

Mr. Clece Aurelus, PE  
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City of Hollywood – Public Utilities  
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Subject:  
Membrane Softening (MS) Train “C” Replacement  
Project No: 20-4238

WATER

Dear Mr. Aurelus:

Date:  
August 21, 2020

Arcadis U.S., Inc. (Arcadis) is pleased to submit this Work Order proposal to complete preliminary and final design and provide permitting and bidding support services for the replacement of Train “C” of the Membrane Softening system at the City of Hollywood’s (City) Water Treatment Plant (WTP).

Contact:  
Tung Nguyen, PE, PMP

This Work Order proposal covers services outlined in Article 2.2 (Pre-Design) and 2.3 (Engineering Design Phase) of the Professional Services Agreement (PSA) (Number 17-1324) executed by and between the City and Arcadis on November 11, 2017. The Terms and Conditions of the PSA shall apply to this Work Order.

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Our ref:  
1040279

## BACKGROUND

### Florida License Numbers

The City currently operates seven membrane softening (MS) trains that soften Biscayne aquifer water using nanofiltration (NF) membrane elements. Each membrane array consists of a 32:16:6 3-stage array, designed to produce two million gallons per day (MGD) of permeate while operating at 90% recovery. Due to the age and performance of the system, the City has a critical need to replace the MS system to improve system reliability and to meet treatment objectives. At this time, the City is considering the removal of the existing arrays and replacement with new, 2-stage arrays. Initially, MS Train C will be removed and replaced with a new 2-stage system. The remaining trains (MS Trains A through G) will be replaced under future projects.

Engineering  
7917

Geology  
GB564

Surveying  
LB7062

## SCOPE OF WORK SUMMARY

At the City's request, Arcadis shall furnish professional engineering services for the project management, preliminary design, final design, permitting, and bidding phase services for the following:

- Train C – Removal of the existing 3-stage array and replacement with a new 2-stage array with a permeate capacity of 2.0 MGD
- New Booster Pump with variable frequency drive (VFD) for the MS skid
- New Sample Stations and instrumentation
- Associated electrical and instrumentation for new equipment
- Connection of the MS array to the existing feed, permeate, and concentrate headers including valves.
- Connection of the MS array to the existing clean in place (CIP) headers including valves.

The scope assumes that the existing chemical feed and storage equipment, degasifier, transfer pump, MS Train A through G, and concentrate management system will remain in service.

## DESIGN PHASE SERVICES

### Task 1 PM, Kick-off Meeting; Data Collection & Review

Arcadis shall provide for the coordination and management of the various tasks associated with fulfillment of the work. Project management effort includes Arcadis staffing, subconsultant coordination and oversight, budget and schedule management. The services to be provided under this task shall cover all phases of this project including preliminary activities, design, permitting, and bidding services. Arcadis shall schedule and facilitate monthly progress calls with the City. Arcadis shall issue monthly invoices in accordance with the terms of the PSA for the duration of the project.

To develop the Basis of Design Report (BODR), it will be necessary to review and evaluate important system historical operational information. To facilitate the collection of supplemental information not readily available to Arcadis from previous efforts, Arcadis shall prepare and submit a list of requested information to the City. This information includes:

- Any previous Engineering Evaluation Report(s) by other consultants
- Previous design reports
- List of WTP and wellfield operational issues
- Record drawings of the treatment plant and well field (digital CADD drawings or GIS shapefiles would be preferred)
- Historical well field water quality data
- MS system operating trend data
- Composition of pre-treatment chemicals
- Monthly operating reports for 2017 through current
- Status of equipment on site

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- Membrane operation and maintenance (O&M) manuals and/or a description of process control
- Cleaning system/procedure and other pertinent information about the system

Arcadis design engineers including sub-consultant shall conduct one (1) site visit to the WTP to observe existing conditions and meet with Plant Operations Staff.

*Deliverable(s): Request for Information*

## **Task 2 Basis of Design Report**

Arcadis shall prepare a BODR to document the design requirements and preliminary design for the MS train's replacement. The BODR will include concept level arrangement drawings, preliminary motor control center (MCC) one-line diagrams, control strategy, a description of control system modifications and a Class 4 engineer's opinion of probable construction cost. The BODR will include a table of contents for anticipated technical specifications for the project and a list of proposed manufacturers and materials. Arcadis shall submit five (5) draft copies of the BODR for City's review and comments. Arcadis shall meet with the City staff to review comments. Pertinent comments will be incorporated into the report before submission of five (5) copies of the final report. It is assumed that the City will provide comments on the draft BODR within 10 business days.

BODR will address the following:

### **2.1. Evaluation of Candidate Membranes**

Arcadis shall contact membrane elements vendors (e.g. Dupont, Hydranautics, LG Chem, Toray) to develop a list of candidate membranes. Options will be evaluated based upon a number of factors including their historical performance at other facilities, fouling potential, ability to provide the required water quality, and specific energy requirements. A shortlist of recommended elements will be developed to be used as the basis of design for the full-scale arrays. Arcadis shall utilize software (provided by the membrane element manufacturers) such as IMS Design and WAVE to project membrane system performance and will utilize this data as a basis for the design of the membrane system.

### **2.2. Membrane Softening System**

Arcadis shall provide recommendations for replacement of the MS treatment system and establish the basis of design which will be used to finalize the design and construction documents. Arcadis shall make recommendations on specific design criteria including the preferred membrane element, design average flux, recovery rate, array configuration, instrumentation type and location, methodology for flux balancing (permeate back pressure vs. interstage boost pump) energy recovery, and materials of construction. Arcadis shall also work with anti-scalant vendors to solicit recommendations for an anti-scalant to optimize system operation, minimize the potential for fouling and scaling, eliminate the use of acid as a pretreatment chemical, minimize cleaning frequency, and increase membrane lifespan. Arcadis shall develop preliminary general arrangement drawings and process instrumentation diagrams (PIDs) that illustrate the basis of design. In addition, Arcadis shall size and select an appropriate booster pump based on the output developed from the performance projections.

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### **2.3. Electrical and Control Requirements**

Arcadis shall assess the electrical requirements for the expansion and shall also identify the control requirements and modifications to the existing system specifically related to the expansion. The replacement of the existing control system is not contemplated as part of the proposed design and will only be modified as needed to integrate the new equipment. Staging and integration of the new controls and maintaining the existing plant operations is a critical aspect of the design that will require thorough planning. Arcadis shall work closely with City staff to develop the optimal staging and the Maintenance of Plant Operations (MOPO) plan for the new controls and integrating it with their existing SCADA system.

*Deliverable(s): Draft Basis of Design Report, Final Basis of Design Report*

### **Task 3 Detailed Design**

Arcadis shall prepare design drawings and specifications for incorporation into the City's standard bidding documents. Drawings and technical specifications will use the Arcadis' standard technical specifications and conform to City standards. Drawings will be developed on 22"x34" sheets and in AutoCAD 2019 or later. Technical specifications will conform to the Construction Specifications Institute (CSI) 16 division format.

### **3.1 Process Mechanical**

This task includes the mechanical design for the project including contract drawings and technical specifications information for the proposed improvements. The design includes provisions for the full replacement of Train A including all membrane elements, pressure vessels, interconnecting piping and valves, flow meters and instrumentation, sample piping and associated sample collection systems, and the membrane feed pump. The preferred system will be a 2-stage system with a permeate production of 2 MGD, new feed pumps, and VFD motors. New sampling stations and new flow meters and instrumentation will be included; however, the existing cleaning system will remain.

### **3.2 Electrical**

This task includes the electrical design for the project including contract drawings and technical specifications for the proposed improvements. The task assumes that the main electrical feed to the facility is sized appropriately for the replacement MS skid and feed pumps, and no modifications to the availability of standby power is required.

### **3.3 Instrumentation and Control**

This task includes the instrumentation and control (I&C) design for the project including contract drawings and technical specifications for the proposed improvements. New instrumentation will be provided within the replacement limits of the new Train A equipment process including new feed pumps and the new sampling stations.

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### 3.4 Structural

This task includes the structural design for the project including contract drawings and technical specifications for the proposed improvements. This task assumes that the existing structure and main support pedestals are adequate for the new replacement Train A equipment. The structural design is limited to confirming adequacy of the existing main support pedestals and providing for design of new supports, hangers, grates, and other structural elements needed to install and connect the new ancillary equipment for Train A.

### 3.5 75% Design Documents

Arcadis shall prepare and submit to the City 75% design documents. The 75% submittal shall include the following:

1. Five (5), hardcopy sets of Technical Specifications for Divisions 01000 through 16000.
2. Five (5), half-size (11x17) sets of drawings for General, Civil, Mechanical, Structural and, Instrumentation and Electrical design.
3. Recommended equipment listing by manufacturer.
4. Preliminary Outage / Tie-in Plan (Shutdown and Sequence of Construction Plan).
5. Updated Engineer's Opinion of Probable Construction Cost estimate (AACE Class 2).

Arcadis shall coordinate a remote 75% design review meeting with the City using Microsoft Teams. Meeting agenda and minutes will be provided.

It is assumed that the City will provide review comments within 10 days from receipt of submittal. Arcadis shall respond in writing to all review comments made by the City, within ten (10) days of their receipt, and will incorporate appropriate design adjustments resulting from the review exchange into the project in the next scheduled submittal.

*Deliverable(s):* Task 3.5 Items 1-5, Review Meeting agenda and meeting minutes, Written responses to comments

### 3.6 100% Design Documents

Arcadis shall prepare and submit to the City 100% design documents incorporating the design concepts agreed upon as a result of the 75% design review meeting with the City. The 100% submittal shall include the following:

1. Five (5), hardcopy sets of Technical Specifications for Divisions 01000 through 16000.
2. Five (5), half-size (11x17) sets of drawings for General, Civil, Mechanical, Structural and, Instrumentation and Electrical design.
3. Final outage and tie-in plans (Shutdown and Sequence of Construction Plan) for piping, electrical, instrumentation and control systems. The time limit for outages and/or bypasses will be identified and coordinated with the Plant Operations Staff.
4. Updated Engineer's Opinion of Probable Construction Cost estimate (AACE Class 2).
5. Milestone Schedule to support the City's priorities for construction of the project.

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It is assumed that the City will provide review comments within 10 days from receipt of submittal. Following receipt of comments, Arcadis shall schedule a final design review meeting with the City to review final responses and complete 100% design comments. Arcadis shall incorporate appropriate design adjustments resulting from the review with City staff and prepare the Final Bid Documents.

*Deliverable(s): Task 3.6 Items 1-5, Review Meeting agenda and meeting minutes, Written responses to comments*

#### **Task 4 Final Bid Documents**

Arcadis shall prepare final bid documents that the City can use for the bid process. These documents shall be used to obtain competitive bids for the construction of this project. The submittal shall include the following:

1. Five (5), hardcopy sets of Final (100%) specifications on standard 8-1/2" X 11" size paper
2. Five (5), hardcopy sets of Final (100%) drawings shall be supplied in full size (22x34)
3. Drawings and Specifications will be signed and sealed digitally in accordance with guidance from Florida Board of Professional Engineers (FBPE) and Section 471.025, F.S (Florida Statue) regarding engineering seals.
4. Updated Engineer's Opinion of Probable Construction Cost estimate (AACE Class 2).
5. Electronic specifications will be provided in a compiled PDF and Word 2019 or later on a CD/DVD.
6. Electronic copy of all drawings will be provided in compiled PDF and AutoCAD 2019 on a CD/DVD.

*Deliverable(s): Task 4 Items 1-6*

#### **Task 5 Permitting**

It is assumed Florida Department of Environmental Protection (FDEP), Broward County, and City of Hollywood Building Division permits are required for this project which will be prepared and submitted by Arcadis before submittal of Final Bid Document. Arcadis will communicate with FDEP, Broward County, and the City of Hollywood Building Division in response to questions. It is assumed that a maximum of one (1) Request for Additional Information will be responded by Arcadis in regard to each permit submittal.

Arcadis will provide copies of correspondence and/or technical data supplied to the agencies in support of the permits to the City. The City will pay fees for all permits. Arcadis will notify the City a minimum of ten (10) working days in advance of permit submittal to allow the preparation of payment of the application fee.

*Deliverable(s): FDEP Application for a Specific Permit to Construct PWS Components, City of Hollywood Building Division Permit Submittal, Broward County Environmental*

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### **Task 6 Bid Support**

Arcadis shall provide bidding support services to the City for the project. Bidding phase services shall include the following:

1. Pre-Bid Meeting: Arcadis shall attend and participate in a Pre-Bid Meeting to provide background information on the project. Arcadis shall prepare the agenda for and shall direct the meeting.
2. Respond to Bidder Requests for Information (RFI): Arcadis shall respond to written Bidder RFIs during the bid period. The City will receive from the Contractors and send to Arcadis for review. Arcadis shall coordinate up to two (2) RFI response packages with the City for responses to the Contractors. Responses shall be provided by way of Addenda.
3. Review Bids: Arcadis shall assist the City in reviewing the qualifications of apparent lowest bidder and the responsiveness of the bid and shall make a recommendation for award to the City. This task is limited to four (4) hours and is intended to review information already compiled by the City.
4. Post Bid Award Services: Arcadis shall prepare the conformed contract documents and deliver them to the City. Bid Documents will be updated to reflect addenda issued during the advertisement, recompiled, and delivered electronically.

*Deliverable(s): Bidder RFIs Responses / Addenda, Conformed Documents*

### **Task 7 Pilot Testing**

Arcadis shall oversee a pilot test, to be performed concurrently with design development, in order to validate model outputs for membrane selection and to optimize the performance of the replacement system. The pilot study will also test operations and fouling control without the use of acid feed (current pretreatment regime consists of pH adjustment using sulfuric acid for carbonate scale control, anti-scalant injection to mitigate mineral scale formation, and cartridge filtration for suspended solids removal.) Two (2) candidate membranes will be tested.

The objectives of the pilot study are to:

- Evaluate NF membrane elements and select one that provides the required permeate water quality with the lowest possible energy input.
- Evaluate the operating characteristics of a 2-stage design and confirm full-scale design criteria.
- Evaluate alternative scale inhibitors (anti-scalant) that control scale formation without the use pH adjustment so that the continued use of sulfuric acid can be eliminated.

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The pilot study will consist of the following activities.

1. **Prepare Detailed Test Plan.** Arcadis shall develop a detailed test plan prior to conducting the pilot study. The contents of the test plan will include the following:
  - Summary of historical water quality for each of the sources feed to the MS system
  - Statement of objectives and conclusions from an evaluation of the raw water quality identifying critical source water wells and conditions to be evaluated during pilot study
  - Schematic drawings and detailed descriptions of the facilities to be used
  - Mode(s) of operation to be tested
  - Time schedules for each mode of operation, in relation to the critical source water wells to be evaluated
  - Sampling locations to be monitored
  - Parameters to be monitored at each sampling location
  - Frequency of monitoring for each parameter
  - Description of on-line and bench analytical equipment to be used for monitoring each parameter
  - Quality assurance and quality control procedures to be used
  - Description of analyses to be used for evaluating the data collected
2. **Procure and Setup Pilot Plant.** Pilot studies can be conducted using pilot-scale equipment or conducting the study by constructing a full-scale membrane array. Because it is impractical to construct a full-scale array for the demonstration study, the study will be conducted using pilot-scale equipment. Arcadis shall coordinate with manufactures/suppliers to procure the pilot plant and the necessary equipment and materials to facilitate the installation of the pilot plant. Materials and equipment include the pilot plant, influent and effluent piping and valves, chemicals, expendables (cartridge filters and membrane elements) and shelter. Once equipment and supplies are received, Arcadis field staff shall setup the pilot plant and conduct initial testing and startup. Arcadis intends to procure a 2-stage pilot system from Harn RO/NF Systems of Venice, FL (or similar), which is generally described below.

The pilot study NF system consists of two pretreatment chemical storage and injection systems, cartridge filtration, a low pressure boost pump, high pressure feed pump, pressure vessels, NF membrane elements, instrumentation, controls, and interstage booster pump. The pilot system has pressure vessels that contain seven (7) membrane elements per pressure vessel staged in a 2-1, 2-stage array to obtain 75% to 85% recovery without using concentrate recycle to increase the recovery. This design replicates the design of a full-size production system, using the same number of membrane elements per vessel and the same permeate flux per stage. The use of VFDs allows the pump speeds to be manually adjusted in order to achieve both first and second stage permeate flux design rates. The pilot system also has PID control loops to automatically control the speed of the reverse osmosis (RO) feed pump based on total permeate flow, and the speed of the interstage boost pump based on second stage permeate flow. The system includes comprehensive instrumentation

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necessary for the collection and automatic logging of data that will be used to evaluate system efficiency and performance, confirm full-scale design criteria, and establish accurate O&M costs.

The pilot plant requires an area of approximately twelve (12) feet long by five (5) feet wide and six (6) feet high. Also needed is an additional five (5) feet on each end of the skid for loading and unloading membrane elements. The system weighs approximately 3,000 lbs. and requires a shelter for protection from weather

The pilot plant requires a raw feed water supply with flows in the range of twenty (20) gallons per minute (GPM) and twenty-five (25) GPM at approximately forty (40) psi. The concentrate flow is approximately 5 GPM.

The pilot plant also requires a 3-phase electrical service, 60-amp service at 460 volt. The electrical control system is self-contained on the NF unit, and requires only power from the house service to the NF system electrical panel. The raw water feed and well flush connections are 2-inch FNPT, while permeate and concentrate connections are 1-inch. The concentrate water and well flush water can be disposed of in a sanitary sewer.

3. **Pilot Testing.** Arcadis shall operate the pilot plant continuously for a duration of three (3) months. Operating data will be continuously logged by the onboard data logging system and will be downloaded remotely through an included aircard. Arcadis shall visit the WTP up to two (2) times per week to collect SDI data, replenish chemical stock as needed, and perform routine checks on the equipment. Arcadis shall perform a membrane cleaning should cleaning be required. At the conclusion of the pilot study, Arcadis shall arrange to have an autopsy performed on a lead element from the first stage to check for fouling, and the tail element from the second stage to check for scale formation. The autopsy report will be provided to the City. Arcadis shall coordinate with the City to document which wells and wellfield are in service for each day of operation to determine the effects of various sources on the operation of the NF system. The pilot system will remain in continuous operation 24-hours per day, 7 days per week for the duration of the study.
4. **Data Collection.** The following is a preliminary list of data to be collected by Arcadis during the pilot study. The final list will be detailed in the pilot testing plan.
  - Water quality data
  - Feed pH
  - Feed ORP
  - Finished water pH
  - Feed conductivity
  - Interstage conductivity
  - Concentrate conductivity
  - 1<sup>st</sup> stage permeate conductivity
  - 2<sup>nd</sup> stage permeate conductivity

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- Total permeate conductivity
  - Feed temperature
  - 1<sup>st</sup> stage feed pressure (feed pressure)
  - 1<sup>st</sup> stage concentrate pressure
  - 2<sup>nd</sup> stage feed pressure
  - 2<sup>nd</sup> stage concentrate pressure (concentrate pressure)
  - Total permeate flow
  - 2<sup>nd</sup> stage permeate flow
  - Concentrate flow
  - Wells utilized
  - Scale inhibitor day tank level
  - Cartridge filter inlet pressure
  - Cartridge filter outlet pressure
5. **Pilot Test Report.** Arcadis shall prepare a draft report summarizing the data collected and results of the data analysis with the conclusions and recommendations clearly summarized. All analytical data will be summarized and presented in tabular and graphical format. The report will also include all other data collected during startup prior to the official demonstration period. Operating and water quality data for each pilot testing period will be presented. The draft report will be presented to the City for review and comment. Arcadis will revise the report, incorporating City comments.
6. **Decommissioning.** At the conclusion of the pilot study, Arcadis will dismantle and dispose of piping and valves connecting the pilot system to the raw water source and the water discharge location. Arcadis will prepare the pilot system for return shipping to the vendor and will organize pick up.
7. **Coordination with FDEP.** Arcadis shall coordinate with FDEP for review and approval of the testing plan, review and approval of the pilot testing results, and preliminary design criteria. It is anticipated that a maximum of two conference call(s) will be held with FDEP and comments will be responded through email correspondence.
8. **City Support and Responsibilities.** The City will be responsible for the following with respect to the installation and operation of the pilot plant.
- Provide historical raw water quality for each of the production wells in use during piloting.
  - Provision of a suitable space for the installation of the pilot plant. The open area between MS Chemical Tanks and Blend Tank has been selected as the desired location.
  - Provide personnel and forklift(s) to load and unload the pilot plant from enclosed trailer during delivery and pick-up.
  - Provide a suitable power supply and will install the necessary electrical equipment to provide power to the pilot plant, including but not limited to the connection to the power source,

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disconnect switch, and power cabling. The electrical requirements include 480V, 3-phase, 60-amp power service.

- Provide a tap into the raw water source upstream of chemical addition. Provide necessary tapping, fittings, and valves to facilitate connection of raw water supply to the pilot plant.
- Provide a suitable location for the discharge of permeate and concentrate from the RO pilot plant. Feed flow is estimated to be 30 GPM.
- Provide mechanical equipment, tools and personnel as needed to assist Arcadis staff in changing pilot membranes and other requested changes to the pilot plant. All special tools will be provided by the supplier.
- At the conclusion of the pilot study, dispose materials associated with the pilot installation in the City's existing solid waste collection bins located at the WTP.

**Deliverable(s):** *Pilot Test Report*

## **SCHEDULE**

Arcadis' services shall commence upon receipt of written authorization from the City, which will constitute Authorization to Proceed (ATP). Submittals will be made in accordance with requirements under Design Phase Services and in accordance with the project schedule provided below. Arcadis estimates that the proposed scope of services will be completed in approximately 66 weeks from receipt of the City's ATP: design and permitting efforts are estimated to be completed within 42 weeks from ATP and 24 weeks is reserved for the Bid Phase (actual bid duration for Bid Phase will depend on the City's procurement schedule).

The overall duration for the pilot testing task which includes initial evaluations, procurement, field testing (3 months), and post-field testing activities is scheduled for 26 weeks and will be performed concurrently and incorporated into the with the design task deliverables.

Arcadis shall prepare a project milestone schedule following Project Kickoff, which will be updated and reported on during the monthly progress meetings. Estimates for completion of key milestones are as provided in the following table.

| <b>Project Tasks</b>                                    | <b>Estimated Duration to Completion from ATP</b> |
|---------------------------------------------------------|--------------------------------------------------|
| Task 1 – PM, Kick-off Meeting; Data Collection & Review | 4 weeks                                          |
| Task 2 – Basis of Design Report (BODR)                  | 16 weeks                                         |
| Task 3.5 – 75% Design Documents                         | 28 weeks                                         |
| Task 3.6 – 100% Design Document                         | 38 weeks                                         |
| Task 4 – Final Bid Documents                            | 42 weeks                                         |
| Task 5 – Permitting (Start)                             | 36 weeks                                         |

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| Project Tasks          | Estimated Duration to Completion from ATP |
|------------------------|-------------------------------------------|
| Task 6 – Bid Support   | 66 weeks                                  |
| Task 7 – Pilot Testing | 26 weeks                                  |

Note: The preliminary project milestones are based on normal working schedules. Travel and schedule restrictions caused by national, state, and local government directives (e.g. Covid-19) may impact this schedule, as well as City procurement schedule).

## BUDGET AND INVOICING

The terms of compensation shall be in conformance with the Professional Services Agreement for General Engineering Consulting Services dated November 11, 2017 between the City and Arcadis U.S., Inc. The proposed lump sum fee for this project is \$396,039.00. A breakdown of this lump sum fee is enclosed as Attachment A. A monthly billing schedule will be developed and submitted for acceptance during project kick-off.

The task breakdown for the lump sum fee is as follows:

| Task                                                    | Fee                  |
|---------------------------------------------------------|----------------------|
| Task 1 – PM, Kick-off Meeting; Data Collection & Review | \$ 15,995.00         |
| Task 2 – Basis of Design Report (BODR)                  | \$ 39,900.00         |
| Task 3.5 – 75% Design Documents                         | \$ 54,386.00         |
| Task 3.6 – 100-% Design Documents                       | \$ 29,486.00         |
| Task 4 – Final Bid Documents                            | \$ 29,675.00         |
| Task 5 – Permitting                                     | \$ 13,050.00         |
| Task 6 – Bid Support                                    | \$ 17,340.00         |
| Task 7 – Pilot Testing                                  | \$ 196,207.00        |
| <b>Total</b>                                            | <b>\$ 396,039.00</b> |

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Mr. Clece Aurelus, PE  
City of Hollywood  
August 21, 2020

Arcadis is excited about this opportunity to assist the City developing the design and construction documents for upgrading the MS system at the City's WTP. We understand the importance of the MS system in treating the multiple sources at the WTP and have dedicated staff ready to deliver this project. Should you have any questions regarding this work order proposal, please do not hesitate to contact me via email ([tung.nguyen@arcadis.com](mailto:tung.nguyen@arcadis.com)) or telephone (954.246.0936).

Sincerely,

Arcadis U.S., Inc.



Tung Nguyen, PE, PMP  
Project Manager

Copies:

Wilhelmina Montero, PE, MS (City of Hollywood)  
Leah Richter (Arcadis)  
Plantation Files (Arcadis)

Enclosures:

Attachment A - Detailed Lump Sum Fee Breakdown

*This proposal and its contents shall not be duplicated, used or disclosed — in whole or in part — for any purpose other than to evaluate the proposal. This proposal is not intended to be binding or form the terms of a contract. The scope and price of this proposal will be superseded by the contract. If this proposal is accepted and a contract is awarded to Arcadis as a result of — or in connection with — the submission of this proposal, Arcadis and/or the client shall have the right to make appropriate revisions of its terms, including scope and price, for purposes of the contract. Further, client shall have the right to duplicate, use or disclose the data contained in this proposal only to the extent provided in the resulting contract.*

|          | Contract Labor Category                                 | Hours                     | Billing Rate (\$ / hr) | Cost         | Fee / Task               | Total Fee     |
|----------|---------------------------------------------------------|---------------------------|------------------------|--------------|--------------------------|---------------|
|          |                                                         |                           |                        |              |                          | \$ 396,039.00 |
|          |                                                         |                           |                        |              | Arcadis Labor \$         | 235,560.00    |
|          |                                                         |                           |                        |              | Subconsultant Costs \$   | 62,000.00     |
|          |                                                         |                           |                        |              | Other Direct Expenses \$ | 98,479.00     |
|          |                                                         |                           |                        |              | Contingency              |               |
| <b>1</b> | <b>Task 1 – Kick-off Meeting; Data Collection &amp;</b> |                           |                        |              | \$                       | 15,995.00     |
|          | <b>Labor Subtotal</b>                                   |                           |                        |              | \$                       | 9,740.00      |
|          | Frank Sidari III, PE                                    | Principal Engineer        | \$ 240.00              | \$ -         |                          |               |
|          | Housam Hobi, PE                                         | Principal Engineer        | \$ 240.00              | \$ -         |                          |               |
|          | Chris Matthews                                          | Technical Expert          | \$ 240.00              | \$ -         |                          |               |
|          | Michael Pillutti, PE                                    | Senior Project Engineer 6 | 8 \$ 180.00            | \$ 1,440.00  |                          |               |
|          | Tung Nguyen PE                                          | Project Manager           | 32 \$ 220.00           | \$ 7,040.00  |                          |               |
|          | Sean Chaparro, PE                                       | Senior Engineer           | \$ 200.00              | \$ -         |                          |               |
|          | Lia Dombroski                                           | Project Engineer 2        | \$ 130.00              | \$ -         |                          |               |
|          | Shantanu Dandane                                        | Project Engineer 2        | \$ 130.00              | \$ -         |                          |               |
|          | Andrea Guzman                                           | Chief Technician          | \$ 150.00              | \$ -         |                          |               |
|          | Danielle McKenna                                        | Senior Technician         | 4 \$ 115.00            | \$ 460.00    |                          |               |
|          | Mindy Mondesir                                          | Administrative 3          | 8 \$ 100.00            | \$ 800.00    |                          |               |
|          | <b>Subcontractor Labor Subtotal</b>                     |                           |                        |              | \$                       | 5,500.00      |
|          | McKim & Creed                                           | -                         | \$ -                   | \$ 5,500.00  |                          |               |
|          | <b>Other Direct Expenses</b>                            |                           |                        |              | \$                       | 755.00        |
|          | Travel                                                  | -                         | \$ -                   | \$ 611.00    |                          |               |
|          | Printing                                                | -                         |                        |              |                          |               |
|          | Miscellaneous Expenses                                  | -                         | \$ -                   | \$ 144.00    |                          |               |
| <b>2</b> | <b>Task 2 – Preliminary Engineering Report</b>          |                           |                        |              | \$                       | 39,900.00     |
|          | <b>Labor Subtotal</b>                                   |                           |                        |              | \$                       | 32,400.00     |
|          | Frank Sidari III, PE                                    | Principal Engineer        | 4 \$ 240.00            | \$ 960.00    |                          |               |
|          | Housam Hobi, PE                                         | Principal Engineer        | 6 \$ 240.00            | \$ 1,440.00  |                          |               |
|          | Chris Matthews                                          | Technical Expert          | \$ 240.00              | \$ -         |                          |               |
|          | Michael Pillutti, PE                                    | Senior Project Engineer 6 | 24 \$ 180.00           | \$ 4,320.00  |                          |               |
|          | Tung Nguyen PE                                          | Project Manager           | 6 \$ 220.00            | \$ 1,320.00  |                          |               |
|          | Sean Chaparro, PE                                       | Senior Engineer           | 28 \$ 200.00           | \$ 5,600.00  |                          |               |
|          | Lia Dombroski                                           | Project Engineer 2        | 44 \$ 130.00           | \$ 5,720.00  |                          |               |
|          | Shantanu Dandane                                        | Project Engineer 2        | 22 \$ 130.00           | \$ 2,860.00  |                          |               |
|          | Andrea Guzman                                           | Chief Technician          | 61 \$ 150.00           | \$ 9,150.00  |                          |               |
|          | Danielle McKenna                                        | Senior Technician         | 2 \$ 115.00            | \$ 230.00    |                          |               |
|          | Mindy Mondesir                                          | Administrative 3          | 8 \$ 100.00            | \$ 800.00    |                          |               |
|          | <b>Subcontractor Labor Subtotal</b>                     |                           |                        |              | \$                       | 7,500.00      |
|          | McKim & Creed                                           | -                         | \$ -                   | \$ 7,500.00  |                          |               |
|          | <b>Other Direct Expenses</b>                            |                           |                        |              | \$                       | -             |
|          | Travel                                                  | -                         | \$ -                   | \$ -         |                          |               |
|          | Printing                                                | -                         |                        | \$ -         |                          |               |
|          | Miscellaneous Expenses                                  | -                         | \$ -                   | \$ -         |                          |               |
| <b>3</b> | <b>Task 3 – 75% Design Submittal</b>                    |                           |                        |              | \$                       | 54,386.00     |
|          | <b>Labor Subtotal</b>                                   |                           |                        |              | \$                       | 38,770.00     |
|          | Frank Sidari III, PE                                    | Principal Engineer        | 4 \$ 240.00            | \$ 960.00    |                          |               |
|          | Housam Hobi, PE                                         | Principal Engineer        | 6 \$ 240.00            | \$ 1,440.00  |                          |               |
|          | Chris Matthews                                          | Technical Expert          | 16 \$ 240.00           | \$ 3,840.00  |                          |               |
|          | Michael Pillutti, PE                                    | Senior Project Engineer 6 | 14 \$ 180.00           | \$ 2,520.00  |                          |               |
|          | Tung Nguyen PE                                          | Project Manager           | 7 \$ 220.00            | \$ 1,540.00  |                          |               |
|          | Sean Chaparro, PE                                       | Senior Engineer           | 32 \$ 200.00           | \$ 6,400.00  |                          |               |
|          | Lia Dombroski                                           | Project Engineer 2        | 72 \$ 130.00           | \$ 9,360.00  |                          |               |
|          | Shantanu Dandane                                        | Project Engineer 2        | 36 \$ 130.00           | \$ 4,680.00  |                          |               |
|          | Andrea Guzman                                           | Chief Technician          | 48 \$ 150.00           | \$ 7,200.00  |                          |               |
|          | Danielle McKenna                                        | Senior Technician         | 2 \$ 115.00            | \$ 230.00    |                          |               |
|          | Mindy Mondesir                                          | Administrative 3          | 6 \$ 100.00            | \$ 600.00    |                          |               |
|          | <b>Subcontractor Labor Subtotal</b>                     |                           |                        |              | \$                       | 15,000.00     |
|          | McKim & Creed                                           | -                         | \$ -                   | \$ 17,500.00 |                          |               |
|          | <b>Other Direct Expenses</b>                            |                           |                        |              | \$                       | 616.00        |
|          | Travel                                                  | -                         | \$ -                   | \$ 116.00    |                          |               |
|          | Printing                                                | -                         |                        | \$ 500.00    |                          |               |
|          | Miscellaneous Expenses                                  | -                         | \$ -                   | \$ -         |                          |               |
| <b>4</b> | <b>Task 4 – 100% Design/Permitting Set</b>              |                           |                        |              | \$                       | 29,486.00     |
|          | <b>Labor Subtotal</b>                                   |                           |                        |              | \$                       | 17,370.00     |
|          | Frank Sidari III, PE                                    | Principal Engineer        | 2 \$ 240.00            | \$ 480.00    |                          |               |
|          | Housam Hobi, PE                                         | Principal Engineer        | 6 \$ 240.00            | \$ 1,440.00  |                          |               |
|          | Chris Matthews                                          | Technical Expert          | 4 \$ 240.00            | \$ 960.00    |                          |               |
|          | Michael Pillutti, PE                                    | Senior Project Engineer 6 | 12 \$ 180.00           | \$ 2,160.00  |                          |               |
|          | Tung Nguyen PE                                          | Project Manager           | 7 \$ 220.00            | \$ 1,540.00  |                          |               |
|          | Sean Chaparro, PE                                       | Senior Engineer           | 4 \$ 200.00            | \$ 800.00    |                          |               |
|          | Lia Dombroski                                           | Project Engineer 2        | 8 \$ 130.00            | \$ 1,040.00  |                          |               |
|          | Shantanu Dandane                                        | Project Engineer 2        | 24 \$ 130.00           | \$ 3,120.00  |                          |               |
|          | Andrea Guzman                                           | Chief Technician          | 32 \$ 150.00           | \$ 4,800.00  |                          |               |
|          | Danielle McKenna                                        | Senior Technician         | 2 \$ 115.00            | \$ 230.00    |                          |               |
|          | Mindy Mondesir                                          | Administrative 3          | 8 \$ 100.00            | \$ 800.00    |                          |               |
|          | <b>Subcontractor Labor Subtotal</b>                     |                           |                        |              | \$                       | 11,500.00     |
|          | McKim & Creed                                           | -                         | \$ -                   | \$ 11,500.00 |                          |               |
|          | <b>Other Direct Expenses</b>                            |                           |                        |              | \$                       | 616.00        |
|          | Travel                                                  | -                         | \$ -                   | \$ 116.00    |                          |               |
|          | Printing                                                | -                         |                        | \$ 500.00    |                          |               |
|          | Miscellaneous Expenses                                  | -                         | \$ -                   | \$ -         |                          |               |
| <b>5</b> | <b>Task 5 – Permitting</b>                              |                           |                        |              | \$                       | 13,050.00     |
|          | <b>Labor Subtotal</b>                                   |                           |                        |              | \$                       | 7,550.00      |
|          | Frank Sidari III, PE                                    | Principal Engineer        | \$ 240.00              | \$ -         |                          |               |
|          | Housam Hobi, PE                                         | Principal Engineer        | \$ 240.00              | \$ -         |                          |               |
|          | Chris Matthews                                          | Technical Expert          | \$ 240.00              | \$ -         |                          |               |
|          | Michael Pillutti, PE                                    | Senior Project Engineer 6 | \$ 180.00              | \$ -         |                          |               |
|          | Tung Nguyen PE                                          | Project Manager           | \$ 220.00              | \$ -         |                          |               |

| Contract Labor Category               |                           | Hours | Billing Rate<br>(\$ / hr) | Cost         | Fee / Task | Total Fee     |
|---------------------------------------|---------------------------|-------|---------------------------|--------------|------------|---------------|
|                                       |                           |       |                           |              |            | \$ 396,039.00 |
| Arcadis Labor                         |                           |       |                           |              | \$         | 235,560.00    |
| Subconsultant Costs                   |                           |       |                           |              | \$         | 62,000.00     |
| Other Direct Expenses                 |                           |       |                           |              | \$         | 98,479.00     |
| Contingency                           |                           |       |                           |              |            |               |
| Sean Chaparro, PE                     | Senior Engineer           | 12    | \$ 200.00                 | \$ 2,400.00  |            |               |
| Lia Dombroski                         | Project Engineer 2        | 24    | \$ 130.00                 | \$ 3,120.00  |            |               |
| Shantanu Dandane                      | Project Engineer 2        |       | \$ 130.00                 | \$ -         |            |               |
| Andrea Guzman                         | Chief Technician          | 8     | \$ 150.00                 | \$ 1,200.00  |            |               |
| Danielle McKenna                      | Senior Technician         | 2     | \$ 115.00                 | \$ 230.00    |            |               |
| Mindy Mondesir                        | Administrative 3          | 6     | \$ 100.00                 | \$ 600.00    |            |               |
| <b>Subcontractor Labor Subtotal</b>   |                           |       |                           |              | \$         | 5,500.00      |
| McKim & Creed                         | -                         |       | \$ -                      | \$ 5,500.00  |            |               |
| <b>Other Direct Expenses</b>          |                           |       |                           |              | \$         | -             |
| Travel                                | -                         |       | \$ -                      | \$ -         |            |               |
| Printing                              | -                         |       | \$ -                      | \$ -         |            |               |
| Miscellaneous Expenses                | -                         |       | \$ -                      | \$ -         |            |               |
| <b>6 Task 6 - Final Bid Documents</b> |                           |       |                           |              | \$         | 29,675.00     |
| <b>Labor Subtotal</b>                 |                           |       |                           |              | \$         | 22,030.00     |
| Frank Sidari III, PE                  | Principal Engineer        | 4     | \$ 240.00                 | \$ 960.00    |            |               |
| Housam Hobi, PE                       | Principal Engineer        | 6     | \$ 240.00                 | \$ 1,440.00  |            |               |
| Chris Matthews                        | Technical Expert          | 8     | \$ 240.00                 | \$ 1,920.00  |            |               |
| Michael Pillutti, PE                  | Senior Project Engineer 6 |       | \$ 180.00                 | \$ -         |            |               |
| Tung Nguyen PE                        | Project Manager           | 6     | \$ 220.00                 | \$ 1,320.00  |            |               |
| Sean Chaparro, PE                     | Senior Engineer           | 20    | \$ 200.00                 | \$ 4,000.00  |            |               |
| Lia Dombroski                         | Project Engineer 2        | 36    | \$ 130.00                 | \$ 4,680.00  |            |               |
| Shantanu Dandane                      | Project Engineer 2        | 16    | \$ 130.00                 | \$ 2,080.00  |            |               |
| Andrea Guzman                         | Chief Technician          | 32    | \$ 150.00                 | \$ 4,800.00  |            |               |
| Danielle McKenna                      | Senior Technician         | 2     | \$ 115.00                 | \$ 230.00    |            |               |
| Mindy Mondesir                        | Administrative 3          | 6     | \$ 100.00                 | \$ 600.00    |            |               |
| <b>Subcontractor Labor Subtotal</b>   |                           |       |                           |              | \$         | 7,000.00      |
| McKim & Creed                         | -                         |       | \$ -                      | \$ 6,000.00  |            |               |
| <b>Other Direct Expenses</b>          |                           |       |                           |              | \$         | 645.00        |
| Travel                                | -                         |       | \$ -                      | \$ 145.00    |            |               |
| Printing                              | -                         |       | \$ -                      | \$ 500.00    |            |               |
| Miscellaneous Expenses                | -                         |       | \$ -                      | \$ -         |            |               |
| <b>7 Task 7 - Bid Phase Services</b>  |                           |       |                           |              | \$         | 17,340.00     |
| <b>Labor Subtotal</b>                 |                           |       |                           |              | \$         | 12,340.00     |
| Frank Sidari III, PE                  | Principal Engineer        |       | \$ 240.00                 | \$ -         |            |               |
| Housam Hobi, PE                       | Principal Engineer        |       | \$ 240.00                 | \$ -         |            |               |
| Chris Matthews                        | Technical Expert          |       | \$ 240.00                 | \$ -         |            |               |
| Michael Pillutti, PE                  | Senior Project Engineer 6 |       | \$ 180.00                 | \$ -         |            |               |
| Tung Nguyen PE                        | Project Manager           | 3     | \$ 220.00                 | \$ 660.00    |            |               |
| Sean Chaparro, PE                     | Senior Engineer           | 20    | \$ 200.00                 | \$ 4,000.00  |            |               |
| Lia Dombroski                         | Project Engineer 2        | 16    | \$ 130.00                 | \$ 2,080.00  |            |               |
| Shantanu Dandane                      | Project Engineer 2        |       | \$ 130.00                 | \$ -         |            |               |
| Andrea Guzman                         | Chief Technician          | 32    | \$ 150.00                 | \$ 4,800.00  |            |               |
| Danielle McKenna                      | Senior Technician         |       | \$ 115.00                 | \$ -         |            |               |
| Mindy Mondesir                        | Administrative 3          | 8     | \$ 100.00                 | \$ 800.00    |            |               |
| <b>Subcontractor Labor Subtotal</b>   |                           |       |                           |              | \$         | 5,000.00      |
| McKim & Creed                         | -                         |       | \$ -                      | \$ 6,500.00  |            |               |
| <b>Other Direct Expenses</b>          |                           |       |                           |              | \$         | -             |
| Travel                                | -                         |       | \$ -                      | \$ -         |            |               |
| Printing                              | -                         |       | \$ -                      | \$ -         |            |               |
| Miscellaneous Expenses                | -                         |       | \$ -                      | \$ -         |            |               |
| <b>8 Task 8 - Pilot Testing</b>       |                           |       |                           |              | \$         | 196,207.00    |
| <b>Labor Subtotal</b>                 |                           |       |                           |              | \$         | 95,360.00     |
| Frank Sidari III, PE                  | Principal Engineer        | 50    | \$ 240.00                 | \$ 12,000.00 |            |               |
| Housam Hobi, PE                       | Principal Engineer        |       | \$ 240.00                 | \$ -         |            |               |
| Chris Matthews                        | Technical Expert          |       | \$ 240.00                 | \$ -         |            |               |
| Michael Pillutti, PE                  | Senior Project Engineer 6 | 132   | \$ 180.00                 | \$ 23,760.00 |            |               |
| Tung Nguyen PE                        | Project Manager           | 52    | \$ 220.00                 | \$ 11,440.00 |            |               |
| Sean Chaparro, PE                     | Senior Engineer           | 12    | \$ 200.00                 | \$ 2,400.00  |            |               |
| Lia Dombroski                         | Project Engineer 2        | 352   | \$ 130.00                 | \$ 45,760.00 |            |               |
| Shantanu Dandane                      | Project Engineer 2        |       | \$ 130.00                 | \$ -         |            |               |
| Andrea Guzman                         | Chief Technician          |       | \$ 150.00                 | \$ -         |            |               |
| Danielle McKenna                      | Senior Technician         |       | \$ 115.00                 | \$ -         |            |               |
| Mindy Mondesir                        | Administrative 3          |       | \$ 100.00                 | \$ -         |            |               |
| <b>Subcontractor Labor Subtotal</b>   |                           |       |                           |              | \$         | 5,000.00      |
| McKim & Creed                         | -                         |       | \$ -                      | \$ 5,000.00  |            |               |
| <b>Other Direct Expenses</b>          |                           |       |                           |              | \$         | 95,847.00     |
| Travel                                | -                         |       | \$ -                      | \$ 2,527.00  |            |               |
| Printing                              | -                         |       | \$ -                      | \$ -         |            |               |
| NFPilot Plant Rental & Services       | -                         |       | \$ -                      | \$ 76,120.00 |            |               |
| Miscellaneous Expenses                | -                         |       | \$ -                      | \$ 1,000.00  |            |               |
| Lab Testing (WQ)                      | -                         |       | \$ -                      | \$ 12,000.00 |            |               |
| Tent Shelter Rental/Setup             | -                         |       | \$ -                      | \$ 4,200.00  |            |               |