting regulatory requirements.

To replace the capacity of the lime softening process, the CITY requests HAZEN design for the addition of up to four additional MS trains along with associated feed pumps, electrical provisions, and appurtenances. The project includes review of potential upgrades to the existing antiscalant, sulfuric acid, sodium hypochlorite, sodium hydroxide, and corrosion inhibitor systems as well as considerations for future additional chemical and physical processes for optimal corrosion control.

This project also includes planning for a future additional degasifier to meet finished water demands.

The project will be completed in multiple phases. The summary of the PFAS Removal project phases is:

- Phase 1 – Regulatory Compliance Evaluation (ongoing)
- Phase 2A – Design of MS Train Addition
- Phase 2B – Corrosion Control Study (this scope)
- Phase 2C – Preliminary Design Report
- Phase 2D – Services during MS Addition Construction
- Phase 3 – Chemical and Post Treatment Addition
- Phase 4 – MS Trains Addition
- Phase 5 - MS Train Upgrades and Lime Softening Decommissioning

The first phase, the PFAS Removal Regulatory Compliance Evaluation, is nearing completion. Option 4, the addition of three 2.5 mgd NF trains and increasing the existing skids to 2.5 mgd was selected. This capacity increase is required such that the membrane plant can provide enough treated water to meet the maximum day demands with only the membrane plant in operation.

The second phase includes the design of an additional MS train, permitting, and bid assistance (Phase 2A). Design services under this scope include the design of one of the NF trains, and the associated feed pump. It is assumed that the new MS train under Phase 2A will be considered redundant equipment and will not require an update to the existing permit.

Phase 2 will also include the corrosion control study (Phase 2B) to determine optimal finished water stabilization for the 100% membrane facility, development of the preliminary design report (Phase 2C) to document the sizing for the future Phase 3, and Construction oversight of the MS train addition (Phase 2D).

Phase 3 will include the design of the chemical and post-treatment systems as defined under Phase 2B.

Phase 4 will include the design and construction oversight of three MS skids. Phase 5 will follow, once all MS trains are operational, to upgrade each existing MS train from 2 to 2.5 mgd.

Upon completion of this project and the future phases of the project, the additional MS trains will offset the production capacity of the lime softening facilities, which may then be decommissioned. The extent of decommissioning of the lime softening facilities is to be determined during the development of the Preliminary Design Report and will be conducted separately under Phase 5 of this project.

SCOPE OF SERVICES

PHASE 2B – CORROSION CONTROL STUDY

Task 1 – Corrosion Control Study for Conversion to 100% Membrane Treatment

1.1 - Desktop Study

The Desktop Study will involve an analysis of historical data to understand past water quality trends and issues. This analysis will help set water quality goals for the project. A baseline sampling plan will be developed to establish current water quality conditions. The plan will include detailed protocols for sampling locations, frequency, and methods. Six distribution system sampling events will be conducted to gather data on water quality throughout the system, at up to ten locations. This data will be crucial for identifying any existing issues and for comparison with post-startup conditions.

1.2 - Post Startup Water Quality Sampling Plan

The Post Startup Sampling Plan will outline the procedures for monitoring water quality after the startup of the new system. This plan will include specific sampling locations, frequency, and methods to ensure comprehensive coverage of the distribution system. The goal is to detect any changes in water quality that may occur because of the new system's operation. Regular sampling will help identify potential issues early and allow for timely corrective actions. The plan will also include protocols for data analysis and reporting to ensure that findings are accurately documented and communicated.

1.3 - Distribution System Materials Scale Analysis

This subtask involves developing a protocol for harvesting pipe samples from the distribution system and identifying suitable sites for sampling. Assistance will be provided for harvesting pipes from four selected sites. The harvested pipes will undergo scale analysis to assess the condition of the materials and identify any corrosion or scaling issues. Coordination and review of the scale analysis will ensure that the findings are accurate and comprehensive. This analysis will provide valuable insights into the impact of the new system on the distribution materials and help inform future maintenance and replacement strategies.

1.4 - Corrosion Control Bench-Scale Testing

HAZEN will develop bench-scale testing plan to evaluate the impact of changes in water treatment on the corrosion and release of metals from lead distribution system materials. This testing will involve the use of small metal coupons used to simulate the materials found in the distribution system. These coupons will be housed in a flow-through setup that operates on an intermittent flow cycle, mimicking real-world conditions. The testing procedure will include periods of stagnation, during which water remains in contact with the coupons for a set period of time. After these stagnation periods, samples will be collected on a weekly basis to measure the rates of metal release and corrosion. This will allow for comparisons between different treatment conditions over time.

Up to six different assessment conditions will be evaluated in this study. These include the control (current conditions), 100% membrane-treated water adjusted with sodium hydroxide, and orthophosphate-based corrosion inhibitor(s), 100% membrane-treated water adjusted with calcium hydroxide and orthophosphate-based corrosion inhibitor(s), and 100% membrane-treated water adjusted with calcium hydroxide. The metal coupons used in the testing will be composed of brass and copper with lead solder, to represent leaded materials found in distribution

systems. Each type of metal coupon will be evaluated in triplicate to ensure the reliability and reproducibility of the results. The evaluations will be conducted in conjunction with a membrane pilot system, which will provide treated water for the testing. The testing and evaluations will continue for a duration of up to 6 months, providing sufficient data to draw meaningful conclusions about the impact of treatment change on the lead-containing distribution system materials.

1.5 - Copper Pitting Corrosion Testing

HAZEN will develop a low-maintenance, largely recirculating/flow through copper pipe loop study designed to evaluate copper pitting corrosion.

HAZEN will design and construct the pipe loops using new copper piping, with the objective of assessing the propensity for copper pitting corrosion following the treatment change. Water quality monitoring will be minimal, with corrosion assessments based primarily on periodic internal inspections of the pipe surfaces rather than focused on copper levels in the water following stagnation.

Three recirculating pipe loops will be operated by HAZEN under the following conditions:

- Baseline (current) drinking water, including blend with lime softened water
- Membrane permeate with NaOH/CaCl₂ stabilization
- Membrane permeate with and CO₂/Ca(OH)₂ stabilization

Additionally, the impact orthophosphate (with and without Zn) at multiple doses will be considered in testing. Water for the membrane-based loops will be collected and stored from the membrane pilot system. The pipe loops will operate for up to ten months, with weekly water changes and water quality adjustments performed three times per week.

Periodically, HAZEN will conduct a detailed examination of the pipe samples to assess the extent and characteristics of pitting corrosion under each test condition.

1.6 - Corrosion Control Study Final Report

The final report will provide documentation of the study's findings, including data analysis, conclusions, and recommendations. This report will be used to size finished water stabilization chemicals and for long-term distribution system management.

KEY ASSUMPTIONS

Key assumptions concerning this scope are:

- CITY will provide access to all necessary facilities for execution of the work.

- CITY will provide location for construction of pipe loops.
- CITY will provide membrane permeate for testing purposes.
- CITY will provide operator assistance as needed to complete the work.
- City will provide assistance with harvesting of pipe samples

SCHEDULE OF COMPLETION

The Schedule for the major work tasks is summarized below

Task	Description	Duration for task/subtask (days)	Calendar Days From Notice To Proceed
Phase 2B – Corrosion Control Study			
1	Optimal Corrosion Control Study	300	300

COMPENSATION

Compensation shall be made to CONSULTANT for a total amount not to exceed an upper limit of \$ 492,723 to be billed as summarized below.

Task	Description	Compensation Type	Estimated Fee
Phase 2B – Corrosion Control Study			
1	Optimal Corrosion Control Study	Not to Exceed	\$362,623
Direct Expenses			
	Laboratory Testing and Materials Costs	Reimbursables	\$130,000
	Reimbursables	Reimbursables	\$100
TOTAL			\$492,723



We look forward to your reply. In the meantime, should you have any questions, please contact us.

Sincerely,

A handwritten signature in blue ink, appearing to read "Janeen M. Wietgreffe".

Hazen AND SAWYER, P.C.

Janeen M. Wietgreffe, P.E., PMP
Vice President

c: File No. 4321-115

Attachments