

CITY OF HOLLYWOOD WATER MASTER PLAN SCOPE November 6th, 2020

WATER MASTER PLAN UPDATE SCOPE

PROJECT UNDERSTANDING

The City of Hollywood (City) is located in the southeast portion of Broward County, Florida. It is bordered on the north by the City of Dania Beach, the City of Fort Lauderdale, and unincorporated portions of Broward County, on the east by the Atlantic Ocean, on the south by the City of Miramar, the City of Pembroke Park, and the City of Hallandale Beach, and on the west by the City of Pembroke Pines and the Conservation area (Everglades). As an enterprise fund, the City owns and operates a potable water system to supply safe and reliable drinking water to its water customers.

The City's current service area population is approximately 200,500 and is expected to grow modestly to 228,100 through 2040. The City's Department of Public Utilities operates or has service agreements for approximately 22 raw water wells (e.g. 14 Biscayne Aquifer wells and eight Floridan aquifer wells). Raw water is pumped to and treated at the City's Water Treatment Plant (WTP) located at 3441 Hollywood Blvd, Hollywood, FL 33021. At the WTP, the City currently treats an average 24.5 million gallons day (MGD) through the lime softening, membrane softening, or reverse osmosis processes prior to blending, storage and pumping into the distribution system. The distribution system includes approximately 700 miles of water main piping with diameters ranging from 2-in to 30-in diameter that are connected to two 1.0 million gallon (MG) elevated tanks and a booster station, the West Hollywood Pumping and Storage Facility (WHPS).

The last comprehensive Water Master Plan update was completed in 2007 and has been successfully applied by the City to guide expansion, rehabilitation, and replacement decisions. Since then, multiple amendments have been issued to the Water Master Plan to reflect major system changes such as facility expansions, water main replacement, and deep injection wells.

As part of the on-going planning cycle, the City now requires an update to the current Water Master Plan to assess and prioritize major assets that will require expansion, rehabilitation, or replacement in the next 20 years. The objective of the Water Master Plan update is to assess the current condition and remaining useful life of the water system assets, understand the growth and needs for new assets, and then identify prioritized projects that address aging infrastructure, consider climate change and sea level rise, improve reliability of service, enhance operational efficiencies, and provide for process optimization. The updated Water Master Plan will be developed using a living master plan approach that allows for dynamic reporting and future updates to the inputs and evaluations that drive the capital project planning within the Water Master Plan. This will be enabled using an Arcadis-developed application that will be customized for the City. The tool is relatively easy to use and maintain and only requires software and IT resources that are readily available at the City. After the completion of the Water Master Plan update, all data and the living master plan tool will be transferred onto and ultimately reside securely within the City's computer network.

SCOPE OF WORK

The City has selected Arcadis U.S., Inc. (Arcadis) and its designated subconsultants (McKim & Creed and Tobon Engineering) to furnish professional engineering services for the Water Master Plan update. This includes overall project management, project initiation, demand and hydraulic evaluations, condition assessment, water plant performance evaluation, and compilation of CIP proposals into a comprehensive 20-year Water Master Plan (through 2040).

The work to be performed by Arcadis for the Water Master Plan Update will extend beyond the City’s current Fiscal Year (FY), which ends on September 30, 2021. The scope of work has been separated into two phases to accommodate the City’s FY funding requirements. Phase 1 tasks (noted below) will be conducted in FY2021 and Phase 2 tasks (also noted below) will be conducted in FY2022. Tasks and their associated funding are summarized in Attachment A.

TASK 1 – PROJECT MANGEMENT AND INITIATION

Task 1.1 – Project Management and Administration (PHASE 1 & 2)

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. Arcadis shall provide written monthly project status updates with each invoice in addition to updating the baseline schedule prepared under Task 1.3 to reflect progress.

On a monthly basis, Arcadis shall conduct a project status meeting conference call with the City. The intent of this meeting, that is typically planned for 1-hr, is to provide working and interim updates on active project tasks and solicit ad-hoc feedback where necessary. The Arcadis Project Manager (PM) will prepare an agenda in advance of each meeting and select task leaders and team members will attend the meeting each month to report on progress and obtain feedback from the City. The key decisions and discussions from the meeting will be captured on a master Decision/Action Items Log for tracking and resolution.

These services span both Phase 1 and 2. The funding allocated for Phase 2 (FY 2022) of this task is based on the project schedule described in the Schedule section and assumes continuation of the project between Phase 1 and 2 (i.e. no stoppage or deferral) and a timely issuance of Authorization to Proceed (ATP) for Phase 2 at the beginning of FY2022.

Deliverable(s):

- *Monthly Project Status Meeting Agenda*
- *Monthly Invoices*
- *Monthly Schedule Updates*
- *Decision/Action Items Log Updates*

Task 1.2 – Data Collection and Request for Information (RFI) (PHASE 1)

Within 21 days from receipt of the ATP, Arcadis shall conduct a review of available and relevant project documentation and prepare a Request for Information (RFI) to characterize the existing condition and enhancement needs for various system components.

Deliverable(s): *Request for Information (RFI)*

Task 1.3 – Project Initiation – Kick-off and Visioning/Goal Setting Workshop (PHASE 1)

Arcadis shall coordinate, schedule, prepare for, and conduct a combined kick-off and visioning/goal setting workshop (**Workshop No. 1**) to review the scope, schedule, budget, as well as roles and responsibilities for the project in addition to facilitating the vision and goal setting efforts for the project.

The workshop will be conducted using a Design Thinking Workshop format with key City stakeholders on the topic of water supply and future growth planning. Design thinking is an innovative, problem-solving approach that puts the human at the front and center of a problem, deeply exploring their challenges and needs. Under this task, Arcadis will plan, facilitate, and conduct a Kickoff and Visioning/Goal Setting Workshop to identify strategic solutions and potentially new ways to address the issue of future growth opportunities in collaboration with the City.

The expected outcomes of the 1-day, 8-hour workshop (or two, half-day sessions) are the following:

- Familiarize project stakeholders on the scope, schedule, budget, project team, communications protocols, and project methodology to deliver the project.
- Identify goals and vision for the future of the City’s Service Area.
- Identify goals and success factors for the Master Plan Update.
- Introduce and define preliminary criteria and framework to be used in the evaluation, grouping and prioritization of recommended projects.
- Preliminary discussions on level of service (LOS) goals required to support and guide the overall decision process for investment in asset repair, Renewal and Replacement (R&R), and expansion. Example criteria include water quality, customer service, resiliency (including climate change and sea level rise implications), reliability, complexity, maintenance, staffing, cost, sustainability, and alignment with strategic plans. Detailed definition and refinement will be subsequently developed under the respective tasks.

Deliverable(s):

- *Meeting Agenda*
- *Workshop presentation and handouts*
- *Project Baseline Schedule*
- *Kick-off and Visioning/Goal Setting Workshop Meeting Summary*

TASK 2 – HYDRAULIC MODELING, FUTURE DEMAND PROJECTIONS, & WATER SUPPLY EVALUATION

Task 2.1 – Hydraulic Model Update and Calibration (PHASE 1)

The model update will incorporate the latest physical and operational changes to better reflect actual system infrastructure. This will include applying updated demand forecasts, factors and patterns, and aligning model response to changing conditions such as pump starts and stops to recent SCADA system data. The purpose of this task is to bring the model up-to-date with current conditions within the system. Arcadis will update the existing City of Hollywood Water Distribution System Model (last updated in 2018) to reflect recent improvements in the City’s distribution system. This includes updating the model with updated GIS that reflect new and modified piping and the new pumps at the HSPS with their calibration curves at the HSPS. This task also includes a coordinated field effort to obtain updated pressure and hydrant flow data. Arcadis, supported by City field crews, will perform a field data collection effort consisting of up to 50 locations for pressure measurement for a one- week duration, up to 25 fire flow tests, and up to 25 pipe roughness coefficient tests. Locations and quantities will be identified in a Field Data Collection Plan provided to the City for review and approval prior to commencing the data collection.

This task includes the following desktop and field efforts:

- GIS Review and Model Updates - Arcadis shall review GIS data and as-builts for updates that will impact the model. This will be accomplished by reviewing the City’s current GIS database using our in-house Data Profiler tool and checking to identify missing data and connectivity gaps. This tool is specifically designed to flag connectivity issues which would prevent the hydraulic model from creating results. All system changes will be incorporated into the model.
- Model Demand Allocation - Arcadis shall review current customer demand information and integrate the demand into the water model. Arcadis shall review City-provided water usage data to update demand patterns for existing customers and projections for future supply needs.
- Model Calibration - Arcadis shall re-calibrate the City’s InfoWater model to reasonably reflect current system conditions and align with industry guidelines (AWWA M32, 4th Edition) for a master planning level model. The target calibration goal for this project is for the model to be within 2.2 psi (5 feet of hydraulic grade line) for the daily average of every individual pressure monitor location. This includes pressure data collected by Arcadis as part of the field data collection effort, and data provided by the City from its SCADA system. Any data provided by the City must also include the elevation of the sensor and the City shall confirm the sensor is calibrated and accurate for the period that data is used for model calibration. Model calibration will utilize pump curves, pumping schedules, tank levels, and SCADA data. Pipe roughness coefficients (Hazen-Williams C-factors) were previously assigned to the City’s distribution piping; these will be reviewed and adjusted, as necessary, utilizing the field data from this task.
- Field Data Collection – Arcadis shall coordinate and conduct a field collection exercise to collect flow testing and pressure data during a one-week duration. A field data collection plan will be provided for City review prior to commencement and all field activities will be coordinated with the City’s operations staff in advance.

The summary of findings will be reviewed at the monthly project status meetings and the Decisions/Action Items Log will be updated as necessary.

Deliverable(s):

- *Field Data Collection Plan*

Task 2.2 – Review Existing Available Planning Data (PHASE 1)

Arcadis shall review existing planning documents and readily-available published data including: the previous City of Hollywood water demand projections from the latest Water Supply Plan, University of Florida Bureau of Economic and Business Research (BEBR) population projections for Broward County, US Census Bureau data, Regional Planning Commission data, City and County Utility Analysis Zone (UAZ) data, building permit and development requests, land use and future land use maps, and the latest Comprehensive Plan. Arcadis shall also obtain from discussion with the City additional anecdotal information on demands such as observed areas of growth or areas with slow to no growth.

The summary of findings will be reviewed during the monthly project status meetings and the Decisions/Action Items Log will be updated as necessary.

Task 2.3 – Estimate Future Water Demands (PHASE 1)

Using the information gathered and reviewed, Arcadis shall update population projections for the existing system for year 2020, and future conditions for years 2025, 2030, 2035, and 2040. Using these population projections, Arcadis shall estimate level-of-service (LOS) water demands for the current and future City service areas. Arcadis shall coordinate the population projections with the Broward County Comprehensive Plan and South Florida Regional Planning Council (SFRPC). Given the anticipated publication schedule, population projections will not consider the 2020 Census results.

Arcadis shall work with the City to assure congruency between the updated demand projections, the City's Consumptive Use Permit, and expectations of the South Florida Water Management District (SFWMD). Arcadis shall allocate the future demands to appropriate locations in the future expansion area based on the future land use maps and utilizing updated GIS. Demands shall be allocated for years 2025, 2030, 2035, and 2040.

Task 2.4 – Distribution of Future Demands (PHASE 1)

Arcadis shall spatially (geographically) and temporally (i.e., when demand is expected) locate future water demand projections, including those demands anticipated outside the current service area. This information will provide the basis for development of future modeling alternatives to be evaluated in Task 2.5. Arcadis shall utilize existing customers to appropriately weigh equivalent residential demand projections. Population and demand projections, and allocation of future demands shall be reviewed with the City during the monthly project status meetings and updated in the Decision/Action Items Log before proceeding to Task 2.5.

Task 2.5 – System Supply Evaluation (PHASE 1)

Arcadis shall review the City-defined LOS and other goals for the water system defined during Workshop No. 1 in addition to incorporating any regulatory-driven system infrastructure improvement needs. This evaluation will include a performance condition assessment to address the additional failure modes beyond mortality and will be conducted through staff interviews and a review of relevant documents and data collected during evaluations of linear assets in Task 3. The outcomes from the hydraulic model will also be incorporated in addition to staff interviews to score the other failure modes for the pipeline assets. All failure mode scoring and information will be stored in the Arcadis RRPS tool to support risk evaluation during Task 5.

Arcadis shall review and evaluate the City's groundwater supply, including the ability of the current supply to meet projected future demands in the context of the existing and future model scenarios. Arcadis shall evaluate the

City’s existing well data, including regulatory data, to identify the most feasible location(s) of future supply wells (if necessary).

Task 2.6 – Distribution System Evaluation (PHASE 1)

Arcadis shall identify and evaluate future alternatives to meet future system expansion needs for the planning periods using the InfoWater model to identify and rank potential expansion alternatives. Individual alternatives will be evaluated for feasibility using design standards and the Objectives and Policies from the City’s Comprehensive Plan, compared to existing scheduled CIP projects, and prioritizing solutions in coordination with the City. Arcadis shall identify the size and route of future distribution system piping improvements, as well as the location, size, and elevation of future distribution storage facilities. Arcadis shall discuss with the City current water quality issues and operational challenges in the City’s distribution system, including the manual operation of the WHPS and challenges for operating the WHPS and HSPS at the same time.

Model results for final scenarios will be compiled and presented for review. The results will be transferred to Task 3 to incorporate into the condition assessment that will also look at the distribution system R&R needs from a physical condition perspective. Capital projects and/or operational improvement alternatives will be identified as part of the evaluation to mitigate or address water quality and operational issues in Task 5.

***Deliverable(s):** The summary of findings will be reviewed during the monthly project status meetings and the Decisions/Action Items Log will be updated as necessary.*

TASK 3 – CONDITION ASSESSMENT

Task 3.1 – Condition Assessment Standards for Vertical and Linear Assets (PHASE 1)

As directed by and in coordination with the City, Arcadis shall coordinate condition assessment standards and templates with the City’s Asset Management consultant to ensure uniformity in the data collection. This includes attending up to two meetings via conference call and reviewing guidance documents provided as part of the Asset Management framework. Prior to commencing field and desktop assessments, Arcadis shall plan, schedule, and facilitate a 4-hour workshop (**Workshop No. 2**) with the City to discuss the standards and scoring for desktop pipeline condition assessments as well as the detailed facility (field) condition assessments at the wellfields, WTP, distribution storage, and distribution pumping facilities.

The goals of this workshop are to:

- Define what is considered an individual facility asset at the asset assembly level for condition assessment in support of capital planning and how the assets will be effectively grouped for analysis. This is slightly different from the current inventory and hierarchy in the City’s Cityworks CMMS which is detailed to the asset component level.
- Finalize standard scoring and templates to be used for the facility condition assessment effort based on the selected levels of service as defined during the visioning and goal setting workshop.
- Finalize the desktop assessment methodology for the water mains using past failure history and available GIS attributes.
- Demonstrate the Arcadis RRPS tool as well as provide an overview of the data collection and evaluation approach will be discussed. This tool will be customized and adapted for the City’s system and will be used to store the condition assessment data, support the overall risk analysis process for all water system assets, and present results.

Assumption(s):

- *Data collection will be conducted using Fulcrum data collection software. This data will be associated with Cityworks Asset IDs and provided in MS Excel or Access to the City.*
- *Condition assessment will be conducted at the asset assembly level and not for all individual asset components.*
- *Specialty testing such as materials, corrosion, thermography, megger, oil analysis, and etc. will not be conducted.*
- *A City-controlled contingency is also included in the event that the condition assessment approach and standards established by the City differ significantly from the scope of work and assumptions described herein.*

Task 3.2 – Desktop Condition Assessment for Linear Assets (PHASE 1)

The desktop pipeline condition assessment will cover approximately 700 miles of water mains and include an analysis of age, materials, diameters and past break history to understand potential factors causing failures such as corrosive soils, high groundwater tables, pressure surges, etc. Pipelines with similar behavior (e.g. cohorts) will be established and deterioration curves generated based on estimated useful life per cohort. The Arcadis RRPS tool will be configured to evaluate the condition of the pipelines through a desktop analysis leveraging the pipe attribute information available in the City’s GIS, the past failure history from Cityworks or other data, interviews with knowledgeable staff, and applying any established service levels or industry standard decay curves to determine what year replacement is required to address physical condition. Their capacity and other service level failures will also be integrated into the analysis through the hydraulic model. Results of field scoring will be reviewed with the City during a regularly scheduled monthly project status meeting.

Task 3.3 – Facility Condition Assessment (PHASE 1)

Arcadis shall conduct assessments of the City’s water system facilities utilizing multi-disciplinary teams walking through each facility and applying standard 1-5 scoring templates for each asset type of electrical, instrumentation, mechanical, buildings, and process structures. These templates will be loaded into a tablet-based data collection system, Fulcrum software, to expedite the data collection process and improve accuracy.

A pilot will be conducted at one process area at the WTP to validate the standards and make sure the output is effective for supporting an accurate master plan. The asset data from Cityworks will be loaded into Fulcrum in addition to the inspection templates by asset class. The pilot evaluation approach is as follows:

- Complete scoring and collect photos of each asset using the field tablet. Data collected will be uploaded daily for QA/QC to ensure data is acceptable for later analysis.
- The initial inventory will be updated by adding, marking for deletion, or modifying assets as needed based on the site visit.
- All data collected will be loaded in the Arcadis RRPS tool where decay curves by assets class can be configured to determine remaining useful life based on the observed conditions and defined service levels. All failure mode scoring and information will be stored in the RRPS tool to support risk evaluation during Task 5.

Once the pilot has been completed and reviewed with City staff, the approach will be finalized and the rest of the assets will be completed. The updated asset inventory stored within RRPS can be exported for upload into Cityworks for the City to incorporate the corrections and additions if desired. The facilities to be evaluated are as follows:

- Administration (including the Filter Building)
- Ammonia
- Deep Well Injection
- Distribution System Elevated Tanks
- Emergency Power
- Fluoride
- Ground Storage
- High Service
- West Pumping Facility
- Lime Softening
- Maintenance Shop
- MS/Reverse Osmosis Facility
- Reclaim
- SCADA
- Sodium Hypochlorite
- Vehicle
- Wells
- WTP/Grounds

It is assumed that the assessment will take approximately 10 days to complete and will be conducted in coordination with City staff. Results of field scoring will be reviewed with the City during a regularly scheduled monthly project status meeting.

Deliverable(s):

- Condition Assessment Templates
- Summary of Desktop Condition Assessment including scoring sheets
- Summary of Facility Condition Assessment including scoring sheets

Assumption(s):

- *Distribution Water Tank inspections (elevated tanks) are not included.*
- *Existing data and condition reports for existing wells, tanks and other major facilities will be used to supplement if available.*
- *Distribution system pressure monitoring stations are not included.*
- *Ground storage tank will be visually evaluated from the exterior and from accessible locations. No interior or confined entry will be performed.*
- *Inspections of wells will be limited to visual assessments of above-ground assets.*
- *Specialty testing such as materials, corrosion, thermography, megger, oil analysis, etc. will not be conducted.*

TASK 4 – WATER TREATMENT PLANT PERFORMANCE EVALUATION

Task 4 is scheduled to begin during Phase 1 (FY2021) and to be completed under Phase 2 (FY2022). Funding allocations have been designated for each subtask below and further detailed in Attachment A.

Task 4.1 – Performance Evaluations (PHASE 1 & 2)

The performance evaluation will build on the facility condition assessments and begin concurrently with Task 3. Arcadis shall leverage our past experience and knowledge of the WTP and begin the evaluation with a review of the WTP and system operating data for the past three years with a specific focus on the current operational practices and future needs. This includes plant flow, unit process regulatory and water quality performance data and chemical dosage and feed rate data. Arcadis will meet with WTP staff to discuss our initial observations and obtain input on their specific concerns and challenges. Arcadis shall note potential compliance challenges and identify treatment or operational strategies so that the City remains in compliance now and for future compliance. Where multiple compliance strategies are possible, Arcadis will review and identify the most appropriate alternative as part of alternatives analysis in Task 5.

This task includes the following evaluations and will culminate with the performance rating to be incorporated into the risk scoring in Task 5:

- Future Regulatory Summary – Arcadis will prepare a summary of future regulatory and water quality requirements, emphasizing those issues that are most critical to the City's system.
- Water Quality Performance Evaluation – Arcadis will summarize and evaluate the City's WTP processes and finished water quality goals, considering both compliance with existing and future regulatory requirements and optimizing operations. Arcadis will coordinate with City staff to re-confirm finished water quality goals meet desired treatment levels and enable consistent compliance with current and anticipated future regulatory requirements. Arcadis will summarize historical water quality performance and assess the capability of existing treatment practices to meet the long-term water quality objectives identified above. Arcadis will highlight any water quality goals, issues or constraints that may impact water quality performance relative to regulatory requirements.
- Treatment Capacity and Hydraulic Evaluation – Arcadis will evaluate improvements to maintain and/or increase production capacities at the City's system. As part of this assessment, Arcadis will define the capacities of the facility based on a hydraulic assessment, recommended design standards, state requirements and engineering judgement and experience. Potential constraints and hydraulic limitations will be identified and potential improvements to eliminate existing capacity constraints will be formulated and evaluated to ensure the facility can meet future capacity requirements.
- Reliability and Redundancy Evaluation – Arcadis will identify vulnerabilities within the treatment processes that can negatively impact plant performance. The evaluation will incorporate condition assessment results for individual assets in developing a comprehensive assessment of current and potential future process-related issues, including resiliency, redundancy, back-up power, maintenance issues and other factors identified during the condition assessment visits.
- Chemical Storage and Feed Systems Evaluation – Arcadis will review the chemical systems and chemical dosing practices to identify opportunities to optimize system performance and potentially reduce chemical usage. Under this task, Arcadis will review the sampling and monitoring protocols currently used for process control at the WTP and make recommendations where appropriate to improve process reliability or reduce operating costs.
- Energy and SCADA Optimization – Arcadis will complete an evaluation of the facility's power and SCADA systems including:
 - Review of electrical systems of pump and motor efficiencies for the major pumping operations (includes WHSP) to identify opportunities to improve energy efficiency and reduce operating costs. Arcadis will review the existing electrical rate schedule to confirm if there are opportunities

to develop a more cost-effective operating strategy. This includes evaluation of pumping scenarios from systems evaluation in Task 2.

- Review of SCADA system to determine the adequacy of the infrastructure as it relates to other similarly sized WTPs. This will be summarized in recommendations for an overall SCADA controls strategy that improves monitoring, control, safety, and the operations of processes throughout the WTP. This strategy can then be incorporated into future design contracts to provide consistency across the variety of capital improvement projects to be implemented at the WTP over the next few years.
- Utilities Evaluation – Arcadis will review supporting utilities, including electrical, lighting, HVAC, plumbing, controls, and instrumentation for compliance with existing codes, potential future building codes and regulatory requirements, safety, and their likelihood for failure. Arcadis will additionally provide the following:
 - Cost/benefit analysis of the ability to provide a renewable energy source, whether on plant property or other City property.
 - Evaluate of heat loading including the relocation of MV transformers to outdoors.
 - Evaluate for energy monitoring and trending of the facilities, acquiring real-time information for power quality and energy trending down to the motor level.
 - Evaluate for possible elevated arc-flash locations and recommendation for mitigation.

The performance evaluations results will be documented in a draft technical memorandum (TM). Following the workshop in Task 4.2, the final TM will be developed incorporating City comments and submitted for project record.

Task 4.2 – Performance Evaluation Results Review (PHASE 2)

Once the performance evaluations have been completed for all facility and pipeline assets, a 4-hour workshop (**Workshop No. 3**) will be held to discuss the findings and results. The draft TM from Task 4.1 will also be discussed during this workshop and comments from the City will be incorporated into the Final TM.

Deliverable(s):

- *Draft and Final TM Water Plant and Distribution Performance Evaluation Summary*
- *Materials and Meeting Summary for Workshop No. 3*

TASK 5 – WATER MASTER PLAN UPDATE

Following condition assessments and performance evaluations in the previous tasks, as well as the review of potential climate change and associated sea level rise risks performed as part of this task below, Arcadis shall develop risk-based capital improvement alternatives. The alternatives will be incorporated into the Water Plan Update under this task.

Task 5.1 – Climate Change Impacts Review (PHASE 2)

As a coastal community, the City has to consider the impacts of climate change and its implications are integral to near and long-term planning. Recently, Arcadis completed a preliminary assessment of hazards associated with sea level rise, tidal flooding, storm surge flooding up to a Category 5 storm at high tide, and groundwater risk as part of our previously-conducted America’s Water Infrastructure Act (AWIA) efforts. This task builds on that recent work and shall include review of the City’s 2020 Citywide Vulnerability Assessment and Adaptation Plan (CVAAP)

as well as other information available from Broward County’s Climate Change Task Force and the regional Southeast Florida Climate Compact and incorporate into the Water Master Plan evaluations and planning. The analysis of the assets herein shall include inundation risk from sea level rise (SLR), storm surge (SS), and extreme precipitation (EP) as detailed and delineated in the CVAAP.

Following the climate change impact analysis, Arcadis shall incorporate the results and those from Task 3 and 4 into the risk evaluations conducted as part of Task 5.2 in order to align with assessments associated with condition, useful life, regulatory drivers, etc. to ensure the best decisions are being made at the right time. Finally, the prioritized assets will be developed into projects and alternatives in Task 5.2 and 5.3 which shall include the identification of limited design criteria (e.g. minimum elevations and locations) required to mitigate the anticipated impacts. In addition, the development of proposed projects to mitigate impacts for the existing assets will be completed as part of Task 5.3 as required including project schedule and cost estimates. The master plan update frequency based on the rate of projected climate change will also be recommended.

It is assumed that the City will provide Arcadis with the Citywide Vulnerability Assessment, inclusive of GIS shape files designating potentially at-risk geographic areas and the associated timing of such impacts. Arcadis shall overlay these files into our RRPS tool and configure a distinct failure mode in the RRPS as part of Task 5.2. Also, 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.).

Task 5.2 – Asset Risk Evaluations (PHASE 2)

Risk is defined as the product of the Likelihood of Failure (LoF) and Consequence of Failure (CoF). Arcadis shall assign a LoF and a CoF score to all assets in a range from 1 (low) to 5 (high). Therefore, the Risk score will range from 1 (1X1) to 25 (5X5). Arcadis scores each asset based on its LoF and CoF scoring, as finalized with the City. The LoF scoring is based on physical and performance condition assessment performed in the previous tasks. The CoF scoring includes triple bottom line factors related to financial, social, and environmental consequences of an asset failure. Pipeline CoF factors are typically based on diameter, depth, demand or pressure shortfall, proximity to major roads, railroads, environmentally sensitive areas and other natural or built structures that would be affected by a failure. Facility CoF factors are typically based on replacement cost, staffing requirements, potential for illness or injury, magnitude of disruption, product quality, permit compliance, and required response time. Results from the recently-completed risk and resilience assessment and Task 5.1 will be used to develop the CoF criteria. GIS spatial relationship are used to assign scores for the proximity and therefore require appropriate reference layers. Facility CoF scoring is performed through an interview process and document review.

A redundancy factor can be applied where multiple assets supporting the same process can afford some level of failure and still meet service levels. A redundancy factor >0 and <1 serves as a multiplier to reduce the CoF score. If no redundancy exists, this factor is set to 1.

The specific CoF and redundancy factors and supporting information will be defined through a workshop facilitated by Arcadis. Each asset will be assigned CoF scores for their related factors within the RRPS tool. Each asset will receive a final overall CoF score based on the maximum score from their individual factors and the redundancy.

The asset risk evaluation includes:

- CoF Workshop (**Workshop No. 4**) – Arcadis shall facilitate a 4-hour workshop for the pipeline and facility assets. The purpose of this workshop is to present and finalize methodology for scoring asset consequence of failure and related redundancy. Input from the City during the workshops will be incorporated into the final methodology.
- Perform Risk Scoring – The CoF scoring from this task and the LoF scoring from Tasks 2, 3 and 4 will be used to produce a Risk score ranging from 1 (low) to 25 (high) for each asset. This will represent the current risk profile and will serve as the principal means to prioritize capital planning.
- Risk Results Workshop (**Workshop No. 5**) – Once the risk results are completed, a 4-hour workshop will be held with City staff to review the results and understand which assets need attention due to risk in addition to end of life. Similar to the condition results review, a Microsoft Power BI interface to the RRPS tool will be used to visualize the data in five-year increments and over the next 20 years by geography or process area to facilitate discussions on needs and the scoring accuracy.

Deliverable(s):

- *Materials and Meeting Summary for Workshops No. 4 and No. 5*
- *Draft and Final Risk Scoring Summary*

Task 5.3 – Project Alternatives Analysis and Cost Estimates (PHASE 2)

Conceptual design alternatives will be developed, and business case evaluations will be completed based upon the asset condition and risk score results as well as the optimization opportunities identified. The business case will identify the project need, the alternatives considered and evaluated through a life cycle costs evaluation, the selected alternative cost and schedule, and document any condition or risk assessment data evaluated. For pipeline assets, the pipelines will be grouped by risk score, replacement year, and geography to identify specific pipes requiring replacement due to growth and condition. Unit costs per pipe diameter for all pipes will be estimated at a conceptual planning level to identify the CIP funding needs for pipelines. Recent City bids for pipeline construction as well as Arcadis databases will be used as a basis for the costs. All opinions of probable cost will be consistent with the Association for the Advancement of Cost Estimating (AACE) Class 5 estimates with contingencies appropriate to the degree of design development. Cost estimates will be developed primarily at the individual assets level. However, where appropriate, project level costs will be developed for major projects.

Arcadis will hold two, 4-hour alternatives review workshops with the City (**Workshops No. 6 and No. 7**) to review the major alternatives evaluated for WTP process improvements and linear assets respectively to achieve the LOS and efficiency goals. For pipelines, the review will focus on annual funding needs for various service level scenarios to select the best fit for the City balancing funding, condition and risk objectives. Comments from the City will be incorporated into the final selection of alternatives.

Deliverable(s):

- *Materials and Meeting Summary for Workshops No. 6 and No. 7*

Assumption(s):

- *Alternatives evaluations will be provided for up to five (5) major proposed projects.*
- *Business case evaluations will be completed for up to 20 proposed projects.*

Task 5.4 – Water Master Plan (PHASE 2)

Arcadis shall compile results into a Water Master Plan Report incorporating all of the work from the previous tasks in to a draft and final report for review by the City. A preliminary table of contents for the report is as follows:

- Executive Summary
- Introduction and Background
- Characterization of Existing System
- Water Supply and Demand Projections
- Water Distribution System Modeling
- Regulatory Review and Water Quality Evaluation
- Climate Change Impacts Review
- Water Supply Capacity, Equipment Condition and Risk Assessment
- Water Treatment Capacity, Equipment Condition and Risk Assessment
- Water Distribution System Desktop Condition and Risk Assessment
- Capital Improvements Plan (including schedules and cost estimates)

A 4-hour workshop (**Workshop No. 8**) will be held to review the Draft Water Master Plan Report. The City will review the draft submittal within 15 business days and provide written comments. Arcadis will schedule and conduct a workshop to review the draft submittal and comments with the City. Discussion and comments received at the workshop will be incorporated into the Final Water Master Plan and submitted for project close-out.

Deliverable(s):

- *Draft and Final Water Master Plan Report*
- *Materials and Meeting Summary for Workshop No. 8*

Task 5.5 – Living Master Plan Decision Support (RRPS) Tool (PHASE 2)

Arcadis shall provide the RRPS tool to the City including two training sessions and a user's manual so the database can be updated on a regular basis as conditions may change in terms of growth or extreme events. This allows for revisions to the inputs that support the Master Plan recommendations and be used to reprioritize existing CIP projects or identify new projects for including in CIP planning.

This tool requires basic skills in GIS to successfully change model assumptions or add new data from condition and risk assessments and rerun the outcomes. Arcadis will coordinate training sessions for the City staff to perform these updates. The first training session will cover all tasks a typical end-user would perform, including loading data, setting CIP parameters, defining cohort aging degradation, running funding scenarios and reviewing results. The second training session should be held two to four weeks later after City staff have used the tool. The second session will review the tool usage, address questions that arose after the first session and review how RRPS is integrated with a source system like Cityworks.

Deliverable(s):

- *Arcadis RRPS tool installation for use on up to five City computers.*
- *Microsoft Access RRPS results database*
- *Power BI template with full risk results*
- *RRPS User and Administrator Guide manual.*
- *RRPS Configuration document specific to the settings made for the City.*
- *Two, six-hour Training Sessions for City staff.*

Assumption(s):

- Availability of at least one City IT resource with detailed Cityworks, ArcGIS and SQL Server knowledge to facilitate setup and integration.
- ArcGIS 10.7 or higher desktop software is installed.
- Microsoft Power BI 2.84.981.0 or higher is installed.

SCHEDULE

The project schedule includes services that span both Phase 1 and 2. In addition, the scope of work includes prerequisite coordination and alignment with condition assessment standards and methodologies being developed by the City under a separate project. As a result, the project milestones below are contingent on timely issuance of Phase 1 ATP and Phase 2 ATP, and are subject to the impacts of coordination with and availability of guidance documents provided by other parties.

Arcadis shall commence Phase 1 upon receipt of written authorization from the City, which will constitute ATP. Submittals will be made in accordance with the project schedule provided below and in Figure 1. Arcadis estimates that the proposed scope of services (Phase 1 and Phase 2 combined) will be completed in approximately 67 weeks from receipt of the City's ATP. Arcadis shall prepare a project milestone schedule and present at the project kick-off meeting which will be updated and reported on during the monthly project status meetings. Estimates for completion of key milestones are as provided in the following table. Refer to Figure 1 for a preliminary schedule depicting tasks and the phasing timeline.

Project Tasks	Estimated Duration to Completion from Phase 1 ATP
Task 1 – PROJECT MANGEMENT AND INITIATION	13 weeks
Task 2 – DEMAND PROJECTIONS AND HYDRAULIC MODELING	35 weeks
Task 3 – CONDITION ASSESSMENT	35 weeks
Task 4 – WATER PLANT PERFORMANCE EVALUATION	43 weeks
Task 5 – WATER MASTER PLAN UPDATE	67 weeks

Notes:

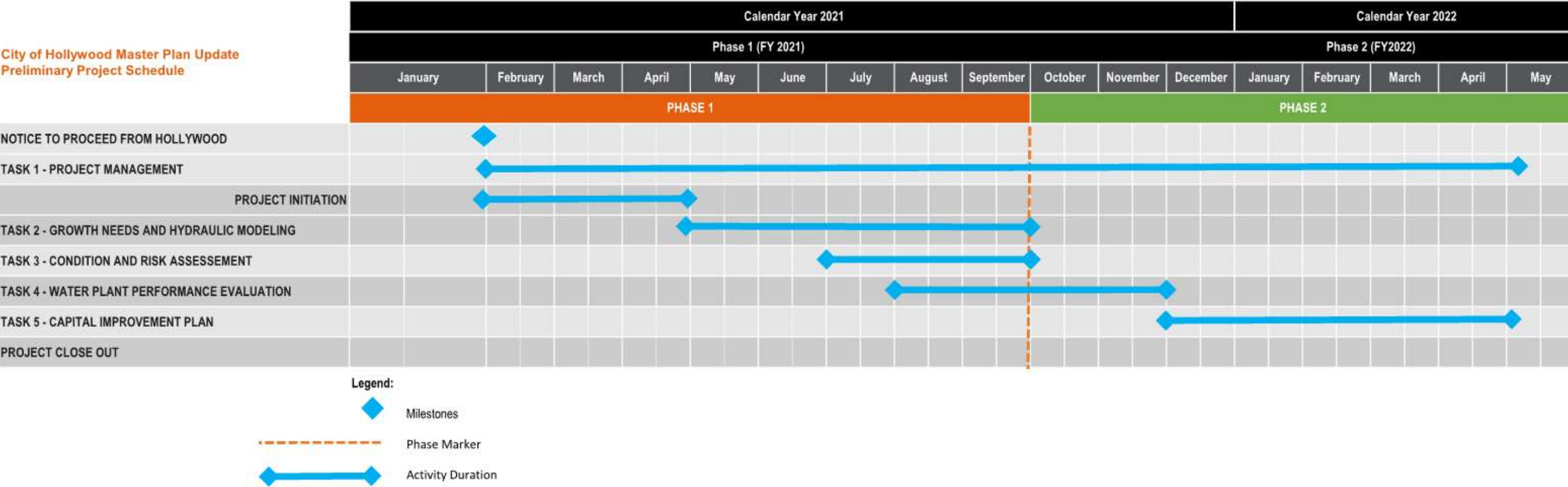
- 1) The preliminary project milestones are based on normal working schedules. Travel and schedule restrictions caused by national, state, and local government directives (e.g. Covid-19) may impact this schedule.
- 2) Project management activities will be performed throughout the duration of the project.
- 3) The schedule assumes the City will review and provide comments on deliverables within 15 business days.

Assumption(s):

- Task 3 completion milestone assumes the commencement of condition assessment planning and tool development within three (3) months of ATP. Accordingly, the schedule assumes that condition assessment standards and guidance documents will be provided to Arcadis by the City (and other consultants) within this timeframe in order to maintain the project schedule.

- *Due to COVID-19 uncertainties and changing preferences related to in person meetings, all workshops are planned to be conducted virtually except for one. Arcadis shall coordinate with the City on the specific timing and selection of which workshop will be selected for the in-person format.*
- *While the Master Planning tasks do take into consideration climate change and the potential associated sea level rise impacts as part of our risk analysis which ultimately drives development and prioritization of projects, it should be noted that detailed modeling for sea level rise/storm surge potential is not included and Arcadis shall rely upon the results of readily-available information as well as the recently-completed Citywide Vulnerability Assessment to be provided by the City.*

Figure 1- Preliminary Project Phasing Timeline



BUDGET AND INVOICING

The terms of compensation shall be in conformance with the terms of the Agreement _____ dated _____, 2020 between the City and Arcadis U.S., Inc. The total lump sum fee for this project (Phase 1 and Phase 2) is \$1,265,885. A breakdown of this lump sum fee is enclosed as Attachment A and B. The project will be billed monthly on a percent complete basis.

Arcadis shall commence services associated with this scope of work upon receipt of Phase 1 ATP anticipated to be issued by or before February 1, 2021. Since the work to be performed by Arcadis for the Water Master Plan Update will extend beyond the City's current Fiscal Year (FY2021), which ends on September 30, 2021, selected tasks will be initiated and funded in FY2021 (Phase 1) and will be continued and completed in FY2022 (Phase 2). This fee assumes that Phase 2 commences in a timely manner beginning in FY2022 (October 1, 2022). The following presents a summary of the scope of services and funding allocations by Phase 1 and Phase 2, respectively. For detailed breakdown by tasks, refer to Attachments A and B. Attachment C provides our subconsultant team members' task order proposals.

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

Task	Phase 1 - FY2021	Phase 2 - FY2022
Task 1 – PROJECT MANGEMENT AND INITIATION	\$114,172.00	\$72,426.00
Task 2 – DEMAND PROJECTIONS AND HYDRAULIC MODELING	\$183,351.00	
Task 3 – CONDITION ASSESSMENT	\$286,185.00	
Task 4 – WATER PLANT PERFORMANCE EVALUATION	\$123,917.00	\$54,154.00
Task 5 – WATER MASTER PLAN UPDATE		\$410,560.00
Subtotal	\$707,625.00	\$522,370.00
Contingency ¹	\$21,120.00	
Subtotal Phase	\$728,745.00	\$537,140.00
Total		\$1,265,885

Notes:

- 1) This contingency is controlled by the City and is reserved for changes or additional services related to conditional assessment standards or Asset Management framework (developed by others) that vary significantly from the scope of work presented herein.

Attachment A
Detailed Fee Breakdown by Subtask

TASK NO	TASK DESCRIPTION	PHASE 1				PHASE 2				PHASE 1	PHASE 2	Total
		ARCADIS	McKim&Creed	Tobon Eng.	ODC	ARCADIS	McKim&Creed	Tobon Eng.	ODC	Subtotal	Subtotal	
Task 1	PROJECT MANGEMENT AND INITIATION	\$ 81,800	\$ 20,062	\$ 6,317	\$ 5,993	\$ 54,840	\$ 13,375	\$ 4,211	\$ -	\$ 114,172	\$ 72,426	\$ 186,598
	1.1 Project Management and Administration	\$ 36,560				\$ 54,840						
	1.2 Data Collection and Request for Information (RFI)	\$ 12,480										
	1.3 Kick-off and Visioning/Goal Setting Workshop	\$ 32,760										
Task 2	HYDRAULIC MODELING, FUTURE DEMAND PROJECTIONS, AND WATER SUPPLY EVALUATION	\$ 157,455	\$ -	\$ 21,056	\$ 4,840	\$ -	\$ -	\$ -	\$ -	\$ 183,351	\$ -	\$ 183,351
	2.1 Hydraulic Model Update and Calibration	\$ 38,000										
	2.1.1 Field Data Collection	\$ 56,995										
	2.2 Review Existing Available Planning Data	\$ 13,920										
	2.3 Estimate Future Water Demands	\$ 8,010										
	2.4 Distribution of Future Demands	\$ 13,650										
	2.5 System Supply Evaluation	\$ 11,460										
	2.6 Distribution System Evaluation	\$ 15,420										
Task 3	CONDITION ASSESSMENT	\$ 246,680	\$ 33,391	\$ 2,004	\$ 4,110	\$ -	\$ -	\$ -	\$ -	\$ 286,185	\$ -	\$ 286,185
	3.1 Condition Assessment Standards	\$ 29,320										
	Contingency for Standards Modifications (B&V) (See bottom Line)	\$ -										
	3.2 Desktop Condition Assessment for Linear Assets											
	Planning and Preparation	\$ 7,200										
	Desktop Analysis	\$ 34,512										
	Data Processing and Reporting	\$ 38,240										
	3.3 Facility Condition Assessment											
	Planning and Preparation	\$ 10,800										
	Field Data Collection	\$ 86,768										
	Data Processing and Reporting	\$ 39,840										
Task 4	WATER TREATMENT PLANT PERFORMANCE EVALUATION	\$ 86,740	\$ 35,195	\$ 1,504	\$ 478	\$ 40,440	\$ 11,732	\$ 1,504	\$ 478	\$ 123,917	\$ 54,154	\$ 178,071
	4.1.1 Future Regulatory Summary	\$ 18,380										
	4.1.2 Water Quality Performance Evaluation	\$ 15,500										
	4.1.3 Treatment Capacity and Hydraulic Evaluation	\$ 19,180										
	4.1.4 Reliability and Redundancy Evaluation	\$ 17,260										
	4.1.5 Chemical Storage and Feed Systems Evaluation	\$ 16,420										
	4.1.6 Energy and SCADA Optimization					\$ 7,360						
	4.1.7 Utilities Evaluation					\$ 5,440						
	4.2 Condition Assessment and Performance Evaluation Results					\$ 27,640						
Task 5	WATER MASTER PLAN UPDATE	\$ -	\$ -	\$ -	\$ -	\$ 348,340	\$ 51,206	\$ 9,024	\$ 1,990	\$ -	\$ 410,560	\$ 410,560
	5.1 Climate Change Impacts Review					\$ 6,600						
	5.2 Asset Risk Evaluations (Prioritized CIP)					\$ 81,060						
	5.3 Project Alternatives Analysis and Cost Estimates					\$ 110,970						
	5.4 Water Master Plan Compilation					\$ 107,590						
	5.5 Living Master Plan Decision Support (RRPS) Tool					\$ 42,120						
Subtotal		\$ 572,675	\$ 88,648	\$ 30,881	\$ 15,421	\$ 443,620	\$ 76,313	\$ 14,739	\$ 2,468			

	Phase 1	Phase 2
Subtotal Phase	\$ 707,625	\$ 537,140
Contingency for Condition Assessment Standards	\$ 21,120	
Total By Phase	\$ 728,745	\$ 537,140
Water Master Plan Total (including contingency):	\$ 1,265,885	

Contract Labor Category		Hours	Billing Rate (\$ / hr)	Cost	Fee / Task	Total Fee
						\$ 1,265,885.00
Arcadis Labor					\$ 1,016,295.00	
Subconsultant Costs					\$ 210,581.00	
Other Direct Expenses					\$ 17,889.00	
Contingency (City Controlled)					\$ 21,120.00	
1 Project Management and Initiation						\$ 186,598.00
Labor Subtotal					\$ 136,640.00	
Melissa Pomales, P.E.	Senior Officer	16	\$ 280.00	\$ 4,480.00		
Leah Richter, P.E.	Company Officer	34	\$ 240.00	\$ 8,160.00		
Celine Hyer, P.E.	Technical Expert	24	\$ 240.00	\$ 5,760.00		
Jim Cooper, P.E.	Technical Expert	2	\$ 240.00	\$ 480.00		
Rebecca Slabaugh, P.E.	Technical Expert	44	\$ 240.00	\$ 10,560.00		
Greg Osthuies, P.E.	Technical Expert	16	\$ 240.00	\$ 3,840.00		
Tung Nguyen P.E.	Project Manager	318	\$ 220.00	\$ 69,960.00		
Michael Knowles, P.E.	Senior Engineer	20	\$ 200.00	\$ 4,000.00		
Sean Chaparro, P.E.	Senior Engineer	20	\$ 200.00	\$ 4,000.00		
Joan Fernandez, P.E.	Lead Engineer	12	\$ 220.00	\$ 2,640.00		
Chris Heltzel	Lead Engineer	4	\$ 220.00	\$ 880.00		
Lauren DaCunha	Project Engineer 2	20	\$ 130.00	\$ 2,600.00		
Lia Dombroski	Project Engineer 2	61	\$ 130.00	\$ 7,930.00		
Danielle McKenna	Senior Technician	30	\$ 115.00	\$ 3,450.00		
Mindy Mondesir	Administrative 3	79	\$ 100.00	\$ 7,900.00		
Subcontractor Labor Subtotal					\$ 43,965.00	
McKim & Creed				\$ 33,437.00		
Tobon Engineering				\$ 10,528.00		
Other Direct Expenses					\$ 5,993.00	
Travel (airfare, hotel, etc.)				\$ 5,618.00		
Miscellaneous Expenses (reproduction, postage, other)				\$ -	\$ 375.00	
2 Hydraulic Modeling, Future Demand Projections, and Water Supply Evaluation						\$ 183,351.00
Labor Subtotal					\$ 157,455.00	
Jim Cooper, P.E.	Technical Expert	40	\$ 240.00	\$ 9,600.00		
Michael Knowles, P.E.	Senior Engineer	124	\$ 200.00	\$ 24,800.00		
Marc Killingstad, P.E.	Lead Engineer	16	\$ 220.00	\$ 3,520.00		
Lauren DaCunha	Project Engineer 2	402	\$ 130.00	\$ 52,260.00		
Anusha Kadudula	Project Engineer 1	585	\$ 115.00	\$ 67,275.00		
Subcontractor Labor Subtotal					\$ 21,056.00	
McKim & Creed				\$ -		
Tobon Engineering				\$ 21,056.00		
Other Direct Expenses					\$ 4,840.00	
Travel (airfare, hotel, etc.)				\$ 4,840.00		
Miscellaneous Expenses (reproduction, postage, other)				\$ -	\$ -	
3 Condition Assessment						\$ 286,185.00
Labor Subtotal					\$ 246,680.00	
Leah Richter, P.E.	Company Officer	4	\$ 240.00	\$ 960.00		
Celine Hyer, P.E.	Technical Expert	214	\$ 240.00	\$ 51,360.00		
Frank Sidari III	Technical Expert	40	\$ 240.00	\$ 9,600.00		
Jim Cooper, P.E.	Technical Expert	4	\$ 240.00	\$ 960.00		
Greg Osthuies	Technical Expert	8	\$ 240.00	\$ 1,920.00		
Tung Nguyen P.E.	Project Manager	78	\$ 220.00	\$ 17,160.00		
Michael Knowles, P.E.	Senior Engineer	12	\$ 200.00	\$ 2,400.00		
Sean Chaparro, P.E.	Senior Engineer	40	\$ 200.00	\$ 8,000.00		
Joan Fernandez, P.E.	Lead Engineer	180	\$ 220.00	\$ 39,600.00		
Chris Heltzel	Lead Engineer	176	\$ 220.00	\$ 38,720.00		
Lauren DaCunha	Project Engineer 2	32	\$ 130.00	\$ 4,160.00		
Project Engineer 2	Project Engineer 2	216	\$ 130.00	\$ 28,080.00		
Lia Dombroski	Project Engineer 2	160	\$ 130.00	\$ 20,800.00		
Seth Anderson	Project Engineer 2	152	\$ 130.00	\$ 19,760.00		
Mindy Mondesir	Administrative 3	32	\$ 100.00	\$ 3,200.00		
Subcontractor Labor Subtotal					\$ 35,395.00	
McKim & Creed				\$ 33,391.00		
Tobon Engineering				\$ 2,004.00		
Other Direct Expenses					\$ 4,110.00	
Travel (airfare, hotel, etc.)				\$ 4,110.00		
Miscellaneous Expenses (reproduction, postage, other)				\$ -	\$ -	
4 Water Treatment Plant Performance Evaluation						\$ 178,071.00
Labor Subtotal					\$ 127,180.00	
Celine Hyer, P.E.	Technical Expert	4	\$ 240.00	\$ 960.00		
Frank Sidari III	Technical Expert	8	\$ 240.00	\$ 1,920.00		
Rebecca Slabaugh	Technical Expert	64	\$ 240.00	\$ 15,360.00		
Brian Duane, P.E.	Technical Expert	16	\$ 240.00	\$ 3,840.00		
Tung Nguyen P.E.	Project Manager	88	\$ 220.00	\$ 19,360.00		
Sean Chaparro, P.E.	Senior Engineer	202	\$ 200.00	\$ 40,400.00		
Chris Heltzel	Lead Engineer	4	\$ 220.00	\$ 880.00		
Project Engineer 2	Project Engineer 2	342	\$ 130.00	\$ 44,460.00		
Subcontractor Labor Subtotal					\$ 49,935.00	
McKim & Creed				\$ 46,927.00		
Tobon Engineering				\$ 3,008.00		
Other Direct Expenses					\$ 956.00	
Travel (airfare, hotel, etc.)				\$ 956.00		
Miscellaneous Expenses (reproduction, postage, other)				\$ -	\$ -	

	Contract Labor Category	Hours	Billing Rate (\$ / hr)	Cost	Fee / Task	Total Fee
5	Water Master Plan Update				\$	410,560.00
	Labor Subtotal				\$	348,340.00
	Melissa Pomales, P.E. Senior Officer	16	\$ 280.00	\$ 4,480.00		
	Leah Richter, P.E. Company Officer	21	\$ 240.00	\$ 5,040.00		
	Celine Hyer, P.E. Technical Expert	130	\$ 240.00	\$ 31,200.00		
	Jim Cooper, P.E. Technical Expert	8	\$ 240.00	\$ 1,920.00		
	Rebecca Slabaugh Technical Expert	60	\$ 240.00	\$ 14,400.00		
	Brian Duane, P.E. Technical Expert	16	\$ 240.00	\$ 3,840.00		
	Chris Matthews Technical Expert	80	\$ 240.00	\$ 19,200.00		
	Greg Osthuus Technical Expert	8	\$ 240.00	\$ 1,920.00		
	Tung Nguyen P.E. Project Manager	76	\$ 220.00	\$ 16,720.00		
	Michael Knowles, P.E. Senior Engineer	28	\$ 200.00	\$ 5,600.00		
	Sean Chaparro, P.E. Senior Engineer	148	\$ 200.00	\$ 29,600.00		
	Joan Fernandez, P.E. Lead Engineer	228	\$ 220.00	\$ 50,160.00		
	Chris Heltzel Lead Engineer	200	\$ 220.00	\$ 44,000.00		
	Karen Bolter Senior Project Engineer	32	\$ 180.00	\$ 5,760.00		
	Andrea Guzman Chief Technician	65	\$ 150.00	\$ 9,750.00		
	Lauren DaCunha Project Engineer 2	62	\$ 130.00	\$ 8,060.00		
	Anusha Kadudula Project Engineer 1	80	\$ 115.00	\$ 9,200.00		
	Project Engineer 2 Project Engineer 2	196	\$ 130.00	\$ 25,480.00		
	Lia Dombroski Project Engineer 2	437	\$ 130.00	\$ 56,810.00		
	Seth Anderson Project Engineer 2	40	\$ 130.00	\$ 5,200.00		
	Subcontractor Labor Subtotal				\$	60,230.00
	McKim & Creed			\$ 51,206.00		
	Tobon Engineering			\$ 9,024.00		
	Other Direct Expenses				\$	1,990.00
	Travel (airfare, hotel, etc.)			\$ 290.00		
	Miscellaneous Expenses (reproduction, postage, other)		\$ -	\$ 1,700.00		

Attachment C

Subconsultant Proposals



ENGINEERS

SURVEYORS

PLANNERS

SCOPE OF SERVICES
for
CITY OF HOLLYWOOD
WATER MASTER PLAN ELECTRICAL AND I&C SERVICES
to
ARCADIS INC.

McKim & Creed will provide services pertaining to the electrical, instrumentation and SCADA equipment, for the City of Hollywood Water Master Plan.

These services are outlined in Exhibit 1 Scope of Work of the "Master Plan Updated Scope", from Arcadis to the City of Hollywood. McKim & Creed's tasks and fees are shown as a separate attachment to this document.

Please feel free to contact Aubrey Haudricourt, project manager, for any questions.

Thank you.

A.Haudricourt, PM

1365 Hamlet Avenue

Clearwater, FL 33756

727.442.7196

Fax 727.461.3827

www.mckimcreed.com

Task No.	Task Description	McKim
Task 1	PROJECT MANGEMENT AND INITIATION	\$ 33,437
1.1	Project Management and Administration	\$ 20,317
1.2	Data Collection and Request for Information (RFI)	\$ 4,920
1.3	Kick-off and Visioning/Goal Setting Workshop	\$ 8,200
Task 3	CONDITION ASSESSMENT	\$ 33,391
3.1	Condition Assessment Standards for Vertical and Linear Assets	\$ 1,028
3.3	Facility Condition Assessment Data Gathering (in plant & remaining facilities)	\$ 30,723
	Condition Assessment and Performance Evaluation Results Virtual Meeting	\$ 1,640
Task 4	WATER TREATMENT PLANT PERFORMANCE EVALUATION	\$ 46,927
4.1	Draft Section on Energy, SCADA Optimization, and Utilities evaluation	\$ 36,960
4.2	Condition Assessment and Performance Evaluation Results	
	Performance Evaluation Results Review Workshop	\$ 2,367
	Final Section on Energy, SCADA Optimization, and Utilities evaluation	\$ 7,600
Task 5	WATER MASTER PLAN UPDATE	\$ 51,206
5.1	Asset Risk Evaluations (Prioritized CIP)	\$ 10,402
	CoF and Risk Results Workshops	\$ 5,000
5.2	Project Alternatives Analysis and Cost Estimates	\$ 19,201
	Alternatives Workshop	\$ 5,000
5.3	Water Master Plan Compilation	\$ 6,402
	Draft Master Plan Workshop	\$ 5,201
TOTAL WATER MASTER PLAN FEE		\$ 164,961



Tobon Engineering

Engineering and Utility Management

SCOPE OF SERVICES

Tobon Engineering referred to as (SUBCONSULTANT) shall perform the engineering Scope of Services as described herein.

INTRODUCTION

City of Hollywood (City) entered into an agreement with Arcadis to provide engineering services in support of its water system. This Scope of Services for the SUBCONSULTANT is to provide services related to a water master plan (WMP) for the existing water service areas served by the City of Hollywood Public Works Department.

SCOPE OF SERVICES

Arcadis will furnish professional engineering services for the overall project management, project initiation, condition assessment, water plant performance evaluation, and compilation of CIP proposals into a comprehensive WMP update through 2040. Subconsultant will assist Arcadis in the development of the WMP through involvement in the following tasks as listed in the scope between the City and Arcadis:

1. Project Management and Initiation (Task 1)
2. Hydraulic Modeling, Future Demand Projections and Water Supply Evaluation (Task 2)
3. Condition Assessment (Task 3)
4. Water Plant Performance Evaluation (Task 4)
5. Water Master Plan Update (Task 5)

Tobon Engineering shall provide the specific following scope of services in assisting Arcadis in the development of the WMP, subtasks shown, and numbering are from the scope of work between the City and Arcadis.

Task 1 Project Management and Initiation

Task 1.1 Project Management and Administration (Phases 1 & 2)

Provide monthly project status updates and participate in calls with the City as needed for a project duration of 67 weeks under two phases.



Task 1.2 Data Collection and Request for Information (RFI) (Phase 1)

Review design reports, studies, GIS and/or performance assessments of the water facilities that characterize the existing condition and enhancement needs for various system components.

Task 1.3 Project Initiation – Kick-off and Visioning/Goal Setting Workshop (Phase 1)

Advise and participate in the visioning/goal setting and kick-off workshops which will review the scope, schedule, budget, and roles and responsibilities.

TASK 2 - HYDRAULIC MODELING, FUTURE DEMAND PROJECTIONS, AND WATER SUPPLY EVALUATION

Task 2.1 – Hydraulic Model Update and Calibration (Phase 1)

The purpose of this task is to bring the model up-to-date with current conditions within the system and bring the model to a level of detail aligned with current industry trends. Arcadis will update the existing City of Hollywood Water Distribution System Model (2018) to reflect recent distribution system improvements. The subconsultant will review and advise on the following tasks which include:

- Model Demand Allocation - Arcadis will review current customer demand information and integrate the demand into the water model. Arcadis shall review City provided water usage data to update demand patterns for existing customers and projections for future supply needs.
- Model Calibration - Arcadis shall re-calibrate the City's Infowater model to current industry standards utilizing pump curves, pumping schedules, tank level and supervisory control and data acquisition (SCADA) data.
- Field Data Collection – Arcadis will utilize flow testing and pressure data from the 1-week period of field data collection that will take place in coordination with the City's operations staff. A field data collection plan will be provided for the City

Task 2.2 – Review Existing Available Planning Data (Phase 2)

Assist Arcadis in the review of existing planning documents and readily available published data including: the previous City of Hollywood water demand projections from the latest Water Supply Plan, University of Florida Bureau of Economic and Business Research (BEBR) population projections for Broward County, US Census Bureau data, Regional Planning Commission data, City and County Utility Analysis Zone (UAZ) data, building permit and development requests, land use and future land use maps, and the latest Comprehensive Plan.

Task 2.3 – Water Supply Evaluation (Phase 1)

Advise and assist with the development of alternatives using design standards and the Objectives and Policies from the City, compared to existing scheduled CIP projects, and prioritizing solutions in



Tobon Engineering

Engineering and Utility Management

coordination with the City. Participate in discussions with the City on current water quality issues and operational challenges in the distribution system, including the manual operation of the WHPS and challenges for operating the WHPS and HSPS at the same time. Capital projects and/or operational improvement alternatives will be identified as part of the evaluation to mitigate or address water quality and operational issues.

TASK 3 – CONDITION ASSESSMENT

Task 3.1 – Condition Assessment Standards for Vertical and Linear Assets (Phase 1)

Participate in a 4-hour workshop (Workshop No. 2) with the City to discuss the standards and scoring for desktop pipeline condition assessments as well as the detailed facility (field) condition assessments at the wellfields, WTP, distribution storage, and distribution pumping facilities.

Task 3.2 - Desktop Condition Assessment for Linear Assets (Phase 1)

Assist and review the desktop pipeline condition assessment which will include an analysis of age, materials, diameters and past break history to understand potential factors causing failures such as corrosive soils, high groundwater tables, pressure surges, and etc.

TASK 4 – WATER PLANT PERFORMANCE EVALUATION (Phases 1 & 2)

Assist and review the Distribution System Performance Evaluation work product. The performance condition assessment to address the additional failure modes beyond mortality will be conducted through staff interviews and a review of relevant documents and data collected during the Task 1 data review as well as field and desktop evaluations.

TASK 5 – WATER MASTER PLAN UPDATE

Task 5.1 – Asset Risk Evaluation (Phase 2)

Assist in the development of conception design alternatives. Subconsultant will participate in Workshop No. 11 and 12 and will review workshop summaries and results.

Task 5.3 – Water Master Plan Compilation (Phase 2)

Arcadis will compile results into a Water Master Plan Report with schedules and budget incorporating all of the work from the previous tasks, a draft and final master plan report will be written that includes the following chapters:

- Executive Summary
- Introduction and Background
- Characterization of Existing System
- Regulatory Review
- Water Production and Demand Projection



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- Water Distribution System Modeling
- Water Treatment Capacity Equipment Condition and Risk Assessment
- Water Distribution System Desktop Condition and Risk Assessment
- Recommended Improvements
- Cost Evaluation and Schedule for Proposed Improvements Over 10 Years

Subconsultant will review all draft and final work products associated with the Water Master Plan Report, make comments, recommendations and edit, as necessary.

Lump Sum Fee	\$ 45,496
Reimbursable Expenses	\$ 200
Total Lump Sum Fee	\$ 45,696

ASSUMPTIONS

1. Total duration of services is 67 weeks and two phases.
2. Meeting minutes shall be prepared by others.
3. Arcadis is responsible for obtaining all data and GIS files needed for analysis and development of draft and final deliverables graphics and reports.
4. Subconsultant will rely on Arcadis and the City for accuracy of GIS and other data necessary for the completion of the tasks listed above.



Tobon Engineering



Hollywood Water Master Plan Hourly Manpower Breakdown

Task Number	Task Description	Subtask Hours	Task Total Labor Hours
1	PROJECT MANAGEMENT AND INITIATION		
	Task 1.1 Project Management and Administration 15 months	32	
	Task 1.2 Data Collection and Request for Information (RFI)	16	
	Task 1.3 Project Initiation – Kick-off and Visioning/Goal Setting Workshop	8	
			56
2	HYDRAULIC MODELING, FUTURE DEMAND PROJECTIONS, AND WATER SUPPLY EVALUATION		
	Task 2.1 – Hydraulic Model Update and Calibration	48	
	Task 2.2 – Review Existing Available Planning Data	24	
	Task 2.3 – Water Supply Evaluation	40	
			112
3	CONDITION ASSESSMENT		
	Task 3.1 – Workshop No. 7 and 8 - Condition Assessment Standards for Vertical and Linear Assets	6	
	Task 3.2 - Desktop Condition Assessment for Linear Assets	4	
			10
4	WATER PLANT PERFORMANCE EVALUATION	16	16
5	WATER MASTER PLAN UPDATE		
	Task 5.1 – Asset Risk Evaluation	16	
	Task 5.3 – Water Master Plan Compilation	32	
			48
	Total Hours		242
	Hourly Rate		\$188
	Labor Total		\$45,496
	Reimbursable Expenses		\$200
			-
	Total Fee		\$45,696