

December 22, 2020

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
Wastewater Master Plan
City Project No. 20-1335

Dear Mr. Jiang:

As requested, Hazen and Sawyer, D.P.C. (Hazen) is pleased to offer engineering services for the development of a Wastewater Master Plan and an accompanying hydraulic model.

BACKGROUND

The City of Hollywood has the responsibility for planning, regulating, designing, constructing, operating and maintaining a wastewater collection system and a regional wastewater treatment system within the City's corporate limits. Additionally, the City must comply with regulatory programs at various levels (federal, state, county and local) and fulfill contractual obligations to its Large Users. Therefore, in an effort to most effectively fulfill its responsibilities, provide a high level of service to its residents and customers, promote quality surface waters, practice water conservation, accommodate growth and economic development, and protect public health, safety and the environment, the City has defined the need for a Wastewater Master Plan.

In accordance with the above, the scope of work outlined herein is presented to:

- Conduct a condition assessment of the Southern Regional Wastewater Treatment Plant (SRWWTP) and 85 sewer lift stations in the City's wastewater collection system
- Update and calibrate the City's wastewater model which includes all sewer manholes, gravity mains, force mains, and lift stations to provide a complete sewer system model
- Develop an up-to-date Wastewater Master Plan

SCOPE OF SERVICES

Task 1 – Project Kickoff, Data Collection and Compilation (Phases 1 and 2)

This task includes a project kickoff meeting for the purposes of providing introductions, establishing and understanding the project goals and objectives, and defining routes of communication, points of contact, and administrative procedures. Meeting minutes will be produced by Hazen following the meeting.

Also included in this task will be the gathering and review of existing information and identification of assets to be evaluated. Quality control of data analysis and technical review for this task will

be performed by Tobon Engineering, a registered County Business Enterprise and Small Business Enterprise. Data to be provided by the City for the work is as follows:

- Geographic Information System (GIS) data for the City's existing wastewater customers, wastewater collection system gravity and pressure mains, and lift stations for the SRWWTP service area
- Historical (most recent 5 years, if possible) customer-level water consumption data (GIS located) for both sewered and unsewered customers
- Maintenance records for all pertinent facilities
- Large User flow rates and volume billing records
- Lift station drawings and pumping unit flow curves and nameplate information if available from the City. H&S shall collect data based on condition assessment field trips.
- SRWWTP MOR/DMR records (Excel) for the last 10-year period

Task 2 – Flow and Load Forecasts (Phases 1 and 2)

Seasonal and non-seasonal current and future customer flows are needed to determine infrastructure and capacity needs throughout the study period. Given that the City is entertaining sewer expansion to serve all customers Hazen will use residential and commercial water demands as documented in the latest Water Supply Plan. Wastewater flow rate and load projections for the treatment plant service area are necessary to determine future capacity and infrastructure needs. In addition, flow rate projections for individual sewer collection basins and Large Users are needed to define the required future pump station and/or pipeline capacities. Large User wastewater flow forecasts will be provided by the City for the 5-year (2025), 10-year (2030) and 20-year (2040) projections and assumed to be input at existing tie-in points. Quality control of data analysis and technical review for this task will be performed by Tobon Engineering, a registered County Business Enterprise and Small Business Enterprise. Based upon the flow information, the Large User forecasts, and historical WWTP flows and loadings, Hazen shall perform the following subtasks:

- Convert water demand forecasts into wastewater flow rates, delineate according to existing collection system service areas, and combine with Large User forecasts to prepare aggregated wastewater flow rate forecasts for the entire wastewater service area for the future 5-year (2025), 10-year (2030) and 20-year period (2040).
- Summarize historical WWTP flow rates and process loadings (BOD & TSS), covering the most recent 10-year period of record.
- Forecast wastewater BOD and TSS loadings to the WWTP for the years 2025, 2030 and 2040 for determination of treatment capacity.
- Estimate flow components including base wastewater flow rates, and infiltration and inflow (I/I).
- Generate a system-wide wastewater flow peaking factor from the historical flow data.

Task 3 – Wastewater Treatment Plant and Lift Station Condition Assessment (Phase 1)

Hazen shall assess the condition of the City's SRWWTP and 85 Lift Stations and sewer pipe network. An estimate of the effective useful life will be made based on available asset information and visual inspection. Hazen will also perform an evaluation and hydraulic analysis of the City's

sewer collection and transmission system. Condition assessment of the sewer pipe network will be made based on the existing GIS database utilizing date of installation and material of construction. Asset data will be verified as a part of the field visits and updated in the asset registry. Hazen will perform a visual condition assessment. Visual inspections will include mechanical, structural, electrical and instrumentation inspections. The goal of the condition assessment is to identify the current state of assets and provide information for an estimate of their expected useful lives and likelihood of failure scores. The hydraulic analysis will be performed using the City's current hydraulic model. Quality control of data analysis and technical review for this task will be performed by Tobon Engineering, a registered County Business Enterprise and Small Business Enterprise.

Hazen shall evaluate the capacity and general condition of the SRWWTP. Additions and improvements necessary to meet treatment requirements for future flows and loadings will be investigated and the following included:

- Provide an overview of the SRWWTP history and treatment process.
- Summarize existing SRWWTP discharge permit conditions.
- Summarize the existing SRWWTP facility hydraulic and/or treatment capacities of each unit process.
- Identify limitations and/or deficiencies of each unit process.
- Review existing available data and/or studies and meet with City staff to receive input and assess the general condition of each unit process facility, including maintenance requirements and any known deficiencies (for the purposes of this task, unit processes are defined as headworks, influent pump station, oxygenation tanks, oxygen generation plant, secondary clarifiers, RAS system, WAS system, chlorination system, odor control system, sludge stabilization system, effluent disposal system, and north and south electric service centers). Identify major equipment and facilities that may need replacement within the 20-year planning period.
- Assemble a team of engineers with expertise in structural, electrical, instrumentation, mechanical and process engineering to meet with City operations and maintenance personnel and conduct a condition assessment of each unit process and all key equipment listed in the previous item (based upon visual observations and in concert with City maintenance personnel).
- Evaluate and define the need for and extent of the improvements, upgrade or expansion of each unit process in order to accommodate projected flow rates/loadings.
- Determine capacities of effluent and residuals disposal facilities required for the projected flow rates and define the need for and extent of upgrade and expansion of these facilities.

Hazen will evaluate the general condition of the City's 85 lift stations and populate a condition assessment form with all assessment activities. Condition assessment criteria categories and ratings to be used will be defined by others. Additionally, condition assessment of the Large User meters, conducted by others, will be incorporated into the Wastewater Master Plan.

Hazen shall estimate useful life based upon a simple straight-line degradation (straight-line degradation from 'new' to 'replace' over the published or typical asset lifespan). Hazen will consolidate and review historical replacement cost data, our local knowledge of replacement cost, databases such as RS Means, and City databases with costs from similar projects to estimate the replacement cost in current dollars for each asset. For a lift station, cost is based on pump size, lift station configuration, and layout. Work planned on the lift stations and extraordinary conditions that have extended or shortened an asset's life will be included to the extent possible.

An evaluation of a parallel force main to the existing Taft Street force main will be conducted to improve future reliability of the City sewer collection system. The conceptual analysis and recommendations will be documented in a Technical Memorandum and reviewed with the City in a workshop.

Task 4 – System Vulnerability and Criticality Assessment (Phase 2)

In addition to the capacity and general condition assessment of the City's SRWWTP, 85 lift stations, and collection system, mitigation of impacts due to sea level rise and storm surge during the CIP planning horizon may be necessary. This task expands on the work performed by Hazen (2020 *Citywide Vulnerability and Adaptation Plan*), including the identification of critical assets, components, and topographical information. This analysis of asset components will include inundation risk, potential mitigation concept development and evaluation, and cost estimation to be incorporated into the Wastewater Master Plan. A phased approach and timeline including proposed projects, project schedule and cost estimates will be established for the duration of the planning period based on critical projections. Sea Level Rise projections will be based on the 2019 update of the *Unified Sea Level Rise Projection, Southeast Florida* as prepared by the Southeast Florida Regional Climate Change Compact's Sea Level Rise Ad Hoc Work Group. Storm surge estimates shall be based on Category 3 events using standard data sets (e.g., NOAA, USACE, USGS, etc.). This task shall include the development of limited design standards for affected existing infrastructure (e.g., gravity collectors, self-sealing doors, conduit penetrations, etc.) requiring rehabilitation/replacement and new construction projects (e.g., minimum floor and electrical panel elevation, etc.). Master plan update frequency based on the rate of projected climate change will be recommended. Additionally, a preliminary business intelligence (BI) reporting database will be developed and presented in a dashboard for possible use by City staff to determine if future planning and tracking efforts may be enhanced.

Task 5 – Capital Improvements Program (Phase 2)

This task consists of the development of a capital project prioritization framework to enable the City to identify, plan, and prioritize the R&R of Wastewater Treatment Plant facilities and Wastewater Pump Station assets, sewer gravity piping and manholes, sewer force main system, reuse distribution system with the highest risk of failure based on effective useful life, condition age, capacity analysis, available condition assessment report or record by others, and consequence of failure assessments. Based on the results of the prior tasks and input from the City, Hazen shall develop recommendations for major wastewater collection, transmission, reuse distribution and secondary effluent piping from Davie and Cooper City, treatment, and disposal

improvements. An estimated time schedule for implementation of the identified wastewater improvements throughout the planning period including present planning-level cost estimates will be developed. A preliminary Quality control of planning and technical review for this task will be performed by Tobon Engineering, a registered County Business Enterprise and Small Business Enterprise.

Task 6 – Wastewater Master Plan Submittals and Progress Meetings (Phases 1 and 2)

Hazen shall provide a Wastewater Master Plan submittal representing the 90% level of completion and attend progress meetings wherein updates will be provided via brief written and/or verbal summaries. The incorporation of comments received at the 90% level will constitute the final submittal (100%). A total of ten (10) meetings are anticipated. Hazen shall prepare meeting minutes comprised of issues discussed relevant to the Wastewater Master Plan.

Task 7 – Wastewater Master Plan Administration, Coordination and Report Preparation (Phases 1 and 2)

Hazen shall prepare and provide 10 copies of all Wastewater Master Plan submittals for review by the City. It is assumed that the final report will be provided in pdf (portable document format) and 3-ring binder format (10 copies). Quality control of technical review for this task will be performed by Tobon Engineering, a registered County Business Enterprise and Small Business Enterprise.

Task 8 – City Commission Workshop Assistance (Phase 2)

Hazen shall assist City staff in a workshop with the City Commission by preparing visuals for the Wastewater Master Plan and attending the workshop to answer questions.

Task 9 – Wastewater Collection System Hydraulic Modeling (Phases 1 and 2)

Using Infoworks ICM, Hazen will update the City's existing wastewater system model based on the current GIS records (baseline system). This effort will also include all gravity piping, manholes, lift stations with actual wet well size and pump curves, development of base flows with reference to average daily flows and peak flows. This baseline system model will be used for model calibration and will include the existing infrastructure. Once updated, flow monitoring and rainfall data will be collected followed by model calibration.

The baseline sewer flow contribution from each of the meter sewersheds will be determined to spatially characterize sewer flow and quantify collection system capacity. A monitoring plan will be developed for each sewershed for effective and efficient placement of metering instruments. Flow meters and rain gauges will be installed within the system to monitor data over an extended period. In addition, pressure data loggers will be installed at key pump stations and force mains. System field monitoring services will be performed by a combination of Hazen staff and specialty field units such as ADS. Based on the size and extent of the Hollywood sewer system, field instrumentation needs sufficient for adequate calibration is estimated to include up to 25 flow

meters for gravity lines, 20 pressure data loggers for force mains, and 2 rain gauges over a 3-month monitoring period.

Hydraulic model calibration efforts will include both dry and wet weather calibration and the flow monitoring data will be analyzed for both accuracy and completeness prior to identifying input parameters for the model. The model input dry weather volumes will be based on the flow monitoring results and include the sanitary wastewater component and the groundwater infiltration component. To improve the accuracy of predicted wet-weather planning conditions, the model will be calibrated to a continuous time series by comparing the modeled flow to the metered field observations under both dry weather and wet weather conditions.

The calibration criteria for both dry and wet weather conditions is shown in the table below. The calibration criteria are based in part on the standards outlined in the Wastewater Planning Users Group Code of Practice for the Hydraulic Modelling of Sewer Systems (WaPUG) (Version 3.001, Amended December 2002).

Sewer System Hydraulic Model Calibration Criteria

Hydraulic Characteristics	Criteria*
<i>Dry Weather Calibration Criteria</i>	
Flow Rate	-10% to 10% of measured or $\leq \pm 0.1$ MGD
Flow Volume	-10% to 10% of measured or $\leq \pm 0.1$ MG
Depth (Avg, Max, Min)	-15% to 15% of measured
Shape	Modeled and metered curves should be similar for flow and depth.
Timing	Peaks, troughs, and recessions of modeled and metered curves should be similar for flow and depth.
<i>Wet Weather Calibration Criteria</i>	
Flow Rate	-15% to 25% of measured or $\leq \pm 0.1$ MGD
Flow Volume	-15% to 25% of measured or $\leq \pm 0.1$ MG
Depth (Avg, Max, Min)	-15% to 15% of measured
Shape	Modeled and metered curves should be similar for flow and depth.
Timing	Peaks, troughs, and recessions of modeled and metered curves should be similar for flow and depth.
Flooding	Corroborated using City data and other historical records.

**In compliance with Wastewater Planning Users Group Code of Practice for the Hydraulic Modelling of Sewer Systems (WaPUG), Version 3.001, Amended December 2002.*

The shape of the modeled and metered curves and the timing of the peaks, troughs, and recessions of the modeled and metered curves will be compared to confirm satisfaction of the calibration criteria. Any needed system improvements to prevent surcharge will be noted and accompanied by planning-level costs.

While approximately 55% of the City is currently served by the wastewater collection system, the City intends to expand the collection system to the unsewered areas. Using customer water consumption records and existing defined “unsewered basins”, Hazen will estimate sewer

volumes and include the impact of a sewer expansion to the collection system model. Flow inputs will be assumed at existing system trunk lines. Preliminary collection system layouts for unsewered basins is not envisioned.

A total of four (4) meetings with pertinent City staff are envisioned specific to the hydraulic modeling effort to discuss results. City assistance will be needed to obtain access to pertinent facilities, particularly for the coordination, deployment and retrieval of monitoring equipment. Upon completion, a separate Technical Memorandum summarizing the modeling, calibration and sewer expansion efforts and results will be submitted and a 2-day workshop for model training will be provided for the calibrated model. Budget allocation for this task per phase is estimated as follows:

Task 9 – WWCS Hydraulic Modeling

Subtask	Phase 1	Phase 2
9.1 Model Update	\$418,057	\$0
9.2 Model Calibration and Verification	\$434,320	\$0
9.3 Model Scenarios	\$0	\$129,138
9.4 Sewer Expansion Modeling	\$0	\$173,618
9.5 Meetings	\$10,041	\$10,041
9.6 Summary Report	\$0	\$32,285
Monitoring and Calibration Services	\$150,000	\$150,000
Subtotal	\$1,012,418	\$495,082

Task 10 – Regulatory Considerations Allowance (Phase 2)

Although the outlook for NPDES permit requirements beyond the year 2020 cannot be accurately determined at this time, additional utility requirements can be reasonably assessed as possibilities. In developing the Wastewater Master Plan, Hazen may be requested to consider the impact of recent or proposed regulatory requirements as authorized by the City including the Clean Waterways Act and other regulatory trends. At the City’s sole discretion, including ocean outfall change reuse compliance, might be conducted by others and incorporated into the Wastewater Master Plan. City input will be obtained to confirm/define scenarios of most concern which will be evaluated under this task.

KEY ASSUMPTIONS

Key assumptions concerning this scope are:

- No site visits to any Large User facilities or meetings/correspondence or any other form of communication directly with Large Users is included.
- Alternative biosolids treatment technologies will not be addressed.

- It is assumed that the City will maintain the current biosolids process to be marketed as a fertilizer. Future biosolids regulatory changes as well as different treated biosolids fate and/or marketability will not be addressed.
- Postulation of regulatory actions resulting in the need for additional reuse facilities will be limited to wastewater-related issues only.
- City shall provide access to plans and data (electronic format), both public and private, that City has record of and provide copies of requested information/documents at no charge.
- This scope does not include any permitting services or negotiations with other agencies, jurisdictions, or parties relative to specific projects. Meetings with these parties may occur relative to general matters and/or conceptual solutions.
- This scope does not cover implementation of any specific project/program including design, permitting, bidding, construction services, etc.
- No preliminary design of sewers for unsewered area is included.
- Data from Large User owned and operated collection system will be incorporated into the model as input data points (ie forced flow nodes). The capacity of the Large User system will not be defined as part of this project.
- Model calibration for gravity scenarios involving the existing customer base will be adjusted with the diurnal pattern and compared with data collected from the gravity flow monitoring effort.
- Model calibration for transmission scenarios involving the existing pump stations will be adjusted with the diurnal pattern and compared with data collected during the gravity flow and transmission pressure monitoring effort.
- No hydraulic model of the SRWWTP is included.
- City will provide access to all necessary facilities for execution of the work. This includes but is not limited to exposing manholes and/or clearing easements for truck/van access.
- Surveying services and underground utility locates are not envisioned.
- The most recent Storm Surge Data, Sea Level Rise projections and LiDAR information available will be used for impacts due to climate change.
- Preliminary construction cost estimate shall be unitized based on local, similar projects and quotes from contractors in accordance with AACE 56R-08 Estimate Class 5. The expected accuracy range is -30% to +50%. All costs will be provided in current dollars.

COMPENSATION

The completion of tasks has been phased in accordance with the City's budget. For the engineering services performed under Tasks 1 through 9 of this Authorization, City agrees to pay a Lump Sum fee of \$1,490,619 for Phase 1 services and a Lump Sum fee of \$1,757,830 for Phase 2 including other direct costs and subconsultants. A Not-to-Exceed allowance of \$47,028 is provided for compensation of Task 10 – Regulatory Considerations which will be based on City input and will be at the City's sole discretion. The total value of this work order is \$3,295,477.

SCHEDULE

Engineering services will be completed within 24 months from Notice-to-Proceed. Services with respect to Phase 1 will be completed in months 1-12. Engineering services with respect to Phase 2 will be completed in months 13-24.

Engineering services for the project will be performed as part of our Professional Services Agreement for Wastewater Master Plan (Agreement) dated March 2020. Services provided by Hazen and Sawyer, D.P.C. shall be limited to those services specifically identified in this work order.

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

Very truly yours,

Hazen AND SAWYER, P.C.



J. Philip Cooke, P.E.
Senior Associate

c: File No. 4321-016/1.0

Attachment

**CITY OF HOLLYWOOD
SOUTHERN REGIONAL WASTEWATER COLLECTION AND TREATMENT SYSTEM
WASTEWATER MASTER PLAN
Fee Breakdown**

	Labor Hours											
<u>Tasks</u>	<u>Senior Officer</u>	<u>Senior Associate</u>	<u>Associate</u>	<u>Senior Principal Engineer</u>	<u>Principal Engineer</u>	<u>Engineer</u>	<u>Senior Designer</u>	<u>Principal Designer</u>	<u>Senior Drafter</u>	<u>Admin Assistant</u>	<u>Subtotal</u>	<u>Fee</u>
PHASE 1 LABOR												
Task 1 - Project Kickoff, Data Collection & Compilatio	2	4	4	8	24	16	2	4	8	2	74	\$ 11,669
Task 2 - Flow and Load Forecasts	0	0	0	0	0	0	0	0	0	0	0	\$ -
Task 3 - WWTP and LS Condition Assessment	20	140	186	236	746	792	0	0	0	42	2162	\$ 349,303
Task 4 - System Vulnerability and Criticality Assessm	0	0	0	0	0	0	0	0	0	0	0	\$ -
Task 5 - Capital Improvements Program	0	0	0	0	0	0	0	0	0	0	0	\$ -
Task 6 - WWMP Progress Meetings and Submittals	1	2	2	4	16	16	0	0	0	2	43	\$ 6,730
Task 7 - WWMP Administration and Preparation	8	32	40	60	200	200	16	40	60	48	704	\$ 105,499
Task 8 - City Commission Workshop Assistance	0	0	0	0	0	0	0	0	0	0	0	\$ -
Task 9 - WWCS Hydraulic Modeling	56	242	326	484	1534	1980	366	190	342	150	5670	\$ 862,418
Task 10 - Regulatory Considerations Allowance	0	0	0	0	0	0	0	0	0	0	0	\$ -
Subtotal	9	34	42	64	216	216	16	40	60	50	8,653	\$ 1,335,619
PHASE 2 LABOR												
Task 1 - Project Kickoff, Data Collection & Compilatio	1	2	4	5	21	38	2	4	6	2	85	\$ 12,346
Task 2 - Flow and Load Forecasts	2	13	16	26	90	112	6	16	29	10	320	\$ 47,629
Task 3 - WWTP and LS Condition Assessment	4	28	30	52	134	144	0	0	0	6	398	\$ 64,723
Task 4 - System Vulnerability and Criticality Assessm	12	96	132	192	468	660	288	0	0	36	1884	\$ 296,907
Task 5 - Capital Improvements Program	17	88	121	176	465	637	231	16	29	40	1820	\$ 284,380
Task 6 - WWMP Progress Meetings and Submittals	1	9	12	15	32	46	0	0	0	2	117	\$ 19,044
Task 7 - WWMP Administration and Preparation	31	122	153	244	854	1068	61	153	275	92	3053	\$ 455,847
Task 8 - City Commission Workshop Assistance	2	8	11	0	24	56	0	56	0	3	160	\$ 24,372
Task 9 - WWCS Hydraulic Modeling	21	125	187	230	595	795	165	0	0	42	2160	\$ 345,082
Task 10 - Regulatory Considerations Allowance	3	12	16	24	90	108	6	16	30	12	317	\$ 47,028
Subtotal	54	239	313	459	1,465	1,915	298	241	334	149	10,314	\$ 1,597,358
DIRECT EXPENSES - PHASE 1												
Subconsultant (Tobon Engineering)												\$ 5,000
Sewer System Monitoring and Calibration Services												\$ 150,000
DIRECT EXPENSES - PHASE 2												
Subconsultant (Tobon Engineering)												\$ 55,000
Sewer System Monitoring and Calibration Services												\$ 150,000
Out-of-pocket												\$ 2,500
Subtotal												\$ 362,500
Total												\$ 3,295,477
Maximum Hourly Labor Rate	274.12	261.80	212.52	181.72	166.32	123.20	151.84	147.84	95.48	73.92		