Town of Carolina Beach 2022 Water System Resiliency Assessment Project No. AIA-D-ARP-0093

Background

In 2015, the Town of Carolina Beach began building an Asset Management (AM) program for their water system. The initial phase of the Town's AM program, funded by a combination of AIA grants and Town funds, included the development of a partial asset inventory (prioritized data collection efforts), execution of condition assessments on certain asset types, and implementation of a CMMS program, Cityworks, as the data repository for condition and asset information. Using a CMMS program has allowed the Town to formally document where and how assets fail. The previous worked performed has improved the accuracy of the Town's asset data and has developed tools and procedures that will support an asset and risk-based management of the Town's infrastructure.

This scope of work will build on the Town's previous efforts by furthering development of risk-based Water System **Project Implementation Guides (Project Sheets).** Project Sheets will propose potential solutions to address asset inventory and condition issues found during ongoing efforts. The Project Sheets will document and prioritize issues found during further data collection efforts, including detailed examination of the 3-year history within Cityworks. This next phase will expand the risk analysis to include current challenges facing the Town, such as impacts of climate change, and will leverage operations and maintenance data collected over the past 3-years in Cityworks to quantify asset risk and reliability. These efforts will enable the Town to apply a data-driven process to identify and prioritize water infrastructure capital projects and develop a long-term Capital Improvement Plan (CIP) that maximizes investment in critical assets to reduce risk of system failure over time. Documents produced from this project will include capital project specific implementation guides that detail the project location, scope, schedule, capital investment, and identify potential funding sources.

The AIA project will provide the Town with a framework to sustainability meet their near- and long-term water system needs and prioritize their 10-year CIP to increase overall system resilience. Key steps in the development of the Water System Project Sheets include:

- Expand the asset registry and condition data
- Risk Analysis
- Develop a Renewal and Replacement (R&R) model and CIP Prioritization Tool
- Develop Project Implementation Guides (Project Sheets)

Scope of Services

Task 1 – Expand Asset Inventory and Condition Data

The objective of this task is to expand and improve the current asset registry and condition information for missing segments of the Town's water system. Previous asset data focused on condition and location data. In order to assess and mitigate the impact of updated risks, including climate change, the Town's asset attribute data must be expanded to include information such as flood zone data. Jacobs and Town staff will collaboratively identify additional climate and resiliency data to be collected during this phase.

An initial workshop will be held to review the data already collected and develop a plan for the remaining asset data collection effort. An additional one workshop would be held, to review the data, identify remaining gaps, and determine additional actions.

Components of this task include asset surveys, condition assessments, and flow monitoring.

Deliverables

- Two (2) workshops:
    - Asset Inventory Planning Workshop
    - Asset Inventory Data Review Workshop
- One (1) one-day site visits for up to 2 consultant staff
- One (1) working sessions
- Condition Assessment Templates
- Updated Asset Inventory
- Condition Assessment Scores

Assumptions

- Town staff will populate Condition Assessment Templates for assets in an Excel format.
- Flow monitoring will be performed by SEPI.

Task 2 – Risk Analysis

The objective of this task is to identify critical risks to the Town's water infrastructure. This process will include review of past 3-years of Cityworks data to validate risks. Using the expanded asset inventory, a criticality assessment will be conducted to assess risk in major subsystems or components. This process will utilize one of the ISO 31000 standard approaches and evaluate the most appropriate method as identified such as likelihood of failure (LOF) X consequence of failure (COF), the development of Reliability Block Diagrams (RBDs) for high priority risks and sub-systems, or determining critical assets (proxy data for COF) and then leveraging asset condition data to facilitate identification of likelihood of failure (LOF). Mapping of town-wide water system risk data will be updated to facilitate visualization and communication of system status. Insights from this analysis will guide revisions to the current preventative maintenance (PM) program, including condition assessment techniques, and CIP prioritization practices. During this step a list of projects to improve system resilience and reduce risk of failure will be developed in a risk mitigation plan actionable format.

Deliverables

- Two (2) workshops for:
    - Data Validation and Risk Ranking Workshop
    - Results Review Workshop
- RBDs for up to 15 high priority systems
- Recommended updates to preventative maintenance program and capital improvements planning practices
- Mapping of town-wide risk data for water assets

Task 3 – Renewal & Replacement Model and CIP Prioritization Tool

The primary objective of this task is to begin to develop a conceptual baseline 20-year funding forecast model with specific focus on identifying the potential funding needs associated with each capital and O&M budgets for each infrastructure system. Estimates will use the expanded asset inventory, updated condition, risk assessment data, and existing data from the Town's CMMS system. System evaluation

estimates and remaining useful lives will require empirical, high-level estimates by Jacobs' financial professionals.

A Renewal & Replacement (R&R) model will be developed to facilitate the generation of an updated capital project list. The model will result in funding levels for typical system characteristics. Jacobs will use a CIP prioritization decision support tool and process. The CIP prioritization tool will allow for the use of Town-specific criteria and values in conjunction for assessments for risk, reliability, maintenance strategies, and growth normally associated with asset management programs. The CIP tool utilizes a prioritization framework that will be customized to the Town and will include the definition of criteria and their importance, identification of performance scales to measure the benefits of candidate projects, identification of costs for use in benefit-cost analyses and cumulative cost outputs.

The condition assessment activities and data analytics will assist in project identification. This task will improve the Town's ability to forecast financial requirements and implement the most impactful and cost-effective projects. As part of this step project financing options will be analyzed and opportunities for state and/or federal grants and loans will be identified.

Deliverables

- Two (2) workshops:
    - R&R Forecast Modeling Method and Data Input Review Workshop
    - R&R Model Review Workshop
- Baseline 20-year R&R Excel Forecast Model

Assumptions

- Asset related engineering analysis or engineering evaluations are not part of this task.
- Enhanced asset data from Task 1 and 2 will be sufficient for development of the baseline model.

Task 4- Develop Project Implementation Guides

The objective of this task is to provide the Town with an updated risked-based capital improvement plan. This effort will include the development of succinct implementation guides for CIP projects. The implementation guides serve to support Town approval and execution of projects within the CIP. Key components of the implementation guides will include: project location, scope, benefit, implementation date, brief project description, expected capital investment, and identify potential funding sources. The project implementation guides standard format will be used to support CIP development and grants and funding opportunities.

Deliverables

- Two (2) workshops:
    - CIP Prioritization Input Workshop
    - CIP Review Workshop
- 10-year CIP, with project implementation guides for projects for next 5-years (up to 10)

Assumptions

- Cost estimates prepared in this scope are conceptual/planning level estimates and are subject to changes in both technical detail and market conditions. As such, Jacobs does not warrant that ultimate costs will not vary from the prepared estimates.
- Jacobs will reasonably rely upon the accuracy, and completeness of the information/data provided by the Town or other third parties.

Schedule

This project will begin in the 4th Quarter 2022 and be completed by the 4th Quarter 2024.

Table 1. Project Schedule

	Year 2022	Year 2023				Year 2024			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Task 1									
Task 2									
Task 3									
Task 4									

Compensation

Payment for all tasks in the Project Scope outlined above will be on a Lump Sum basis for $200,000, inclusive of all labor and expenses. This budget reflects efforts tied to the schedule above. Table 2 presents the estimated AIA grant disbursement breakdown by Task. Jacobs shall not incur costs in excess of this fee without advance written authorization from the Town. The work defined herein shall be governed by the terms and conditions of the Agreement for Professional Services. Please sign and return as your formal Notice to Proceed.

Table 2. Estimated Grant Disbursement Breakdown by Task

Activity	**Grant Source**
	Water Project No. AIA-D-ARP-0093
Task 1 – Expand Asset Inventory and Condition Data	$80,000
Task 2 – Risk Analysis	$40,000
Task 3 – Renewal & Replacement Model and CIP Prioritization Tool	$40,000
Task 4 – Develop Project Implementation Guides	$40,000
AIA Grant Total	**$200,000**