ARCADIS Design & Consultancy for natural and built assets

CITY OF HOLLYWOOD, FLORIDA

PROJECT NO. 20-1336

PROFESSIONAL ENGINEERING SERVICES FOR CITY OF HOLLYWOOD WATER MASTER PLAN UPDATE

June 2020

Title Page

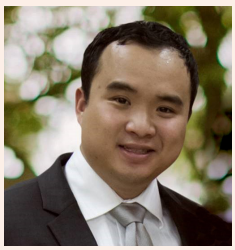
STATEMENT OF QUALIFICATIONS

City of Hollywood - Project No. 20-1336

PROFESSIONAL ENGINEERING SERVICES FOR CITY OF HOLLYWOOD WATER MASTER PLAN UPDATE | JUNE 8, 2020

ARCADIS POINTS OF CONTACT

LEAH RICHTER, PE | Principal in Charge
8201 Peters Road, Suite 3200
Plantation, Florida 33324
954.599.7368



TUNG NGUYEN, PE, PMP | Project Manager
8201 Peters Road, Suite 3200
Plantation, Florida 33324
954.246.0936

THIS SHEET MUST BE SIGNED

RESPONDENT CHECK LIST

IMPORTANT: Please read carefully, sign in the spaces indicated and return with your Submittal.

Respondent should check off each of the following items as the necessary action is completed:

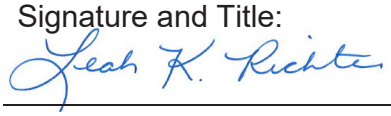
1. The Submittal has been signed.
2. Any required descriptive literature, etc. have been included.
3. Any information required is included.
4. Any addenda have been signed and included.
5. The mailing envelope has been addressed to:
   Office of the City Clerk
   City of Hollywood
   P.O. Box 229045.
   Hollywood, FL 33022-9045
6. The mailing envelope must be sealed and marked with Submittal Number, Submittal Title and Due date.
7. The Submittal will be mailed or delivered in time to be received no later than the specified due date and time. Otherwise Submittal cannot be considered.
8. Submittal includes:
   a) Statement of current and projected workload
   b) List of sub-consultants
   c) Auditor's letter
   d) Organizational chart
   e) Litigation
   f) Project schedule

ALL COURIER-DELIVERED STATEMENTS OF QUALIFICATIONS MUST HAVE THE RFQ NUMBER AND TITLE ON THE OUTSIDE OF THE COURIER PACKET

Company Name:

Arcadis U.S., Inc.

Signature and Title:



Leah K. Richter, PE | Vice President

Date: June 8, 2020

PROJECT SUBMITTAL

FROM: Arcadis U.S., Inc.
8201 Peters Road, Suite 3200
Plantation, FL 33324

DATE: June 8, 2020

CITY OF HOLLYWOOD
Department of Public Utilities
c/o City Clerk
2600 Hollywood Blvd.
Hollywood, FL 33022-9045

RE: RFQ NO. 20-1336

To whom it may concern:

The undersigned, as Respondent, hereby declares that we have examined the Scope of Services and informed ourselves fully in regard to all conditions pertaining to the work to be done for the City of Hollywood's Consulting Services Contract – **PROFESSIONAL ENGINEERING SERVICES FOR CITY OF HOLLYWOOD WATER MASTER PLAN UPDATE.** The Respondent further declares that the only persons, company or parties interested in this Submittal or the Contract to be entered into as principals are named herein; that this Submittal is made without connection with any other person, company or companies making a Submittal; and it is in all respects fair and in good faith, without collusion or fraud.

The service to be furnished by us is hereby declared and guaranteed to be in conformance with the specifications of the City.

The undersigned agrees that should this Submittal be accepted, to execute the contract and present the same to the City for approval within twenty (20) days after being notified of the awarding of the contract.

The undersigned further agrees that failure to execute and deliver said forms of contract within twenty (20) days, will result in damages to the City.

IN WITNESS WHEREOF, I have hereunto subscribed my name on this 21 day of May, 2020, in the County of Broward, in the state of Florida.

Respondent's Firm or Trade Name

Corporation, Sole Proprietorship, Partnership (Circle One)

Phone No.: 954 761 3460

Address 8201 Peters Road, Suite 3200

City and State Zip Plantation, FL 33324

BY: Leah K. Richter, PE
Typed and Written Signature

Vice President
Title

Notary Public State of Florida
Mindy Mondesir
My Commission GG 220051
Expires 09/16/2022

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ARCADIS Design & Consultancy for natural and built assets

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LETTER OF TRANSMITTAL

City of Hollywood
Office of the City Clerk
2600 Hollywood Blvd., Room 221
Hollywood, FL 33020

Arcadis U.S., Inc.
8201 Peters Road,
Suite 3200,

33324 Plantation Florida, FL
Tel 954 7613460
www.arcadis.com

Subject:

Project No. 20-1336 | Professional Engineering Services for City of Hollywood Water Master Plan Update

Water South

Dear Evaluation Committee Members,

Date:
June 8, 2020

Contact:
Leah Richter, PE

Phone:
954 761 3460

Email:
Leah.Richter@arcadis.com

In the current pandemic environment of COVID-19, many industries and sectors moved to deliver goods and services remotely, scaled back operations, or even stopped temporarily. However, the water sector did not pause. As an essential service provider, the City of Hollywood (City) ensured that water facilities continued functioning every day, providing high-quality water and cost-effective services to meet the demands and needs of your customers during this unprecedented time. This critical mission added to the capital and resource demands from normal operating and capital cost burdens. Now, more than ever, the City has a unique opportunity to capitalize on and maximize the benefits that this Water Master Plan Update will provide.

As your trusted partner and Engineer for over 15 years, Arcadis understands your challenges and goals. Our experience and understanding of your water system facilities, system risks, and goals uniquely qualifies us to support you in the identification of needs, prioritization of critical projects, and development of management strategies of your multiple water supply sources. We understand that the City's major facilities and assets to be evaluated under the proposed Master Plan Update project include water supply wellfields, deep injection wells, ground and elevated storage tanks, water treatment facilities, and distribution system many of which were originally constructed in the 1960's and are over 50 years old. We helped the City develop your most recent Master Plan in 2007 which laid the roadmap for improvements through the present day including upgrade of the existing RO treatment trains, Membrane Softening trains, and the High Service Pump Station among many other system improvements. Arcadis is dedicated to delivering exceptional results to the City through the leadership of **our talented, local team** by leveraging our **national leaders in water treatment and risk-based water planning** and executing our **proven approach and innovative solutions**. We offer the City the following benefits:

City of Hollywood
June 8, 2020

Our local and talented team: Arcadis has maintained an office in Broward County for more than 30 years. Located just minutes away in our Plantation Office, our local team of nearly 20 staff is familiar with not only the City and your facilities, but also community and regional issues that could impact the success of this project. Our local Principal-in-Charge, Leah Richter, and Project Manager, Tung Nguyen will work together closely to provide exceptional technical delivery while ensuring the City's satisfaction and needs are met at every step, leveraging our industry-leading expertise and delivering success to you locally.

Proven Delivery Capability: Our team has successfully partnered with and delivered quality projects for the City for nearly two decades with many of the same staff proposed for this project, giving you peace of mind that a high quality Water Master Plan Update will be completed with no learning curve required, saving you time and money. Our institutional knowledge gained through the completion of the City's previous Master Plan, hydraulic model update, AWIA risk and resilience assessment, and plant and pump station evaluation projects allows us to uniquely understand the City's facilities and needs.

Nationals Leaders in Water Treatment and Risk-Based Water Planning: With over 100 water treatment plant and water system master plans completed in the past 10 years, Arcadis has a proven record of delivering master plans that guide the actions and preparations that will enable the City to respond to the challenges of today and tomorrow. Arcadis is an industry leader in applying asset management principles for risk-based master planning with over 15 years of experience in delivering these types of projects. Our superior understanding of regulatory requirements from our more than 25 years of engineering and technical engagement in USEPA's regulatory development and review process provide the City further peace of mind that your Master Plan Update will address current and future regulations. This expertise allows us to quickly identify issues of concern to the City and develop cost-effective, innovative, and practical solutions that emphasize operability and dependability.

On behalf of our team, we thank you for the opportunity to present our Statement of Qualifications for this important project. Please do not hesitate to contact us should you have any questions. We look forward to participating in the next steps of the evaluation process and continuing to serve as your consultant and partner in the achievement of your water system planning and improvement objectives.

Sincerely,

Arcadis U.S., Inc.

Leah K. Richter, PE
Vice President

Tung Nguyen, PE, PMP
Certified Project Manager

ARCADIS Design & Consultancy for natural and built assets

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SUBMITTAL QUESTIONNAIRE FORM

ENGINEERING SERVICES QUALIFICATION STATEMENT
AND SUBMITTAL QUESTIONNAIRE

PROJECT NAME: **PROFESSIONAL ENGINEERING SERVICES FOR WATER MASTER PLAN**
PROJECT NO.: **20-1336**

1. FIRM NAME & OFFICE LOCATION (Mailing Address and Street Address)

Name: Arcadis U.S., Inc.

Mailing Address:
Street/PO Box: 8201 Peters Road, Suite 3200
City: Plantation **State** FL **Zip** 33324

Physical Address (if different from above):
Street:
City: State: Zip:

Phone (954) 761 - 3460 Ext: Fax (954) 761 - 7939

Primary E-Mail Address: leah.richter@arcadis.com

Web Site Address: www.arcadis.com

Contacts:
1. Name: Leah Richter, PE Title: Vice President
2. Name: Tung Nguyen, PE Title: Senior Water Engineer

2. TYPE OF ORGANIZATION

A. Check One:

- [X] Corporation (complete Section B and G)
- [ ] Sole Proprietorship (complete Section D)
- [ ] Other (complete Section F and G
- [ ] Partnership (complete Section C and G)
- [ ] Joint Venture (complete Section E and G

B. If a Corporation, State incorporated:

Date of Incorporation: Delaware

State in which Incorporated: 10/9/1997

If an out-of-state corporation that is currently authorized to do business in the State of Florida, give the date of such authorization: Delaware

Name and Titles of Principal Officers — Date Elected

Alexander Rothchild, CEO and Director | elected 5/28/2020
Brian Kundert, EVP and Director | elected 5/28/2020
Darren English, CFO and Director | elected on 5/28/2020
Heather Polinsky, COO | elected on 1/30/2020
Kathleen Abbott, Business Line President, Environment | elected 5/28/2020
Wassim Selman, Business Line President, Infrastructure | elected on 9/5/2019
John McCarthy, Business Line President, Water | elected on 9/5/2019
Aren Fairchild, Corporate Secretary and Chief Legal Officer | elected on 9/5/2019
Anita Luten-Bellin, Treasurer elected on 9/5/2019

C. If a Partnership, State formed:

Date of Partnership: _____

Type of Partnership (General or Limited): _____

Names and Addresses of Partners:

_____

_____

D. If Joint Venture, State formed:

Date of Joint Ventureship: _____

Names and Addresses of Joint Venturers:

_____

_____

_____

E. If a Sole Proprietorship, State created:

Name and Address of Sole Proprietor:

_____

_____

F. If other than above, please describe:

G. Related Parent Company, Divisions, and Subsidiaries:
(Attach additional information on other office locations, if appropriate)

See attached.

Please attach the following:

a. Corporate Organization Chart — Please see Pg. 25 of Proposal Submittal, following Submittal Questionnaire
b. Resumes of Principal Staff — Please see Appendix A of proposal response.
c. Corporate Family Tree — Please see Pg. 25 of Proposal Submittal, following Submittal Questionnaire
d. Company Brochure/Annual Report — Please see Pg. 21 of Proposal Submittal, following Submittal Questionnaire

3. EMPLOYEES AND PERSONNEL Provide a separate listing for personnel at the corporate (national) level, with the state (Florida) level and for the local office.

Permanent Office Staff	Number	Avg. Years With Firm		
		1-5	5-10	10+
Administrative	1	1	0	0
Project Management	2	2	0	0
Engineers	5	4	0	1
Design/Drafting	0	0	0	0
Computer Services	0	0	0	0

Permanent Office Staff	Number	Avg. Years With Firm		
		1-5	5-10	10+
Clerical /Technicians	0	0	0	0
Procurement	0	0	0	0
Project Control and Estimating	0	0	0	0
Construction Management	6	3	0	3
Research and Development	0	0	0	0

Local Office Location:
Plantation, FL

* Note: These figures represent Permanent Office staff only, as requested, and do not include Temporary, Part Time as Needed, or Remote Office Staff.

Discipline	Engineers		Designers
	Reg	Total	Total
Civil	1	1	
Sanitary	2	2	
Structural			
Mechanical			
HVAC			
Process			
Electrical	2	2	
Instrumentation			
Industrial			

* Please note: not all disciplines are captured. Therefore, the above chart counts may differ.

Discipline (*Procurement*)	**Personnel**
Capital Equipment Buyers	
Subcontract Administrators	
Bulk Material Buyers	
Inspection/Expediting	
Clerical/Technical Support	

Discipline (*Construction Management*)	**Personnel**
Field Superintendents	
Home Office Management	
Planners (Site, City, Community)	5
Architects	
Other	1

3. EMPLOYEES AND PERSONNEL Provide a separate listing for personnel at the corporate (national) level, with the state (Florida) level and for the local office.

Permanent Office Staff	Number	Avg. Years With Firm		
		1-5	5-10	10+
Administrative	4	1	0	3
Project Management	22	6	2	14
Engineers	78	46	14	18
Design/Drafting	13	1	2	10
Computer Services	3	0	0	3

Permanent Office Staff	Number	Avg. Years With Firm		
		1-5	5-10	10+
Clerical /Technicians	77	65	3	9
Procurement	0	0	0	0
Project Control and Estimating	3	2	0	1
Construction Management	5	2	1	2
Research and Development	0	0	0	0

Local Office Location:
All Florida

* Note: These figures represent Permanent Office staff only, as requested, and do not include Temporary, Part Time as Needed, or Remote Office Staff.

Discipline	Engineers		Designers
	Reg	Total	Total
Civil	3	3	5
Sanitary			
Structural	10	10	
Mechanical			
HVAC			
Process			
Electrical	2	2	1
Instrumentation			
Industrial	1	1	

* Please note: not all disciplines are captured. Therefore, the above chart counts may differ.

Discipline (*Procurement*)	**Personnel**
Capital Equipment Buyers	
Subcontract Administrators	
Bulk Material Buyers	
Inspection/Expediting	
Clerical/Technical Support	

Discipline (*Construction Management*)	**Personnel**
Field Superintendents	3
Home Office Management	
Planners (Site, City, Community)	1
Architects	
Other	2

US TOTAL WORKFORCE

3. EMPLOYEES AND PERSONNEL Provide a separate listing for personnel at the corporate (national) level, with the state (Florida) level and for the local office.

Permanent Office Staff	Number	Avg. Years With Firm		
		1-5	5-10	10+
Administrative	59	25	9	25
Project Management	345	110	57	175
Engineers	1263	733	255	275
Design/Drafting	104	23	15	66
Computer Services	56	7	8	44

Permanent Office Staff	Number	Avg. Years With Firm		
		1-5	5-10	10+
Clerical /Technicians	583	382	57	144
Procurement	14	10	1	3
Project Control and Estimating	79	41	12	10
Construction Management	153	78	30	45
Research and Development	8	2	2	4

Local Office Location:
All of U.S

* Note: These figures represent Permanent Office staff only, as requested, and do not include Temporary, Part Time as Needed, or Remote Office Staff.

Discipline	Engineers		Designers
	Reg	Total	Total
Civil	103	103	35
Sanitary			
Structural	50	50	
Mechanical	18	18	
HVAC			
Process			
Electrical	54	54	22
Instrumentation			
Industrial	3	3	

* Please note: not all disciplines are captured. Therefore, the above chart counts may differ.

Discipline (*Procurement*)	**Personnel**
Capital Equipment Buyers	8
Subcontract Administrators	
Bulk Material Buyers	
Inspection/Expediting	
Clerical/Technical Support	

Discipline (*Construction Management*)	**Personnel**
Field Superintendents	35
Home Office Management	
Planners (Site, City, Community)	46
Architects	
Other	66

Maximum Man-Hours Available Per Year: ~~2000~~ 1560 Per employee, on average

Current Estimated Man-Hours Per Year: 1,925 Available

4. FINANCIAL INFORMATION

A. Attach a copy of current audited income statement and balance sheet. See Appendix B

5. WORK EXPERIENCE:

A. Types of Services Provided (Check Yes or No)

	Yes	No		Yes	No
Feasibility Studies	☒	☐	Stress Analysis*	☒	☐
Drawings					
Preparation of Specifications	☒	☐	Pipeline	☒	☐
Construction Mgmt. Services	☒	☐	Surveying	☒	☐
Process Problem Analysis	☒	☐	Direct Hire Field Construction	☐	☒
Energy Conservation Studies	☒	☐	Detailed Instrumentation & Control	☒	☐
Soil and Foundation Studies	☒	☐	Process Design	☒	☐
Foundation Design	☒	☐	Equipment Design	☒	☐
Structural Design	☒	☐	Detailed Electrical	☒	☐
Testing Capability	☒	☐	Detailed Piping Design	☒	☐
Detailed Mechanical	☒	☐	Construction Management	☒	☐

Procurement ☒ ☐ Inspection/Expediting ☒ ☐

B. Drafting Method Utilized:

*Manual ☐ Computer ☒ If Computer, What Program: AutoCAD, Microstation, Revit

C. Please attach summaries for projects, related to the type of work to be awarded as a result of this submittal, completed by your firms including: Please see Section 4 of proposal response.

1) Location of project and client
2) Description of project
3) Your scope of involvement in project
4) Contract type (e.g. reimbursable/fixed fee/fixed price)
5) Approximate value of contract
6) Duration of work
7) Project Manager Utilized

6. EXPERIENCE WITH THE CITY OF HOLLYWOOD

A. Most Recent City of Hollywood Work Experience: (Date/Location/Description)

AWIA Risk and Resiliency Assessment | 2019 - 2020

4-Log Disinfection Evaluation | 1/2020 -7/2020

Water System – Risk and Resilience Assessments for the 2018 America's Water Infrastructure Act | 2019 - March 2020

Hydraulic Model Updates and Calibration | 2016 - 2019

High Service Pump Upgrades | 2015 - 2020

WTP Class I Injection Well System | 2010 - 2015

Deep Injection Well Design | 2015 - 2016

Mechanical Integrity Testing for DIW | 2017

B. Current City of Hollywood Engineering services agreement, if any: (Agreement Number/Expiration Date/Location/Description)

Professional Services Agreement for General Engineering Consultant Services

City of Hollywood Department of Public Utilities | Water Treatment Plant & Wastewater Treatment Plant Projects - City Project No. 17-1324

Agreement entered November 7, 2017

Expiration date - November 7, 2021

7. SUBCONTRACTED SERVICES:

List Subcontractor/ Sub-consultant firms expected to be utilized, and their portion of the work below:

Name of Firm	Area of work to be Performed under this agreement
McKim & Creed	Electrical, Instrumentation and Controls Assessments/ Energy Management
Tobon Engineering	Technical Assistance/Hydraulic Modeling

Also, provide resumes of individuals from these firms whom the Subcontractors shall utilize for completion of the construction. See Appendix A

Identify those subcontractors that are Minority/Women's Business Enterprises and repeat required information in "Minority/Woman Business Participation", below for said Subcontractors. (THIS REQUIREMENT FOR M/WBE INFORMATION IS VOLUNTARY) See following page - for Tobon Engineering M/WBE Information

8. BUSINESS SIZE AND CLASSIFICATION

A. Size (check one)

☐ Small
A domestic concern that normally employs less than 500 persons, or as defined by section 3 of the Small Business Act.

☒ Large
A domestic concern which, including domestic and foreign divisions and affiliates, normally employs 500 or more persons, is independently or publicly owned or controlled and operated and

which may be a division of another domestic or foreign concern.

B. Classification (check where applicable; may be more than one)

☐ Foreign:
A concern which is not incorporated in the United States or an unincorporated concern having its principal place of business outside the United States.

☐ Minority:
A business, at least 50% of which is owned by minority group members, or, in case of publicly owned businesses, at least 51% of the stock of which is owned by minority group members. For the purpose of this definition, minority group members are Black-Americans, Hispanic-Americans, American-Orientals, American-Indians, American-Eskimos, and American-Aleuts.
(THE REQUIREMENT FOR M/WBE INFORMATION IS VOLUNTARY)

☐ Women:
A business that is at least 51% owned and controlled by a woman or women.
(THE REQUIREMENT FOR M/WBE INFORMATION IS VOLUNTARY)

☐ Nonprofit:
A business or organization that has received nonprofit status under IRS Regulation 501C3.

☐ Sheltered:
A sheltered workshop or other equivalent business basically employing the handicapped.

Please indicate in the space below how your firm complies with the definitions selected above.

Arcadis U.S., Inc. is a U.S. company incorporated in the State of Delaware) and a wholly-owned subsidiary of Arcadis, N.V., a publicly-trade corporation headquartered in Amsterdam, the Netherlands per pages 23 - 24 of the Submittal Questionnaire.

9. PROFESSIONAL ENGINEER'S LICENSE:

Respondent must hold a valid State of Florida Professional Engineer's License to be considered a qualified bidder.

State of Florida Professional Engineer's License No.: 7917

Date: February 28, 2021

Primary Classification: Engineering Services

8. BUSINESS SIZE AND CLASSIFICATION

A. Size (check one)

☒ Small
A domestic concern that normally employs less than 500 persons, or as defined by section 3 of the Small Business Act.

☐ Large
A domestic concern which, including domestic and foreign divisions and affiliates, normally employs 500 or more persons, is independently or publicly owned or controlled and operated and which may be a division of another domestic or foreign concern.

B. Classification (check where applicable; may be more than one)

☐ Foreign:
A concern which is not incorporated in the United States or an unincorporated concern having its principal place of business outside the United States.

☒ Minority:
A business, at least 50% of which is owned by minority group members, or, in case of publicly owned businesses, at least 51% of the stock of which is owned by minority group members. For the purpose of this definition, minority group members are Black-Americans, Hispanic-Americans, American-Orientals, American-Indians, American-Eskimos, and American-Aleuts.
(THE REQUIREMENT FOR M/WBE INFORMATION IS VOLUNTARY)

☐ Women:
A business that is at least 51% owned and controlled by a woman or women.
(THE REQUIREMENT FOR M/WBE INFORMATION IS VOLUNTARY)

☐ Nonprofit:
A business or organization that has received nonprofit status under IRS Regulation 501C3.

☐ Sheltered:
A sheltered workshop or other equivalent business basically employing the handicapped.

Please indicate in the space below how your firm complies with the definitions selected above.

State Certified MBE

Broward County Certified SBE/CBE

10. QUALIFICATION FORM PREPARED BY:

Name (print or type): Leah Richter, PE

Title: Vice President

Signature: Leah K. Richter

Address: 8201 Peters Road, Suite 3200, Plantation, FL 33324

Telephone Number: 954.761.3460

SUBSIDIARY INFORMATION

Company Name	Complete Address	Relationship
Arcadis CE, Inc.	44 South Broadway, 9th Fl. White Plains, NY 10601	Subsidiary
Arcadis Central AM Holdings, LLC	630 Plaza Drive, Suite 200 Highlands Ranch, CO 80129	Subsidiary
Arcadis Corporate Services, Inc.	630 Plaza Drive, Suite 200 Highlands Ranch, CO 80129	Subsidiary
Arcadis FieldTech Solutions, LLC	630 Plaza Drive, Suite 200 Highlands Ranch, CO 80129	Subsidiary
Arcadis G&M of Ohio, Inc.	One Seagate, Suite 700 Toledo, OH 43604	Subsidiary
Arcadis of Michigan, LLC	28550 Cabot Drive Novi, MI 48377	Subsidiary
Arcadis of New York, Inc.	110 West Fayette St., Suite 300 Syracuse, NY 13202	Subsidiary
Construction Dynamics Group, Inc.	7550 Teague Rd., Suite 210 Hanover, MD 21076	Subsidiary
E2 ManageTech, Inc.	320 Commerce St., Suite 320 Irvine, CA 92602	Subsidiary
Lawson, Noble & Webb, Inc.	1500 Gateway Blvd., Suite 200 Boynton Beach, FL 33426	Subsidiary
Lewis & Zimmerman Associates, Inc.	7550 Teague Rd., Suite 210 Hanover, MD 21076	Subsidiary
LFR Holding Corporation	630 Plaza Drive, Suite 200 Highlands Ranch, CO 80129	Subsidiary
PinnacleOne, Inc.	410 N. 44th Street, Suite 1000 Phoenix, AZ 85008	Subsidiary
Reese, Macon & Associates, Inc.	630 Plaza Drive, Suite 200 Highlands Ranch, CO 80129	Subsidiary
Rise Alaska, LLC	880 H Street, Suite 101 Anchorage, AK 99501	Subsidiary
Rise International, LLC	2000 South Michigan Ave., Suite 200 Chicago, IL 60604	Subsidiary

ARCADIS Design & Consultancy for natural and built assets

CORPORATE BROCHURE

Our Mission

To create exceptional and sustainable outcomes for our clients in the natural and built asset environments.

From climate change and rising sea levels, to rapid urbanization and pressure on natural resources, we live in an increasingly complex world.

Arcadis helps you navigate this complexity by understanding the bigger picture. Whether it's maximizing space in cities, making wasteland habitable or simply taking what you do further, we deliver outcomes that improve quality of life, safely and sustainably.

Connecting your vision to our know-how, our people create value through built and natural assets that work in harmony with their surroundings – from a children's hospital in Chicago and environmental restoration in Texas to flood protection in New Orleans and high-speed rail capacity in California.

Our diverse experience means we apply collective wisdom to every challenge – big and small. In this way, our experience protecting the Dutch coast for generations is being applied to securing New York's flood defenses today. So whatever your challenge, our teams bring the necessary perspective to provide the right answers, now and in the future.

Arcadis. Improving quality of life.

Our Services

Buildings

Program, Project & Construction Management

Planning & Pre-Design Phase
- Planning & Permitting
- Site Evaluation & Selection
- Master Budget & Schedule Development
- A/E Selection Assistance

Design Phase
- Risk Analysis & Management
- A/E Team Management
- Cost Estimation & Control
- Constructability Reviews

Bidding Phase
- Bid Packaging & Management

Construction Phase
- Contract Administration
- Schedule & Budget Management
- Change Order Evaluation
- Onsite Observation

Project Close-Out & Occupancy Phase
- Punchlist Coordination
- Move-In Scheduling & Management
- Owner's Staff Training Coordination

Contract Solutions
- Design/Build Program Management
- Dispute Avoidance & Resolution
- Schedule Evaluation & Monitoring
- Contract Document Review
- Delay Impact Analyses
- Litigation Support & Expert Testimony
- Custom Training Services

Value Engineering

Sustainability Consulting & Policy Commissioning

Environment

Site Investigation

Remediation
- Closure Strategy Development
- Brownfields Redevelopment
- Guaranteed Outcome Programs
- Portfolio Management/Liability Transfer
- In Situ & Existing Remediation
- Military Munitions Response
- Sediment Remediation
- Remedial Construction
- Treatability Studies
- Operations, Maintenance & Monitoring - all phases
- Waste Management

Planning & Permitting
- Public Outreach
- Environmental Impact Statements - NEPA, other
- Facility Siting/Routing
- Permit Strategy/Acquisition
- Natural Resource Management Plans
- Field Studies/Surveys
- Mitigation Plans

Risk & Eco-Restoration
- Natural Resource Damages
- Aquatic Habitat Restoration
- Wetland Mitigation
- Ecological & Human Health Risk Assessment

Strategic Environmental Consulting
- Community Relations
- Due Diligence / M&A Support
- Environmental Reserve Management
- Asset Management
- Environmental Management Systems Design & Auditing
- Expert Witness/Litigation Support
- Global Product Stewardship
- Decision Economics
- Regulatory Advisory Services
- Sustainability Assessments/Program Development

Compliance
- Multimedia Compliance Auditing
- Title V & Non-Title V Air Permitting
- National Pollutant Discharge Elimination System Permitting
- Stormwater Pollution Prevention Plans
- Spill Prevention, Control & Countermeasure Plans
- EPCRA Tier II & HMBP Reporting
- RCRA Permitting & Compliance
- Process Safety Management
- Risk Management Plans
- TSCA Evaluation & Compliance
- Asbestos, Lead & IAQ Surveys
- Outsourced EHS Compliance Solutions

Energy/Climate Change
- Energy Audits/Demand Minimization
- Carbon/Greenhouse Gas Management
- Carbon Credits
- Renewable Energy Solutions
- Climate Adaptation

Geographic Information Systems / Information Management

Incident Response & Recovery

ARCADIS Design & Consultancy for natural and built assets

Infrastructure

Transportation

Intelligent Transportation Systems
Planning & Design
- Roadway
- Transit
  - Light Rail
  - Heavy Rail
  - Bus Rapid Transit
- Airport
- Bridge
- Tunnel
- Seaport
- Corridor Planning
- Multi-Modal Facility Planning
- Comprehensive Transportation

Traffic Engineering
Structural Engineering
Environmental Impact Assessment & Permitting
Public Involvement
Asset Management

Facilities

Management Consulting
Integrated Facilities Management
Building Design & Engineering
Corporate Responsibility
Off-Shore Manufacturing Solutions

Land Resources

Residential, Commercial, Industrial & Multi-Use Development
Master Land Planning
Urban Planning & Development
Civil Engineering & Site Design
Landscape Architecture
Surveying & GIS

Geographic Information Systems

Global Positioning Systems

Water

Water Management

Coastal Restoration
Flood Protection
Resiliency
Water Basins
Hydraulic Structures
Urban Water

Water Supply Planning and Development

Integrated Water Supply Planning
Ground Water Supply Development
Surface Water Supply Development
- Fresh Water
- Oceans

Water Conservation

Water Collection, Conveyance and Distribution

Water Conveyance
Green Infrastructure
Drinking Water Distribution
Wastewater Collection
Stormwater Collection
Marine Pipelines
Tunnels

Treatment

Drinking Water
Wastewater
Water Reuse
Industrial

Business Advisory

Management Consulting

Asset Management
Financial
IT Solutions
Organizational Design
Procurement/Owners Agent
Strategy and Decision Making
Energy

Alternative Project Delivery

Design-Build
Public-Private Partnerships
Construction Management at Risk
Owner's Representative

The Sectors We Serve

Commercial

Healthcare
Hospitality
Office

Education

K-12
Higher Education

Government

Federal
State
Municipal

Private Industry

Aerospace
Automotive
Chemical
Commercial
Conglomerates
Consumer Goods
Contractors
Equity Financiers
Financial
Freight Rail
Insurance
Mining & Metals
Oil & Gas
Pharmaceutical
Power and Utilities
Telecomm, Technology & Electronics

Regional Authorities

Transportation

Aviation
Highways & Bridges
Mass Transit
Ports & Harbors

Water/Wastewater

Private System Operators
Water/Wastewater Authorities

Our process, your results

Arcadis approaches your project or program with integrity; focused, individualized attention; collaboration; sustainability; and global awareness. We think globally and act locally, adapting best practices from around the world to suit the specific needs of your organization and your communities. You can count on us to be there, time and again, to overcome even the toughest challenges to your business' success.

We partner with you to fully understand your goals, objectives and concerns. While you concentrate on your core business, our experts go to work for you, delivering value, achieving high performance and creating smart solutions that deliver bottom-line results

For more information on Arcadis' capabilities, visit us at **arcadis.com**


www.arcadis.com

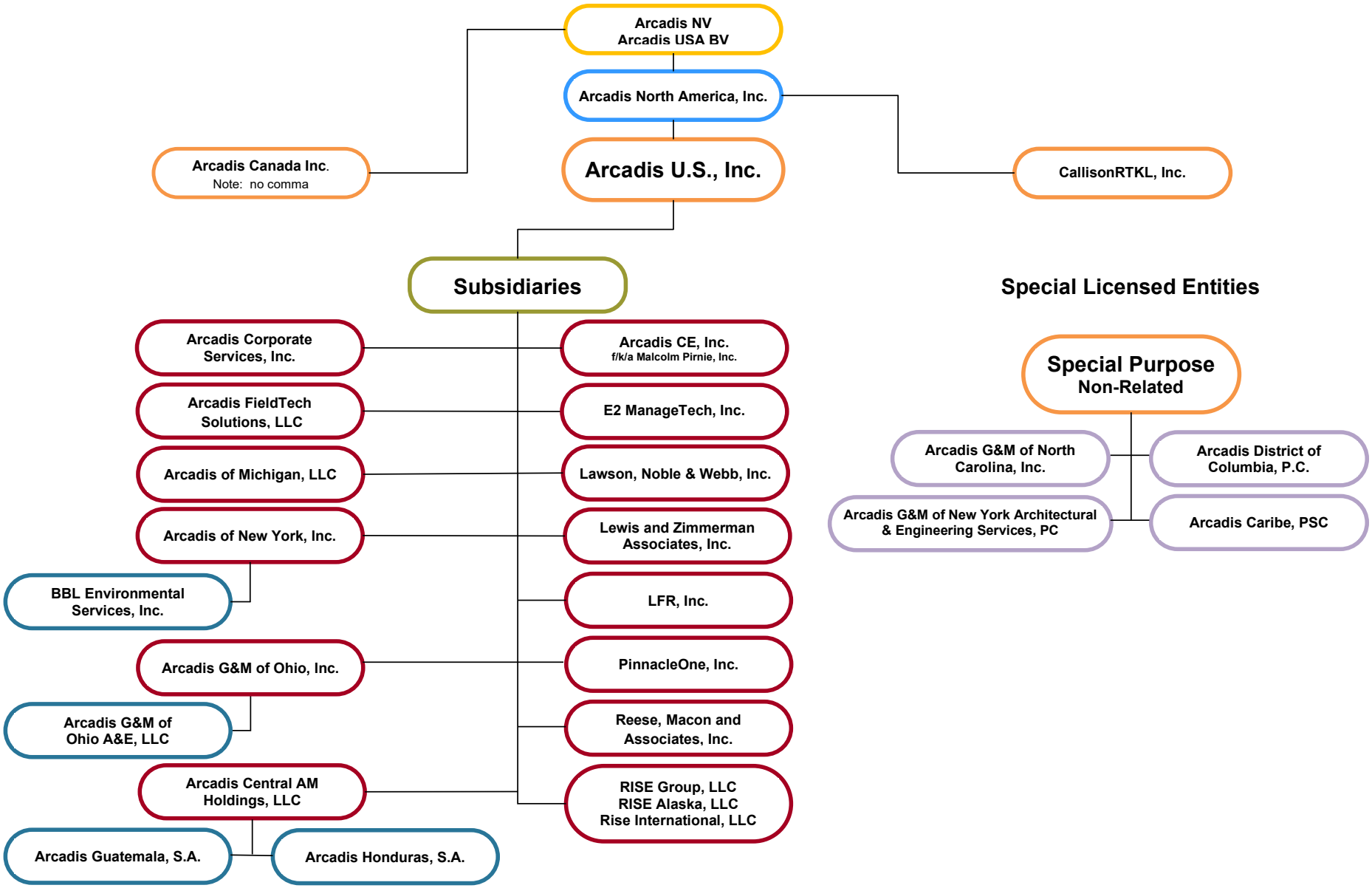

Arcadis


Arcadis North America


@ARCADIS_US

V20160108

Corporate Org Chart/Corporate Family Tree



ARCADIS Design & Consultancy for natural and built assets

3

FIRM QUALIFICATIONS

3 FIRM QUALIFICATIONS

Introduction to Arcadis

Arcadis U.S., Inc. is a leading global natural and built asset design and consultancy firm working in partnership with our clients to deliver exceptional and sustainable outcomes through the application of design, consultancy, engineering, and project management services. We are active in the fields of infrastructure, water, environment, and buildings. Arcadis is dedicated to providing comprehensive services for public and private clients, including water and wastewater engineering, hydraulic modeling, water quality analysis, stormwater engineering, permitting, financial consulting, information management solutions, and management and operations strategies.

With over 27,000 employees in over 40 countries, our clients have access to the best talents of our multidisciplinary staff and the most effective, optimally structured project teams in any geographic location.

Regardless of client size, every Arcadis customer receives personal attention and responsive service from a dedicated client service manager and a carefully selected project team.

Arcadis has long-standing relationships with many clients involving a wide variety of environmental consulting and engineering services, some spanning multiple decades. Working closely with our clients to address their unique circumstances and concerns, we have developed innovative ideas and solutions for some of the most complex problems and projects in the water industry.

Arcadis offers a full range of engineering services, including:

- Architecture
- Master Planning and Sustainable Urban Development
- Program Management
- Cost Management
- Contract Solutions
- Business Advisory
- Digital Innovation
- Engineering
- Environmental Solutions
- Water Solutions

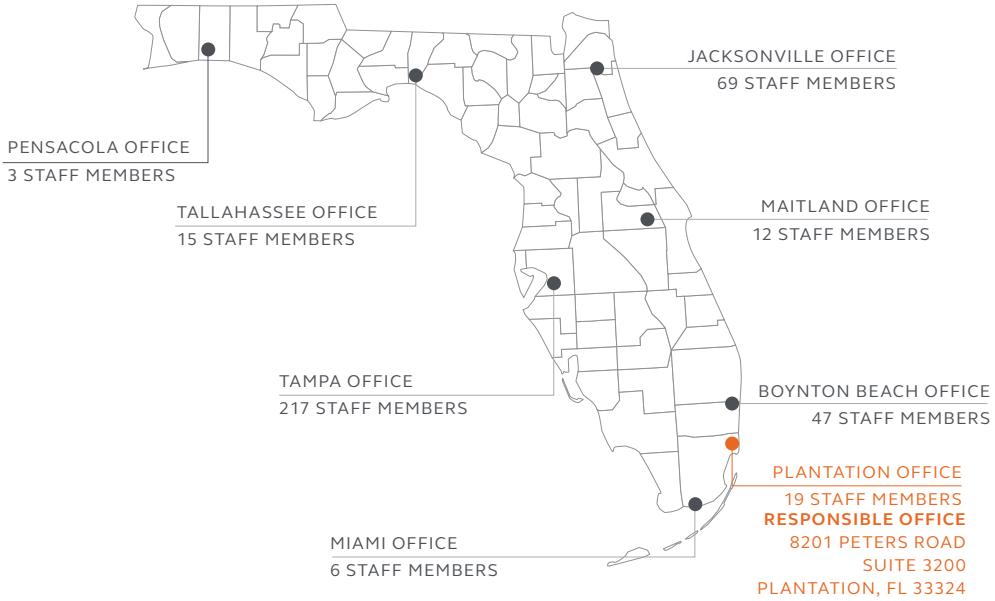
Engineering News Record (ENR) Magazine in 2019.

GLOBAL

#1 in Water	#5 Design Firm

NATIONAL

#6 Water Treatment, Desalination	#7 in Water Supply
#11 in Wastewater Treatment	#13 Design Firm



Our local Plantation office has a team of 19 staff members and is supported by 350+ professionals among 8 Florida offices. Arcadis has performed a thorough review of resources in the State to ensure that local knowledge and established local relationships **can be leveraged to bring the City of Hollywood exemplary services.**

Arcadis is Local

The Arcadis organization has more than 125 years of firm experience in water planning, design and construction. Our team is comprised of professionals that span the industry and have experience with clients from all regions of the U.S, and most notably, experience working with the City of Hollywood for more than 15 years.

We bring to the City the capabilities of a large, diversified firm, but with a profound understanding of local circumstances. Our staff and team of Professional Engineers, Scientists and Inspectors are ready to work with you to bring this to fruition. Our team brings the following value to the implementation of this plan:

Proven Delivery Capability

- Our knowledge gained through the completion of the CIty's previous master plan, hydraulic model update, AWIA assessment and plant and pump station evaluation work allows us to start with no learning curve, saving time and money.
- Our team has successfully delivered quality projects for the City for nearly two decades with many of the same staff proposed for this project, giving you peace of mind that a high quality Water Master Plan will be completed on time and on budget.

Experts in Risk Based Water Planning

- Arcadis is an industry leader in applying asset management principles for risk based master planning for water plant and pipeline assets with over 15 years of experience in delivering these types of projects. We bring existing tools and templates that are proven and can be immediately implemented for your Master Plan.
- Our Arcadis National Asset Management experts including Celine Hyer and Greg Osthues are located in Tampa, Florida and can easily participate in this important effort for the City bringing their lessons learned from over 50 plus projects in the US.

National Leaders in Water Treatment Process and Regulatory Evaluations

Arcadis employs some of the most talented and experienced water quality and treatment specialists in the industry today, who bring extensive knowledge in industry best practices through involvement in various organizations like the American Membrane Technology Association and development of dozens of guidance manuals. We also bring a superior understanding of regulatory requirements from our 25 years of engineering and technical support to USEPA in regulatory development and review. Our expertise allows us to quickly identify issues of concern to the City and develop cost-effective, innovative, and practical solutions that emphasize operability, dependability, and an ability to react to both short-term changes in water quality and long-term changes in water quality regulations.

Living Master Plan

Arcadis offers the option of delivering a decision support planning tool configured with all of the data and decision making processes that can be easily updated with new information as conditions change to provide more agility and flexibility in your Capital Plan. An Arcadis-developed existing GIS based tool is immediately available for use or Innovyze InfoAsset Planner can be configured if desired by the City. All information captured about the assets will be available to update Cityworks CMMS as needed.

Arcadis has maintained an office in Broward County for over 30 years. With nearly 20 staff located minutes away in our Plantation Office, our local team is familiar with not only the City of Hollywood and your WTP, but also community and regional issues that can impact the success of your project.

Arcadis' Capabilities

Arcadis employs some of the most talented and experienced water specialists in the industry today. We serve a diverse array of clients and actively participate in the development of water quality regulations to keep the firm at the forefront of the water industry. Our 100-year history of leadership in water quality engineering has been built on the collective experience of hundreds of on-staff experts focusing on improving the quality of water supplies and developing effective water systems from treatment through distribution. Applying best practices for master planning, we utilize asset management principles to identify and prioritize the future capacity as well as the renewal needs considering consequences of failure and risk. We utilize asset management principles to identify and prioritize capacity and renewal needs considering consequences of failure and overall risks.

Arcadis as a National Leader in Drinking Water Planning and Engineering for Both Facilities and Distribution Systems

60+ in the last 10 years

11.5 billion gallons per day

Water Treatment Plant Master Plans & Designs

40+ in the last 10 years

$5b capital improvements

Water System Modeling & Master Planning

30+ in the last 10 years

425k asset condition assessments

Utility Asset Management

50+ in the last 10 years

2.5 billion gallons per day

Water Treatment Plant Hydraulic Analyses

50+ in the last 10 years

2.5 billion gallons per day

Treatment Plant Designs Completed

25 years of experience

14+ rules supported

Regulatory Support & Planning

Water Distribution System Master Planning & Modeling

Arcadis has completed dozens of drinking water master planning efforts throughout the U.S in the last 10 years and is recognized as the industry leader in hydraulic modeling. Our comprehensive, flexible approach to water planning begins with developing demand projections that incorporate the anticipated savings of proven water conservation techniques, recent plumbing code changes, impacts of economic and rate trends, population and employment projection data, and water reuse opportunities.

We have completed literally hundreds of projects requiring the production of demand projections. We help utilities assess options for the development of new supplies and optimization/ maximization of existing surface and/ or groundwater supplies using reservoir and groundwater system models to fine-tune analyses. Using the latest hydraulic modeling techniques, we develop practical plans for extension and upgrades of water distribution systems. Through our many and varied projects, Arcadis has acquired experience in a broad range of planning problems for the rehabilitation and expansion of existing systems.

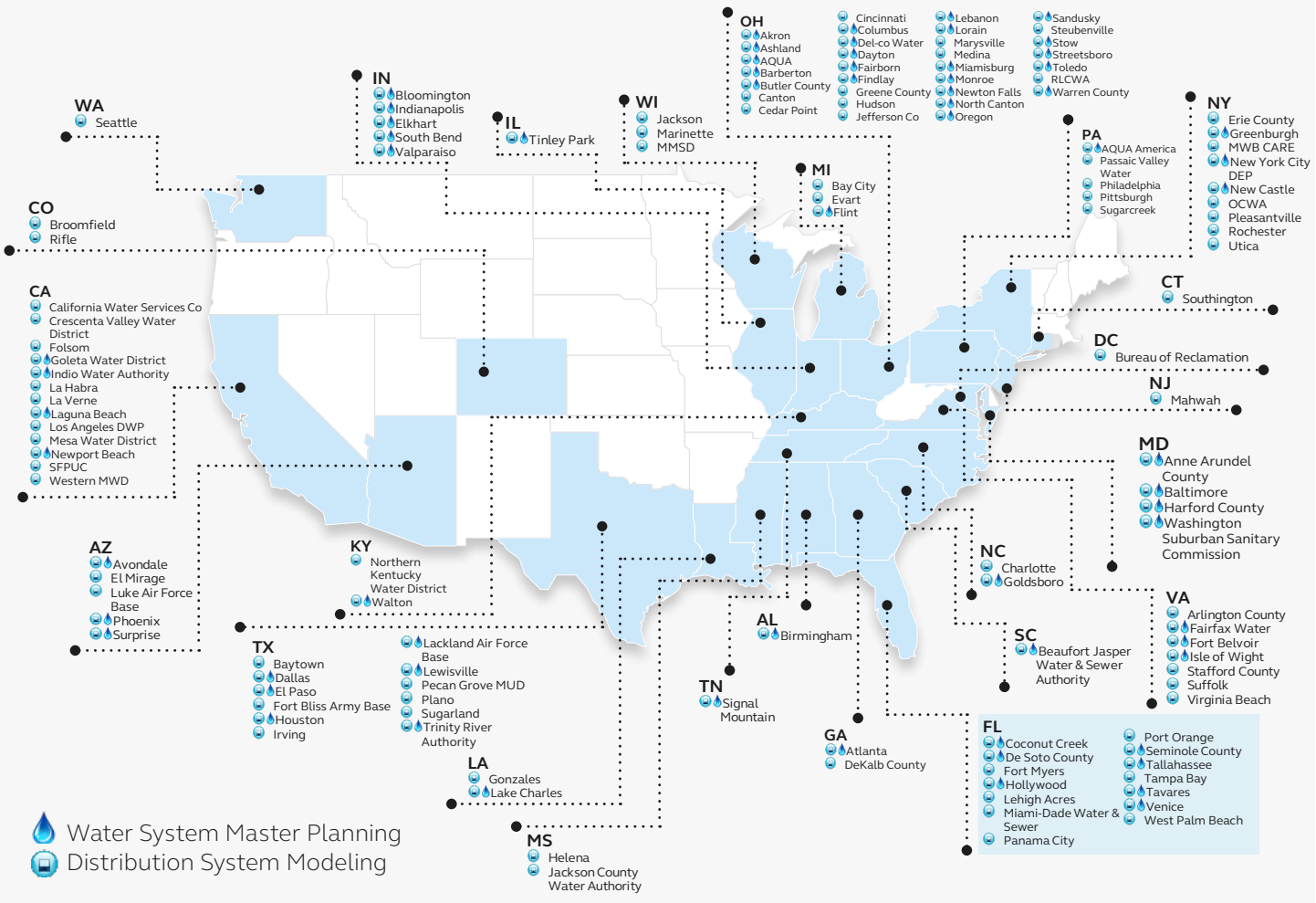
Arcadis is a recognized leader in distribution system modeling and planning, specializing in water master planning, demand forecasting, model calibration, operations evaluation and optimization, and water quality modeling applications. Our staff has performed numerous hydraulic and water quality analyses of water distribution systems using public and proprietary industry-

Our team developed your latest hydraulic model and assisted the City in converting to InfoWater modeling software. **We are familiar with all aspects of this software and regularly provide training to utilities.**

standard models, including WaterGEMS, WaterCAD, InfoWater Pro, InfoWater MSX, InfoWater UDF, InfoSurge, Mike Urban WS, InfoWorks WS, EPANET-BAM, H2Omap, EPANET, EPANET-MSX, and TEVASPOT. Our team developed your latest hydraulic model and assisted the City in converting to InfoWater modeling software. We are familiar with all aspects of this software and regularly provide training to utilities. Our strong local and national experience in water distribution system hydraulic modeling and master planning, which provides utilities like the City with a framework to make consistent decisions regarding planning, O&M and design. Our engineers have provided these services to a wide range of municipal, industrial and private clients, developing new or replacement systems, as well as evaluating and upgrading existing systems. From enterprise wide business planning of risk and resiliency to detailed design, such as sizing THM volatilization systems in storage facilities and sizing surge relief valves through transient modeling, we have worked for a variety of small, medium and large clients across the U.S., where our expertise in water distribution modeling and planning has assisted utilities in characterizing system performance under varying conditions. Where deficiencies were identified, we used water system models to explore the benefits and costs of various solutions.

Figure 3.1 is a U.S. map which shows some of the water distribution system models and master plans developed by Arcadis. Our experience includes more than 40 water system master plans for water utilities in 25 states, including some of the largest and most complex water systems in the U.S. (e.g., Los Angeles, Dallas, Houston, Phoenix, Detroit, and New York City).

Figure 3.1 | Water Distribution System Models and Master Plans



Water Treatment Facility Master Planning & Design

Our project team has extensive water treatment facility master planning experience at water treatment plants, ranging in size from 5 MGD to more than 250 MGD. We have also supported numerous lime softening and membrane facilities in process evaluations and optimization. These projects often later extend into design and construction due to Arcadis' full-service capabilities.

In addition, the majority of our water treatment projects involve work within existing facilities. This work typically is more complex than new designs because of the need to integrate solutions within existing infrastructure and to maintain effective treatment operations during plant modification. We have extensive experience in planning and designing improvements to WTPs and executing them with minimal disruption to normal operations, including identification of prioritized capital projects and master planning for capital improvements when they are needed. **We completed the City's last Master Plan in 2007 and have been working with the City on implementing its recommendations ever since.** This institutional knowledge, in combination with our national experience, will be key in key in developing appropriate and practical solutions to address the needs of the City's WTP. Table 3.3 provides a partial summary of our experience on recent water treatment facility master planning and design projects with process components similar to those at the City of Hollywood's WTP.

Figure 3.2 | Planned, Designed, and Implemented Drinking Water Technology in Medium to Large Facilities

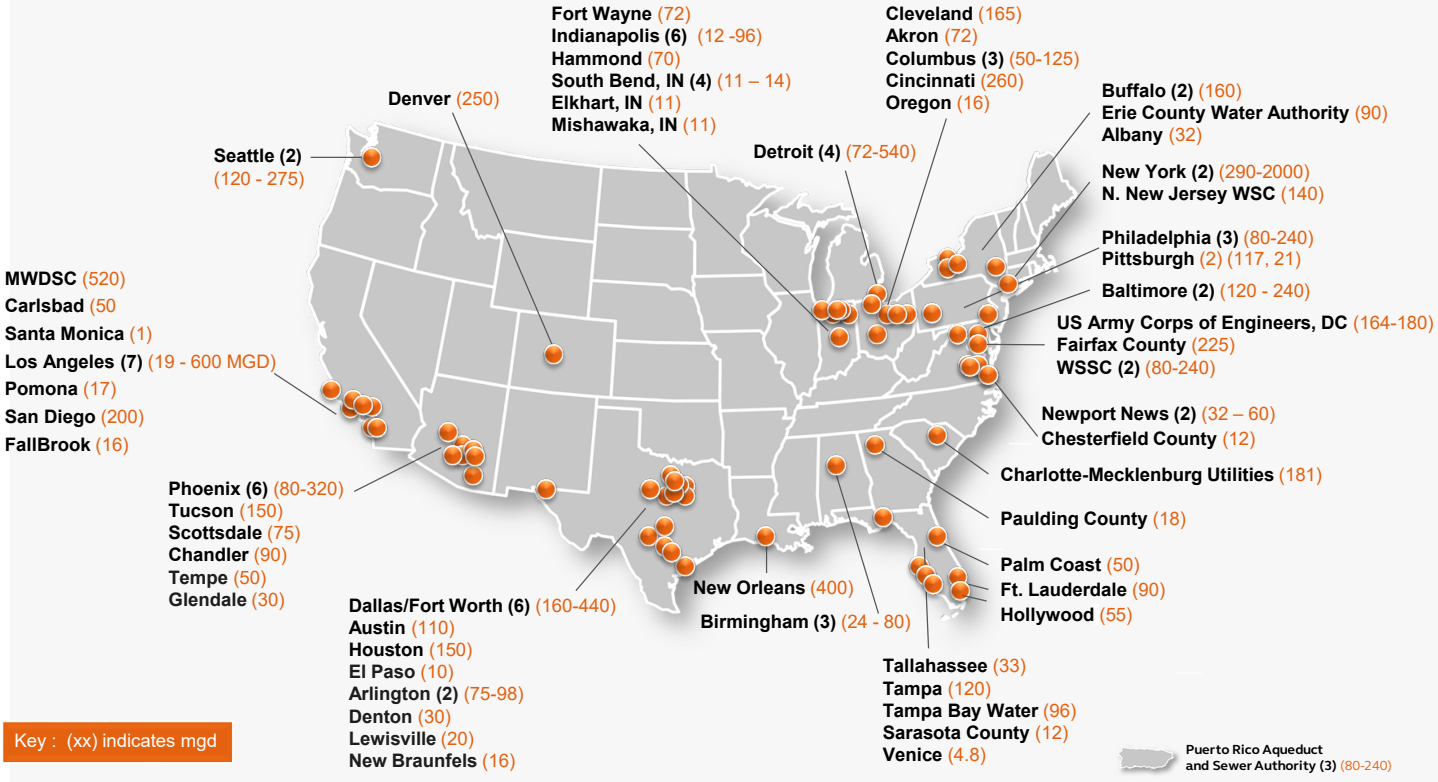


Table 3.3 | Similar Water Treatment Plant Planning & Design Experience

	Softening	Membranes	Chemical Systems	Hydrogen Sulfide Treatment	Water Supply Evaluation	Planning	Process Optimization	Regulatory Support	Design
City of Hollywood, FL	●	●	●	●	●	●	●	●	●
Broward County Water and Wastewater Services, FL						●	●	●	●
City of Sunrise, FL					●		●	●	●
Miami-Dade Water and Sewer Department, FL						●		●	
Charlotte County, FL	●	●				●		●	●
City of Venice, FL				●		●	●		
Tallahassee, FL						●			
Tampa Bay Water, FL						●	●	●	●
Jackson County Utility Authority, MS		●				●		●	●
City of Wheeling, WV		●				●		●	●
City of Sugar Land, TX		●				●		●	●
El Paso Water Utilities, TX		●				●		●	
Fort Bend County Water Control and Improvement District No. 2, TX		●				●		●	●
Guadalupe Blanco River Authority, TX		●				●		●	●
Pecan Grove Municipal Utility District, TX		●				●		●	●
San Patricio Municipal Water District, TX		●				●		●	●
City of Scottsdale, AZ		●				●		●	●
City of Elkhart, IN					●	●		●	●
City of Fort Wayne, IN	●		●	●	●	●	●	●	●
City of South Bend, IN			●		●	●	●	●	●
City of Bay City, MI	●				●	●	●	●	
City of Minneapolis, MN									
Liberty, MO	●					●	●	●	
City of Grand Forks, ND	●					●			
Butler County, OH	●					●			
City of Columbus, OH	●		●		●	●		●	●
City of Dayton, OH	●				●	●			●
City of Delaware, OH	●	●				●		●	
City of Delphos, OH	●		●		●	●		●	●
City of Fairborn, OH	●	●			●	●		●	
City of Findlay, OH	●		●			●		●	●
City of Harrison, OH		●				●			
City of Lancaster, OH						●			
City of Lebanon, OH						●			
City of Oregon, OH	●		●			●	●	●	●
City of Marysville, OH	●					●	●	●	
City of Mason, OH	●					●			
City of Miamisburg, OH	●	●				●		●	●
City of Newark, OH	●					●		●	
City of Toledo, OH	●		●			●	●	●	●
City of West Carrollton, OH	●	●							
City of Westerville, OH	●							●	
Columbiana, OH	●								●
Del-Co Water Company, OH	●		●			●		●	●
Greene County, OH	●	●			●	●		●	●
Huber Heights, OH	●	●				●			
Warren County, OH	●	●				●		●	●
Wausen, OH	●					●	●	●	
Chino Basin Desalter Authority, CA		●				●		●	●
City of Santa Monica, CA		●				●		●	●
Poseidon Water, CA		●				●		●	●
San Diego County Water Authority, CA		●				●			
Consolidated Mutual Water Company, CO		●				●		●	●

Hydraulic Analysis

50+
in the last 10 years

2.5
billion gallons per day

Water Treatment Plant Hydraulic Analyses

Virtually all of our water projects have a hydraulic evaluation component. Within the general area of treatment plant hydraulics, we have performed analyses for:

- Hydraulic capacity evaluations.
- Hydraulic design.
- Hydraulic profile development.
- Maintenance of plant operations during construction (MOPO).
- Mixing and dilution studies.
- Short-circuiting studies.
- Determination of baffling factors and chlorine breakthrough curves.

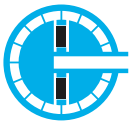
In addition to our extensive knowledge and experience using "off-the-shelf" hydraulic models, we would like to focus on our hydraulic evaluation experience using two specific models—Visual Profile and FLUENT®. **Visual Profile is an in- house hydraulic model used exclusively for the hydraulic analysis of treatment plants and has been applied successfully on facilities ranging from 1 to 1,200 mgd.** This model was developed to support our core services and improve our ability to offer these services by providing an optimal tool for the design and analysis of treatment plant hydraulics.

Visual Profile is an interactive, Windows-based program. The efficiency of the model results from the grouping of hydraulic elements commonly found in treatment plants (such as weirs, flumes, pipe, launderers, open channels and distribution channels) in the specific sequence in which they occur in the plant. This arrangement allows modeling of the same sequence of elements repeatedly for different flow or operational conditions. This setup allows for the rapid evaluation of many design alternatives, improving decision-making capability and optimizing the use of our clients' limited capital funds.

FLUENT® is a computational fluid dynamic (CFD) model that can be used to visualize complicated three-dimensional flow fields. CFD modeling can be used to simulate and visualize the movements, mixing processes, chemical reactions and particles in a fluid medium and can provide information on important flow characteristics, such as pressure loss, flow distribution, short-circuiting and solids deposition. CFD analysis complements traditional design tools by adding previously unavailable insight into the design, thereby reducing risk.

Regulatory Assistance and Planning

100
in the last 10 years



4.5
billion gallons per day

Treatment Plant Designs Completed

Developing an effective master plan for the City of Hollywood water system requires an in-depth understanding of current and future regulatory requirements. Arcadis brings superior understanding of regulatory requirements as a result of our more than 25 years of experience providing engineering and technical support to the USEPA Office of Ground Water and Drinking Water (OGWDW). Over that period, we have conducted treatability studies, prepared technologies and costs (T&C) documents, and developed guidance to assist public water systems to meet critical requirements of many of the rules promulgated over that period.

Arcadis developed T&C and guidance manuals for most major drinking water regulations over the past 15 years, including the Enhanced Coagulation and Enhanced Precipitative Softening Guidance Manual, the Stage 2 Disinfectants and Disinfection Byproducts Rule (DBPR) Operational Evaluation Guidance Manual, and the Membrane Filtration Guidance Manual. Our water treatment experts have also contributed to the development of numerous American Water Works Association (AWWA) standards and manuals of practice including M65: On-site Generation of Hypochlorite, M53: Microfiltration and Ultrafiltration Membranes for Drinking Water, M61: Desalination of Seawater, and the upcoming 2nd ed. of M46: Reverse Osmosis and Nanofiltration.

Arcadis has also provided engineering services to the American Water Works Association (AWWA) in support of regulatory negotiation, including the Arsenic Rule, Stage 2 DBPR, chromium (VI), perchlorate, N-Nitrosodimethylamine (NDMA), and the proposed Lead and Copper Rule (LCR) revisions. We are also currently participating with the AWWA Disinfection Byproduct Technical Advisory Work group which will provide assistance to AWWA during the regulatory negotiation process that could eventually result in a Stage 3 DBPR . Lastly, we are carefully tracking state and upcoming federal regulations on emerging contaminants including 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS).

No team is better positioned to help the City of Hollywood develop a master plan that appropriately considers existing and future regulatory requirements than Arcadis. A summary of our regulatory assistance experience is provided in Table 3.4.

Table 3.4 | Relevant Regulatory Development Experience

Role	Literature Review	Bench- and Pilot-scale Studies	Technology and Cost Document	Guidance Manual(s)	Federal Advisory Committee	Technical Working Group	AWWA Support
Stage 1 Disinfectants and Disinfection Byproducts Rule	✓	✓	✓	✓	✓	✓	✓
Stage 2 Disinfectants and Disinfection Byproducts Rule	✓		✓	✓	✓	✓	✓
Arsenic Rule	✓		✓			✓	✓
Radionuclides Rules	✓		✓				
Lead and Copper Rule	✓			✓			✓
Lead and Copper Rule Revisions	✓	✓	✓	✓		✓	✓
Revised Total Coliform Rule	✓		✓			✓	
Groundwater Rule	✓		✓				
Atrazine	✓						
Unregulated Contaminants Monitoring Rule / Candidate Contaminant List	✓				✓	✓	✓

Asset Management and Condition Assessment

Effective asset management is a critical component of a water master plan. Asset management provides the risk based framework by which R&R and growth projects are prioritized, and capital and operations budgets are developed and managed. Arcadis is a national leader in asset management and assists our clients in developing asset management programs to meet long-term customer service level objectives and develop risk-based prioritization and funding programs. It is anticipated that this project will use a structured asset management framework to complete a condition assessment and risk-based prioritization of projects to ultimately develop a 10 year CIP. Arcadis is a national leader in asset management with the skills to assist our clients in developing ISO 55000 compliant asset management programs and applying IIMM standards to meet their financial, sustainability, reliability and level of service goals. Our asset management service offerings include strategy development, business planning, infrastructure condition assessment and capital and O&M planning. Our Arcadis staff lead and serve on AWWA and WRF Asset Management Committees at the National and Local Levels. We have recently contributed to AWWA Manual M77 Condition Assessment of Water Mains and will bring that experience on desktop risk assessment to this project.

30+
in the last 10 years

425k
asset condition assessments

Utility Asset Management

Arcadis offers proven condition assessment tools and templates for water facility assets including a tablet based data collection system, pre-populated visual assessment forms for mechanical, electrical, I&C and structural assets. Our team also has extensive experience with Cityworks CMMS and can integrate and update the existing inventory as well as provide suggestions for configuration improvements.

Table 3.5 | Partial Summary of Recent Water System Asset Management & Condition Assessment Experience

Project Name/Owner	Asset Inventory	Condition Assessment	Vulnerability Assessment	Benchmarking and Key Performance Indicators	Maintenance Evaluation and Optimization	Life-Cycle Analysis of Alternatives	Capital Improvements Plan
Asset Management Plan | Lee County, FL	✓		✓	✓	✓	✓	✓
Asset Management Program | Indian River County , FL	✓	✓		✓	✓	✓	✓
Asset Management Framework Development | Miami Dade Water & Sewer Department, FL	✓	✓		✓	✓	✓	✓
Asset Management Program Enhancements | Toho Water Authority, FL	✓	✓		✓	✓	✓	✓
Asset Management Program – Phase I | Tarrant Regional Water, TX	✓	✓	✓	✓		✓	✓
Engineering and Program Services for Asset Management | New York City, DEP, NY	✓	✓	✓	✓	✓	✓	✓
Asset Management Program | Columbus, OH	✓	✓	✓	✓		✓	✓
Comprehensive Asset Management Plan | Greater Cincinnati Water, OH	✓	✓	✓	✓	✓	✓	✓
Asset Management Registry and Program Services | Birmingham Water Works & Sewer Board, AL	✓	✓	✓	✓	✓	✓	✓
Asset Management Program Services | Washington Suburban Sanitary Commission, DC	✓	✓	✓		✓	✓	✓
San Antonio Water System | San Antonio, TX	✓	✓		✓		✓	✓
Asset Management and CIP | The Metropolitan District, CT	✓	✓		✓		✓	✓
Asset Management Program Planning | Loudoun Water, VA		✓					

ARCADIS Design & Consultancy for natural and built assets

4

PREVIOUS PERFORMANCE ON RELATED PROJECTS

4 PREVIOUS PERFORMANCE ON RELATED PROJECTS

Project Experience

Arcadis has completed more than 100 drinking water master plans and capital plans throughout the U.S. We help utilities assess options for the optimization of existing supplies and infrastructure, while also planning for future growth and/or regulatory compliance. Our master plans incorporate system-wide water quality management solutions, not just at the treatment plant. Through our many and varied projects, Arcadis has acquired experience in a broad range of planning problems facing the rehabilitation and expansion of existing systems. Below is a matrix showing recent and relevant projects that our key technical team members' have lead with our referenced projects detailed on the following pages.

Matrix Table of Key Team Member Experience Related to Reference Projects

	High Service Pump Upgrades Hollywood, Florida	Hydraulic Model Updates and Calibration | Hollywood, Florida	Risk & Resilience Assessment Hollywood, Florida	Four-Log Disinfection – Basis of Design Report | Hollywood, Florida	Miami Dade Water & Sewer Department Bond Engineering Contract | Miami, FL	Water Master Plan & Master Plan Update | Tallahassee, Florida	Engineering & Professional Services | Venice, Florida	Toho Asset Management Implementation | Kissimmee, Florida	Indian River County Asset Management Implementation Services | Vero Beach, FL	Immokalee - Raw Water Well No. 4 Immokalee Seminole Indian Tribe, FL	Loudoun Water Engineering BOA | Ashburn, VA	Water Quality Master Plan New Orleans, Louisiana
Leah Richter, PE | Principal in Charge	✓	✓	✓		✓					✓		
Tung Nguyen, PE, PMP | Project Manager	✓	✓	✓	✓	✓						✓	
Rebecca Slabaugh, PE, ENV SP | Technical Advisor - Water Quality & Treatment				✓								
James Cooper, PE, CWO, ENV SP | Technical Advisor - Distribution System	✓	✓				✓	✓					
Greg Osthues, PE, IAM | Technical Advisor - Asset Management					✓			✓	✓			
Brian Duane | Technical Advisor - Pumping	✓											
Michael Knowles, PE | Task Lead - Demand Projections & Modeling						✓						
Lauren DaCunha, PE | Demand Forecasting & Model Calibration		✓				✓	✓	✓	✓			✓
Marc Killingstad, PE | Water Supply Planning										✓		
Lia Dombroski, EIT | Vulnerability/Risk	✓		✓	✓								
Celine Hyer, PE, IAM | Task Lead - Facilities Assessment					✓	✓		✓	✓		✓	
Daniel Stepner, PE | Asset Condition Facilities					✓							
Sean Chaparro, PE | Treatment Capacity & Performance Evaluation				✓		✓	✓					✓
Melissa Pomales, PE, IAM | Task Lead - Integrated CIP Plan					✓	✓		✓				
Joan Fernandez, PE, IAM | Alternatives Evaluation			✓		✓			✓		✓		
Chris Heltzel, GISP, IAM | Planning Decision Support Tool					✓			✓	✓			
Aubrey Haudricourt, PE | Electrical/Power Supply	✓				✓		✓	✓				
Sam Hobi, PE | Structural Engineer			✓				✓	✓				
Stephanie Bishop, PE | Chemical Systems				✓								

City of Hollywood: High Service Pump Upgrades

Hollywood, Florida

Client
City of Hollywood

Wilhelmina Montero, PE
2600 Hollywood Blvd Hollywood, FL 33020
954.921.3930

Duration of Work
2019-2019

Schedule and Scope
Original: 2019-2019 | Scope as requested
Achieved: 2019-2019 | Scope as requested

Change Orders
None

Key Personnel
Brian Duane
Leah Richter
Tung Nguyen
James Cooper
Aubrey Haudricourt
Lia Dombroski

Arcadis was selected by the City of Hollywood to evaluate the high service pumping system at the water treatment plant. The project consists of replacing and reconfiguring the existing aging high service water pumps that were originally constructed in 1972. Replacement of the existing pumps was deemed necessary to maintain water delivery reliability and to improve energy efficiency. The existing pumping system consisted of various sizes of constant speed pumps that ranged in size from 200 to 700 HP (3,000 to 14,000 gpm).

The improvements consist of installing six (6), 400 HP, variable speed, 8,000 gpm pumps, associated electrical and mechanical improvements, and upgrades to the control system that will allow the City to maintain a consistent discharge pressure. The rehabilitation of the pump station includes the replacement of the pump check valves and isolation valves. A new climate controlled room was added to house the VFDs and other electrical equipment.

Technical Innovations: Evaluation of SCADA information to determine the flow variability of the system for proper pump selection. Expansion of the existing SCADA control system necessary to automate the pump controls necessary to vary the pump speed in order to maintain a constant water discharge pressure into the water distribution system.

Hydraulic Model Updates and Calibration

Hollywood, Florida

Client
City of Hollywood

Clèce Aurélus, P.E.

2600 Hollywood Blvd Hollywood, FL 33020

954.921.3930

Duration of Work
2015-2017

Schedule and Scope
Original: 2015-2016 | Scope as requested
Achieved: 2015-2017 Project completion extended to 2017 for Client approved extension due to software selection | Scope as requested

Change Orders
None

Key Personnel
Jim Cooper (Project Manager)
Lauren DaCunha
Leah Richter
Tung Nguyen

The City of Hollywood owns, maintains and operates approximately 30 miles of water distribution piping and water storage, including (2) 2.5 million gallon ground storage tanks, (2) 1 million gallon elevated tanks and the City's Water Treatment Plant and associated plant water storage.

The City of Hollywood selected Arcadis to update and calibrate the City's water distribution system hydraulic model to better represent current system conditions. Arcadis initially began working on the first hydraulic model for the City in 2007. As a part of this hydraulic model update and calibration, the model was converted into the widely-adopted InfoWater software platform. The purpose of this project is to simulate various future demand conditions and provide a calibrated tool for the City to utilize on a regular basis for improvement evaluations.

As part of this project, the Arcadis team developed a detailed field data collection plan to obtain pressure data throughout the distribution system over a week period as well as perform pipe roughness (C-factor) testing and fire flow testing. Select testing was performed during night hours to minimize disruption to traffic and water customers as well as minimize the effects of local water use in large hotel areas along the beachfront.

The pressure recorders were used to support determining the system's diurnal demand patterns along with SCADA data for pumping and tank level information to compare to the model results to complete the calibration for the City with this extended period simulation (EPS) model. The model demands were gathered from the City to update updated InfoWater model to reflect the current demands and pressures throughout the system. Customer billing data was utilized to allocate specific customer demands at the parcel level throughout the system. Model scenarios were developed to represent system current and future (year 2030) conditions during average demands, maximum demands, and fire flow. Arcadis also provides comprehensive training on water distribution systems and the InfoWater software for City representatives. A portion of time is reserved for follow-up training and questions as the staff begin regular use of the new software.

Risk & Resilience Assessment

Hollywood, Florida

Client
City of Hollywood

Wilhelmina Montero, PE

2600 Hollywood Blvd Hollywood, FL 33020

954.921.3930

Duration of Work
July 2019 - March 2020

Schedule and Scope
Original: July 2019 - March 2020 | Scope as requested
Achieved: July 2019 - March 2020 | Scope as requested

Change Orders
None

Key Personnel
Joan Fernandez (Project Manager)
Leah Richter
Tung Nguyen
Lia Dombroski
Sam Hobi

Starting in July of 2019, Arcadis conducted a Risk and Resilience Assessment of the City of Hollywood's Water System physical and cyber assets using the AWWA J100-10 Standard Risk and Resilience Assessment Methodology. The Hollywood water system is comprised of a ground storage tank, elevated storage tanks, water supply wellfields, deep injection wells, and a water treatment facility. The water treatment plant has a capacity of 59.9 MGD and provides an average daily flow of approximately 20-22 MGD to its service population in the City of Hollywood and adjacent populations in Broward County. The project used a workshop-based approach that collaboratively addresses the elements required by AWIA and promotes effective knowledge transfer of the assessment methodology to City staff. Arcadis led four workshops that are designed to conduct the assessment and to make key decisions. The first workshop started by identifying critical facilities, assets, and threats to be considered for the assessment. The next workshop formalized threat asset pairs of concern and addressed the corresponding consequences and vulnerabilities. The last two workshops determined the threat likelihood, calculated the overall risk and resilience profile, and developed risk reduction ideas. Between workshops, Arcadis performed analysis, template preparation and risk assessment documentation to allow the project to be completed efficiently. A Risk Assessment and Recommendations Report was completed to present the results and recommendations of the RRA. The RRA was completed on schedule and certification was submitted to the EPA on March 21, 2020 ahead of the March 31, 2020 regulatory deadline.

Four-Log Disinfection – Basis of Design Report

Hollywood, Florida

Client
City of Hollywood

Wilhelmina Montero, PE
2600 Hollywood Blvd Hollywood, FL 33020
954.921.3930

Duration of Work
TBD – Scheduled for 2020

Schedule and Scope
Original: $97,496 – Scheduled for 2020
Achieved: TBD – Scheduled for 2020

Change Orders
None

Key Personnel
Tung Nguyen (Project Manager)
Stephanie Bishop
Lia Dombroski
Rebecca Slabaugh
Sean Chapparo

In 2017, the City obtained conditional approval from the Broward County Depart of Health (BCDOH) to convert the City's Water Treatment Plant (WTP) to 4-log virus inactivation using free chlorine. In order to implement this project, Arcadis was tasked to develop the basis of design for the design and construction of the improvements necessary for conversion to free chlorine feed. In addition, bench scale testing was performed to determine breakpoint chlorination, disinfection credit (CT), and potential for disinfection byproduct (DBP) formation. As part of this effort, a detailed condition assessment of the WTP's existing on-site sodium hypochlorite system, chemical storage tanks, feed equipment and piping, and ancillary system was completed. The key tasks complete under this project included:

1. Coordination with the authority having jurisdiction (AHJ) which was changed from Broward County Department of Health to Florida Department of Environmental Protection (FDEP).
2. Water treatment plant condition assessment for chemical storage, on-site generation, chemical feed equipment, piping, electrical feed, and building structural integrity
3. Benching scale testing to validate desktop disinfection study and DBP formation
4. Basis of design for conversion of to free chlorine feed at the water treatment plant.

Miami Dade Water & Sewer Department Bond Engineering Contract

Miami, Florida

Client
Miami-Dade, Water and Sewer Department (WASD)

Frances Morris

3071 SW 38th Avenue Miami, FL 33146

786.552.8104

Duration of Work
May 2016-Ongoing

Schedule and Scope
Original: May 2016-Ongoing
Achieved: May 2016-Ongoing

Change Orders
None

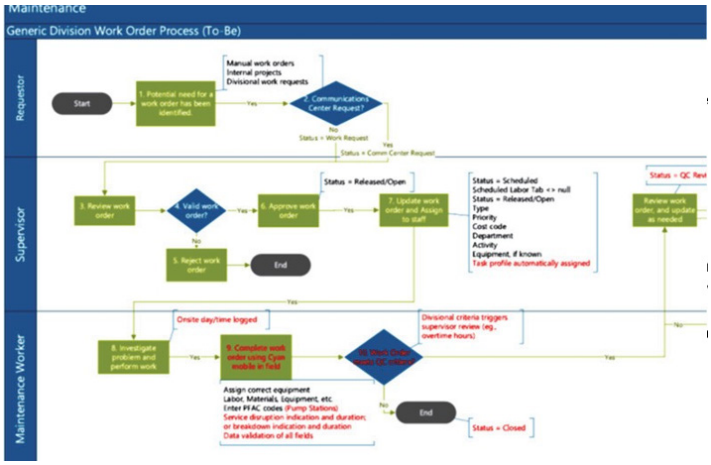
Key Personnel
Leah Richter (Project Manager)
Celine Hyer
Melissa Pomales
Greg Osthues
Joan Fernandez
Robert Ryall
Daniel Stepner
Chris Heltzel
Aubrey Haudricourt

Arcadis U.S., Inc. (Arcadis) and its team members have served as Miami Dade Water and Sewer Department's (WASD) Bond Consultant for nearly 10 years, providing bond consulting engineering services pursuant to WASD's Senior Bond Ordinance 93-134 (Master Bond Ordinance). A summary of Arcadis' services in accordance with the Master Bond Ordinance is provided below.

Annual Bond Engineer's Report

Arcadis develops an Annual Bond Engineer's Report (Annual Report) in accordance with Section 607 of the Master Bond Ordinance. The purpose of the Annual Report is to assess, describe and document the following:

- The condition of one-third of the water and wastewater facilities each year.
- The operations of water and wastewater facilities.
- The adequacy of the capital improvement program.
- The adequacy of Renewal and Replacement funding.
- The Department's compliance with bond covenants relating to debt service coverage and other financial conditions.



In order to achieve these requirements, Arcadis coordinates closely with WASD executive and operations staff in order to gain access and schedule inspections of the Wastewater Treatment Plants (WWTP), Water Treatment Plants (WTP), wellfields, booster pump stations, storage facilities, and pumping stations. Physical condition data is collected utilizing a tablet-based software program, facilities inspection reports are then generated and used to develop narrative descriptions of the facilities condition. As part of the Annual Report, Arcadis also conducts detailed reviews of operational data from the WWTPs and WTPs to confirm adherence to regulatory and permit requirements, summarizes budgeted vs. actual Capital Improvement and Renewal and Replacement expenditures. Significant deviations from budgeted and actual expenditures are highlighted. Arcadis staff then meet with WASD to collectively review and present the findings from the Annual Report.

Consulting Engineer Report Development for the issuance of Series 2017 and Series 2019 Revenue Bonds

Most recently, Arcadis developed the Consulting Engineer Report (CER) to support the issuance of WASD's Series 2017 revenue bonds in the amount of $929,380,000 and the Series 2019 revenue bonds in the amount of $233,305,000. Specific efforts associated with the development of the 2017 and 2019 CER included review of WASDs operations, facility physical condition, and finances. Arcadis summarized the findings from the facility inspections efforts conducted as part of the Annual Bond Engineer inspection as well as developed a five-year feasibility analysis. Arcadis also participated in meetings with rating agency staff, bond consultants and attorneys and other involved parties until the official statements were issued.

Adequacy of Rates and Fees and Renewal and Replacement Fund

Arcadis prepares an annual financial assessment in order to provide an opinion on the adequacy of rates and charges, recommend the monthly amount to be deposited into the Renewal and Replacement (R&R) Fund, as well as approve the plan for expenditure of bond proceeds in order to keep WASD in compliance with sections 508, 605, 606 and 607 of their Master Bond Ordinance. To accomplish these efforts Arcadis conducts the following activities:

- Analyzes the Department's projected expenses and revenues for the current fiscal year with respect to budgeted amounts and recent historical experience.
- Assesses the adequacy of the rates and charges in the proposed budget for the upcoming Fiscal Year to fund all projected expenses.
- Reviews R&R reports and R&R projects planned for the upcoming Fiscal Year for consistency of planned R&R projects with current definitions for maintenance, R&R, and capital projects.
- Reviews R&R projects planned in consideration of identified R&R needs in subsequent years.
- Utilizes results of the system's condition inspections conducted as part of a separate task authorization, assess the adequacy of the R&R Fund to maintain the water and wastewater systems in good operating condition.
- Reviews the MYCIP for the upcoming fiscal year to assess the consistency of proposed expenditures with representations made by the County in applicable bond series resolutions in accordance with Section 402 of the Bond Ordinance.
- Assesses the need for the capital improvements to enable the Department to meet utility service demands and regulatory requirements.
- Develops a report summarizing findings and recommendations associated with the adequacy of proposed rates and charges, recommended deposit to the R&R Fund, and approval or recommended changes of the proposed MYCIP expenditures.

Development of Wholesale Customer True-up and Rates

In support of the annual wholesale customer true-up and rate development, Arcadis staff reviews the WASD developed wholesale customer true-up model and data to confirm the dollars owed by the Department to the wholesale customer. Arcadis then works with Department Staff to review and adjust, if necessary, the allocated costs and customer responsibilities between wholesale and local WASD system customers' actuals vs budgeted in order to develop revenues to be owed to, or recovered from, each individual WASD wholesale customer. Arcadis then uses the information developed as part of the true-up to develop projected Water and Sewer Wholesale Customer rates for the coming Fiscal Year. Arcadis staff conducts several meetings with WASD staff to present the findings of this effort as well as discuss any questions. A report summarizing the findings of the true-up and updated rates is then developed and issued to WASD staff for review and use.

Miscellaneous Management Consulting and Valuation Services

In addition to the requirements of the bond engineer in accordance with the Bond Ordinance, Arcadis provides other management consulting and valuation services at the request of WASD, such as development of an Asset Management Framework, Service Area Release request reviews, asset valuation and analysis of alternative funding mechanisms for varying service scenarios, detailed Retail Rate Study and Cost of Service analysis, and other miscellaneous assignments at the request of the Capital, Operations, or Finance team.

Asset Management Framework Phase I

Miami-Dade Water and Sewer (M-D WASD) has initiated the efforts to create an enterprise-wide Asset Management (AM) Framework to support the over 2,600 staff and align work practices, decision making and overall operations with M-D WASD's goals and objectives. The currently planned AM development, as required by the Consent Decree, is limited in scope to complying with the development and implementation of a Capacity, Management, Operation and Maintenance (CMOM) Program and does not provide broad applicability across M-D WASD's divisions and overall operation.

Recognizing a need to develop and implement an integrated AM strategy across the organization, M-D WASD retained Arcadis U.S., Inc. (Arcadis) to assist in the development of an AM Framework. Under this effort, Arcadis documented existing business practices associated with M-D WASD's current AM efforts and provide guidance about best practices and methods that will help align AM practices across the Utility. The scope of the Phase 1 of the AM Framework included:

- Performed an assessment that provides a high-level review of M-D WASD's current asset management practices related to Practices and Processes, Information Systems and Data and Knowledge.
- Documented 'as-is' AM business processes and identified areas of improvement.
- Performed a Strategic Asset Management Gap (SAM GAP) Analysis to identify current gaps and set priorities for the three core elements – Practices and Processes, Information Systems and Data and Knowledge.
- Developed concept level 'to-be' AM business processes to align with ISO 55000 requirements.
- Identified relevant key performance indicators (KPIs) and developed benchmarks for these KPIs.

City of Tallahassee Water Master Plan & Master Plan Updates

Tallahassee, Florida

Client
City of Tallahassee

Jarrod Whitaker

408 N Adams St., Tallahassee, FL 32301

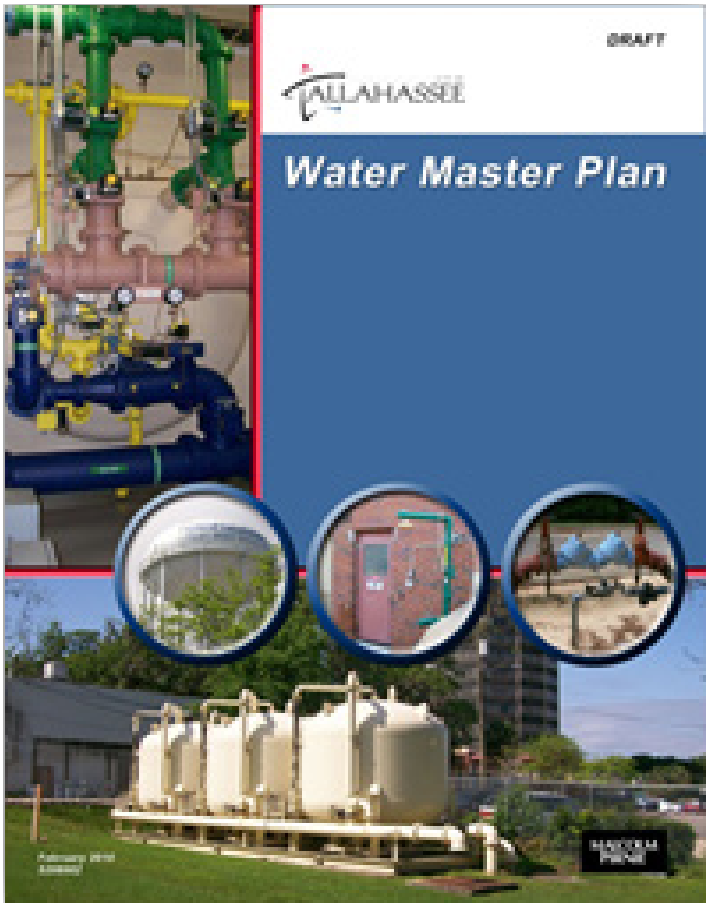
850.891.6884

Duration of Work
November 2019-Ongoing

Schedule and Scope
Original: 5/29/2020 -Ongoing
Achieved: 5/29/2020-Ongoing

Change Orders
None

Key Personnel
Sean Chapparro (Project Manager)
Lauren DaCunha
Jim Cooper
Melissa Pomales
Celine Hyer
Michael Knowles



Arcadis first developed a water master plan (WMP) for the City of Tallahassee to identify needed distribution system improvements and water supply alternatives to assure that the City's water customers' needs were met in 2010, Arcadis was hired to do the 5-year updates for their Water Master Plan in 2015 and again in 2020. Arcadis originally developed and calibrated an all-pipes hydraulic model of the existing distribution system in 2010 in the InfoWater software platform, and updated the city's geographic information system (GIS) to reflect new infrastructure construction and customer demands for the 2015 and 2020 WMPs; key elements of the plan include development of future population and demand projections; identification of distribution expansion alternatives using the City's distribution model, including storage and other improvements to maintain adequate system pressure; identification of future supply alternatives; evaluation of the potential impacts of water conservation and reuse in reducing future demands and reducing capital expenditures; and prioritization and development of a downtown infrastructure replacement program.

City of Venice: Engineering & Professional Consulting Services

Venice, Florida

Client
City of Venice

Javier Vargas

200 North Warfield Avenue Venice, FL 34285

941.882.7309

Duration of Work
2005-Ongoing

Schedule and Scope
Original: 2005-Ongoing | All work assignments to date have successfully been completed on budget and schedule.
Achieved: 2005-Ongoing | All work assignments to date have successfully been completed on budget and schedule.

Change Orders
None

Key Personnel
Sean Chapparro
Lauren DaCunha
James Cooper
Michael Knowles
Sam Hobi
Aubrey Haudricourt

Arcadis has maintained an engineering and professional consulting services contract with the City of Venice (City) since 2005, under which it has successfully completed a number of services at both the 4.32 million gallon per day (mgd) Reverse Osmosis (RO) water treatment plant (WTP) and 6 mgd Eastside Advanced Wastewater Treatment Facility (AWWTF). Arcadis' long history and proven experience with the City have resulted in a profound relationship with utility staff and intimate knowledge of the City's needs and priorities. To date, we have received approximately 21 task orders under this contract. Key water system services performed under the contract include: (1) a RO WTP feasibility study; (2) a Water Master Plan; (3) a structural assessment of the clear well at the RO WTP, (4) design of a hydrogen sulfide scrubber at the RO WTP, (5) design of a CO2 feed system, (6) design of new high service pumps at the RO WTP, (7) water booster pump station conceptual design, (8) RO WTP Sodium Hypochlorite Bulk Storage System Replacement, and (9) preparing the permit renewal package for their Eastside WRF. Some of our tasks include:

Water Master Plan: Arcadis developed a comprehensive water master plan and 20-year CIP. The project included an assessment of raw water supply, treatment and distribution system needs (including creating and calibrating a distribution system hydraulic model). The resulting recommendations were prioritized and developed into a 20-year CIP.

RO WTP Feasibility Study: ARCADIS conducted an assessment of the WTP to identify RO and WTP R&R project needs, including determination of the best approach for delivering the identified projects (e.g., design-build, design-bid-build, etc.). The evaluation included the pumps, electrical and controls systems, treatment process, standby power, chemical feed systems, and odor control system.

Structural Assessment: Arcadis completed a structural condition assessment of the clearwells at the RO WTP to identify areas of concern in the exterior and interior of the clearwell, as well as the membrane roofing system to be repaired. Arcadis developed the repair recommendations, developed bid documents for implementation of recommended repair work, and provided construction administration services.

Hydrogen Sulfide Odor Control System: Arcadis completed a comprehensive evaluation of available odor control alternatives to replace the existing degasifier, chemical scrubber. The evaluation included an assessment of implementation requirements, operation and maintenance considerations, advantages/disadvantages and costs for several odor control alternatives. Arcadis compreted preliminary and detailed design two degasifiers and a biotrickling filter with associated neutralization and cleaning in place systems to control hydrogen sulfide odor at the RO WTP. Arcadis provided design, bid and construction phase services for the upgrades.

CO2 Feed System Replacement: Arcadis evaluated replacement needs for the existing CO2 feed system to address operational issues. The evaluation included an assessment to confirm the required design CO2 dosages and feed rates; and required carrier water flows and pressures for the new CO2 system. The selected system was a 120 lb/hr pressurized solution feed system with multiple feed diffusers to optimize carrier water usage depending on system flows. Arcadis provided design, bid and construction phase services for the upgrades.

RO WTP High Service Pump Replacement: Arcadis assessed and confirmed the replacement needs for the High Service Pumps and associated piping, valves, wiring and appurtenances at the Venice RO WTP. Arcadis provided detailed design documents, bidding assistance and construction administration services for the replacement of the three existing high service pumps, motors and associated appurtenances at the RO WTP.

Water Booster Pump Station Conceptual Design: Arcadis completed preliminary conceptual design of a new water booster pump station to improve supply and pressure on the north-east side of the City's distribution system. The booster pump station also included a sodium hypochlorite chemical disinfectant booster system. As part of this assessment, Arcadis evaluated system hydraulics and pump types, developed conceptual alternatives for the layout of the new booster station, evaluated requirements for a disinfectant booster system including storage and metering pump system sizing, reviewed alternatives/requirements for water main piping to and from the booster station, and evaluated location and sizing of a ground storage tank for the system.

RO WTP Sodium Hypochlorite Bulk Storage System Replacement: Arcadis provided design, bidding, and construction administration services for the replacement of the sodium hypochlorite bulk storage tanks, transfer pump, piping, valves and appurtenances at the City's RO WTP. This project also included concrete repairs and recoating of the existing containment area and replacement of the FRP roofing system.

Eastside WRF Permit Renewal: Arcadis provided engineering services required to obtain a renewal of the operating permit for the Eastside Water Reclamation Facility. As part of this work, Arcadis prepared and gathered the necessary data and reports for the permit renewal, and prepared and submitted the required FDEP permit renewal application forms.

Toho Asset Management Implementation Assistance & Condition Assessments

Kissimmee, Florida

Client
Toho Water Authority

Robert Pelham
951 MLK Jr. Blvd. Kissimmee, FL 34741
407.709.3677

Duration of Work
Phase I – 6/2015
Phase II - ongoing

Schedule and Scope
Original: 6/2015 - Scope as requested
Achieved: 6/2015 - Scope as requested

Change Orders
None

Key Personnel
Celine Hyer (Project Manager)
Greg Osthues
Chris Heltzel
Lauren DaCunha
Melissa Pomales
Joan Fernandez
Aubrey Haudricourt
Sam Hobi

Arcadis is assisting Toho Water Authority (TWA) with the implementation of their comprehensive asset management program. The Phase I initial work included a review of the overall asset management strategy as well as a thorough assessment of TWA's software capabilities. The largest single task has been condition, criticality and risk assessments of TWA's water, wastewater and reuse assets to facilitate risk-based capital planning. Task orders have included the following:

- Development of new performance measures and a reconfiguration of TWA's Infor EAM maintenance management system to accept condition assessment and asset management attribute data.
- Improvements to TWA's capital improvement planning process including business case templates and prioritization scoring procedures based on triple bottom line criteria.
- Creation of Condition, Criticality and Risk Guidelines documents to support overall asset management standardized procedures including asset definitions and hierarchies. Training was also provided to TWA staff during a pilot area project and later during the lift station assessments.
- Performance of Condition Criticality and Risk Assessments for TWA's major assets including six water treatment facilities, six wastewater treatment facilities and 300 pumping stations to date. The assessments include, remaining useful life and replacement cost estimates for the assets to assist in creating the 5-year capital improvement program projects and with long-term renewal and replacement planning.
- Piloting of Asset Hound tablet-based data collection program to collect field inventory and condition asset data to eliminate paper forms and data entry.

Phase II work which is now underway will focus on two areas for improvement

- Strategic Asset Management Plan: This will meet ISO 55000 requirements and include a policy, maturity assessment and plan for improvements, overall objectives linked to the strategic plan, governance, key decision policies for risk and capital planning and process for continuous improvement.
- Asset Management Plans: Building from the SAMP Asset Management Plans for the major asset classes will be prepared including gravity sewer and force mains, water mains, water plant, wastewater plants, and lift stations. These will define the strategies necessary to address risk and poor condition through maintenance and capital programs.

Indian River County Asset Management Implementation Services

Vero Beach, Florida

Client
Indian River County Department of Utility Services

Vincent Burke

1801 27th Street Vero Beach, FL 32960

772.226.1835

Duration of Work
Phase I – 2/2019
Phase II - Ongoing

Schedule and Scope
Original:2/2019 - Scope as requested
Achieved:2/2019 - Scope as requested

Change Orders
None

Key Personnel
Celine Hyer (Project Manager)
Greg Osthues
Chris Heltzel
Lauren DaCunha

Arcadis assisted Indian River County Department of Utility Services (IRCDUS) in developing and implementing a comprehensive asset management program. This project aims to establish a roadmap for the implementation of an Asset Management Program and Plans that integrates whole asset lifecycle analysis, data collection, work processes, information systems, decision analysis, risk- based project planning, maintenance optimization, and performance management. The project's Phase I scope of services included the following key activities:

Asset Management Gap Analysis. The WERF SAM Gap analysis tool was used to provide a baseline of asset management current maturity for IRCDUS as well as a comparison to other utilities across the country.

Asset Management Strategy and Roadmap. A strategy to fill and prioritize the gaps included the development of an AM Policy, a strengths, weaknesses, opportunities and threats analysis, establishment of goals and objectives, discussion of performance metrics and a prioritized Implementation Roadmap to fill the gaps over the next 8 years.

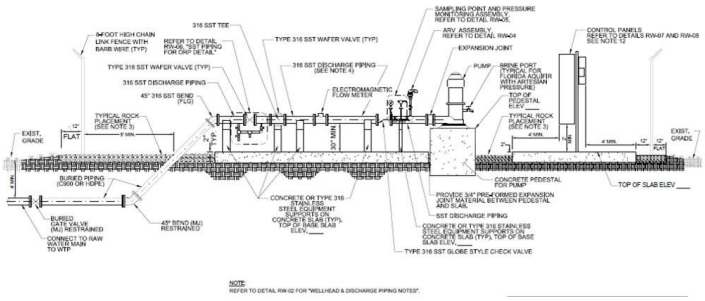
Condition and Risk Assessment Methodology & Pilot. Condition assessment and risk methodology for vertical assets was developed including asset hierarchy, asset definition, required attributes, scoring methodologies for asset physical condition, performance condition, consequence of failure and risk, effective and remaining useful life, replacement costs, and risk-based capital planning. The methodology was tested at 1 water plant, 1 wastewater plant and 4 lift stations.

Work Management Improvements. The SEMS CMMS was reconfigured to accept the pilot data and to create condition assessment work orders.

Phase II services will focus on the following:
Support for procuring a new computerized maintenance management system, pipeline asset condition and risk assessments and additional treatment facility condition and risk assessments.

Immokalee - Raw Water Well No. 4

Immokalee Seminole Indian Tribe, FL



Client
Seminole Tribe of Florida

Emran Rahaman

6300 Stirling Road Hollywood, Florida 33024

954.347.9163

Duration of Work
4/28/2017 - 5/18/2019

Schedule and Scope
Original: 4/28/2017 - 5/18/2019 | Scope as requested
Achieved: 4/28/2017 - 5/18/2019 | Scope as requested

Change Orders
None

Key Personnel
Joan Fernandez (Project Manager)
Leah Richter
Marc Killingstad

The Seminole Tribe of Florida (STOF) owns and operates the Immokalee Water Treatment Plant (WTP) which produces potable water for the Immokalee Reservation. The WTP is located at 435 Eustis Avenue, Immokalee, FL 34142. The current capacity of the Immokalee WTP is 216,000 gallons per day.

This project initiated the expansion of the raw water supply capacity by locating, designing, and permitting a fourth production well to deliver additional groundwater to the WTP.

The WTP has three (3) 100 gallon per minute (gpm) water supply wells drawing from the surficial aquifer. The three wells feature well screen and filter pack completions. The typical configuration of the wells is 10 inches in diameter, cased to 140 feet below land surface, and screened over the interval of 140 to 210 feet below land surface. Each well is equipped with a vertical turbine line shaft pump designed and capable of withdrawing 100 gpm and delivering the raw water to the WTP. The planned location of Well 4 is east, and in the vicinity, of the WTP.

The permitting process involved the STOF Environmental Resource Management Department and the South Florida Water Management District.

Arcadis prepared a conceptual design report and permitting Well 4 through the STOF Environmental Resource Management Department (ERMD) and South Florida Water Management District (SFWMD)

Loudoun Water Engineering BOA

Ashburn, VA

Client
Loudoun Water

Jessica Dzara
44865 Loudoun Water Way Ashburn, VA 20147
571.291.6549

Duration of Work
2011-2019

Schedule and Scope
Original: 2011-2019 | Scope as requested
Achieved: 2011-2019 | Scope as requested

Change Orders
None

Key Personnel
Celine Hyer
Tung Nguyen

Loudoun Water's mission is to sustainably manage water resources in advocacy of health, environment and quality of life. Arcadis has been partnering with Loudoun Water to support it Asset Management mission since 2011.

Arcadis worked with Loudoun Water under the Environmental Engineering BOA and has provided a wide range of services through this contract. The following provides a summary of key asset management task orders under this contract.

Loudoun Water Asset Management Program Planning and Implementation.

Arcadis developed an Asset Management Program Planning and Implementation Program for Loudoun Water. This project produced the following:

- Organizational alignment and training of operations, maintenance, and engineering staff
- Repeatable methodologies and tools for condition, criticality, and risk assessment
- Improved asset data for decision making

Phase 1. services included an asset management gap analysis and strategy development. This initial project included a set of facilitated strategy and vision workshops and interviews with key management and staff across operations, maintenance, engineering, finance, and IT to understand current work practices, processes, tools, and performance. A final project report was developed detailing gaps and opportunities to lead the asset management program forward. The project outcome included a comprehensive asset management implementation plan with a prioritized list of improvement initiatives to be implemented over the next 3-5 years from 2014 – 2016.

The results were discussed and validated with the Loudoun Water leadership team during a final planning workshop. The final gap analysis report also included recommendations for key roles and responsibilities required to manage the asset management program moving forward, as well as a comprehensive change matrix identifying benefits, cost factors, and key issues related to the high-priority initiatives. In addition, this initial phase of work included development of a common asset management program statement that was in alignment with Loudoun Water's strategic plan.

Phase 2. Arcadis assisted Loudoun Water with the implementation phase of a risk focused asset management program. The Phase 2 project focused on the following core tasks:

- Development of a comprehensive risk methodology encompassing asset hierarchy, attribute data standards, condition assessment, criticality, useful life, and valuation methodology.
- Development of a comprehensive guidelines manual in collaboration with staff through a series of interactive workshops.
- Implementation of the above methodology through a pilot consisting of several community systems including Lenah Run, Waterford, and Selma Estates.

The pilot includes comprehensive field condition assessment and inventory of all major treatment and pumping assets, along with hands-on training and knowledge transfer for operations and maintenance staff. The outcome of the pilot included a long-term renewal and replacement forecast that can be:

- Integrated into the existing CIP. At the conclusion of the pilots, a complete dataset will be provided for upload into the SAP EAM/CMMS system. The processes will form the foundation for future similar and expanded asset management program development efforts.
- With the implementation of SAP, we are developing a series of customized reports to assist with the asset management program.

Water Reuse Business Case Analysis. Developed guidelines for a consistent approach to future financial business cases for large capital water investments across Loudoun Water.

Asset Management SAP Reporting Pilot. The objective of this project was to implement the methodologies to track asset condition and risk in SAP, which is the system Loudoun Water uses for their asset registry and maintenance management. The structure and data was created in SAP for two pilot facilities and utilizing Business Intelligence/Business Objects (BOBJ) for the report environment. The overall process and approach was built during this pilot program before expanding it to other facilities.

Facilities Risk Assessment Project. This project entailed performing field condition assessments at five Loudoun Water facilities, which assisted Loudoun Water with understanding the condition and risk of its assets and develop a more efficient CIP. The assessment data was uploaded to SAP and used to generate Asset Management SAP reports. Loudoun Water is leveraging its SAP investment to visualize data and better understand the condition and risk of assets through graphical, informative, and insightful asset management dashboard style reports. Key outcomes of the effort include reports that are informative, graphical, insightful, and easy to interpret. The reports help prioritize and justify projects in Loudoun Water's capital improvement program as well as increase the efficiency of preventative maintenance programs.

Asset Management Gap Assessment and Roadmap. This project entailed utilizing one of the leading industry frameworks: The Water Research Foundation Strategic Asset Management Gap Analysis (SAM GAP) tool. This framework utilizes a tactical and detailed methodology, and the assessment results identify strengths and opportunities in the current asset management program in order to re-assess and update priorities moving forward. The outcome of the Asset Management practices assessment was a summary of improvement opportunities which were then prioritized and grouped into initiatives for the utility. These initiatives were then further compiled and planned into an overall Asset Management Program Roadmap for 2020 - 2025. The roadmap provided a clear vision and line of sight into how and when improvements to the program will be achieved.

To implement the roadmap, Loudoun Water assembled a Steering Team and Work Teams, each of which was cross-functional with representatives from throughout the organization. Each work team was assigned initiatives to implement from the overall Asset Management Program Roadmap. The Steering Team provides executive oversight to ensure alignment with the Strategic Plan and oversees key activities being performed by the Work Teams. The Work Teams address and implement improvements related to key areas of the asset management program.

Water Quality Master Plan

New Orleans, Louisiana

Client
Sewerage and Water Board of New Orleans (SWBNO)

Bob Turner
8800 S. Claiborne Ave. New Orleans, LA
504.865.0405

Duration of Work
May 2016- May 2017

Schedule and Scope
Original: May 2016 – May 2017 | Scope as requested
Achieved: May 2016-May 2017 | Scope as requested

Change Orders
None

Change Orders
None

Key Personnel
Sean Chapparro
Lauren DaCunha

SWBNO selected the Arcadis team to develop a water treatment master plan for their 240-mgd Carrollton WTP and 40-mgd Algiers WTP. Both facilities use the Mississippi River as their source of supply and have historically provided safe and reliable drinking water to the Board's customers. However, budgetary constraints have limited maintenance activity at the facilities, and much of the equipment at both plants has reached the end of its useful life, raising concerns regarding the ability to reliably meet the needs of their customers in the future.

Arcadis conducted a comprehensive condition assessment of the facilities (mechanical, electrical, structural and architectural), identified plant vulnerabilities that could impact the ability to reliably produce water, conducted a benchmarking evaluation to compare treatment performance to industry standards, and identified operational and capital improvements needed to address deficiencies and maintain compliance with current and future regulations.

Arcadis' water quality compliance assessment detailed the current status of treatment performance at the plants and, more importantly, helped the SWBNO identify key treatment infrastructure improvements necessary to maintain and improve current water quality performance for reliable plant operation. The project team conducted site visits and reviewed water quality and operational data to identify water treatment process deficiencies and recommend capital and operational improvements.

Life-cycle cost analyses were conducted to compare alternatives, and recommended improvements were prioritized based on risk. Risk was determined based on the physical (what condition is the equipment in) and process (does it/will it meet its performance requirements?) condition and criticality.

Arcadis developed a detailed 20-year capital improvements plan for both WTPs that provides a roadmap for continued delivery of safe and reliable drinking water to all SWBNO's customers. The purpose of this effort was to develop a balanced capital and financial plan representing the anticipated capital needs and costs for the two WTPs.

Condition assessments and a thorough evaluation of rehabilitation alternatives led to the development of a comprehensive capital improvements program, which grouped improvements into projects and ordered them according to priority for completion. This prioritization of projects helped the SWBNO effectively budget and plan capital improvement requirements over the next twenty years.

Master Plan. Arcadis prepared the Board's first master plan in more than 20 years. A $200-million plan that will help the Board continue to provide the high-quality of service its customers have come to expect.

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5

EXPERTISE OF DESIGNATED STAFF

5 EXPERTISE OF DESIGNATED STAFF

Proposed Project Team

Arcadis' singular and renewed emphasis on client focus, places your needs, visions, and objectives as the driver in everything we do. The people selected and the way we have structured our team for this proposal is based solidly upon our direct knowledge and experience of your preferences for how projects are delivered, your expectations of the quality of work you receive, and the degree of responsiveness and sophistication in the level of service we provide as your consultant. We have selected team members that know and have successfully worked with one another on previous similar projects. Many of these team members have also worked on projects for the City of Hollywood and have strong working relationships with your staff. Our proposed organizational chart for this project is presented on the next page, followed by brief project role descriptions for key personnel communicating the significant value each person contributes to the project team. The descriptions and organizational chart demonstrate the required elements and disciplines for this project in an organized structure. This arrangement supports our goal of completing projects on-schedule and on-budget, and provides the County with one Arcadis contact person, Mr. Nguyen, Project Manager responsible for the overall success of the project. Resumes for each team member are included in Appendix A.

Subconsultants

Arcadis has teamed with subconsultants who have experience working in South Florida and in most instances, also have experience working directly with the City. Our team includes Tobon Engineering (Technical Assistance/Hydraulic Modeling), a firm founded by Maurice Tobon, PE and McKim and Creed (Electrical and Instrumentation & Controls Assessments and Energy Management). With these firms on our team who also have a long history of performing work for the City, we will be able to execute at a high level from day one. Each of these firms were selected based on their specialized experience and their history of providing similar services in Broward County and in some instances directly for the City of Hollywood. In most cases, Arcadis also has teamed with them on other projects in the area so we understand how to do business together. The proposed subconsultants are listed below along with summaries of their individual experience.

McKIM&CREED
ENGINEERS SURVEYORS PLANNERS

McKim & Creed, Inc. is a committed team of talented professionals who improve the quality of life for businesses and communities by providing world-class engineering and geomatics solutions. Our technical specialties include civil, environmental, mechanical, electrical, plumbing, and structural engineering; industrial design-build services; airborne and mobile LiDAR/scanning; unmanned aerial systems; subsurface utility engineering; and hydrographic and conventional surveying services for the energy, transportation, federal, land development, water and building markets. As an employee-owned company that has been in operation since 1978, we provide these services through excellent work, dedicated service and a passionate desire to solve problems and impact lives. McKim & Creed's depth of local resources offers the flexibility to provide experienced staff at your disposal to keep your project on track. Our solid background and experience have resulted in the method and controls being in place to balance staff requirements while maintaining quality, schedule and budget for our clients. McKim & Creed is committed to meeting budget and schedule requirements.

Tobon Engineering
Engineering and Utility Management

Tobon Engineering is a minority owned engineering consulting business founded by Maurice Tobon, P.E., PMP a Professional Engineer with over 30 years of experience in water, wastewater engineering, master planning, utilities management, hydraulic modeling, and climate change in south Florida and internationally. The owner and president of Tobon Engineering, Maurice Tobon served for fifteen years at the highest management levels of two of the largest water utilities in south Florida (Palm Beach County and City of Fort Lauderdale) and was responsible for nearly $ 1 billion in capital improvements. During his employment with the City of Fort Lauderdale as Engineering Design Manager in Utilities he was also responsible for construction management and contract negotiations. Therefore Mr. Tobon has unique experience and insight from many years of working within the public sector.

Organizational Chart

CITY OF Hollywood FLORIDA

QA/QC
Frank Sidari, PE, BCEE*

Technical Advisors

Rebecca Slabaugh, PE, ENV SP*
Water Quality & Treatment

James Cooper, PE, CWO, ENV SP
Distribution System

Greg Osthues, PE, IAM*
Asset Management

Brian Duane, PE
Pumping

Principal in Charge
Leah Richter, PE

Project Manager
Tung Nguyen, PE, PMP

TASK LEAD
Michael Knowles, PE
Demand Projections & Modeling

Maurice Tobon, PE, PMP[1]
Hydraulic Modeling

Lauren DaCunha, PE
Demand Forecasting & Model Calibration

Marc Killingstad, PE*
Water Supply Planning

Michael Knowles, PE
Desktop Condition Pipelines and Performance

TASK LEAD
Celine Hyer, PE, IAM
Facilities Assessment

Tung Nguyen, PE, PMP
Asset Condition Facilities

Sean Chaparro, PE
Treatment Capacity & Performance Evaluation

Celine Hyer, PE, IAM
Risk Assessment

TASK LEAD
Melissa Pomales, PE, IAM
Integrated CIP Plan

Joan Fernandez, PE, IAM
Alternative Evaluation & Costing

Melissa Pomales, PE, IAM
Leah Richter, PE
Project Prioritization & Scheduling

Chris Heltzel, GISP, IAM
Planning Decision Support Tool

Planning, Engineering & Technical Support

Stephanie Bishop, PE
Chemical Systems

Tung Nguyen, PE
Samuel Palermo, PE
Pump Stations

Paul Walansky, PE
Hydraulics

Daniel Stepner, PE
Mechanical

Aubrey Haudricourt, PE[2]
Michael Fadini, PE[2]
Electrical/Power Supply

Lia Dombroski, EIT
Joan Fernandez, PE, IAM
Vulnerability/Risk

Michael Stoup, PE[2]
Michael Tweedel, PE[2]
SCADA/instrumentation

Keren Bolter, Phd
Resiliency

Robert Ryall, PE
Financial Analysis

Rebecca Slabaugh, PE, ENV SP*
Regulatory

Seth Finnicum, PE
GIS/CMMS

Daniel Garcia, PE
Pipelines

Matt Daves, PE[2]
Don Pettigrew, PE[2]
Energy Management

Sam Hobi, PE
Errol Dawkins, RA
Structural/Architectural

Estephania Pilar
Water Supply Planning

Subcontractor Key: Tobon Engineering[1] | McKim & Creed[2]

Team members with an asterisk (*) are licensed PEs in a state other than Florida.

Key Personnel

LEAH RICHTER, PE | PRINCIPAL IN CHARGE

Ms. Richter has a diverse background in program management, business advisory and financial consulting services and civil engineering. She specializes in assisting municipal clients in South Florida with managing their planning, operational and capital program needs. Her experience includes project management and delivery, vendor procurement, contract compliance, regulatory permitting, public outreach, annual reporting to bondholders/trustees, litigation support services, environmental compliance and operation and maintenance evaluation. She serves as the Project Manager for the Miami Dade County Water and Sewer Department Bond Engineering and Financial Services contract. Ms. Richter currently serves as Arcadis's Southeast Florida Operations Leader and is located in our Plantation office, just minutes from the City to provide rapid response to any request.

TUNG NGUYEN, PE, PMP | PROJECT MANAGER

Mr. Nguyen is a Project Management Professional and licensed civil engineer experienced in water and wastewater treatment plant design, process evaluation and optimization, project controls, and construction management by multiple project delivery methods including design-build (D-B). He is also well versed in using designer and contractor tools and software including BIM, CADD, GIS, database, Primavera CM4 and P6, MS Projects, e-Builder, and share-point as well as other emerging digital technologies such as drones and 3D scanning. Mr. Nguyen is currently serving as the Project Manager for several ongoing projects with the City and is located in our Plantation office, providing rapid response to any request.

REBECCA SLABAUGH, PE, ENV SP | TECHNICAL ADVISOR - WATER QUALITY & TREATMENT

Ms. Slabaugh serves as the Drinking Water Practice Leader at Arcadis. She brings over 13 years of experience engineering and managing drinking water quality and treatment projects, including process selection and optimization, regulatory compliance, water quality monitoring, bench and pilot testing, and cost estimating. She has completed preliminary and detailed process designs for ground and surface WTPs ranging in size from <1 mgd to 1,300 mgd and has experience with conventional and advanced water treatment processes. She is a contributing author to multiple AWWA Manuals of Water Supply Practice and has provided regulatory support to AWWA, EPA, and various state agencies. Ms. Slabaugh is currently serving as QA/QC on the City's Four-Log Improvement Project.

BRIAN DUANE, PE | TECHNICAL ADVISOR - PUMPING

Mr. Duane's experience includes the design of more than 100 water and wastewater pumping facilities ranging in size from under 1 million gallons per day (mgd) to 2,200 mgd. He is a technical expert in hydraulics, pumping systems and the design of mechanical process systems, and he routinely provides assistance with start-up and troubleshooting of mechanical systems. Throughout his career, Mr. Duane has partnered with clients to provide cost-effective solutions that are functional, practical, maintainable and constructible. He offers exceptional value to clients based on his proven track record of practical design; history of successful project execution and completion; and understanding of the client's needs during design, construction, start-up and post-construction phases of the project. Mr. Duane establishes strong working relationships with each client's staff so that the project team can understand and address the client's desires and requirements.

JAMES COOPER, PE, CWO, ENV SP | TECHNICAL ADVISOR - DISTRIBUTION SYSTEM

Mr. Cooper represents Arcadis as our Global Lead for Intelligent Water: the process of water systems embracing digital ecosystems in frontline operations and in utility management with the purpose of improving financial stability, customer experience, and operations and maintenance key performance indicators. He balances engineering and management expertise with hands-on experience as a certified operator by leading diverse teams to deliver innovative, practical and sustainable solutions in water system treatment, management, modeling, machine learning, artificial intelligence and optimization. Mr. Cooper is a trustee for the American Water Works Association and has authored multiple publications at international conferences, webinars and public meetings, including lead author of AWWA Manual of Practice 32, Computer Modeling of Water Distribution Systems. Mr. Cooper led the development of the City's recent hydraulic model.

GREG OSTHUES, PE, IAM | TECHNICAL ADVISOR - ASSET MANAGEMENT

Mr. Osthues is a national Technical Director for water and brings extensive experience in the assessment and prioritization of utility infrastructure including treatment plants, pumping stations, storage facilities, water distribution systems and distribution systems. Mr. Osthues has served as technical lead for the development of prioritized capital improvement programs for complex infrastructure across the Country. He is an accredited asset management specialist in the development of performance management programs and infrastructure condition and risk assessment programs for capital planning.

FRANK SIDARI, PE, BCEE | QA/QC

Mr. Sidari has over 20 years of engineering and project management experience supporting water and wastewater systems through engineering and research. His work has included leading project planning, design, construction, and operation of public and private water systems. He has worked on drinking water systems ranging from several thousand gallons per day to over 100 mgd, including treatment, disinfection, pumping, and storage applications. Mr. Sidari provides company-wide advisory on drinking water and emerging water quality issues from the treatment plant to the consumer's tap. He has also authored more than 75 papers and technical presentations on water and wastewater topics.

MICHAEL KNOWLES, PE | DEMAND PROJECTIONS & MODELING - TASK LEAD

Mr. Knowles is a project engineer with more than 18 years of experience in water, wastewater and reclaimed water engineering. He is experienced in various aspects of environmental engineering from design development through construction administration. His project experience includes water and wastewater treatment facilities, water and sewer distribution systems, and environmental permitting. Mr. Knowles is especially adept at hydraulic modeling using Bentley and Innovyze software as well as the use of geographic information systems (GIS) in planning and design efforts.

CELINE HYER, PE, IAM | FACILITIES ASSESSMENT - TASK LEAD

Ms. Hyer has over 20 years of specific experience in risk based asset management in support of Capital Planning. She has led condition and risk assessments for water, and wastewater infrastructure for projects encompassing pipes, pumping facilities and treatment equipment totaling over 1,500,000 assets. As part of the risk assessments, she has created short- and long-range capital plans using business case templates and triple bottom line analysis. Prior to Arcadis Celine served as the Engineering Director for Hillsborough County Utilities where she was responsible for creating and implementing the 5 year capital plan for all water and sewer infrastructure. She is also a national thought leader on asset management for water utilities and currently serves as the Vice Chair for the AWWA Asset Management Committee and the Water Main Condition Assessment Committee

MELISSA POMALES, PE, IAM | INTEGRATED CIP PLAN - TASK LEAD

Ms. Pomales is a licensed Professional Engineer and Project Management Professional, with a diverse and broad range of experience in program and project management, utility consulting and business advisory, procurement and strategic planning, feasibility and financial analyses, planning, and design. Ms. Pomales is the Florida Area Leader for our Water Business Line and is located in our Plantation office, providing ready access to the senior leadership team of the firm.

LAUREN DACUNHA, PE | DEMAND FORECASTING & MODEL CALIBRATION

Ms. DaCunha specializes primarily in water and wastewater-related design, water modeling, and infrastructure condition assessment. Specifically, she has assisted in several condition assessments; completed designs and calculations; performed data collection and analysis; completed hydraulic analysis of several water distribution systems and created GIS maps/figures; developed cost estimates and assisted in report, specification and contract writing; and several permitting and funding applications.

MARC KILLINGSTAD, PE | WATER SUPPLY PLANNING

Marc Killingstad is a Technical Expert (Groundwater Hydrologist) and is currently the Director of the Hydrogeology Community of Practice as well as the technical lead for the Remediation Hydraulics Practice Area for Arcadis North America (NA). He has extensive experience and knowledge in applying state-of-the-art concepts and principles of quantitative hydrogeology to support site investigation and remedial design work and to help resolve water supply issues/support water resources investigation work in a wide variety of geologic settings throughout North America, South America, Africa, Australia, and Europe. He has been principal investigator on numerous groundwater flow and solute transport modeling projects and has participated in regulatory meetings and provided litigation support in which modeling/ quantitative hydrogeology was used to support negotiations.

SEAN CHAPARRO, PE | TREATMENT CAPACITY & PERFORMANCE EVALUATION

Mr. Chaparro has experience in municipal drinking water and wastewater treatment master planning, design, and special evaluations. Experience in drinking water treatment includes condition assessments, plant optimization evaluations, water quality planning, treatment process evaluations, facility planning, Safe Drinking Water Act compliance assessments, corrosion control treatment evaluations, chemical feed system evaluations, and residuals handling and disposal evaluations and design.

JOAN FERNANDEZ, PE, IAM | ALTERNATIVES EVALUATION

Joan Fernandez is a licensed Professional Engineer with a diverse and broad range of experience in the business consulting, civil, and environmental fields. She has over 15 years of experience in project management, planning, design, permitting, procurement and construction management. During her professional career Ms. Fernandez has worked closely with various internal and external stakeholders staff at all levels, consultants and contractors in conducting contract negotiations, presentations, workshops, and project implementation. Ms. Fernandez continues to be involved in the development and delivery of Capital Improvement Projects (CIP) for various clients valued at more than $15 million including City of Sunrise, City of Boynton Beach, City of Hollywood and Miami-Dade Sewer and Water Department.

LIA DOMBROSKI, EIT | VULNERABILITY/RISK

Ms. Dombroski has three years of civil and environmental engineering experience serving municipal and government clients in the water and wastewater industry. She has led in the development of 6 large community water system risk and resilience assessments (RRAs) per AWIA of 2018, including the City of Hollywood's. She has assisted in the condition assessments of large-scale water and wastewater infrastructure including water/wastewater treatment processes, storage facilities, pumping facilities, distribution/collection systems, and other supporting facilities. She has also been heavily involved in report writing focusing on local legislation, regulatory requirements, capital improvement programs, financial obligations, as well as permitting and construction oversight activities.

CHRIS HELTZEL, GISP, IAM | PLANNING DECISION SUPPORT TOOL

Mr. Heltzel specializes in information management, application development, systems selection and implementation to support water utility asset management. He has extensive experience managing IT projects, including implementations of geographic information systems (GIS), computer-aided drafting and design software (CADD), hydraulic modeling, computerized maintenance management systems (CMMS), financial and customer information systems (FIS & CIS), condition assessment software, rate studies and capital improvement planning. Chris is architect of the Arcadis Rehabilitation and Replacement Planning System application using risk-based prioritization for horizontal (piping) and vertical (facility) asset capital planning. Chris has used these technologies to help over one hundred different utilities effectively manage their information.

Key Subconsultants

MAURICE TOBON, PE, PMP | HYDRAULIC MODELING

President of Tobon Engineering and a professional water engineer with over 30 years of experience in water, wastewater, reclaimed water engineering, climate change and utilities management in south Florida and internationally. Served for over fifteen years at the highest management levels of two of the largest water utilities in south Florida (Palm Beach County and City of Fort Lauderdale) and was responsible for nearly $ 1 billion in program management capital improvements. Unique experience and insight from being in government for many years and understands the issues faced by water and wastewater utilities. Responsible for formulating sustainable infrastructure solutions in line with strategic visions and key intended outcomes and missions as defined by the Executive Administration.

AUBREY HAUDRICOURT, PE | ELECTRICAL ENGINEER

Mr. Haudricourt, of McKim and Creed, brings 42 years of experience in both electrical and instrumentation engineering and construction. He has designed and overseen the installation of power generation, controls systems, lighting for large facilities. He has also been involved in security assessment and security design. His expertise includes evaluating existing conditions, treatment facility electrical systems, and both electrical and instrumentation systems.

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6

APPROACH

6 APPROACH

Project Understanding

The 2007 Water Master Plan has been successfully applied by the City to guide expansion, rehabilitation and replacement decisions; however conditions have changed over time and a refresh is necessary to continue to have a successful roadmap for the future. The City of Hollywood 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 10 years. The objective of the Water System Master Plan update is to assess the current condition and remaining useful life of the water system assets, understand the growth needs for new assets, and then identify prioritized projects, which address aging infrastructure, improve reliability of service, enhance operational efficiencies, and provide for process optimization. The City has made a significant investment in Cityworks to support overall work and asset management and a risk based approach to assist the City in meeting asset management best practices for capital planning could support further advancements in the processes and data for decision making once this project is completed as summarized in Figure 6.1.

To provide a comprehensive Water Master Plan all major components of the City's water system should be addressed, including: Wellfields, Treatment, Storage and Distribution.

Wellfields

The City's raw water supply is obtained through a series of wellfields pumping ground water from the Biscayne and Floridan aquifers. The Biscayne aquifer provides a higher-quality source water and is the primary raw water source. The Floridan aquifer is a brackish supply and is used as the City's alternative water supply source. According to the 2015 Water Supply Plan, the Biscayne aquifer allocation alone is able to meet projected demands through approximately 2026, after which a combination of the Biscayne and Floridan supplies are needed. Since the 2007 Water Master Plan, the City has continued to invest in expansion of the Floridan aquifer, installing additional wells to meet projected water demands and provide increased reliability and diversity in the supply sources, with plans for additional wells should these be needed to meet demands beyond 2030.

Treatment

The City operates three different water treatment trains: lime softening, membrane softening, and reverse osmosis. Raw water from the Floridan wells is treated using reverse osmosis separately from the raw water from the Biscayne wells due to difference in water quality. Lime softening and membrane softening is used to treat water from different wells within the Biscayne aquifer.

These treatment trains utilize different secondary treatment systems. The lime softening system has two different types of filtration: traditional open top dual media filters and enclosed self-backwashing filters. The membrane softening system includes covered outlet degasifers, while the reverse osmosis system includes degasfiers and two-stage scrubbers. Each of these processes utilize different chemical systems.

These treatment systems all require careful assessment to understand their remaining useful life, optimize treatment, and simplify operations. An example of this is the structural condition of the self-backwashing filters which are part of the lime softening system. This process equipment is showing signs of age (corrosion) which requires periodic maintenance, the condition assessment needs to address if this system should continue to be rehabilitated, replaced in-kind, or if a different treatment process would be best to help in process standardization. There have also been process updates since the 2007 Master Plan that need to be captured in the updated Master Plan (i.e. 2010 RO Train D addition) to characterize the current treatment process and establish current WTP firm and nominal capacities.

Injection well for disposing concentrate from the WTP treatment process.

High Service Pump Station

Storage

Treated water from the three treatment processes is combined in a blend tank with further chemical adjustment. Water from the blend tank is pumped via three transfer pumps into five ground storage tanks and a clearwell (11 MGD of finished water storage). Ten high service pumps then pump water into the distribution system. While the quantity of the high service pumps remains the same since the 2007 Water Master Plan, the high service pumps have been replaced and should be assessed and characterized along with the other storage infrastructure in the updated Master Plan.

Distribution

The distribution system includes two 1 MG elevated storage tanks and 5 MG of ground storage located at the West Hollywood Storage and Pump Facility. The distribution system currently includes approximately 700 miles of water main piping. The updated Master Plan needs to account for changes to the distribution system since the 2007 Plan, which did not include the West Hollywood Storage and Pump Facility and only accounted for 600 miles of distribution piping. The City currently has an InfoWater hydraulic model, but it was last calibrated in 2017 and may not account for recent distribution system improvements. Updating this information in the new plan will properly characterize the water system and provide support in prioritizing future capital improvements.

Reuse

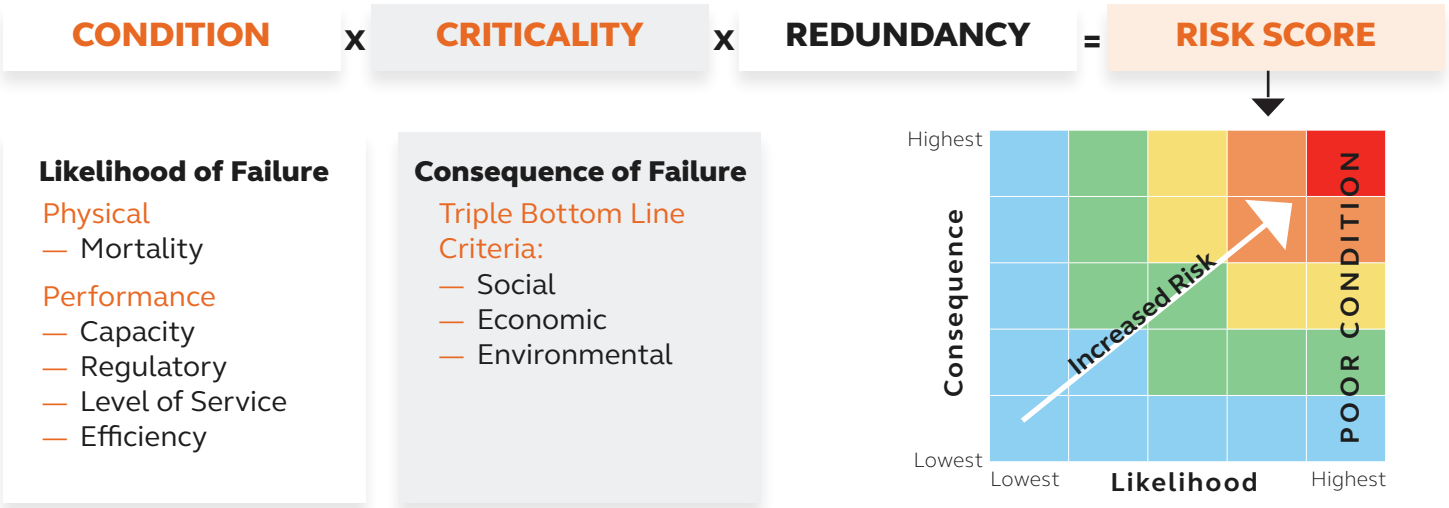
The City has an existing reuse system that provides irrigation and non-potable industrial process water. A portion of the treated water from the City-owned Southern Regional Wastewater Treatment Plant is discharged via deep injection wells. Lower-salinity wastewater effluent is also imported from surrounding communities.

Project Approach

Master Plan Objectives will be accomplished through the following main tasks:

1. **Growth Needs and Hydraulic Modeling** will be completed, including a review of the City's current reuse and conservations efforts, to understand recent trends in per-capita consumption and population projections for future growth needs. This critical task will inform the remaining tasks to identify current and future capacity service levels that will be required for the water system assets to meet over the 10-year planning horizon. Hydraulic Model Update and Calibration will be performed to update the model to represent current conditions within the distribution system, and to identify system service deficiencies and determine improvements required to meet level of service goals.
2. **Condition Assessments** (pipelines, pumping, wellfields and the water treatment plant) including identification of needed improvements using an asset management framework, which considers current physical condition, performance reliability, redundancy, future changes in capacity, regulations and other considerations. See Figure 6.1 for the overall proposed risk framework. For the pipeline assets, a desktop evaluation will be performed to determine the physical conditions based on existing information while inspections with a multidisciplinary team of electrical, I&C, mechanical and structural engineers will be completed for the pumping, wellfield and treatment plant assets.
3. **Water Plant Performance Evaluation** will include a rigorous assessment of the performance of the water plant through engineering analysis, interviews, and document reviews to score all assets for the other failure modes around capacity, regulatory, efficiency and level of service. This will support a true remaining life assessment as well as identify potential alternatives for the application of new technologies or equipment under Task 4.

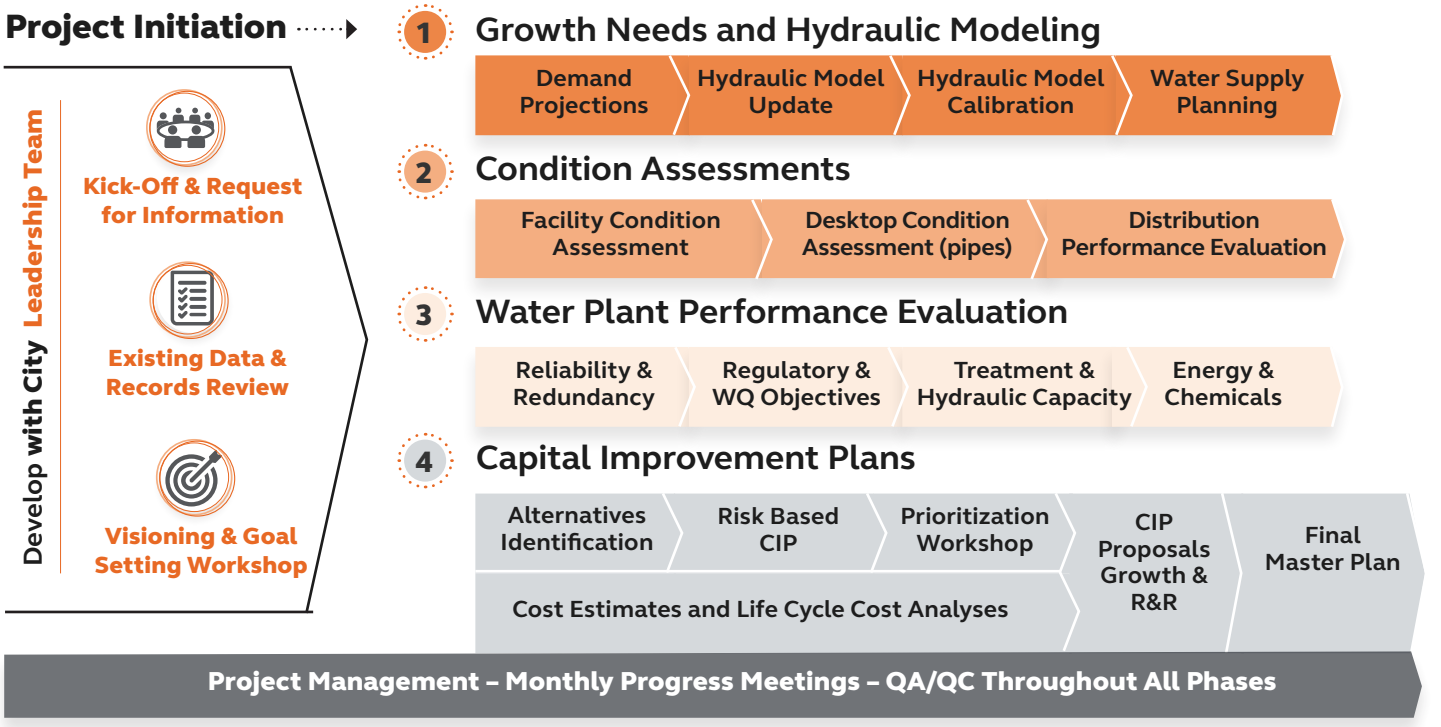
Figure 6.1 – Risk Framework



4. **Capital Improvement Planning**, with specific recommendations for years 0-5, 5-10 complete with descriptions, justifications and feasibility-level cost estimates. Asset criticality will be evaluated and added to the asset condition assessment to support a transparent and defensible risk-based prioritization of assets for inclusion into projects. Criticality scoring will initially leverage the risk and resilience project just completed by the City and Arcadis under the AWIA rule requirements. Projects will be evaluated for alternatives and prioritized against each other through the use of business cases and triple bottom line prioritization criteria. An optional "living master plan" can be provided inside of a configured decision support tool to offer seamless updating of the CIP as conditions change and share data with Cityworks CMMS and the Innovyze InfoWater hydraulic model.

The approach presented in Figure 6.2 is based on decades of similar experience by Arcadis. It has been refined over the years based on lessons learned and modified to accommodate the City's specific project objectives. The following subsections present this approach and provide examples of how we will approach key tasks. Our schedule and approach to project management are presented at the end of the section.

Figure 6.2 – Overall Project Approach



TASK 0 - Project Initiation

Workshop #1 – Kick-off meeting

Kick-off meetings lay the groundwork by gathering input from all stakeholders to prioritize project work activities. Our kick-off workshop will provide the foundation for a collaborative process resulting in an accurate and effective Master Plan that achieves the City's objectives. Our project work plan, work breakdown structure, schedule, roles and responsibilities of our project team and City staff, points of contact, communication protocols, data management and sharing protocols, and quality control will be discussed during this workshop.

Key success factors for Task 0 include:

Engaging All Stakeholders and Establishing Clear Goals. The kick-off workshop will establish project objectives and rules of engagement, identify stakeholders, establish protocols for data gathering, interviews, site visits, condition assessments, and confirm workshop participation and deliverable review.

Quickly Assimilating System Knowledge and Available Data. Our team has previous knowledge of the distribution system hydraulic model as well as the water treatment plant facility and pumping stations, which will allow us to quickly assimilate any recent changes or data that the City has compiled to develop a deeper understanding of

the water system and its assets that will receive ratings as part of the condition assessment. This will ensure that the City receives a condition rating and risk assessment for all assets and an electronic record that can be easily uploaded into your Cityworks CMMS, if desired.

Data Exchange

We will create and maintain a Microsoft SharePoint site for data management and exchange between the City, project stakeholders, the consultant team, and others as necessary. This will provide for seamless, secure exchange of information between multiple organizations as well as document retention for all meetings.

Information Needs Request

Our project team will develop a detailed information needs request that identifies data and information necessary to perform the work. We will submit the request immediately upon authorization from the City to start work and will discuss as part of the kick-off meeting. A preliminary list of information includes:

- Record Documents
- Reports
- Contract documents
- As-built documents
- O&M manuals
- Maintenance records
- Asset hierarchy
- Existing asset inventory database
- Latest water system GIS data
- Historical finished water production data
- Water consumption data (from billing)
- Water audit report
- Operational data from SCADA and remote pressure sensors
- Standard operating procedures
- Water quality monitoring plans

Testing and Inspections. Previous inspections and/or testing reports on equipment. Examples include vibration testing, thermography, well testing, pump efficiency testing, maintenance reports completed by outside contractors, etc.

Operational Data. Average-day and maximum-day data for flow and pressure for pumping systems; power consumption; monthly operating reports from the treatment plant showing chemical feed rates/dosages, residuals, and water quality data of the water at various points throughout the plant, including raw water, treated, settled, filtered, and finished.

Shop Drawing/Submittals. Available information on major process equipment, pumps, motors, VFD's, building envelope systems, mechanical systems, electrical systems, and I&C systems.

Pump Hydraulic Data. All available record information associated with the hydraulic performance of each pump.

Distribution Hydraulic Model. The latest version of the City's distribution system hydraulic model in InfoWater software.

Asset and Data Review and Gap Analysis

Our project team brings familiarity with the City's system and consists of individuals who participated in the previous projects related to plant and pumping upgrades, hydraulic modeling, and the risk and vulnerability AWIA assessment. This team will identify the major assets that are to be reviewed, available information from record documents, and determine any potential gaps that must be collected as part of the project. This will be developed from the 2007 Master Plan Document, the 2014 Bond Engineer Report, the 2015 Updated Water Supply Plan, the 2017 hydraulic model update, the Cityworks CMMS and GIS asset data, our Team's institutional knowledge and experience from our current as needed contract, available record documents, and results of the kick-off workshop.

Conduct Meetings with City Staff

Once the existing information is reviewed, the Arcadis team will conduct meetings with City operations and engineering staff to gain an understanding of the operating requirements of the water supply, distribution and water treatment plant assets and the overall data quality of the information received. We will also conduct meetings with maintenance staff to better understand maintenance practices, preventative maintenance measures, and recurring asset performance and maintenance issues.

Task 0 - Workshop #2 – Visioning & Goal Setting

The cornerstone to successful completion and implementation of the Master Plan will be collaboration between our team and the City. Ownership of the Final Master Plan is critical to its successful implementation, and that requires buy-in from the City and its staff. Achieving that buy-in requires collaboration. Task 6 (Project Management) describes a number of the communication tools we will use to foster that collaboration. In addition, it is critical that every level of the City, from operations staff to the Director, be on-board and take ownership of the Final Plan. For that reason, we will hold a Visioning and Goal Setting Workshop to:

1. Establish specific levels of service goals (LOS). LOS goals are required to support and guide the overall decision process for investment in asset repair, renewal and Replacement, and expansion. During this task, Arcadis will present industry best practices and benchmarking standards for various LOS and work with the City to refine and/or define additional LOS. Industry best practices will be complied from a wide variety of sources such as AWWA Partnership for Safe Water, AWWA and American Water Works Association Research Foundation (AWWARF) manuals and standards, Water Research Foundation (WateRF) reports, guidelines developed by the Insurance Services Office (ISO), benchmarking studies, design handbooks, federal and state regulations, local codes, and project team experience.
2. Define preliminary criteria and framework to be used in the evaluation, grouping and prioritization of recommended projects. Example criteria include: water quality, customer service, resiliency, reliability, complexity, maintenance, staffing, cost, sustainability, and alignment with strategic plans.

Task 0 Deliverables:

- **Request for information**
- **Materials, facilitation and meeting minutes for workshops #1 and #2**
- **Project Share Point site for data exchange**
- **Data Collection and Review TM #1**

Task 1 – Growth Needs and Hydraulic Modeling

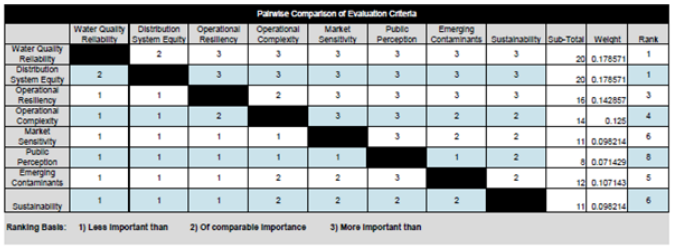
Demand Analysis and Future Projections

Historical Data Analysis

Reviewing historical consumption data to identify trends in consumption based on location and customer class will be important for understanding the future direction of water use. Building upon the data compiled during the previous Master Plan and the previous hydraulic model (both completed by Arcadis), we will review finished water production for the entire system, metered use by wholesale customers, and residential, commercial and industrial customer metered usage. The difference between production and billed usage will be used to determine non-revenue water. Current and future use rates (gallons per capita per day, gpcd) for each customer class will be determined based on historic billing data and local and industry trends. While developing these estimates, consideration will be made for reduced consumption due to water-conservation efforts within industries, manufacturing, recycled water programs, and technological advances that allow consumers to be more efficient with their water usage such as smart irrigation based on soil moisture and weather forecasts, low-flow showers and faucets, etc.). Per capita water usage across the U.S. in general is now trending downward and **we bring a proven approach to forecasting future demands, including the impact of economic conditions** and the City's projected rate changes. Specific data for the City will be reviewed for comparison. It is recommended that low, midrange and high demand projections be developed that incorporate variability in unit retail consumption.

Determining non-revenue water usage is an extremely valuable analysis that can be used to target water leakage reduction programs. Understanding the quantity and location of the unbilled water will be important for the assignment of demands under both current and future conditions. Future amount and allocation of non-revenue water will incorporate anticipated system changes and improvements. Demand patterns associated with nonrevenue water are also unique and often do not align with billed demand patterns. **Our industry leading experience provides a solid foundation for demand forecasting which will be used throughout the project.**

Figure 6.3 – Example of Decision Making Framework Selected for Paulding County, GA. Through collaborative workshops with Paulding County, a pairwise comparison methodology and evaluation criteria were selected and later applied to evaluate treatment process alternatives. During the Visioning and Goal Setting Workshop, our team will work collaboratively with the City of Hollywood to select levels of service goals and a decision-making framework that meets your short- and long-term needs and objectives.



Pairwise Comparison of Evaluation Criteria

	Water Quality Reliability	Distribution System Equity	Operational Resiliency	Operational Complexity	Market Sensitivity	Public Perception	Emerging Contaminants	Sustainability	Sub-Total	Weight	Rank
Water Quality Reliability		2	3	3	3	3	3	3	20	0.178571	1
Distribution System Equity	2		3	3	3	3	3	3	20	0.178571	1
Operational Resiliency	1	1		2	3	3	3	3	16	0.142857	3
Operational Complexity	1	1	2		3	3	2	2	14	0.125	4
Market Sensitivity	1	1	1	1		3	2	2	11	0.098214	6
Public Perception	1	1	1	1	1		1	2	8	0.071429	8
Emerging Contaminants	1	1	1	2	2	3		2	12	0.107143	5
Sustainability	1	1	1	2	2	2	2		11	0.098214	6

Ranking Basis: 1) Less important than 2) Of comparable importance 3) More important than

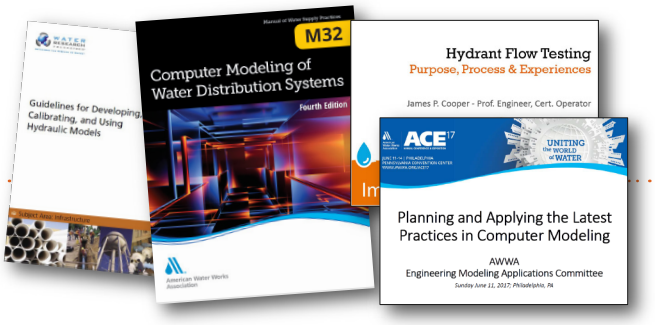
Demand Projections and Scaling Factors

Once base demands have been established, demand scaling factors must be identified to extrapolate demands allocated to each customer meter location to project average and maximum daily system flow conditions unique to each customer class. Our deep technical knowledge of modeling, demand forecasting and planning will ensure the results of this task provide realistic and practical factors throughout each hour of the day. Seasonal, daily and hourly demands vary from community to community based on variables, such as climate, customer types, and areas of irrigation based on economic factors. It is important that appropriate demand peaking factors be selected so that water system improvements are not unduly oversized, thus increasing costs and creating water quality concerns. Our technical experts will work with the City to review the data to determine appropriate factors to use for each service area while considering the impacts on system-wide peaking demands.

The key component of this task includes analyzing the specific areas where the population is anticipated to change (either increase or decrease). This evaluation may consider conservation efforts/ urban trends, trends in industry demographics and their water needs, and the impact of climate change on water use patterns and emergency water supply needs. Getting these assumptions correct will not only affect the City's planning budget but could also impact water quality, if growth projections fail to be realized.

A number of data sources will be compiled to develop the 10-year water demand projections. We will analyze population and employment estimates based on available information from the South Florida Regional Planning Council (SFRPC), Wholesale Customer projections, Census Bureau and other applicable sources. These estimates will be compared to the data developed during the previous studies. Recent billing data will then be used to generate the current per-capita water demand to be used or determining future water distribution planning needs. It is recommended that population be projected down to the parcel-level granularity for the most accurate representation of the projected demands. Using this methodology, we will work the City to compare projected populations with known development/ re-development plans. Arcadis has accomplished this on several past projects using a detailed GIS analysis based on traffic analysis zones (TAZ) population projections and anticipated land use data. TAZ is an area with homogenous areas of land use and socio-economic characteristics. The result is a highly accurate association of the projected demands with the nearest model nodes based both on projected population and land use.

Jim Cooper is the lead author of the most referenced guidance on computer modeling, AWWA M32.



Hydraulic Modeling Update and Calibration

Model updates consist of accurate representation of system infrastructure, applying updated demand forecasts, factors and patterns, and matching model reactions 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 and bring the model to a level of detail aligned with current industry trends. This will be accomplished by the Arcadis team with a mindset for future use of the model and allow for ease of long-term model maintenance by the City. Our calibration process has been proven with dozens of similar projects as shown in Figure 6.4.

GIS Review

Prior to updating the model, Arcadis will evaluate the source GIS data which will be used to update the pipes within the modeling software. We will conduct a review of the City's current GIS database to identify missing data and connectivity gaps using our in-house Data Profiler tool. This tool is specifically designed to flag connectivity issues which will prevent the hydraulic model from creating results. Our GIS review will consider the following topological parameters, among others:

- Pipe split candidates: Pipelines that are not split that need to be based on a node proximity that would represent a tee, fitting, change in diameter,

year of installation or material.
- Nodes in close proximity: Node points that are not connected to a pipeline.
- Parallel pipes: Share the same upstream and downstream nodes that may be duplicates.
- Crossing pipes: Crossing but not connected

We will communicate our findings to support the City's ongoing GIS development and refinement. We will also coordinate with engineering staff and wholesale community staff to obtain and analyze additional available data that will be needed for the development and calibration of the model.

Arcadis has developed multiple tools to allow for a seamless GIS-model interoperability, as well as ongoing improvements available in the existing built-in tools within InfoWater modeling software. We will develop a clear and concise process to maintain this GIS integration and make sure appropriate updates are passed to the respective systems. Any tools necessary to do this will be provided to the City for long-term model maintenance. This update will include a review of the 1:1 relationship between model pipes, hydrants, valves, and fittings in the existing model with GIS data. For the review, a tool will be provided to compare every element and the corresponding applicable data within each attribute table, as was recently done on a project for Washington Suburban Sanitary Commission (WSSC) where we had to compare the data from a model with over 160,000 pipes with GIS information. For any discrepancies found, Arcadis will discuss with the City the differences and update the model accordingly.

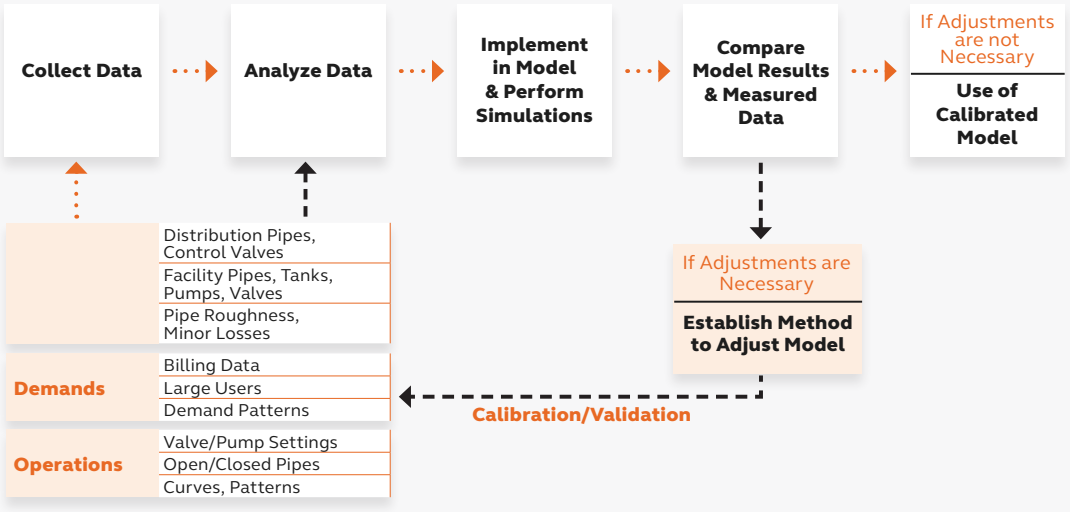
Model Demand Allocation

The allocation of hydraulic model demand is a critical step in the development and calibration of a hydraulic model, and can influence quantifying and locating water loss in future analyses. To assign the water consumption to the correct locations in the distribution system, we will apply the City's geocoded customer billing data to develop model node demands using InfoWater's Demand Allocator. We will evaluate using Allocator's nearest pipe or nearest node analysis, depending on which allocation method would result in the most accurate water demand allocation possible. If necessary, we will support the City with geocoding customer addresses to locate customer meters geospatially. Water production and/or water loss (based on availability and confidence-level) in each service area will be considered, and multipliers will be used to globally scale water consumption to account for water lost in the distribution system. This will serve as the baseline approach to model demand allocation, to be further refined during model calibration.

Model Calibration

Model calibration is believed by the water industry to be the most technically challenging aspect of modeling (per AWWA survey by the Engineering Modeling Applications Committee). We bring a proven approach and unique tools that will accelerate the model calibration process. Blending our depth of calibration experience with innovative approaches proposed specifically for this project, we feel our plan offers efficient and effective methods resulting in an exceptional model of the

Figure 6.4 | Hydraulic Model Calibration Process



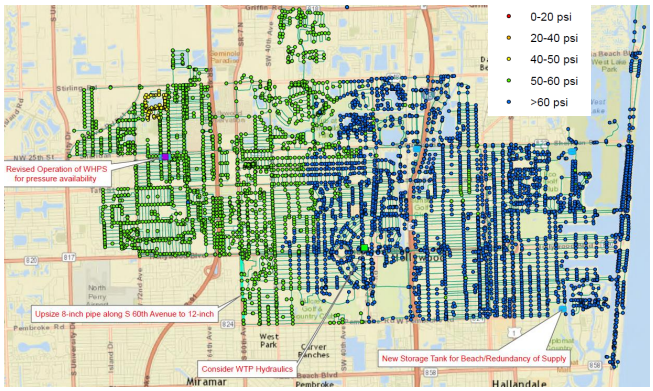
City's water distribution system and wholesale communities. A critical component of model calibration is being provided accurate operational data, including individual pump flow rates and operations, and elevations of any pressure sensors provided to Arcadis for model calibration. Calibration will be based on the best available data that is provided to Arcadis. Calibration goals will align with industry best practices for model calibration for the purposes of this Master Plan. Our approach consists of the following calibration tools:

1. Our team has developed computer scripts to directly read the InfoWater database and bring results into Microsoft Excel and PowerBI for automated comparison of calibration data. This, along with calibration SCADA templates developed by our team, will make it easy to visualize the calibration results at multiple locations and for multiple scenarios.
2. Similarly, we have developed computer scripts which directly read the InfoWater database of comparison of multiple scenarios within the model. This visualization of comparison provides an efficient means to understand the impact of any changes during calibration from adjustment to adjustment.
3. We will work closely with City staff during the calibration process to understand any anomalies and develop solutions. In consultation with City staff, we will use a macro and a micro calibration approach for the model calibration. During coordination workshops, we will collaboratively develop a set of criteria for macro and micro calibration. For example, the criteria could be that pressure at a node is within seven percent of the measured data. During macro calibration parameters like diurnal curves and demand at a node can be adjusted to match model pressures to field observed data. Alternatively, during micro calibration parameters like pipe roughness factors will be adjusted to match model results to observed data. City staff will be updated and consulted with before and after any major updates.

Model Simulations and System Evaluation

Once the model calibration is complete, we will create necessary scenarios and data sets within the model for existing system conditions, future system conditions and various system evaluations. This project requires a significant number of

Our team is familiar with your system and identified the following improvements during the previous system hydraulic model evaluation.



model scenarios to be developed under a variety of demand conditions. The Arcadis team is highly experienced with creating organized hierarchical structures for dozens of model runs, such as with our recent Future System Needs Assessment Project for WSSC which required over two dozen scenarios of future demand alternatives. We know and understand the importance of setting scenarios up correctly the first time and making sure that the structure is flexible to accommodate additional scenarios in a logical framework. This results in ensuring project budget and schedule requirements are met. For this project, steady state and extended period simulations will be developed in the model for determining system deficiencies under existing and future demand conditions. For the parent-child relationship, each parent scenario will be associated with a 10-year planning horizon and the corresponding child scenarios will be developed for each specific model run. Demands for each planning horizon will be allocated at the parent level and will be carried through to each child scenario. We will review the City-defined Level of Service and other goals for the water system defined during the Task 1 Visioning Workshop. We will also review and incorporate any regulatory-driven system infrastructure improvement needs. Model results for final scenarios will be compiled and presented in a dashboard for ease of 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.

Arcadis recently evaluated and made recommendations for system improvements as part of the previous model update and calibration. These included additional distribution system storage, development of a boosted pressure zone to better utilize the West Booster Pumping Station, and piping improvements. Any unimplemented improvements will be re-evaluated based on the updated model and future system demand projections.

All model scenarios and evaluations throughout this task will be presented to the City through Arcadis ACE, our Analytics and Collaboration Environment. This allows the City to see model results, system service deficiencies and recommended improvements in an interactive environment throughout the project as shown in Figure 6.5.

Figure 6.5 | Arcadis Analytics & Collaboration Environment (ACE)

Water Supply Planning

Raw water from the Floridan Aquifer, which is a brackish supply requiring reverse osmosis treatment, is accessed through 8 existing wells. Groundwater from the Biscayne Aquifer is a fresh, high quality supply and is accessed through 14 wells in the Biscayne Southern and Western wellfields. After available information has been reviewed and the concerns and priorities of City personnel discussed at the Kickoff Meeting (refer to Task 7), we will evaluate the City's water supply.

The level of effort for the water supply evaluation will be minimized since there was a water supply plan update prepared by Brown & Caldwell in 2015 which can be applied to this work. The evaluation will involve the completion of three subtasks: Source water capacity assessment, source water quality assessment, and source water future needs assessment.

Source Water Capacity Assessment

For the 8 wells in the Floridan aquifer and the 14 wells in the Biscayne aquifer we will summarize the flow rates that can be produced by individual production wells and the well field as a whole. The capacities of the production wells will be evaluated by reviewing information in previous well field studies and will consider the current conditions of individual wells. The source water evaluation will also establish redundancy needs for the source water system and the availability of water from interconnects with surrounding systems during emergency conditions.

Source Water Quality Assessment

On a well-by-well basis for each well field, we will summarize data for these and other analytical parameters (where this data exists), and compare the data to drinking water standards and the City's water treatment goals. We will identify and address any foreseeable challenges to achieving the City's treatment goals.

Source Water Future Needs Assessment

The source water capacities established during the source water capacity assessment will be compared to projected future demands under the population growth scenarios provided by the City to determine the future source water needs for the City. If it is found that well yields are insufficient to meet the needs of the City within the 10-year planning horizon, we will identify potential alternatives for obtaining additional source water. We will also identify what demands would trigger improvements and incorporate our recommendations into the Capital Improvements Program report. Based on a review of the 2015 Water Supply Plan Update, the combination of existing Biscayne and Floridan wells are anticipated to be sufficient to meet demands through 2030; however, if updated conditions warrant additional supply improvements, it is anticipated that rehabilitation of the existing wells or expansion of the Floridan well field would be the preferred alternatives over developing new water supply sources to meet future demands.

Task 1 Deliverables

- **Demand Analysis & Projections TM #2**
- **Tool to check 1:1 relationship between the GIS and model and GIS data**
- **Model Update TM #3**
- **Calibrated hydraulic model**
- **Model Calibration Results TM #4**
- **Model Simulations and System Evaluation TM #5**
- **Source Water Needs Assessment TM#6**

Chris Heltzel from Arcadis has extensive Cityworks experience in configuration support, leveraging existing data for condition and risk assessments, and integration into the Arcadis RRPS and other decision support tools.

Task 2 – Condition Assessments

The goal of the condition assessment is to identify all failure modes for asset level planning so that all capacity, enhancement and aging infrastructure needs can be successfully addressed in the 20 year Master Plan for water supply, distribution and treatment assets. The Arcadis team will employee best practices from the International Infrastructure Management Manual, to evaluate each asset against all potential failure modes as summarized in the Table below.

The assessment process considers all relevant data (written and electronic), provides independent assessment of individual assets and fully engages our team knowledgeable about pipeline and plant design, with the City's operations and maintenance staff. The process results in a thorough understanding of each asset relative to all failure modes, which is essential to estimating remaining useful life and evaluating rehabilitation versus replacement options for a sound long-term plan. The following table identifies some of the challenges we know exist at the City based on our team members' experience.

Task 2 - Workshop #1 – Condition Assessment Standards

A workshop will be held with the City to discuss the standards and scoring for both the boots on the ground facility condition assessments as well as the desktop pipeline condition assessments.

Key issues for the workshop will include defining what is considered an individual asset for condition assessment in support of capital planning and how the assets will be effectively grouped for analysis, which is slightly different from the current detailed inventory and hierarchy in your Cityworks CMMS. Facility assessments will include multi-disciplinary teams walking through each facility and applying standard scoring templates for each asset type of electrical, instrumentation, mechanical, buildings, and process structures. The Arcadis team has a standard library of successful physical condition templates to start with saving significant time on this process. These templates will be loaded into a table based data collection system, Fulcrum software, to expedite the data collection process and improve accuracy. 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 as described in Task 1 both during and immediately after the completion of the facility walk throughs. Standard scoring and templates for these assessments will also be customized for the City based upon the existing Arcadis library and the selected levels of service as defined during the visioning workshop.

For the desktop pipeline condition assessment, the Arcadis team has a proven approach and existing Renewal and Replacement Planning System (RRPS) tool that can be leveraged to complete

Failure Mode	Typical Measures	Assessment Data Sources
Mortality	Physical Condition (damage, corrosion, leakage vibration, past pipeline failures).	Boots on the ground assessments, staff Interviews, pipeline failure analysis
Capacity	Ability to meet current and future needs	Previous reports and analysis, hydraulic model (pipelines)
Regulatory/Level of Service	Ability to meet regulatory compliance and other goals (reliability, ?) now and in the future.	Management systems: SCADA, LIMS, CIS, Cityworks
Efficiency	Ability to deliver lowest life cycle costs (labor, power, chemicals, spare parts, etc.)	CMMS data, staff interviews, hydraulic and process models

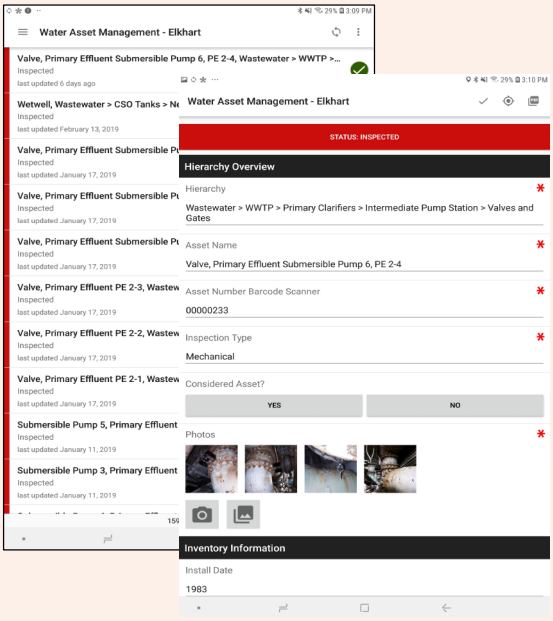
the assessment as well as support the overall risk analysis process for all water system assets. For the pipelines, the approach begins with an analysis of age, materials, diameters and past break history to understand potential factors causing failures such as corrosive soils, high groundwater tables, pressure surges, etc. Cohorts, pipelines with similar behavior will be established and deterioration curves generated based on estimated useful life per cohort. capacity and other service level failures can be integrated into the analysis through GIS. A demo of the Arcadis RRPS tool as well as an overview of the approach will be discussed during the workshop. City input will be incorporated into the final methodology.

Detailed Facility Inspections

Following the development of the standards, a pilot will be conducted at one process area at the plant 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. Each asset class will have a dedicated expert in the field to perform the inspections. Scoring and photos of each asset will be stored in the tablet and uploaded daily for QA/QC. The Cityworks initial inventory will be updated, adding, deleting, or modifying assets as needed based on the site visits. All data collected will be stored 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.

The team leader will perform the performance evaluation through interviews, document reviews, and outcomes from the demand projections.

Fulcrum deploys assessment forms to the tablets at the click of a button



Subject matter experts will support as needed to score the other failure modes. All failure mode scoring and information will be stored in the RRPS tool to support risk evaluation during task 4. Once the pilot has been completed and reviewed with City staff, the rest of the assets will be completed. The updated asset inventory stored within RRPS can be exported to excel or access for upload

Features of the RRPS Decision Support Tool

RRPS Function	Description
Asset Inventory	Accepts full asset inventory from GIS and CMMS with asset ID and attribute information.
Effective Useful Life	Assigns EUL based on asset class with an unlimited number of classes and creates deterioration curves. Data tables have reference EULs from previous projects.
Condition Assessment	Follows full IIMM best practices for physical and performance scoring using a 1-5 rating and customized category weighting.
Consequence of Failure	Also follows IIM best practices, including triple bottom line consequence of failure evaluation and redundancy allowances if desired.
Cost Estimating	Follows AACE Level 5 guidance
Rehabilitation vs Replace	Considers rehabilitate versus replace based on risk, condition, location and EUL.
Project Definitions	Assets are assigned to projects following a facility hierarchy, geography or programmatically by asset type, cost and risk.
CIP Scenarios	Calculates system wide metrics for condition, risk and annual cost based on service level goals, set investment amounts or both.

into Cityworks for the City to incorporate the corrections and additions if desired.

Desktop Pipeline Condition Assessment

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 GIS, the past failure history from Cityworks or other files, 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.

Distribution System Performance Evaluation

The outcomes from hydraulic model will 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 RRPS tool to support risk evaluation during Task 4.

Task 2 - Workshop #2 Condition Assessment Results Review

Once the condition assessment has been completed for all facility and pipeline assets a workshop will be held with the City to review the results including the poorest condition assets for each failure mode by asset type, process area or geography to obtain feedback on the effectiveness of the model. A Microsoft Power BI interface to the RRPS tool will be used that can visualize the data now and over the next 20 years as the assets age to facilitate discussions. Comments from the City will be incorporated into the final model configuration.

Task 2 Deliverables:

- **Materials, facilitation and meeting minutes for Workshop #1 and #2**
- **Draft and final database of assets with condition scoring for all failure modes and remaining life estimations**

Task 3 – Water Plant Performance Evaluation

Task 2 will focus on looking at individual assets and their physical and performance condition, where Task 3 will evaluate facility systems (including the treatment process) to determine deficiencies and/or optimization opportunities that should be further explored as part of the alternatives analysis under Task 4. Asset condition data by process from Task 2 will be evaluated to begin the list of potential improvement areas.

For this task, we will evaluate the available plant operating data for the past three years to gain an understanding of the current operational practices and unit process performance parameters. This will include plant flow, unit process water quality parameter data and chemical dosage and feed rate data.

During the condition assessment visits, Arcadis will start the water process optimization effort by observing operations and meeting with WTP staff to discuss their concerns. At the end of the initial site visit, our team will again meet with City staff to review and discuss initial findings and thoughts. This will allow the City to immediately vet proposed focus areas of the evaluation and alternatives being considered.

Condition Assessment Template for Mechanical Assets

Mechanical Tier 1 Visual Condition Assessment

Criteria	Evaluation	1	2	3	4	5
Corrosion	Surface only	None	<10%	10%-50%	>50% - 75%	>75%
	Structural (loss of metal)	None	-	-	1 location	>1 location
Leakage	Gaskets / Connections	None	Historic only	Drip only	Stream 1 loc	Stream >1 loc
	Holes / Failures	None	-	-	1 location	>1 location
Vibration / Noise	Vibration Apparent with Noise	None	-	Noise >10% to 20% normal	Noise >20% to 30% normal	Noise >30% normal
	Non-Structural Damage	None	-	-	Yes	-
	Structural Damage	None	-	-	-	Yes
Concrete Support	Surface Cracking / Loose Grout	None	<10%	10%-50%	>50% -75%	>75%
	Through Cracks	None	-	-	<25%	>=25%
	Missing Pieces	None	-	-	-	1 or more
Steel Supports	Surface Corrosion	None	<10%	10%-50%	50%-75%	>75%
	Structural Corrosion	None	-	-	<25%	>=25%
	Missing/Broken Anchors	None	-	-	<25%	>=25%

Our experts hold leadership roles on various organizations like the American Membrane Technology Association, lead research in emerging technologies, and have written dozens of guidance manuals.

Arcadis will note potential compliance challenges and identify treatment or operational strategies so that the City remains in compliance now and is well-positioned for future compliance. Where multiple compliance strategies are possible, the alternatives analysis in Task 4 will review and identify the most appropriate. The Facilities System Assessment under this task will also include the following evaluations:

Treatment Capacity and Hydraulic Evaluation

We will assess the unit processes treatment parameters based on the plant capacity rating, general water industry unit process design parameters, state requirements and report on any limiting factors of the treatment processes. The work associated with the evaluation of the unit-treatment processes will include identifying any hydraulic bottlenecks between basins or treatment processes.

We will evaluate the facilities for storage and handling of the different plant chemicals based on the analysis of dosage and feed rate data looking at the adequacy of bulk storage, provisions for spill containment and disposal and chemical feed equipment capability to accurately meter chemicals considering the range of flows encountered at the plants.

As alterations to the treatment processes are considered and capital budgets are developed, hydraulic impacts and a focus on avoiding potential intermediate pumping will be considered.

Arcadis is currently assisting with ongoing process and equipment evaluations at the plant and will be able to quickly incorporate those findings into this analysis and the overall risk and prioritization framework.

Reliability and Redundancy Evaluation

Our reliability evaluation will identify vulnerabilities within the treatment train 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 redundancy, back-up power, maintenance issues and other factors identified during the condition assessment process.

Regulatory and Water Quality Evaluation

Developing an effective CIP requires an in-depth understanding of current and future regulatory requirements. Arcadis brings a superior understanding of regulatory requirements from our more than 25 years of experience providing engineering and technical support to the USEPA Office of Ground Water and Drinking Water. Over that period, we have conducted treatability studies, prepared technologies and costs (T&C) documents and developed guidance to assist public water systems in meeting the critical requirements of many of the rules promulgated over that period. We will evaluate the existing treatment processes in terms of their capacity to consistently achieve the City's water quality objectives and regulatory requirements.

We will identify potential treatment changes that may be necessitated by future regulatory developments, changes in the quality of the City's source waters, or for improved performance where equipment is near the end of its useful life.

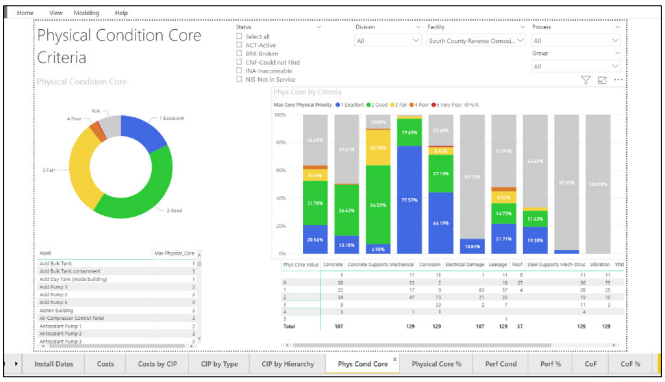
We will also look at the impact of future drinking water regulations on water quality and treatment, including the proposed maximum contaminant levels for perchlorate, proposed Lead and Copper Rule revisions (which are expected to be finalized this year), select per- and polyfluoroalkyl substances (PFAS) that are or will soon be regulated in various states or at the federal level, and issues that have been raised, discussed and researched for years, but for which no regulatory timeframe has been set. This includes contaminants like N-nitrosodimethlyamine (NMDA), strontium, 1,4-dioxane, brominated disinfect byproducts, pharmaceutically active compounds (PhACs), personal care products (PCP), endocrine disruptors (EDC's) and certain pesticides. These chemicals represent a broad range of chemicals and regulations that may have a significant impact on plant performance and future plant processes.

Our experts serve as technical advisors to AWWA and USEPA on policy and regulatory development and assist with the development of new AWWA standards and manuals of practice. We also have extensive experience with advanced treatment technologies, having designed and built some of the largest membrane filtration, reverse osmosis, advanced oxidation and granular activated carbon (GAC) facilities in the U.S. meet the desired

Chemical, Energy and SCADA Optimization

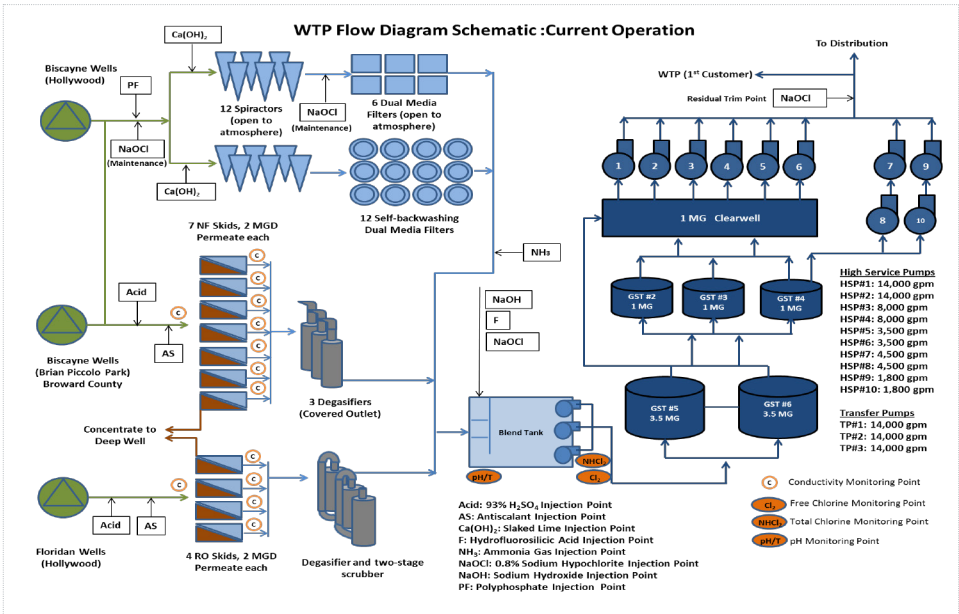
Chemical and energy costs represent a substantial portion of many water plants' O&M budgets, especially for membrane facilities. We will review

Figure 6.6 | Power BI Condition Results Dashboard



pump and motor efficiencies for the major pumping operations during our condition assessment task to identify opportunities to improve energy efficiency and reduce operating costs. In addition, utility rate structures (i.e., peak and off-peak electricity rates) can have a significant impact on power costs. We will review the existing rate structure to confirm if there are opportunities to develop a more cost-effective operating strategy. For example, can we do more pumping during off-peak hours and what are the treatment implications of such an operating strategy. Chemicals also represent a significant fraction of most water systems' O&M budgets. We will evaluate existing chemical dosing practices and look for opportunities to reduce

Figure 6.7 | Water Treatment Plant Process Flow Diagram (Current Operation)



chemical usage. We will also investigate whether switching certain chemicals can allow for lower operating costs, greater performance and/or fewer safety risks. Under this task, we will also review the sampling and monitoring protocol currently used for process control at the water plant and make recommendations where appropriate to improve process reliability or reduce operating costs.

Currently, the SCADA system monitors portions of the treatment plant process, but is limited in its ability to control various systems, such as chemical dosages and pumping rates. We will review the entire SCADA system, including the new monitoring and controls being incorporated into the lime softening filter improvements project, to determine the adequacy of the infrastructure as it relates to other similarly sized WTPs. We will develop 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.

Core Utilities Evaluation

All core utilities, including electrical, lighting, HVAC, plumbing, controls, and instrumentation will be evaluated for their compliance with existing codes, potential future building codes and regulatory requirements, safety, and their likelihood for failure. Similar to the SCADA controls strategy for non-critical utility improvement projects, an overall strategy will be developed so as capital projects are released for construction there is a consistent approach within each building and throughout the entire WTP.

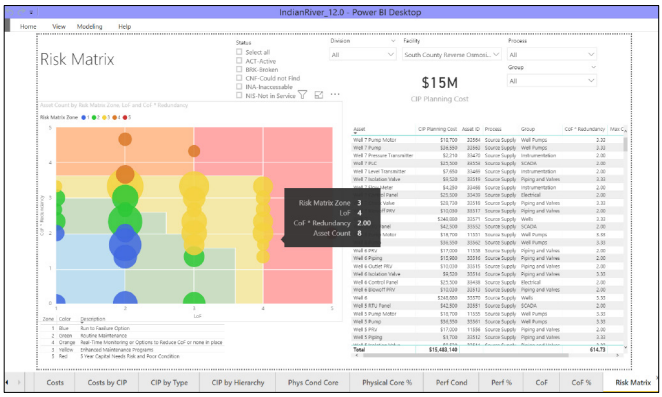
Task 3 - Workshop #1 – Water Plant Performance Evaluation Results

Once the treatment plant performance evaluation has been completed, a workshop will be held with the City to review the results including potential water quality, compliance or capacity challenges and potential opportunities for optimization.

Task 3 Deliverables:

- **Materials, facilitation and meeting minutes for Workshop #1**
- **Water Treatment Plant Performance Evaluation TM**

Figure 6.8 | Power BI Risk and Capital Planning Dashboard



Task 4 – Capital Improvement Program

Criticality & Risk Scoring

In addition to the likelihood of failure determined by the condition assessment, risk considers the criticality or consequence of failure and the availability of redundancy to mitigate failure impacts. The risk scores normalize the evaluation and provide for an “apples to-apples” comparison to prioritize projects for assets of different types and functions. The criticality criteria will be developed for the pipeline and facility assets following the triple bottom line principal, which incorporates the economic, social and environmental impacts of a failure. Arcadis will provide examples of consequence scoring from similar planning projects, including Florida utilities, to assist the City in developing the optimum scoring approach.

Task 4 - Workshop #1 – Criticality and Risk Scoring Standards

The proposed methodology for scoring asset criticality and risk for the facility and pipelines assets and how the risk score relates to the capital planning time periods will be discussed with the City during a workshop. Asset criticality will build from the assessment performed by the City and Arcadis for the risk and resilience AWIA project and incorporate hydraulic criticality from the Innovyze model.

Arcadis has a library of templates to start with for the facility assets as well as the pipeline assets that addresses triple bottom line criteria such as

impacts of asset failure on the environment, society and financially for the Utility. For pipeline assets, Arcadis typically leverages GIS to assign criticality since the adjacent infrastructure and pipeline attributes can be applied in addition to understand hydraulic criticality from the model. Asset Risk will be proposed to follow an industry standard equation and include redundancy as appropriate to reduce overall risk. Based on the risk matrix and scoring, rules will be established to allow assets to be considered for various CIP time frames. Input from the City during the workshop will be incorporated into the final methodology.

Perform Risk Scoring

Applying the scoring standards developed in the workshop, the Arcadis team will work to score asset criticality and risk. It is anticipated that pipeline assets will be scored using GIS queries and facility assets will be scored through an interview processes and document reviews. The RRPS tool accepts input from either process and will calculate the overall risk score considering redundancy.

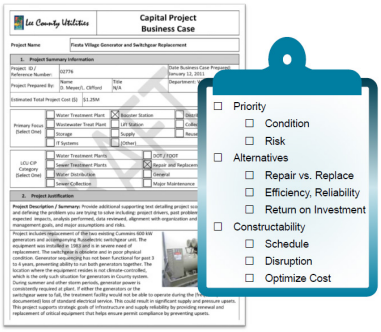
Task 4 - Workshop #2 – Risk Results

Once the risk results are completed, a 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 that can visualize the data in 5 year increments and over the next 20 years by geography or process area to facilitate discussions on needs and the scoring accuracy. Comments from the City will be incorporated into the final model configuration.

Project Alternatives Analysis and Cost Estimates

Based upon the asset condition and risk score results as well as the optimization opportunities identified, logical projects will be created and evaluated through a business case for facility assets. 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, a summary of 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. The Arcadis team has a library of templates for business cases to select from including long and short forms that will be submitted to the City for review and modified to align with the Master Planning needs.

Business Case Template



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. For facility assets, the Arcadis team will prepare cost estimates for the proposed project alternatives using standard Arcadis worksheets from major component take-offs, cost curves, or past Arcadis projects in the South. All opinions of probable cost will be consistent with the Association for the Advancement of Cost Estimating (AACE) Class 4 estimates with contingencies appropriate to the degree of design development.

Workshop #3 – Alternatives Review

A workshop will be held with the City to review the major alternatives evaluated for plant process improvements to achieve the level of service 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. The RRPS tool will be used to prepare the scenarios and for review with the City. Comments from the City will be incorporated into the final alternatives selections.

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:

- Introduction
- Characterization of Existing System
- Regulatory Review
- Water Demand Characterization
- Water Demand Projections and Capacity Expansions
- Water Distribution System Modeling
- Water Treatment Equipment Condition and Risk Assessment
- Water Distribution System Desktop Condition and Risk Assessment
- Cost Evaluation and Schedule for Proposed Improvements Over 10 Years

Optional Living Master Plan Decision Support Tool

As an optional service, the Arcadis team can provide the RRPS configured tool to the City including training sessions and a users manual so that the Master Plan can be updated on a regular basis as condition may change in terms of growth or extreme events. Only basic skills in GIS are required to successfully change model assumptions or add new data from condition and risk assessments and rerun the outcomes.

If the City is interested in using Innovyze for planning, the Arcadis Team can configure Info Asset Planner in a similar manner to the RRPS tool as we have done for JEA in Jacksonville, FL and San Antonio Water Services in TX. However, Info Asset Planner only support building a 5 year CIP and does not perform long term funding analysis over 20 years.

Task 4 Deliverables:

- **Materials, facilitation and meeting minutes for Workshop #1, #2, and #3**
- **Final database with asset condition, consequence of failure, risk and remaining life that can be uploaded to CityWorks.**
- **Draft and final Master Plan with project costs and schedule for the next 10 years.**
- **Optional Decision Support Tool configured with CIP planning logic and project data.**
- **Optional Decision Support Tool training for City staff.**

Criticality scoring example table for facility assets

Criteria	Measure	1	2	3	4	5
Economic COF Criteria and Scores						
Capital cost	Replace cost	<$5k	<$25	<$25-<$100k	$100-$500k	500k
O&m impacts	Staffing and cost impacts	No impacts	Low (<=2 ftes for <= 1 day)	Moderate (2+ ftes for <=2 week)	High (2+ ftes for >2 week)	Highest 2+ fte's > 4 week
Social COF Criteria and Scores						
Level of service delivery	Disruption length and magnitude	None	<1 day Localized	>1day Localized	<1 day Widespread	>1day Widespread
Health & safety	Potential for injury	No potential	Potential for minor injury	Potential for moderate injury	Potential for major injury	Potential for fatality
Environmental COF Criteria and Scores						
Regulatory	Permit Compliance Enforcement Action	No Compliance Impact	-	Eventual Non-Compliance if No Response	-	Immediate Non-Compliance
	Time to Respond & Repair When Failure Could Impact Regulatory Compliance or Releases to the Environment	Immediate or no impact anticipated	<2 hrs	2 to <8 hrs	8 to <24 hrs	>24 hrs

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7

CURRENT & PROJECTED WORKLOAD & SCHEDULE TO COMPLETE PROJECT

7 CURRENT & PROJECTED WORKLOAD & TIME SCHEDULE TO COMPLETE PROJECT

Current/Anticipated Workloads

The staff resources available in our local and regional offices provide significant "bench strength" that facilitates required resource allocations to meet the City's needs. Our south Florida offices (Plantation, Boynton Beach and Miami) include more than 50 professionals to cover the activities required for the Master Plan Update. We have more than 350+ additional professionals located throughout Florida. Key project personnel are available to initiate the work immediately upon contract execution and to continue work on an ongoing basis. Furthermore, we commit to providing other resources as needed to supplement the proposed team to meet your needs. Our Project Manager, Tung Nguyen, will be responsible for scheduling and committing team resources to assigned project and incorporating additional staff as needed.

Tung has already reviewed our firm's available staffing, project team member qualifications, and current and projected workload. Arcadis has a thorough understanding of the schedule and budget requirements necessary to provide the City with timely and cost-effective service. Additionally, based on a recent workload evaluation, our committed staffing resources are below our projected capacity for the project duration. We believe our availability is more than enough to meet the City's staffing requirements, as illustrated by the below tables and charts.

Team's Expertise & Percentage of Work

Key Personnel

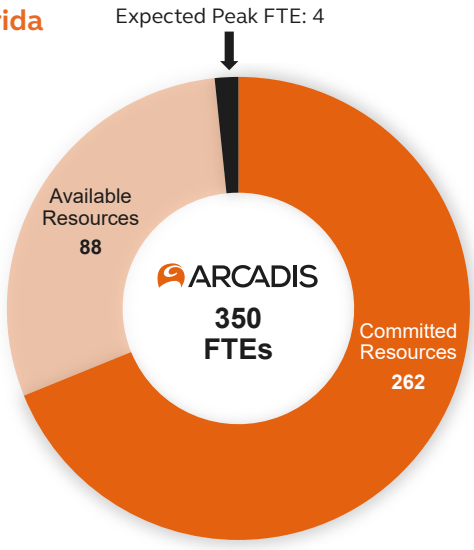
Name & Role	Years of Experience	% of Work
Leah Richter, PE | Principal in Charge	23	2%
Tung Nguyen, PE, PMP | Project Manager	15	20%
Frank Sidari, PE, BCEE | QA/QC	20	1%
Rebecca Slabaugh, PE, ENV SP | Technical Advisor - Water Quality & Treatment	13	2%
James Cooper, PE, CWO, ENV SP | Technical Advisor - Distribution System	16	2%
Greg Osthues, PE, IAM | Technical Advisor - Asset Management	33	.5%
Brian Duane, PE | Technical Advisor - Pumping	39	.5%
Michael Knowles, PE | Task Lead - Demand Projections & Modeling	18	10%
Lauren DaCunha, PE | Demand Forecasting & Model Calibration	11	5%
Marc Killingstad, PE | Water Supply Planning	25	1%
Lia Dombroski, EIT | Vulnerability/ Risk	3	5%
Celine Hyer, PE, IAM | Task Lead - Facilities Assessment	30	10%
Sean Chaparro, PE | Treatment Capacity & Performance Evaluation	18	3%
Melissa Pomales, PE, IAM | Task Lead - Integrated CIP Plan	17	8%
Joan Fernandez, PE, IAM | Alternatives Evaluation	15	5%
Chris Heltzel, GISP, IAM | Planning Decision Support Tool	32	3%
Maurice Tobon, P.E., PMP | Hydraulic Modeling	30	4%

Support Personnel

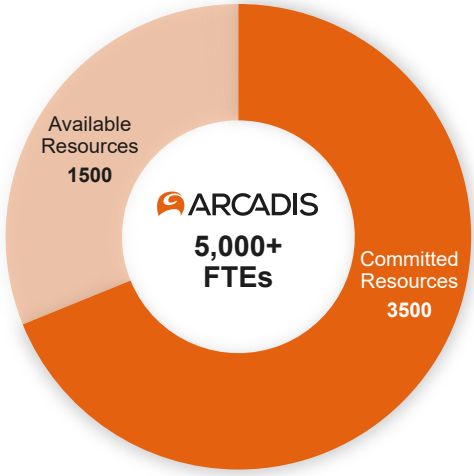
Name & Role	Years of Experience	% of Work
Stephanie Bishop, PE | Chemical Systems	30	1.5%
Sam Palermo, PE | Pump Stations	16	.5%
Paul Walansky, PE | Hydraulics	21	1%
Daniel Stepner, PE | Mechanical	14	1%
Keren Bolter, Phd | Resiliency	11	1%
Robert Ryall, PE | Financial Analysis	20	.5%
Seth Finnicum, PE | GIS/CMMS	16	2%
Daniel Garcia, PE | Pipelines	18	1%
Errol Dawkins, RA | Architectural Designer	32	.5%
Sam Hobi, PE | Structural Engineer	25	1.5%
Estephania Pilar | Water Supply Planning	2.5	1%
Aubrey Haudricourt, PE | Electrical/ Power Supply	42	3%
Michael Fadini, PE | Electrical/Power Supply	30	.5%
Mike Stoup, PE | SCADA/ instrumentation	25	2%
Michael Tweedel, PE | SCADA/ instrumentation	30	.5%
Matt Daves, PE, LEED AP, CBCP | Energy Management	19	.5%
Don Pettigrew, PE | Energy Management	40	.5%

Furthermore, we commit to provide other resources as needed to supplement the proposed team to meet the City's needs. Tung will be responsible for scheduling and committing team resources to the project and incorporating additional staff as needed. The following pie charts graphically represent the projected workload for the firm, as well as our Florida team. As shown in the Florida pie chart, out of 350+ full-time employees (FTEs), seventy-five percent is projected to be engaged on ongoing projects. The remaining 25% or 88 FTEs are available for future projects and to support projects such as this one. We expect a maximum of 4 FTEs will be required during the peak of this project.

Florida



Arcadis North America



Municipal Staff Support

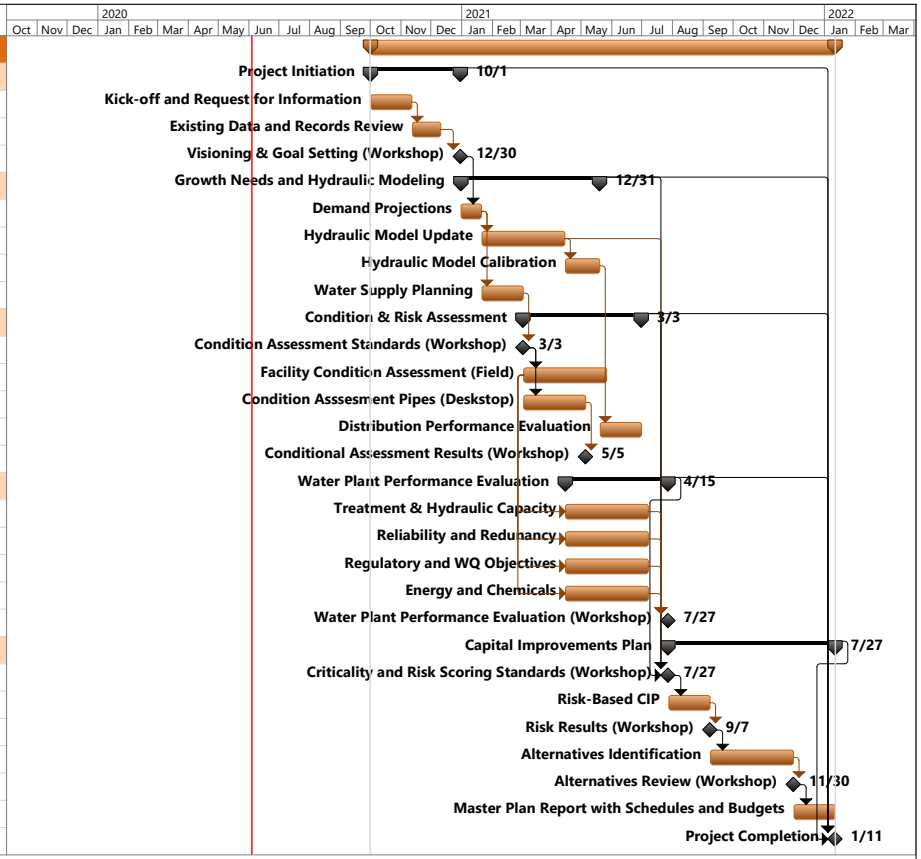
We anticipate the following type of support from the City's municipal staff for this type of engagement:

- Provide requested data in RFI
- Attendance at all Workshops
- Participation in walk throughs and interviews on facility condition assessment
- Participation in interviews on pipeline desktop assessments
- Participation in interviews on asset criticality
- Review of Deliverables within 2 weeks

Schedule

We understand the importance of maintaining this project on schedule and meeting the milestone dates defined in the City's request for proposal. We have prepared our preliminary project schedule, included below, based on our proposed Work Breakdown Structure as part of our comprehensive project management approach. This schedule will be reviewed and refined with the City following notice to proceed, and again at project kick-off, and at monthly meetings. Our proposed schedule is both realistic and achievable and is based on our high degree of knowledge of the City and decades of experience providing similar services to a variety of clients in the region and throughout the U.S. We are confident that our schedule management will result in this project delivered within the City's schedule requirements.

ID	Task Name	Duration	Start	Finish
1	**1 City of Hollywood Master Plan Update - Preliminary**	**66.8 wks**	**Thu 10/1/20**	**Tue 1/11/22**
2	**1.1 Project Initiation**	**13 wks**	**Thu 10/1/20**	**Wed 12/30/20**
3	1.1.1 Kick-off and Request for Information	30 days	Thu 10/1/20	Wed 11/11/20
4	1.1.2 Existing Data and Records Review	21 days	Thu 11/12/20	Thu 12/10/20
5	*1.1.3 Visioning & Goal Setting (Workshop)*	0 days	Wed 12/30/20	Wed 12/30/20
6	**1.2 Growth Needs and Hydraulic Modeling**	**20 wks**	**Thu 12/31/20**	**Wed 5/19/21**
7	1.2.1 Demand Projections	15 days	Thu 12/31/20	Wed 1/20/21
8	1.2.2 Hydraulic Model Update	60 days	Thu 1/21/21	Wed 4/14/21
9	1.2.3 Hydraulic Model Calibration	25 days	Thu 4/15/21	Wed 5/19/21
10	1.2.4 Water Supply Planning	30 days	Thu 1/21/21	Wed 3/3/21
11	**1.3 Condition & Risk Assessment**	**17 wks**	**Wed 3/3/21**	**Wed 6/30/21**
12	*1.3.1 Condition Assessment Standards (Workshop)*	0 days	Wed 3/3/21	Wed 3/3/21
13	1.3.2 Facility Condition Assessment (Field)	60 days	Thu 3/4/21	Wed 5/26/21
14	1.3.3 Condition Asssesment Pipes (Deskstop)	45 days	Thu 3/4/21	Wed 5/5/21
15	1.3.4 Distribution Performance Evaluation	30 days	Thu 5/20/21	Wed 6/30/21
16	*1.3.5 Conditional Assessment Results (Workshop)*	0 days	Wed 5/5/21	Wed 5/5/21
17	**1.4 Water Plant Performance Evaluation**	**14.8 wks**	**Thu 4/15/21**	**Tue 7/27/21**
18	1.4.1 Treatment & Hydraulic Capacity	60 days	Thu 4/15/21	Wed 7/7/21
19	1.4.2 Reliability and Redunancy	60 days	Thu 4/15/21	Wed 7/7/21
20	1.4.3 Regulatory and WQ Objectives	60 days	Thu 4/15/21	Wed 7/7/21
21	1.4.4 Energy and Chemicals	60 days	Thu 4/15/21	Wed 7/7/21
22	*1.4.5 Water Plant Performance Evaluation (Workshop)*	0 days	Tue 7/27/21	Tue 7/27/21
23	**1.5 Capital Improvements Plan**	**24 wks**	**Tue 7/27/21**	**Tue 1/11/22**
24	*1.5.1 Criticality and Risk Scoring Standards (Workshop)*	0 days	Tue 7/27/21	Tue 7/27/21
25	1.5.2 Risk-Based CIP	30 days	Wed 7/28/21	Tue 9/7/21
26	*1.5.3 Risk Results (Workshop)*	0 days	Tue 9/7/21	Tue 9/7/21
27	1.5.4 Alternatives Identification	60 days	Wed 9/8/21	Tue 11/30/21
28	*1.5.5 Alternatives Review (Workshop)*	0 days	Tue 11/30/21	Tue 11/30/21
29	1.5.6 Master Plan Report with Schedules and Budgets	30 days	Wed 12/1/21	Tue 1/11/22
30	1.6 Project Completion	0 wks	Tue 1/11/22	Tue 1/11/22



Task | Summary | Inactive Milestone | Manual Summary Rollup | External Milestone
Split | Project Summary | Inactive Summary | Manual Summary | Deadline
Milestone | Inactive Task | Manual Task | External Tasks | Progress

Project: City of Hollywood Master Plan Update
Date: NTP 10/1/2020

Page 1

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8

ABILITY TO COMPLETE PROJECT ON TIME & BUDGET

8 ABILITY TO COMPLETE PROJECT ON TIME & BUDGET

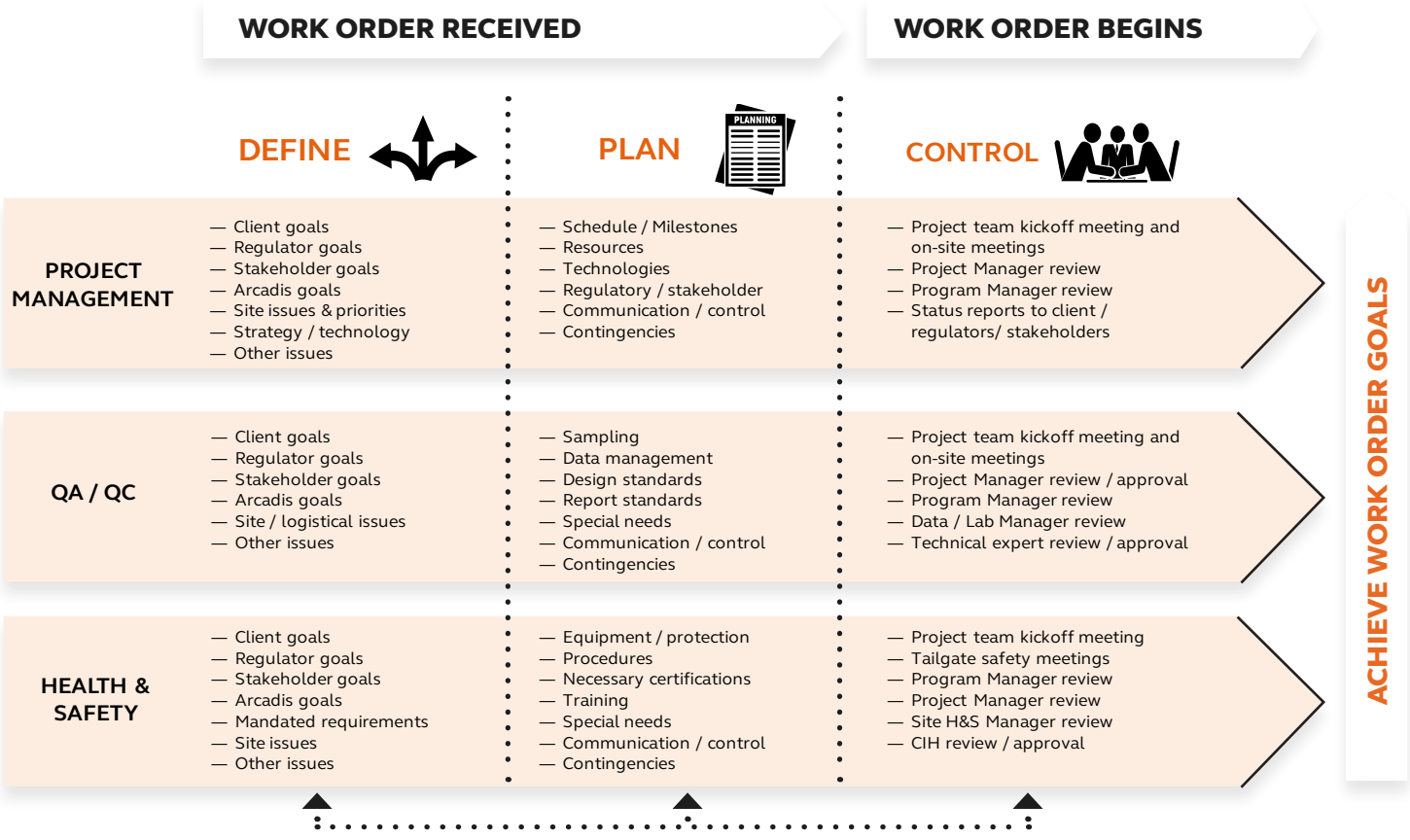
Controls to Maintain Schedule and Budget

Upon receipt of the authorization to proceed, Tung will commence a planning meeting in which the appropriate Work Breakdown Structure (WBS) is determined and the appropriate roles are assigned to meet the scope of work. At a minimum, the project planning team will consist of the Certified Project Manager (CPM); and Task Managers (TM) as warranted; the lead technical expert and the quality consultant (QC).

Each member of the assigned management team has the ability to view, track and update the portion of the project which they are responsible.

The WBS is planned at a level that is required by the scope to be performed by the work authorization. Resources for labor, subcontractor and expenses are budgeted and scheduled at the lowest level of the WBS. The cost for those resources are posted, monitored and updated at that lowest level such that assignment and tracking of the scope, schedule and budget can be performed at the lowest level of the WBS.

Our planning, scheduling and budgeting program is an Oracle ERP system that is integrated with the Accounting & Finance (A&F) database to provide job-to-date (JTD) actual costs, estimate to complete (ETC) costs and schedules to provide an estimate at completion (EAC) cost and schedule. The ERP project plan uses the WBS breakdown appropriate for work authorization. The data regarding the WBS and costs budgeted as a part of the planning process is uploaded from the ERP program into the A&F database as a method to allow for appropriate cost tracking against the budgets. When costs are incurred the data is posted simultaneously in the A&F database and into Oracle ERP. The project team on a regular basis updates the ETC costs in Oracle ERP to ensure any appropriate changes in the EAC is captured and submitted back to the A&F database for further tracking.



Within Oracle ERP, all Tasks within WBS have a specific ID, and can use the scheduling functionality including predecessor, successor interdependencies, scheduling on a Task bases and milestone management. The appropriate schedule and duration can also be planned for each resource and Task.

Oracle ERP is a resource loaded schedule that automatically sets a time-phased budget baseline at the control level upon the initial submittal of the resource loaded schedule. Revised baseline budgets are set upon the change in compensation/ authorized task order amounts in the system. In addition, revised baselines can also be set at any time over the course of the project as needed.

Each Contract / Task Authorization is assigned a unique base Project number. Each Project number requires a minimum of one Phase and each phase requires a minimum of one Task.

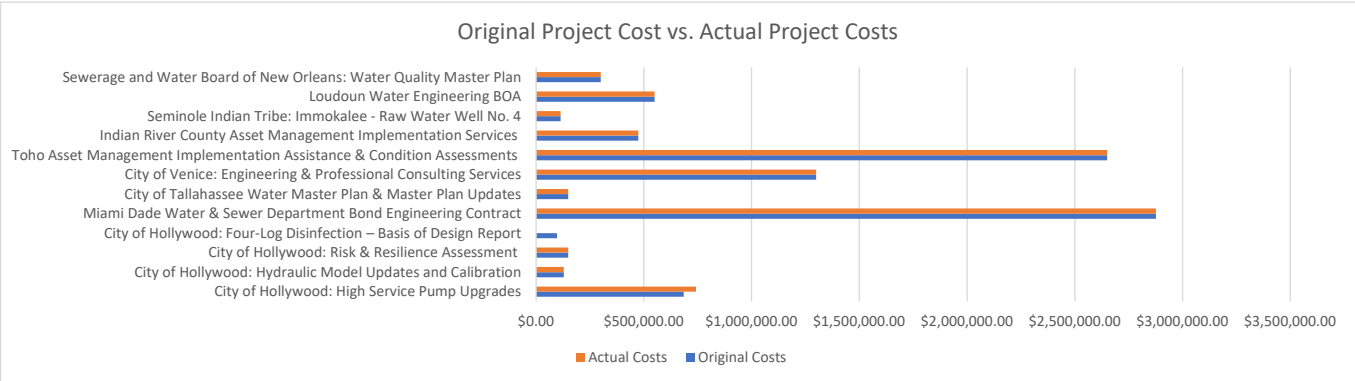
Each Phase and Task has a unique description and identifier in the system. Depending upon the size and complexity of the project and the WBS required to align with the contract and needed to appropriately manage the scope, the Project may have multiple Phases and the Phases may have multiple Tasks. There is not a limit to the number of Phases and Tasks that can be set up as to be able to accommodate a robust WBS.

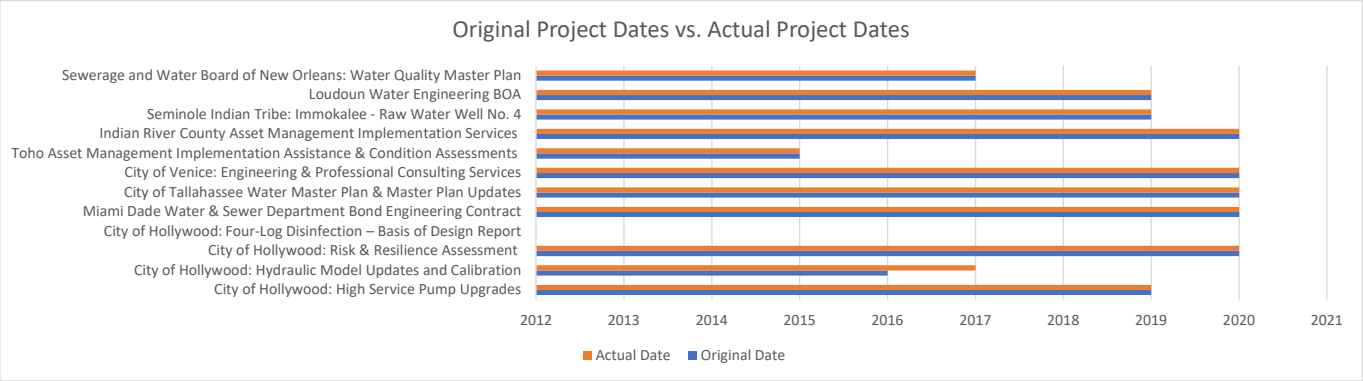
Our client-focused project management approach enables us to consistently deliver quality projects ahead of schedule and under budget. This is proven not only through our most recent project work with you, but also on projects completed for other clients, which you may confirm when speaking with our references. The table and bar charts below represent our ability to complete our projects on time and on budget.

Budget and Schedule Matrix

Projects	Costs		Schedule	
	Original	Actual	Original	Actual
City of Hollywood: High Service Pump Upgrades | Hollywood, Florida	$684,990	$741,810	2019	2019
Hydraulic Model Updates and Calibration | Hollywood, Florida	$128,420	$128,420	2016	2017*
Risk & Resilience Assessment | Hollywood, Florida	$149,500	$149,500	2020	2020
Four-Log Disinfection – Basis of Design Report | Hollywood, Florida	$97,496	TBD	TBD – 2020	TBD – 2020
Miami Dade Water & Sewer Department Bond Engineering Contract Miami, Florida	$2,876,270	$2,876,270	2020	2020**
City of Tallahassee Water Master Plan & Master Plan Updates Tallahassee, Florida	$149,610	$149,610	2020	2020**
City of Venice: Engineering & Professional Consulting Services Venice, Florida	$1,300,000	$1,300,000	2020	2020**
Toho Asset Management Imple mentation Assistance & Condition Assessments | Kissimmee, Florida	$2,650,000	$2,650,000	2015	2015
Indian River County Asset Management Implementation Services | Vero Beach, Florida	$475,000	$475,000	2020	2020**
Immokalee - Raw Water Well No. 4 | Immokalee Seminole Indian Tribe, Florida	$114,000	$114,000	2019	2019
Loudoun Water Engineering BOA | Ashburn, Virginia	$550,000	$550,000	2019	2019
Water Quality Master Plan | New Orleans, Louisiana	$300,000	$300,000	2017	2017

*Project completion extended to 2017 for Client approved extension due to software selection | **Ongoing projects





*Project completion extended to 2017 for Client approved extension due to software selection

Reference Table

Projects	Client	Point of Contact	Contact Information
City of Hollywood: High Service Pump Upgrades Hollywood, Florida	City of Hollywood	Wilhelmina Montero, PE	954.921.3930
Hydraulic Model Updates and Calibration Hollywood, Florida	City of Hollywood	Clèce Aurélus, P.E.	954.921.3930
Risk & Resilience Assessment Hollywood, Florida	City of Hollywood	Wilhelmina Montero, PE	954.921.3930
Four-Log Disinfection – Basis of Design Report Hollywood, Florida	City of Hollywood	Wilhelmina Montero, PE	954.921.3930
Miami Dade Water & Sewer Department Bond Engineering Contract | Miami, Florida	Miami Dade Water & Sewer Department	Frances Morris	786.552.8104
City of Tallahassee Water Master Plan & Master Plan Updates | Tallahassee, Florida	City of Tallahassee	Jarrod Whitaker	850.891.6884
City of Venice: Engineering & Professional Consulting Services | Venice, Florida	City of Venice	Javier Vargas	941.882.7309
Toho Asset Management Implementation Assistance & Condition Assessments | Kissimmee, Florida	Toho Water Authority	Robert Pelham	407.709.3677
Indian River County Asset Management Implementation Services | Vero Beach, Florida	Indian River County Department of Utility Services	Vincent Burke	772.226.1835
Immokalee Raw Water Well No.4 | Immokalee Seminole Indian Tribe, Florida	The Seminole Tribe of Florida (STOF)	Emran Rahaman	954.347.9163
Loudoun Water Engineering BOA | Ashburn, VA	Loudoun Water	Jessica Dzara	571.291.6549
Water Quality Master Plan | New Orleans, Louisiana	Sewerage and Water Board of New Orleans	Bob Turner	504.865.0405

Please feel free to reach out to references regarding our performance.

QA/QC Procedures

Arcadis defines quality as understanding, planning for and meeting clients' needs and expectations while consistently conforming to the applicable standards of professional practice. Our quality management process integrates our firm's quality policies, procedures, and activities into our projects. The process involves clear definition of project roles and responsibilities, project-specific planning to incorporate quality in every aspect of the project, and identification of appropriate quality assurance and control procedures for each project.

Our quality management program defines the steps we take as a firm so that we:

- Do the right job by asking the right questions and providing the right solution
- Have the right team on the project
- Do the job right by correctly using the appropriate techniques to resolve the problem

Quality assurance at Arcadis is founded on processes, national resources, and knowledge teams that support but also challenge the project team to consider all relevant external stakeholder, technical, and organizational issues and quickly reach a consensus on the right solution. Once that consensus has been established, our team focuses on doing the job right.

Quality control activities confirm that all deliverables meet the client's specified quality standards and requirements and applicable industry standards. Our quality control activities include, as appropriate, formal project reviews conducted by a team of technical advisors with extensive experience in the relevant discipline(s). These advisors are specifically charged with performing rigorous reviews of project deliverables to confirm that they meet the industry standard of care as well as the client's stated project-specific goals.

Risk Management

Our team's familiarity with the City and our expertise in water master planning allows us to anticipate challenges that may arise on this project. At the project onset during the confirmation of the schedule, we will break the project down into its essential components to better understand potential risks. Our approach to risk mitigation will take advantage of the City's experience and urge your full involvement in the analysis.

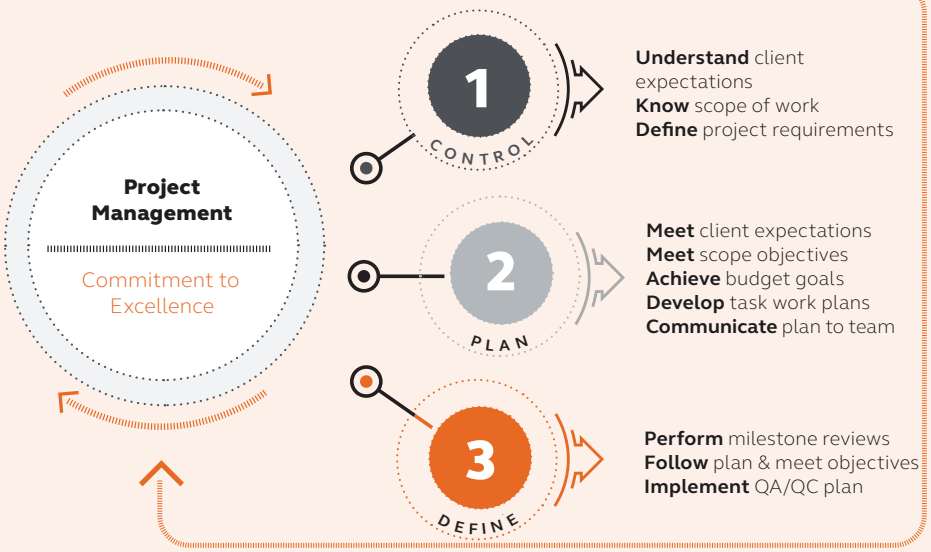
Quality is not an act. It is a **Habit**

QUALITY ASSURANCE
Our technical experts will perform targeted reviews informed by our knowledge of similar utilities and lessons learned. At each milestone we will confer with the City to see that goals are met.

OPERATIONS
From start to finish, our QA/QC advisors will review project deliverables to identify any issues that may arise or limit operability.

QUALITY CONTROL
Our team leadership will perform discipline cross-coordination reviews to confirm that all planning components work together seamlessly, eliminate any conflicts, and achiever your overall project goals.

Quality begins with the **Intent,** which is fixed by **Management**



ARCADIS Design & Consultancy for natural and built assets

9

LITIGATION

9 LITIGATION

As a large, multi-disciplined international firm, Arcadis has various legal proceedings pending at any given time. Such claims are disputed and not reasonably expected to be adversely determined, applicable insurance is available, and/or such claims are not reasonably expected to materially impact the financial condition or the operations of Arcadis, nor will they affect Arcadis' ability to fully perform the applicable services. These occurrences represent a nominal percentage of Arcadis' total projects at a frequency understood to be commensurate with or below industry standards for companies of similar size doing projects of similar type and volume. Arcadis' Litigation Five-Year History is attached below.

ARCADIS Design & Consultancy for natural and built assets

Updated: Q4 2019

The following is a summary of all litigation for the preceding five years. Such claims are disputed and not reasonably expected to be adversely determined, applicable insurance is available, and/or such claims are not reasonably expected to materially impact the financial condition or the operations of Arcadis.

Litigation Five-Year History: **Arcadis U.S., Inc. and All Affiliates**

Plaintiff	Defendant (Arcadis Affiliate)	Date Suit Filed	Nature of Incident	Type of Claim	Jurisdiction	Business Line	Government Claim (Y/N)	Resolution 1 = Case Ongoing 2 = Dismissal 3 = Resolved/Settled 4 = Judgement
O.K. Auto Sale, Inc.	Arcadis of Michigan	Dec-19	Plaintiff claiming unjust enrichment and interference with business due to non-removal of groundwater pump shed	Prof. Liability	Ingham County, MI	Env	N	1
P.F. Moon Co., Inc.	Arcadis US	Aug-19	Third party complaint claiming professional negligence and breach of contract causing monetary damages	Breach of Contract	Hamilton County, TN	Water	N	1
Beazer East, Inc.	Arcadis US	May-19	Professional negligence claim related to remediation site	Prof. Liability	Allegheny	Env	N	1
PIKA-Pirnie JV, LLC	U.S. Army Corp of Engineers	May-19	Appeal before Armed Services Board of Contract Appeals of government's final decision denying Plaintiff's claim regarding work performed under contract W912DY-10-D-0025	Appeal	ASBCA	Env	Y	1
Freeman-Lawson, Malenee	Arcadis US	Apr-18	Plaintiff alleges auto-related injury related to Defendant Arcadis employee Tabetha Julie Scott	Auto	Hamilton Cnty, OH	--	N	3
Corbett, Michael Patrick	Arcadis US	Feb-19	Plaintiff alleges personal injury in connection with his work at Croton Water Treatment Plant	General Liability	New York, NY	Water	N	1
Vaba, Kenneth	Arcadis US/Arcadis NY	Feb-19	Personal injury for failure to maintain premises in a safe condition	General Liability	Queens Cnty, NY	Infra	N	3
Carter, James Lee	Arcadis US	Feb-19	Plaintiff alleges personal injury as a result of a fall on the sidewalk of the premises known as 90 Barclay Street, New York, New York 10007 and/or 140 West Street, New York, New York 10007.	General Liability	New York Cnty, NY	Water	N	1
Donahue, Jennifer	Arcadis US	Nov-18	Plaintiff alleges personal injury in connection with auto accident	Auto	Worcester Cnty, MA	--	N	1
Javier, Cristobal	Arcadis US	Sep-18	Plaintiff alleged personal injury in connection with employment with JVN Restoration Inc., an Arcadis subcontractor	General Liability	Bronx Cnty, NY	Env	N	1
Rivera, Jackelyn and Gilberto	Arcadis US	Jul-18	Plaintiffs allege negligence in connection with CM services	Prof. Liability	Broward Cnty, FL	Infra	N	3
Bitsky, Lisa and Thomas	Arcadis US	Apr-18	Plaintiffs allege personal injury in connection with slip/trip and fall	General Liability	Cook Cnty, IL	Infra	N	1
Popel, Shulamit	Arcadis US	Mar-18	Plaintiff alleges negligence in connection with roadway in construction zone	General Liability	Cook Cnty, IL	Infra	N	1
Arcadis Canada	Ritepro Corporation	Mar-18	Collection matter	Breach of Contract	Quebec	Env	N	3
Woodbranch Cowtown Parking	Callison RTKL and Arcadis US	Feb-18	Plaintiff alleges breach of contract and negligence in connection with parking garage plans	Breach of Contract/Prof. Liability	Tarrant Cnty, TX	Infra	N	1
Boud, James	Arcadis US	Feb-18	Plaintiff alleges personal injury in connection with performance of his work	General Liability	Richmond Cnty, NY	Water	N	1
Burton, Edwin	Arcadis US	Jan-18	Employment discrimination claim	Employment	Middlesex Cnty, NJ	Corp	N	3
Lecain, Judith and Richard	Arcadis US	Jan-18	Plaintiff alleges negligence in connection with intersection design	Prof. Liability	Chatham Cnty, GA	Infra	N	1
Flavius, Devon	Arcadis of NY, Arcadis CE, and Arcadis US	Dec-17	Plaintiff alleges personal injury in connection with performance of his work	General Liability	Orange Cnty, NY	Water	N	3
Newport National/Cornerstone LLC	Arcadis US	Nov-17	Lease dispute	Breach of Contract	San Diego, CA	Corp	N	3
Black, Daniel	Arcadis of NY	Oct-17	Plaintiff alleges injuries related to fall at construction site	General Liability	Kings Cnty, NY	Water	N	2
Boonton Investors, LLC and Garden Commercial Properties	Arcadis US	Oct-17	Third-party complaint for premise liability and contribution and indemnification in connection with underlying personal injury claim (Edward Larson v. Boonton Investors, LLC, et al.)	General Liability	Morris Cnty, NJ	Env	N	1
Grimsley, Rosemary	Arcadis US	Oct-17	Plaintiff alleges negligence in connection with placement of a concrete barrier in a construction zone	Prof. Liability	Desoto Parish, LA	Infra	N	3
Arcadis US	Steadfast Insurance	Sep-17	Insurance coverage claim for failure to pay amounts owed under an environmental cost cap policy	Breach of Contract	Westchester Cnty, NY	Env	N	3
Bautista, Norman	Arcadis US	Apr-17	Wage claims	Employment	Alameda Cnty, CA	Corp	N	2
Arocena, Hector	Malcolm Pirnie	Mar-17	Plaintiff alleges unsafe and hazardous conditions at project site related to injury	General Liability	Bronx Cnty, NY	Water	N	2
Barsky, Alla	The Rise Group	Mar-17	Plaintiff alleges negligence in connection with roadway and bicycle lane in construction zone	General Liability	Cook Cnty, IL	Water	N	2
O'Brien, James	Malcolm Pirnie	Feb-17	Plaintiff alleges unsafe and hazardous conditions at project site related to slip and fall injury	General Liability	Dutchess Cnty, NY	Water	N	3
City of Newark	Malcolm Pirnie and Arcadis US	Feb-17	Client's 3rd party claim for indemnification in underlying claim against client in connection with denial of change order request (Scafar Contracting v. City of Newark)	Prof. Liability	Essex Cnty, NJ	Water	N	2*
City of New York	Malcolm Pirnie	Jan-17	Breach of contract and design defects related to private wastewater treatment plant upgrades	Prof. Liability	New York Cnty, NY	Water	N	3
Weckbecker, Charles	Malcolm Pirnie	Sep-16	Plaintiff alleges unsafe and hazardous conditions at project site related to slip and fall injury	General Liability	Nassau Cnty, NY	Water	N	1
Bedard, Judith	Arcadis US	Sep-16	Plaintiff alleges that long term disability was unjustly terminated	Employment	USDC - ED PA	Corp	N	3
Chambliss	Arcadis US	Aug-16	Breach of contract and negligence claims related to drilling services	Breach of Contract	Broward Cnty, FL	Env	N	3
Kelly, Russell and Paula	Arcadis US	Aug-16	Taking of property and reverse condemnation claims due to location of sewer pump station adjacent to plaintiffs' home	Prof. Liability	Baton Rouge, LA	Water	N	1
Glenmont Arlington Kendall	Arcadis C&M (BHR)	Jul-16	Plaintiff alleges defect in project design and construction	Prof. Liability	Duval Cnty, FL	Bldgs	N	3
Butenko, Aleksey	LFR and Arcadis US	Jun-16	Personal injury due to auto accident	Auto	Sacramento Cnty, CA	--	N	3
Crawford Labs	Arcadis US	Jun-16	Dispute over contract structure and pricing	Breach of Contract	Arbitration - IL	Env	N	3
Lanham, Winifred	Arcadis CE and Arcadis US	Feb-16	Plaintiff alleges that short term disability was prematurely discontinued and denial of long term disability	Employment	USDC - SD NY	Corp	N	3
Visionary Integration Professionals	Arcadis US	Dec-15	Breach of services agreement - collection	Breach of Contract	Douglas Cnty, CO	Corp	N	3
Hayes, Bradley Steven	Arcadis US	Oct-15	Plaintiff alleged that family members suffered fatal illnesses on property that was contaminated by toxic metals; alleged a number of defendants, including Arcadis, responsible	Prof. Liability	USDC - ED KY	Env	N	2
Visionary Integration Professionals	Arcadis US	Sep-15	Breach of services agreement - collection	Breach of Contract	Hillsborough Cnty, IL	Corp	N	3
Yonkers Contracting	Arcadis US and Malcom Pirnie	Sep-15	Breach of contract claims against client and others, including Arcadis and Malcolm Pirnie, related to delays and disruptions of project causing monetary damages	Breach of Contract/Prof. Liability	Westchester Cnty, NY	Water	N	1
City of Chicago	The Rise Group and Arcadis US	Sep-15	Client's 3rd party claim for contribution in underlying claim against client for negligence (Young v. CTR)	Prof. Liability	Cook Cnty, IL	Infra	N	3
Buono, Anthony	Arcadis US	Jul-15	Personal injury due to vehicle collision	Auto	Middlesex Cnty, NJ	--	N	2
Rodriguez, Antonio	Arcadis US	Jul-15	Personal injury to employee of 3rd party contractor at project site	General Liability	Middlesex Cnty, NJ	Env	N	2
Enviro-Equipment	Arcadis US	Jul-15	Breach of rental agreement - collection	Breach of Contract	Wake Cnty, NC	Env	N	3

ARCADIS Design & Consultancy for natural and built assets

Updated: Q4 2019

The following is a summary of all litigation for the preceding five years. Such claims are disputed and not reasonably expected to be adversely determined, applicable insurance is available, and/or such claims are not reasonably expected to materially impact the financial condition or the operations of Arcadis.

Litigation Five-Year History: **Arcadis U.S., Inc. and All Affiliates**

Plaintiff	Defendant (Arcadis Affiliate)	Date Suit Filed	Nature of Incident	Type of Claim	Jurisdiction	Business Line	Government Claim (Y/N)	Resolution 1 = Case Ongoing 2 = Dismissal 3 = Resolved/Settled 4 = Judgement
Honneycutt, Leo Baxter	Arcadis US	Jun-15	Taking of property and reverse condemnation due to location of sewer pump station behind plaintiffs' home	Prof. Liability	Baton Rouge, LA	Water	N	3
Interstate Home Loan	Arcadis US	May-15	Breach of contract claim against client and negligence claim against Arcadis related to environmental easement	Prof. Liability	Suffolk Cnty, NY	Env	N	2
Wilson, Gilberto	Arcadis US	Feb-15	Personal injury due to vehicle collision	Auto	Kings Cnty, NY	--	N	3
Induchem Services	Arcadis US	Dec-14	Alleged non-payment for services performed	Breach of Contract	San Juan, PR	Env	N	3
Friedauer, Paul	Rostan	Dec-14	Personal injury/death of 3rd party construction contractor worker near project site	General Liability	Monmouth Cnty, NJ	Env	N	3

ARCADIS Design & Consultancy for natural and built assets

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ADDENDA

10 ADDENDA

CITY OF HOLLYWOOD
DEPARTMENT OF PUBLIC UTILITIES
ENGINEERING AND CONSTRUCTION SERVICES DIVISION

1621 N. 14th Avenue
Hollywood, FL 33019
Phone (954) 921-3930 Fax (954) 921-3591

ADDENDUM NUMBER 1

Date: **April 28, 2020**

FOR: **REQUEST FOR STATEMENTS OF QUALIFICATIONS (RFQ) PROFESSIONAL ENGINEERING SERVICES FOR CITY OF HOLLYWOOD WATER MASTER PLAN UPDATE**

FILE NUMBER: **20-1336**

ALL RESPONDENTS BE ADVISED OF THE FOLLOWING CHANGES TO THE ABOVE REFERENCED PROJECT AS LISTED BELOW:

This addendum is issued as part of the RFQ package for the above described project. The changes incorporated in this addendum shall be considered as a part of the documents and shall supersede, amend, add to, clarify, or subtract from those conditions shown in the original documents dated March 30, 2020. The respondent shall coordinate all modifications herein with all trades and disciplines related to the RFQ package. **The respondent shall acknowledge receipt of this addendum per Item No. 4 of the "Respondent Check List" included in this addendum**. Failure to do so may subject Respondent to disqualification.

Item 1: INTRODUCTORY MEETING CANCELLATION

The project introduction meeting scheduled for **Thursday, April 30, 2020 at 9:00 AM**, at the Water Treatment Plant, 3441 Hollywood Boulevard, Hollywood, Florida, 33020, **is canceled**.

Item 2: RESPONDENT CHECK LIST

Refer to Exhibit 1 of this addendum for "Respondent Check List" to be included in RFQ Response Package.

Item 3: PROFESSIONAL ENGINEERING CONSULTANT SERVICES AGREEMENT
Refer to Exhibit 2 of this addendum for "Professional Engineering Consultant Services Agreement"

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ADDENDUM NUMBER 1

Item 4: NOTES RELATED TO RELEVANT REQUEST RECEIVED FROM POTENTIAL RESPONDENTS

1. Which information is required for the submittal: the information on the questionnaire that was attached, the list of information listed in the RFP text items a through i on page 8 or both?
   Response: The information on the submittal questionnaire and the list of information listed in the RFQ document (items a through i on page 8) are required.

2. In the interest of the health and safety of our employees, clients and communities we are following the guidance from the CDC to promote social distancing and limit in-person contact until the coronavirus precautions are lifted. Therefore, would the City allow electronic submissions of our response to project # 20-1336?
   Response: Electronic submittal will not be accepted.

3. Will the City still have the project introduction meeting at the Water Treatment Plant on Thursday, April 30, 2020 at 9:00 AM or will this be changed to a virtual meeting?
   Response: No. This meeting is canceled.

4. Is there a planholder list available for this project?
   Response: See Exhibit 3

5. Also, will there still be a site meeting on April 30th at the water treatment plant?
   Response: No. This meeting is canceled.

ALL OTHER TERMS AND CONDITIONS IN THE RFQ PACKAGE SHALL REMAIN THE SAME.

Clece Aurelus, P.E.
Interim Assistant Director
Department of Public Utilities
City of Hollywood

Leah Richter, PE Vice President

CITY OF HOLLYWOOD
DEPARTMENT OF PUBLIC UTILITIES
ENGINEERING AND CONSTRUCTION SERVICES DIVISION

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ADDENDUM NUMBER 2

Date: **May 14, 2020**

FOR: **REQUEST FOR STATEMENTS OF QUALIFICATIONS (RFQ) PROFESSIONAL ENGINEERING SERVICES FOR CITY OF HOLLYWOOD WATER MASTER PLAN UPDATE**

FILE NUMBER: **20-1336**

ALL RESPONDENTS BE ADVISED OF THE FOLLOWING CHANGES TO THE ABOVE REFERENCED PROJECT AS LISTED BELOW:

This addendum is issued as part of the RFQ package for the above described project. The changes incorporated in this addendum shall be considered as a part of the documents and shall supersede, amend, add to, clarify, or subtract from those conditions shown in the original documents dated March 30, 2020. The respondent shall coordinate all modifications herein with all trades and disciplines related to the RFQ package. **The respondent shall acknowledge receipt of this addendum per Item No. 4 of the "Respondent Check List" included in Addendum No. 1**. Failure to do so may subject Respondent to disqualification.

Item 1: CHANGE IN RFQ DEADLINES

The statements of qualifications will be received by the City Clerk of the City of Hollywood, Florida, on or before (but not later than) **2:00 PM** Local Time on **Monday, June 8, 2020**. The office of the City Clerk is located at City Hall, 2600 Hollywood Boulevard, Room 221, Hollywood, Florida, 33020. On **Monday, June 8, 2020** at **2:30 PM**, the names of the companies submitting statements of qualifications will be read publicly at the Southern Regional Wastewater Treatment Plant, 1621 N. 14th Avenue, ECSD Conference Room, Hollywood, Florida, 33020.

Item 2: DELIVERY OF RFQ PACKAGE

To assist in mitigating the 2019 Novel Coronavirus (COVID-19) potential exposure and transmission risks, City Clerk is not accepting personal delivery at this time. All RFQ packages need to be mailed to City Clerk of the City of Hollywood, or delivered to Records and Archives located in the Annex building on the west side of City Hall, 2600 Hollywood Boulevard, Hollywood, Florida, 33020. It is recommended that a delivery confirmation email be sent to the Project Manager, Wilhelmina Montero, P.E.

CITY OF HOLLYWOOD
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ADDENDUM NUMBER 2

(wmontero@hollywoodfl.org) after you drop off the packages but before 2 PM on the submittal date.

Item 3: WEBEX TELEPHONIC MEETING FOR ORAL PRESENTATION
Oral Presentation will be conducted through WebEx telephone meeting. City will provide WebEx meeting link, dial in number and access code before the Oral Presentation. RFQ Respondent could present their files through sharing computer function during the WebEx meeting.

Item 4: CHANGE IN RFQ ANTICIPATED SCHEDULE

RFQ, Page 10, Section VIII, "Anticipated Schedule", shall read as follows:
The schedule shown below is provided for general information purposes only. Specific dates have been estimated and may vary as circumstances change.

Advertise for Qualifications:	**March 30, 2020**
Submission Deadline, 2:00 PM:	**June 8, 2020**
Short list Notification for Oral Interviews:	**July 2, 2020**
Oral Interviews:	**July 20, 2020**
Commission Approval:	**October 2020**

Item 5: CHANGE RFQ SECTION V, "SELECTION CRITERIA"

RFQ, page 6, Section V, "Selection Criteria", Item 2, shall read as follows.

2. **Previous Performance on Related Projects (30 points)** - Rating to be evaluated based on a list of similar jobs and resumes of staff involved and the overall capability of the firm to perform Conduct Condition Assessment of all water system components such as water treatment processes, storage facilities, pumping facilities and all other related facilities. This will be evaluated by examining the qualifications and prior experience of the firm based upon the documentation submitted. Significant experience in performing substantially the same type of projects to receive the most points. No experience on the type of project should receive zero points. Firms with problems on previous jobs should have points deducted. References in the Broward, Miami-Dade, Monroe, and Palm Beach

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ADDENDUM NUMBER 2

Counties of Florida will be of primary interest to the City. The City may conduct telephone surveys to evaluate performances as viewed by references. For all referenced projects include:

- Owner's name, address and telephone number
- Original schedule and scope of project
- Achieved schedule and scope of project
- Number and brief description of change orders or amendments issued during the project. This shall include change orders for both engineering services and the subsequent construction work where applicable

Item 6: CHANGE RFQ SECTION VII, "ORAL PRESENTATION"

RFQ, page 9, Section VII, "ORAL PRESENTATION", Item 4, shall read as follows.

3. Master Plan Development Philosophy and Concepts (15 Points) - Explain in detail your Master Plan Development philosophy and how it will be used to deliver a successful outcome in this specific project setting. Include details that will be analyzed and incorporated into the overall Master Plan Development. Explain how you will ensure that the project will be implemented to include all the aspects the City desires. Describe how you have used innovative Master Plan Development concepts on other similar projects.

Item 7: NOTES RELATED TO RELEVANT REQUEST RECEIVED FROM POTENTIAL RESPONDENTS

1. The scope of services in section II calls for a master plan, while the selection Criteria Section V, Previous performance section references 'design and construction management of water treatment plant improvements'. Is the intent of this contract to have the selected firm provide design/construction services?

   Response: Refer to Item 5 of this addendum.

2. The scope of services in section II calls for a master plan, while the selection Criteria Section V, Previous performance section references asks for information of all referenced projects to include 'average turnaround time for request for information and shop drawing/submittal approvals'. This is typically requested for

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ADDENDUM NUMBER 2

projects in construction. Typically Master Plan deliverables do not have this information. Can you please clarify?

Response: Refer to Item 5 of this addendum.

3. Section VII Oral Presentation, evaluation criteria '4. Design Philosophy and Concepts', can you please help us better understand the relevance of this criteria to the master planning solicitation?

   Response: Please refer to Item 6 of this addendum.

4. Could the City grant a one week extension on the proposal due date?
   Response: Refer to Item 1 of this addendum.

4. Can we can we show a percentage of total work vs. estimated number of hours for letter "g" on page 8?
   Response: Percentage of total work is acceptable.

5. Are items 5 and 6 on page 7, which are listed as the selection criteria, required for the submittal as they don't seem to be indicated as required in any of the written descriptions, attachments or addenda?
   Response: Yes, these items are required for the submittal.

6. Are the last 2 bullets listed for number 2 on the selection criteria required, as they relate more to construction projects vs. planning and design work which is the scope of this project?
   Response: Refer to Item 5 of this Addendum.

ALL OTHER TERMS AND CONDITIONS IN THE RFQ PACKAGE SHALL REMAIN THE SAME.

Clece Aurelus, P.E.
Interim Assistant Director
Department of Public Utilities
City of Hollywood

Leah K. Richter

Leah Richter, PE Vice President

ARCADIS Design & Consultancy for natural and built assets

APPENDIX A

Resumes

Ms. Richter has a diverse background in program management, business advisory and financial consulting services and civil engineering. She specializes in assisting municipal clients in South Florida with managing their planning, operational and capital program needs. Her experience includes project management and delivery, vendor procurement, contract compliance, regulatory permitting, public outreach, annual reporting to bondholders/trustees, litigation support services, environmental compliance and operation and maintenance evaluation. She serves as the Project Manager for the Miami Dade County Water and Sewer Department Bond Engineering and Financial Services contract. Ms. Richter currently serves as Arcadis's Southeast Florida Operations Leader and is located in our Plantation office, just minutes from the City to provide rapid response to any request.

LEAH RICHTER, PE | PRINCIPAL IN CHARGE

EXPERIENCE

City of Hollywood: AWIA Risk and Resilience Assessment / Hollywood, FL

Served as Quality Assurance Manager for the development of a Risk and Resilience Assessment in accordance with the requirements of America's Water Infrastructure Act completed in March 31, 2020.

City of North Miami Beach: Emergency Response Plan Update / North Miami Beach, FL

Served as Project Manager for the update of the City's ERP conducted previously in accordance with the requirements of the Bioterrorism Act. Activities included facilitation of workshops with City staff to identify relevant updated data and information, and revised strategies for response to scenarios and incidents, coordination with Public Safety Officer for distribution and exercising of the ERP, and update of the ERP.

Broward County FL: Solid Waste and Recycling Study / Fort Lauderdale, FL

Serves as Project Manager for the County's ongoing study focused on how to achieve the state mandated 75% recycling goal and developing a path forward for the future governance and infrastructure necessary for long-term solid waste management within Broward County.

Miami-Dade County FL: Water and Sewer Department Bond Engineering Services / Miami, FL

Serves as Project Manager for WASD's Rates, Fee Analysis, and Bond Engineering Contract. Responsible for overseeing and delivering all assignments and task orders under the multi-year contract serving WASD's Executive Leadership team. Projects and activities conducted to date include Asset Management Framework Development, Retail Rate Study, Mixed Use Customer Rate Analysis, Annual Review of the Adequacy of Rates and Fees, Annual Review of Wholesale Customer Rate Impacts and True Up, Annual Condition Assessment of all WASD Facilities, and miscellaneous other assignments for the varying divisions of the Department.

City of Davis: Design Build Transactional Consulting/Davis, CA

Served on the transactional consulting team developing the design/build agreement terms in association with the implementation of the necessary facility upgrades needed at the City's WWTP to achieve compliance with the City's National Pollution Discharge Elimination System (NPDES) permit for surface water discharge. Activities included development of request for qualifications documents, evaluation of submittals for shortlist, preparation of key contract terms and risk matrices, as well as detailed design/build agreement for issuance to the pre-qualified vendors.

Multiple FL Clients: Emergency Response Planning Services / FL

Served as Deputy Project Manager and Project Engineer for the development of emergency response plans for four water utilities in accordance with the Bioterrorism Act of 2002 and USEPA Guidance. Activities included: Review of vulnerability assessment and emergency management information; kickoff workshop; development of draft emergency response information; review workshops; preparation of emergency response plan.

Miami-Dade County FL: PortMiami Consulting Engineer's Services for Master Bond Ordinance 88-66 / Miami, FL

Serves as Project Manager for the following financial support required by PortMiami in order to meet the requirements of Master Bond Ordinance 88-66 and established management policies which consists of reviewing unaudited quarterly financial results for Q3 and Q4 of FY2014, including a review of actual financial results in comparison to projected results; assisting PortMiami with preparation of updated FY2014 year-end financial projections given the unaudited year to date actual results, including an evaluation of reasons for any significant

EDUCATION
MS, Civil Engineering, 2002

BS, Environmental Engineering, 1997

Program Management, Academy - Leading Complexity University of Oxford - Said Business School

YEARS OF EXPERIENCE
23

PROFESSIONAL REGISTRATIONS
Professional Engineer - FL

deviations of actual financial results from projected results, and an assessment of the impact of any deviations on ability to meet debt service coverage requirements; and participate in regular meetings with PortMiami staff to discuss financial analyses, forecast results, and other recommendations as may be required as PortMiami's Consulting Engineer for the authorized period. In addition, Arcadis conducted comprehensive facility inspections of the entire PortMiami facility to review the state of condition and repair of the infrastructure as well as ultimately generate recommendations for repair, renewal, and replacement, and issuance of a Consulting Engineer's Report documenting the results of such inspections and associated recommendations.

Solid Waste Authority of Palm Beach County: New 3,000 tpd Renewable Energy Facility / West Palm Beach, FL

Serves as Principle in Charge and Program Manager for the planning, permitting, procurement, financing, public outreach and conceptual design for the overall implementation of a new 3,000-ton-per-day waste-to-energy facility adjacent to the authority's existing North County Resource Recovery Facility (NCRRF). Key activities include development of a request for qualifications and request for proposals of a design-build-operator, development of application documents required under the Power Plant Siting Act, development of a design criteria package to be utilized during the procurement process, development and implementation of an extensive public outreach program and overall program management activities to support the development of this estimated $700M capital project, the first of its kind in more than 15 years.

City of Key West, FL: Utilities Waste Rate Study / Key West, FL

Developed a financial model for the City's solid waste utility department. Activities included reviewing revenue characteristics (historical and budget), and other documentations provided to support revenue and expense projections; developed a comprehensive financial model to project cash flow for a five-year period, completed pricing surveys, and developed rate recommendations. Presented recommendations to the City.

Puerto Rico Aqueduct and Sewer Authority: Valenciano Dam Design-Build-Finance Procurement / San Juan, PR

Served as Project Manager for the procurement of a design-build- finance team for the design and construction of PRASA's $200M dam, reservoir and raw water intake pump station project in the Valenciano Region. Activities included development of request for qualifications, comprehensive evaluation of prospective bidders statements of qualifications and development of detailed request for proposals, including finance and agreement terms, issued the pre-qualified bidders.

City of North Miami Beach FL: Miscellaneous Support Services / North Miami Beach, FL

Served as Deputy Project Manager to support the City in its implementation of a $50 million membrane softening treatment facility and related improvements.

Lee County: Lee County Utilities Litigation Support / Fort Myers, FL

Served as Deputy Project Manager for the support to the Lee County Attorney in negotiations with the county's contractor, on behalf of the Lee County Utilities Department to resolve open contract issues and recover funds for completing repairs to the water and wastewater system. Elements of the project included: Review of key documents, inspection services, negotiation assistance, mediation meeting attendance and report preparation.

Lee County FL: Lee County Utilities Evaluation / Fort Myers, FL

Served as project engineer in the annual inspection of Lee County's Water and Wastewater Treatment Facilities, as well as the County's wastewater collection system and water distribution system. Assisted with annual inspections and the preparation of the annual Site Assessment and Operations Evaluation reports.

Mr. Nguyen is a Project Management Professional and licensed civil engineer experienced in water and wastewater treatment plant design, process evaluation and optimization, project controls, and construction management by multiple project delivery methods including design-build (D-B). He is also well versed in using designer and contractor tools and software including BIM, CADD, GIS, database, Primavera CM4 and P6, MS Projects, e-Builder, and share-point as well as other emerging digital technologies such as drones and 3D scanning. Mr. Nguyen is currently serving as the Project Manager for several ongoing projects with the City and is located in our Plantation office, providing rapid response to any request.

TUNG NGUYEN, PE, PMP | PROJECT MANAGER

EXPERIENCE

City of Hollywood Four-Log Disinfection | Engineering and Construction Department, City of Hollywood

Project Manager. Responsible for leading the conditional assessment of the existing WTP disinfection system, basis of design report for converting to 4-log virus inactivation, and bench scale testing for DBP formation. As part of this effort, Arcadis also coordinated with Florida DEP to obtain preliminary approval on the conceptual design previously submitted to and reviewed by the Broward County Department of Health.

Port of Miami Project Controls (Staff Augmentation) | Seaport Department, Miami Dade County

Project Controls Engineer. Responsible for providing project controls and scheduler services to assist in monitoring contractual obligations associated with Port Miami's $1.4 billion capital improvements program. As part of this effort, Mr. Nguyen served as the liaison between the Construction Team Project Managers and the Port Miami Capital Development Project Managers. In this staff augmentation role, Mr. Nguyen was embedded with Port Miami staff and performed activities such as managing the master program schedule, developing risk registers, updating project costs, and implementing Project Management Institute (PMI) best practices. He also led the blue-printing, development, and implementation of PowerBi portals to assist in updating and sharing information between departments.

FEMA Hazard Mitigation Assistance Grant | Water and Sewer Department, Miami Dade County

Design Engineer. Arcadis successfully helped Miami Dade County WASD secure two Hazard Mitigation grants under FEMA DR-4337 (Hurricane Irma) to obtain approximately $30M in funding for floodproofing twelve critical pump stations. Mr. Nguyen led the field technical inspections, engineering feasibility evaluations, alternatives development, and cost estimating for two master pumps stations and the 10 supporting collection stations. The grant application was submitted with over a dozen mitigation upgrades for each station all of which were approved and funded.

Raw Wastewater Pump Station 2 Upgrades & Filter and Disinfection Facility Upgrades | Blue Plains AWTP, Washington D.C.

He managed the design and construction phases for the critical pumping stations at DC Water's Blue Plains AWTP (740 MGD). The project design phases were managed using Primavera P6 schedules and were completed on schedule and budget and met all KPIs.

Project Manager. Responsible for the design and construction of the $20.0 million upgrade for the Raw Water Pumping Station No.2 project at DC Water's Blue Plains AWTP. The design included the phased rehabilitation and replacement of the nine existing 600 HP, end-suction centrifugal pumps rated at 100 MGD each, a new electrical distribution system, and station upgrades to extend its useful life for 20 years.

Project Manager. Responsible for the pre-selection, design and construction of the filter influent pumping station upgrades at the Filtration and Disinfection Facility. The $19.5 million project included the pre-selection procurement and design of 10 vertical line-shaft pumps, four 5kV VFD, and electrical upgrades for 36 deep bed filters. The 500 horsepower pumps are rated for 77 mgd at 30 feet of head and deliver secondary effluent to the final filter building.

Hamlin WRF Phase 1 | Orange County, Florida

Design Engineer. The Hamlin WRF (Phase 1) project consisted of designs and master planning for a new water reclamation facility located in Orange County, Florida. The treatment process included preliminary treatment with screening and grit removal, activated sludge configured as a 5-stage Bardenpho process, secondary

EDUCATION
BS, Civil & Environmental Engineer, George Mason University, 2008

YEARS OF EXPERIENCE
15

PROFESSIONAL REGISTRATIONS
Professional Engineer - FL, VA

Project Management Professional – VA

clarifiers, RAS and WAS pumping systems, cloth disk filtration and disinfection. The effluent for the plant is stored and distributed as reuse or sent to rapid infiltration basins located onsite. Mr. Nguyen the engineer-of-record for the Reject Pond and Reject Return Pumping station. The pond is sized to hold up to 5 mgd of process water during treatment upset or when quality does not meet reuse or groundwater recharge standards. He also led the development of the control strategies for the pumping systems as well as reject control interfaces with secondary and disinfection unit processes.

Holmes Run Pumping Station Rehabilitation Preliminary Engineering Report | Fairfax County, Virginia

Project Manager. The Holmes Run Pumping Station (HRPS) is a 10-mgd scalping station located in a sub-sewershed in Fairfax County, VA which serves approximately 2.5 million residents. The original station was built in 1967 and was upgraded in 1995. The preliminary engineering phase included a comprehensive condition assessment of the facility, permit gap analysis, field CCTV investigation, lead and asbestos survey, conceptual design for rehabilitation of the facility, Envision screening, and cost estimates. Mr. Nguyen led the process mechanical design including hydraulic transient analysis of the force-main and pump design. In addition, he was the project manager and led the design team which included structural, architectural, civil, electrical, plumbing, and control disciplines during the design phase. As part of the preliminary design, the entire station was field scanned in converted to BIM environment so that future design will include assets management functions.

Loudoun Water, Virginia

Program Manager. As the Deputy Program Manager for Loudoun Water's Potomac Water Supply Program (PWSP), Mr. Nguyen provided oversight for the administration over $14 million of professional services for the Program and Construction Management services under the PWSP. The total estimated cost for the multi-phase Program is $460 million and will provide the County with clean, reliable potable water through 2040 in addition to creating additional water supply resources for the region (i.e. over 8.0 billion gallons 'water banked' in retired hard rock quarries). Mr. Nguyen adapted PMI standards and industry best practices in order to develop and execute using a comprehensive Program Management approach. The clear management framework facilitated the coordination of numerous projects and task orders under the Program which included over 60 design professionals across 5 major design firms. He also managed the feasibility study, procurement, development, and successful roll-out of e-Builder to facilitate collaboration for the team.

Project Manager. Mr. Nguyen was the project manager for the final design of the Raw Water Intake and Pumping Station. He successfully managed over $3.1 million of professional services and completed the design within schedule and budget. The $35.5 million capital project and included an array of 16 half-barrel screens in the river, 500-ft of intake lines, 5,000-ft of small diameter piping embedded in the river, 250-ft of 16-ft dia tunnels, 125-ft of a deep shaft (30-ft dia), and pump station for four 600 HP (13.1 MGD) vertical turbine pumps. Mr. Nguyen also coordinated with County, State, and Federal agencies and managed the permitting process that required approvals from over a dozen entities having jurisdiction such as VDEQ, MDNR, Army Corp, VMRC, ICPRB, Loudoun County, and environmental groups.

Project Manager. Mr. Nguyen was the project manager for the final design of the Raw Water Transmission Main. The associated capital project was estimated to be valued at over $40 million and included over 6-miles of 42-in and 36-in raw water force main. The project also included significant planning coordination to integrate with the overall program's schedule and interfacing projects – the Raw Water 20 mgd river intake and pumping station, the 20-mgd water treatment plant, and future 40-mgd quarry reservoir and pumping station.

Project Manager. Mr. Nguyen was the project manager for the development of the Preliminary Engineering Report for the Raw Water Supply System. The fast-track design effort was valued at over $2 million (professional services) and was completed in less than 6 months including submission to Virginia Department of Health (VDH). The report resulted in conceptual plans for major facets including regional water supply planning, permit gap analysis, raw water intake, raw water pumping station, six miles raw water transmission pipelines, conversion of retired 300-ft deep rock quarries (1.2 billion gallons of off-line storage), geotechnical explorations, and flood plain alteration studies. The estimated capital budget for facilities was estimated to be over $85 million.

Corbalis WTP Stage III Expansion | Fairfax Water, Virginia

Lead Project Engineer. Mr. Tung Nguyen was the project engineer for the $164 million expansion of Fairfax Water's Corbalis WTP to 225-mgd in Herndon, Virginia. He was responsible for shop drawing management and utilized Primavera Expedition to streamline approval and tracking of 10,000 project records including over 3,100 shop drawings. He also managed the installation, testing, and start-up of the Finished Water Pumping Station (two 1,500 HP, 60 mgd horizontal split-case pumps) and the Ozone System upgrades - which included construction of the cryogenic storage system and vaporizers (liquid oxygen), ozone generators, contacting basins, destruction, and quenching systems.

Key duties included shop drawing reviews, maintaining P3 database and user accounts, daily inspections logs/photo database, field inspection, monthly construction schedule reviews, processing schedule/weather delay claims, and field performance testing of the new ozone system under current live plant operations (2,100 lbs/day at 150 mgd).

Mr. Sidari has over 20 years of engineering and project management experience supporting water and wastewater systems through engineering and research. His work has included leading project planning, design, construction, and operation of public and private water systems. He has worked on drinking water systems ranging from several thousand gallons per day to over 100 mgd, including treatment, disinfection, pumping, and storage applications. Mr. Sidari provides company-wide advisory on drinking water and emerging water quality issues from the treatment plant to the consumer's tap. He has also authored more than 75 papers and technical presentations on water and wastewater topics.

FRANK SIDARI, PE, BCEE | QA/QC

EXPERIENCE

Membrane Filtration Plant Critical Improvements | PWSA, Pittsburgh, Pennsylvania

As the authority's engineer for vertical assets, led primary efforts to respond to PADEP requests for changes in system operations to achieve 1-log inactivation of Giardia and perform operational and capital improvements to the membrane filtration plant. Work included implementation of a booster chlorination system, 320 module replacements, MFP assessment and improvements, SCADA adjustments and development of revised procedures. Provided supporting calculations and documentation for PADEP approval. Oversaw plant shut-down and off-line maintenance while responding to regulatory authorities. As a technical expert with Arcadis provided consultation regarding membrane plant restart. Interfaced with engineering, operations, and laboratory staff to complete an assessment of facility status, water quality issues, and standard operating procedures.

Water Production and Distribution Risk Assessment | WEB, Aruba

As Chief Consulting Engineer at Special Pathogens Laboratory lead the risk assessment of the water production and distribution system for WEB Aruba. Assessment included reverse osmosis (RO) treatment, transmission, and distribution systems. Production (11.6 MGD) included three RO treatment trains utilizing a combination of surface and beach well intakes, cartrige and media filtration, two pass membrane filtration, reminieralization, storage, UV disinfection, and corrosion control systems. Distribution included four pressure districts utilizing 14 pump stations and 14 storage tanks. Provided recommendations regarding operation and maintenance of the system to manage microbial risks. Reviewed a hydraulic report (by others) and provided recommendations regarding system improvements and managing water quality. Led the development of WEB's Water Safety Plan for managing water quality and production risk.

Aspinwall WTP Capital Improvements | PWSA, Pittsburgh, Pennsylvania

As the authority's engineer for vertical assets, provided technical support and management of programs for capital improvements at the 117 MGD Aspinwall WTP and distribution pump stations. Developed project requirements and scopes of work for proposals, participated in proposal evaluation and consultant selection, and led project kick-offs meetings. Capital projects included: Aspinwall WTP Electrical Backup Power Improvements, Aspinwall WTP Pretreatment Chemical System and Clarification Improvements, Clearwell Emergency Response, Highland Reservoir Pump Station and Rising Main, and New Highland/ Garfield Pump Station. The projects address the condition, capacity, and suitability of critical vertical assets to maintain water treatment and distribution capabilities in a safe, reliable and cost effective manner.

Clearwell Study and Planning | PWSA, Pittsburgh, Pennsylvania

As project manager, supported the evaluation of the existing clearwell at the Aspinwall Water Treatment Plant. The study was completed to develop and review various alternatives to replace or modify the clearwell to provide redundancy. The buried clearwell is a single 50-million-gallon concrete structure constructed in 1905. The study included evaluation of the two finished water pump stations for the 117-mgd WTP, which also utilize the clearwell as a suction wet well. The recommended alternative included the installation of combined filter effluent UV, upgrade of the pump stations with VFDs and a small suction well, and modification of the existing clearwell to address structural deficiencies, provide maintenance capabilities, and address CT and capacity over a range of water quality conditions.

Treatment and Distribution Process Flow Diagrams | PWSA, Pittsburgh, Pennsylvania

As the authority's engineer for vertical assets, performed walk through of the Aspinwall WTP, Membrane Filtration Plant, and 10 pump stations to confirm and create comprehensive and up-to-date process flow diagrams of water production and primary pumping and storage facilities. Coordinated field observations with historic drawings, SCADA documents, and authority operations staff. Worked with the on-call engineer (Arcadis) to provide drafting and QA/QC of drawings.

EDUCATION

AAS Ecology/ Environmental Technology, Paul Smith's College 1995

AS Liberal Arts, Math/Science, Corning Community College 1996

BS Forest Engineering, SUNY College of Environmental Science and Forestry 1998

MS Civil and Environmental Engineering, Carnegie Mellon University 2002

YEARS OF EXPERIENCE

20

PROFESSIONAL REGISTRATIONS

Professional Engineer – PA, OH, MD

Board Certified Environmental Engineer

Ms. Slabaugh serves as the Drinking Water Practice Leader at Arcadis. She brings over 13 years of experience engineering and managing drinking water quality and treatment projects, including process selection and optimization, regulatory compliance, water quality monitoring, bench and pilot testing, and cost estimating. She has completed preliminary and detailed process designs for ground and surface WTPs ranging in size from <1 mgd to 1,300 mgd and has experience with conventional and advanced water treatment processes. She is a contributing author to multiple AWWA Manuals of Water Supply Practice and has provided regulatory support to AWWA, EPA, and various state agencies. Ms. Slabaugh is currently serving as QA/QC on the City's Four-Log Improvement Project.

REBECCA SLABAUGH, PE, ENV SP | TECHNICAL ADVISOR - WATER QUALITY & TREATMENT

EXPERIENCE

Chlorine and Ammonia Feed System Assessments for Implementation of Four-Log Disinfection | City of Hollywood, Hollywood, FL

Technical advisor on study to determine necessary modifications to the existing chlorine and ammonia systems to achieve four-log virus inactivation at the City's water treatment plant.

Water Distribution System Optimization Plan | City of Flint, Flint, MI

Project manager for development of a distribution system optimization plan that includes assessment of current practices and corrosion control treatment as compared to industry best practices (i.e., AWWA Partnership for Safe Water), identification of associated gaps, and assessment of the human and financial resources in order to develop a recommended prioritized list of improvements for the City of Flint.

Distribution System Water Quality Audit | City of St. Petersburg, FL

Technical advisor on audit that compares the City's current practices to the AWWA G200 Standard for Distribution System Operation and Maintenance and the AWWA Partnership for Safe Water Distribution System Optimization Program to identify gaps and develop a recommended prioritized list of improvements.

Filter Evaluation | Fort Wayne City Utilities, Fort Wayne, IN

Project manager for ongoing study to assess filterability challenges at lime softening plant and identify potential improvements to filter design and operations, including filter media composition, depth and size.

Collins Park WTP 20-Year Master Plan & Needs Assessment | City of Toledo, Toledo OH

Process engineer for water master plan project designed to improve treatment plant performance and operations and develop a 20-Year Capital Improvements Plan (CIP) program. Project work included assessment of historical water quality performance, detailed condition assessment, evaluation of potential alternatives to improve treatment plant performance and operations, and development of CIP.

Water Master Plan Update | City of Elkhart, IN

Evaluated existing capacities of three groundwater treatment plants, conducting a high-level compliance review with respect to the Stage 2 DBPR and the Ground Water Rule (GWR), conducting a review of the current CIP based on recent water demands, and preparing recommendations for future capital improvement projects.

Water Master Plan Update | Fairborn, OH

Technical lead on regulatory compliance evaluation for water master plan update. Work included a review of raw, finished and distribution system data as compared to current and future regulations and evaluation of potential benefits of providing 4-log virus inactivation for compliance with the GWR.

Interim Water Production Plan | Citizens Energy Group, Indianapolis, IN

Process engineer responsible for benchmarking and assessing existing conditions at four surface and nine ground water treatment plants and identifying potential alternatives to increase treatment capacity, reliability, and water quality performance.

Softening and Corrosion Control Treatment Improvements | City of Miamisburg, Miamisburg, OH

Technical advisor to the City of Miamisburg on a transition plan for maintaining effective corrosion control treatment during commissioning of a new membrane softening process.

EDUCATION

MS Environmental Engineering
Virginia Polytechnic Institute and State University 2007

BS Civil Engineering
Purdue University
2005

YEARS OF EXPERIENCE

13

PROFESSIONAL REGISTRATIONS

Professional Engineer – IN

Certified Construction Documents Technologist

Water Quality Testing and Plant Optimization | City of Bay City, Bay City MI

Process engineer for detailed audit of plant operations at the Bay City Municipal Water Treatment Plant (BCMWTP) to identify performance-limiting factors and process adjustments that could be implemented to optimize treatment performance and minimize DBP levels with minimal capital investment at the plant.

WTP Corrosion Control Treatment Update and Simultaneous Compliance Assessment | City of Bay City, Bay City, Michigan

Process engineer for comprehensive evaluation of corrosion control treatment, softening/coagulation practices, and related simultaneous compliance issues at the Bay City Municipal WTP. Work included evaluation of existing water quality conditions and operations/process control data, modeling of various treatment process alternatives, and identification of treatment modifications.

Water System Evaluation | South Bend Water Works, South Bend, IN

Project manager on evaluation to optimize system operations as a result of declining demands while meeting City goals. Work included demand projection estimates, calculations of theoretical capacities of all facilities, development of a life cycle cost tool, a detailed alternatives analysis considering both cost and non-cost factors, and hydraulic modeling.

Water System Asset Condition Assessment | Citizens Energy Group, Indianapolis, IN

Assessment of the condition of nine groundwater and surface water treatment plants, groundwater wells in seven well fields, and a representative sample of pump stations and storage tanks throughout the distribution system; review of operational performance and regulatory compliance; and identification of recommendations for future capital projects.

Mr. Cooper represents Arcadis as our Global Lead for Intelligent Water: the process of water systems embracing digital ecosystems in frontline operations and in utility management with the purpose of improving financial stability, customer experience, and operations and maintenance key performance indicators. He balances engineering and management expertise with hands-on experience as a certified operator by leading diverse teams to deliver innovative, practical and sustainable solutions in water system treatment, management, modeling, machine learning, artificial intelligence and optimization. Mr. Cooper is a trustee for the American Water Works Association and has authored multiple publications at international conferences, webinars and public meetings, including lead author of AWWA Manual of Practice 32, Computer Modeling of Water Distribution Systems. Mr. Cooper led the development of the City's recent hydraulic model.

JAMES COOPER, PE, CWO, ENV SP | TECHNICAL ADVISOR - DISTRIBUTION SYSTEM

EXPERIENCE

Hydraulic Model Updates and Calibration | Hollywood, Florida

Arcadis was tasked with upgrading the City's hydraulic water model to better represent the existing system. As a part of this model update and calibration, completed field C-factor and hydrant testing in the City's water distribution system with City staff. Served as lead modeler in the analysis of field data and existing SCADA data to determine a calibration day for the model. Reviewed population projection data up to the projected 2035 planning horizon and gathered proposed system improvements to be implemented into the model to apply demand for current and future scenarios and model calibration to provide the City with a realistic planning tool for the future and contributed to the training of City staff to use their newly calibrated model.

Intelligent Water System Development and Optimization | City of Akron, Ohio

Lead Engineer in support of Akron's development as a smart water network, including integrating distribution models, GIS and IT resulting in an optimized treatment process based on data analytics that resulted in the best water quality produced in the history of the plant while also achieving 8-20% reducing in chemical costs annually.

Water Information Network Phase I Los Angeles Department of Water and Power

Technical Advisor supporting evaluation of water system integration needs and create an accessible, easy-to-use data management and exchange framework using OSIsoft Pi Server. The framework will help leverage data consumption to align business needs and technology investment with organizational strategy.

Comprehensive Water Strategic Plan | Anne Arundel County, Maryland

Engineer assisting with hydraulic model development, calibration and evaluation of fire flow scenarios, categorization of improvements and development of various improvements.

Billing System Development, Implementation and Support | Green Bay Metropolitan Sewerage District, Green Bay, Wisconsin

Project Manager of ongoing services supporting the Arcadis team development and implementation of a new customer billing system.

Downtown Water Storage and Pumping Facility Design | City of Atlanta, GA Dept. of Watershed Management, Atlanta, Georgia

Technical Advisor on an emergency storage and pumping system to support the downtown area focused on operations, preliminary engineering and design via a design-build delivery.

Water Planning Basic Ordering Agreement | Washington Suburban Sanitary Commission (WSSC), Washington D.C.

Technical advisor for multiple task orders focused on planning, modeling and optimizing the water distribution network consisting of over 5,500 miles of pipe, 86 pressure zones and 18 pumping stations.

Demand Forecasting and Distribution Model Update | Greater Cincinnati Water Works, Ohio

Project Manager of demand forecasting, hydraulics and water quality, field data collection program, wholesale customers coordination, system evaluation and model maintenance and training program.

Water Distribution Technical Assistance | Citizens Energy Group, Indianapolis, Indiana

Technical Advisor for conveyance planning and management practices. Tasks include evaluating existing practices and recommending process improvements, resource optimization based on latest industry best practices, and assistance with internal and contract staff.

EDUCATION

Artificial Intelligence: Implications for Business Strategy, MIT Sloan School of Mgmt. 2019

Master of Science, Civil Engineering Univ. of Akron 2009

Bachelor of Science, Civil Engineering Univ. of Akron

YEARS OF EXPERIENCE

16

PROFESSIONAL REGISTRATIONS

Professional Engineer, OH (76210), WI(43140-6), IN(PE11600019), KY(31458), FL(81576), VA(0402059056), GA(PE044744)

Envision Sustainability Professional

Class II Water Dist. Operator, OH

D2 Water Dist. Operator, CA

Class I Wastewater Operator

CSI Certified Construction Doc. Tech

Mr. Osthues is a national Technical Director for water and brings extensive experience in the assessment and prioritization of utility infrastructure including treatment plants, pumping stations, storage facilities, water distribution systems and distribution systems. Mr. Osthues has served as technical lead for the development of prioritized capital improvement programs for complex infrastructure across the Country. He is an accredited asset management specialist in the development of performance management programs and infrastructure condition and risk assessment programs for capital planning.

GREG OSTHUES, PE, IAM | TECHNICAL ADVISOR - ASSET MANAGEMENT

EXPERIENCE

Asset Management Program | New York City Department of Environmental Protection (NYCDEP), NY

Asset management lead for development of global risk assessment methodology for use by the three Operating Bureaus within NYCDEP for all wastewater treatment, water supply and water distribution assets in support of capital planning. Risk assessment methodology includes physical and performance condition assessment for mode and probability of failure combined with consequence of failure evaluation. Responsible for developing risk assessment methodology based on International Infrastructure Management Manual® guidelines and adapting for NYCDEP's specific asset base including conducting workshops to build consensus across the Bureaus on the approach and resulting capital plan.

Asset Management Services | Indian River County, Vero Beach, FL

Condition and risk assessment lead for the implementation of a comprehensive asset management program. Phase I condition and risk assessment included a WTP, WWTP a water booster station and four WW pump stations. Activities included visual field assessments, maintenance data review and staff interviews for equipment performance and reliability. Short- and long-term planning results and tools were provided including recommended CIP projects, enhanced maintenance programs, and long-term funding needs based on service levels.

Asset Management Program – Water and Wastewater | Lee County, Fort Myers, FL

Asset management task leader for development of asset condition, criticality and risk assessment methodology for water, wastewater and reclaimed water systems, including: a water plant, wastewater plant, 33 lift stations, 50 miles of sewer and 60 miles of water and reclaimed water distribution. Activities included: development of asset hierarchy, development of assessment methodologies and guidelines with LCU staff, field collection of asset inventory and condition assessment data, criticality evaluation and risk analysis. Results were used to develop estimates of asset effective life and to develop business cases for a prioritized 10-year CIP.

Asset Management Program – Water and Wastewater | Toho Water Authority, Kissimmee, FL

Asset management task leader for development of condition assessment and risk methodology for asset management program involving a wastewater treatment plant, water treatment plant and 47 lift stations. Facilitated workshops with Toho staff to develop customized guidelines for the assessment methodology. Directed the field asset inventory and condition assessment process, including data management and quality assurance. Facilitated workshops to review results and to develop overall risk assessment and the long-term asset renewal and replacement needs.

Asset Management Framework Phase I Miami Dade Water and Sewer Department, Miami, Florida

Condition and risk assessment lead to perform ISO 55000 gap analysis and assist in business process improvements and mapping around service levels and performance management, capital planning, risk assessment, maintenance, and IT systems. Assisted with the development of new SOPs for Condition and Risk Assessment covering all water and wastewater vertical assets for treatment plants and pump stations.

Asset Management Program and Water Master Plan | Greater Cincinnati Water Works, OH

Technical lead for facilities assessment including water treatment plants, booster stations, valve chambers, storage reservoirs, elevated tanks and large maintenance facility. Evaluation included field and desktop assessment for over 5,000 assets involving structural, mechanical, electrical, HVAC and I&C evaluations. Methodology evaluated physical condition and overall performance including

EDUCATION
BSCE Civil Engineering, University of Massachusetts 1987

ME Environmental Engineering, Manhattan College 1994

YEARS OF EXPERIENCE
33

PROFESSIONAL REGISTRATIONS
Professional Engineer - NY

IAM Asset Management Accreditation – Institute of Asset Management

capacity, regulatory and reliability using multiple data sources from process control and maintenance systems. The Master Plan resulted in a 10-year capital improvement program for upgrades and asset renewal and replacement at each facility.

Asset Management Plan for Department of Public Utilities | City of Columbus, OH

Technical lead for overall risk assessment across all DPU's facilities including water treatment, pumping and storage; wastewater treatment and pumping and electric distribution. Physical condition assessment included visual inspection, desktop data review and selected non-destructive testing for over 45,000 assets with evaluations for structural, mechanical, electrical, HVAC and I&C assets. Evaluations were also completed for multiple levels of service including capacity, regulatory and reliability performance. The assessment resulted in a 5-year capital improvement program and a 20-year long-term funding projection.

Asset Management Program and 25-Year Capital Needs Assessment | The Metropolitan District Commission, Hartford, CT

Project manager for development of the District's asset management program including: water distribution, storage and booster stations, wastewater collection and lift stations and four wastewater treatment plants. Program development utilized the ISO 55000 framework and gap analysis and included development of service levels, standard operating procedures for condition, criticality and risk assessment, maintenance program evaluation and business case templates for capital project prioritization. Program resulted in a 10-year CIP for water and wastewater and a 40-yr funding needs projection.

Asset Management Program | The Metropolitan Sewer District of Greater Cincinnati, Cincinnati, OH

Technical lead for development and implementation of the condition and risk assessment methodology for MSDGC's asset management program including multiple wastewater treatment facilities and pumping stations. Activities included field data collection for assessment of physical condition for structural, mechanical, electrical, instrumentation and HVAC assets along with staff interviews to assess equipment and process operating performance. Data management was coordinated to include work history from the Maximo CMMS in evaluating asset reliability and to update the asset register with results of the condition assessment. Results were utilized to develop a prioritized CIP and long-term funding projections.

Mr. Duane's experience includes the design of more than 100 water and wastewater pumping facilities ranging in size from under 1 million gallons per day (mgd) to 2,200 mgd. He is a technical expert in hydraulics, pumping systems and the design of mechanical process systems, and he routinely provides assistance with start-up and troubleshooting of mechanical systems. Throughout his career, Mr. Duane has partnered with clients to provide cost-effective solutions that are functional, practical, maintainable and constructible. He offers exceptional value to clients based on his proven track record of practical design; history of successful project execution and completion; and understanding of the client's needs during design, construction, start-up and post-construction phases of the project. Mr. Duane establishes strong working relationships with each client's staff so that the project team can understand and address the client's desires and requirements.

BRIAN DUANE, PE | TECHNICAL ADVISOR - PUMPING

EXPERIENCE

Elm Fork Water Treatment Plant Pump Station 1 | Dallas Water Utilities, Texas

Technical advisor for 160-mgd high service pump station (four – 40 mgd horizontal split case pumps with 2750 Hp motors) and 160-mgd raw water pump station. Pump motors were water cooled to reduce noise and HVAC requirements. Project included scale hydraulic modeling of suction piping at Clemson Engineering Hydraulics.

City of Hollywood Water Treatment Plant High Service Pump Station | City of Hollywood, Florida

Design engineer for the preliminary design and technical advisor for the final design of 57.6-mgd firm capacity pump station that includes six – 8,000 gpm, 400-hp horizontal split case pumps with VFDs. Project includes scale hydraulic modelling of clear wells at Clemson Engineering Hydraulics to verify suction intake conditions.

Aspinwall Clearwell Replacement Project | Pittsburgh Water and Sewer Authority, Pennsylvania

Technical advisor for the hydraulic evaluation of the Fox Chapel, Breucken, and Aspinwall pump stations to evaluate the impact of pumping water to various reservoirs while the Aspinwall clearwell is removed from service for rehabilitation or replacement. Project included the development of a field testing protocol for measuring the performance and NPSH requirements of the existing pumps.

Central Hillsborough Water Treatment Facility – High Service Pump Modifications | Hillsborough County, Florida

Technical adviser for the troubleshooting and repair of 4 high service pumps that were experiencing severe cavitation problems. Evaluation included scale hydraulic modeling of the inlet piping to the horizontal split case pumps that indicated rapidly varying inlet flow conditions due to the piping configuration. Recommended improvements included minor piping modifications and the installation of flow straightening vanes.

Mitchell Water Treatment Plant Electrical and High Service Pump Improvements | City of Greensboro, North Carolina

Technical advisor for the installation of new horizontal split case high service pumps. Because the suction piping did not meet Hydraulic Institute standards and the pumps were operating in a suction lift condition, scale hydraulic modeling was performed to validate the suction hydraulics for the pump manufacturers.

Quarry A Water Supply Reservoir | Loudoun Water, VA.

Technical advisor for the preliminary engineering and final design of the 40-mgd Quarry A Raw Water Pumping Station. The project consists of a deep shaft pump station located on the quarry rim. The deep shaft is connected to the quarry via horizontal intake tunnels that allow for fill and withdrawal at optimal levels within the water column. Raw water conveyance from the quarry to the water treatment facility is provided by four 1,500 HP submersible turbine pumps located in the deep shaft.

Quarles Water Treatment Plant | Cobb-Marietta Water Authority, Georgia

Preliminary design and evaluation of vertical turbines in cans versus horizontal split case for 100 mgd high service pump station consisting of five, 20 mgd pumps with 1500 Hp motors and VFDs.

Wyckoff WTP HSP #2 Rehabilitation | Cobb-Marietta Water Authority, Georgia

Custom refurbishment of 52-year-old, two-stage, horizontal split case, 1,250-HP, De Laval high service pump. Impellers were removed, sent out for 3D scanning, reverse engineered, and new impellers cast in stainless steel. Motor was replaced with a new 1,500-HP unit.

EDUCATION
BME, Bachelor of Mechanical Engineering, Georgia Institute of Technology, 1981

YEARS OF EXPERIENCE
39

PROFESSIONAL REGISTRATIONS
Professional Engineer, GA, TX, FL, NY, VA

Mr. Knowles is a project engineer with more than 18 years of experience in water, wastewater and reclaimed water engineering. He is experienced in various aspects of environmental engineering from design development through construction administration. His project experience includes water and wastewater treatment facilities, water and sewer distribution systems, and environmental permitting. Mr. Knowles is especially adept at hydraulic modeling using Bentley and Innovyze software as well as the use of geographic information systems (GIS) in planning and design efforts.

MICHAEL KNOWLES, PE | DEMAND PROJECTIONS & MODELING - TASK LEAD

EXPERIENCE

Tallahassee Water Master Plan update (2019-2020) | City of Tallahassee, Tallahassee, Florida

Project Engineer. The City of Tallahassee uses an average of approximately 35 mgd from approximately 30 active wells. The distribution system includes more than 1,200 miles of piping and eight elevated storage tanks. Responsibilities on the master plan update project included reviewing, updating and calibrating the existing hydraulic model using GIS InfoWater; developing water demand projections for the next 20 years; evaluating the current water distribution system and water production capacity; developing alternatives for meeting increased water demands until 2040; and assembling the 20-year CIP and water master plan update report for the city.

Regional System Planning and Engineering Study | Peace River, Manasota Regional Water Supply Authority, Florida*

As project engineer, participated in the inventory of existing water supply sources and facilities, projection of public water supply needs, inventory of existing wastewater and reuse systems, conservation programs, capital improvement programs, assessment of existing and proposed regulations, evaluation of needs vs. existing sources, report preparation, meetings, coordination and administration. The goals of the project were to identify and prioritize preferred long-term water supply projects over a 20-year planning period for the local government entities within the four-county area comprising the Water Planning Alliance.

Water Master Plan and Wastewater Master Plan Updates | Collier County, Florida*

As project engineer, assigned demands to the hydraulic model and imported the GIS infrastructure of the water / sewer / reclaimed water system into WaterGEMS. The first major goal of the master plan updates was to develop a strategic county-wide plan that will guide implementation of cost-effective, reliable, integrated water and wastewater systems. A second major goal was to provide the documentation to support SRF low-interest loan applications to fund construction of proposed water and wastewater projects. The water transmission system and wastewater collection system were modeled using WaterGEMS to determine the improvements required to maintain the established level of service standards.

Reclaimed Water Master Plan and Curtis Hixon Reclaimed Water Pipeline | City of Tampa, Florida*

As project engineer, identified limits for expanding the reclaimed water system based on capturing potential irrigators; determined potential reclaimed water demand and potable water offsets using meter records; identified potential cooling tower locations based on property appraiser shapefiles; located transmission and distribution pipelines based on city shapefiles; identified potential property easements, hazardous sites and permits required for service area expansion based on city, county and state shapefiles; and created and presented posters and PowerPoint shows for three client workshops. The purpose of the project was to develop a master plan with a 20-year planning horizon that will outline the reclaimed water utility growth through build-out with the intent of maximizing the beneficial use of the resource. The project also included the planning, design and permitting of a reclaimed water pipeline from the existing system to Curtis Hixon Park, including a crossing under the Hillsborough River.

South Tampa Area Reuse (STAR) Expansion Evaluation | City of Tampa, Florida*

As project engineer, identified users with large irrigation demands within proximity to the existing reclaimed water system using GIS files. The goal of the project was to identify potential new customers within city limits to received reclaimed water for irrigation purposes, industrial

*Experience with previous firm

EDUCATION
BS Civil Engineering University of South Florida 2002

ME Environmental Engineering Sciences University of Florida 2018

YEARS OF EXPERIENCE
18

PROFESSIONAL REGISTRATIONS
Professional Engineer, Florida

use and other permittable uses. The study also included preparation of example business cases to assist the city in developing financial strategies to help finance the program.

Planned Unit Development Hydraulic Model | Collier County, Florida*

Determined the closest water and wastewater infrastructure (GIS) for new developments to connect to, determined the remaining system capacity and sized the pipelines, and created a GIS figure of the existing and proposed infrastructure. The county wanted hydraulic modeling reviews for 40 proposed PUDs, which are reviewed for conformity to utility standards and adequacy of the existing adjacent utility infrastructure to serve the proposed development.

North County Wastewater Master Plan Update | Manatee County, Florida*

As project engineer, assigned parcels/meter records to sewersheds within GIS; determined existing and future wastewater demands based on GIS files (population projections, land use and meter records); imported GIS infrastructure and demands to create a SewerCAD model; assigned data to the wastewater infrastructure in GIS from Excel sheets (street addresses, wet well diameters, power supply, etc); produced figures for the report; and created and presented posters and PowerPoint shows for client workshops. The scope of services included hydraulic modeling, development of a geo-database using GIS information, population forecasting, wastewater flow projections, collection and analysis of water and wastewater flow estimates, identification of long- and short-term deficiencies and solutions associated with growth, identification of transmission and pumping facility requirements, preparation of a 25-year CIP project list, and preparing a schedule of recommended improvements.

North County Wastewater Model Update Report | Sarasota County, Florida*

As project manager, participated in updating and revising a SewerCAD model of the north service area for the county based on recent flow records that required geo-coding first, then using records drawings and SCADA records. A standard operating procedure for updating future North County wastewater models was drafted for the county to incorporate into a unified SOP for all county wastewater models.

Water-Sewer GIS Boundary Project | Collier County, Florida*

As project manager, translated legal descriptions of the district boundary into a coordinate-correct GIS layer based on section/township/range and parcel shapefiles from the Property Appraiser. The County requested a GIS boundary map of the water and the sewer district boundaries to use as a tool for determining which parcels are in, out or partially within the district boundary.

Ms. Hyer has over 20 years of specific experience in risk based asset management in support of Capital Planning. She has led condition and risk assessments for water, and wastewater infrastructure for projects encompassing pipes, pumping facilities and treatment equipment totaling over 1,500,000 assets. As part of the risk assessments, she has created short- and long-range capital plans using business case templates and triple bottom line analysis. Prior to Arcadis Celine served as the Engineering Director for Hillsborough County Utilities where she was responsible for creating and implementing the 5 year capital plan for all water and sewer infrastructure. She is also a national thought leader on asset management for water utilities and currently serves as the Vice Chair for the AWWA Asset Management Committee and the Water Main Condition Assessment Committee.

CELINE HYER, PE, IAM | FACILITIES ASSESSMENT - TASK LEAD

EXPERIENCE

Asset Management Implementation Phase I and II , Toho Water Authority: Kissimmee, FL

Program Manager for asset management program implementation work for Toho Water Authority's overall asset management program. Tasks included establishing asset hierarchy and definitions, performance measures, performing inventory, condition and risk assessments of 15 water and wastewater treatment plant and 300 lift station assets, creating procedures for prioritizing capital projects, analyzing asset criticality and consequence of failure and modifications to Infor EAM to produce capital planning reports. Phase II task activities will include writing a strategic asset management plan and individual asset management plans by asset class.

Lift Station and Force Main Risk Based Master Plan | Plant City, FL

Technical Advisor for the risk-based capital plan that includes 44 lift stations and force mains. Assets for renewal were selected based upon risk scores and bundled into logical projects. Business case templates will be used to prioritize the projects and capacity needs will be incorporated to make a wholistic 5-Year Master Plan.

Indian River County Condition Asset Management Services | Vero Beach, FL

Project Manager for the implementation of an asset management program. Phase I activities included a formal gap analysis, strategy, pilot condition and risk assessments a one water plant, one wastewater plant and 4 lift stations, and improvements to workflows and data capture in the CMMS. Short and long-term planning results and tools were provided for the pilot including recommended capital projects, enhanced maintenance, and funding needs based on service levels.

Asset Management Framework Phase I | Miami, Florida

Technical Lead to perform a gap analysis and assist in business process improvements and mapping around service levels and performance management, capital planning, risk assessment, maintenance, and IT systems. A condition and risk assessment guidelines process was created to evaluate all treatment plant and pumping stations assets in support of developing the capital plan for renewal and replacement of assets.

Elkhart Asset Management and Capital Planning | Elkhart, IN

Quality Assurance Lead for developing a risk framework to prioritize long-term and short-term capital renewal of separate and combined sewer, water distribution, water and wastewater treatment plants, pump stations, and storage tanks. Procedures and results were documented in an Asset Management Plan.

Comprehensive Asset Management Plan – Facility Audits and 10-Year CIP | Greater Cincinnati Water Works, Ohio

Technical lead and workshop facilitator for development of the overall asset management program, including asset hierarchy and definition standards. Assessment guidelines for visual and desktop condition assessment, consequence of failure and risk were developed for water plants, booster stations, valve chambers, storage reservoirs, and elevated tanks. Program development provided a comprehensive field assessment pilot program across all asset categories for GCWW staff training and knowledge transfer of asset management principles and procedures.

Risk Assessment, Project Prioritization and Asset Management | New York City Department of Environmental Protection, New York

Task leader for the condition and risk assessment of assets covering water, wastewater, stormwater and all facilities owned and operated by NYCDEP, including over 50,000 equipment assets at treatment and pumping facilities and 200,000 pipe assets, including water, sewer and stormwater mains. The outcome of the data collection and

EDUCATION
BS Chemical Engineering, Florida Institute of Technology 1988

MS Engineering Management, Florida Institute of Technology 1989

YEARS OF EXPERIENCE
30

PROFESSIONAL REGISTRATIONS
Professional Engineer – FL

Institute of Asset Management
IAM Certificate

evaluation was a 4- and 10-year capital plan for renewal and replacement of assets based on risk and remaining life. Business case templates and prioritization using a custom Arcadis-designed tool facilitated the CIP creation. Guidelines documents, tools and staff training will allow NYCDEP staff to make this an ongoing program. Tools included a custom asset management information system that stored all risk data, and created business cases. Phase III is underway and will update the CIP through new risk assessment and business cases for treatment plant and pumping assets.

Asset Management Plan | Lee County, Fort Myers, FL

Program Manager to implement a comprehensive asset management program for the county, including an organization assessment, software evaluation and implementation of Lucity CMMS, pipeline, multiple treatment plants, and over 500 lift stations inventory condition and risk assessment program, and workshops to formulate an overall plan and strategies. Guidelines documents, SOP's, short and long term R&R needs, service levels and KPI reporting have also been completed as part of this four phase project which was conducted over a three year period.

AWU Asset Management | City of Austin Water Utility, Austin, TX

Task Leader for phase II asset condition, criticality and risk assessment methodology and pilot project for linear and vertical assets at Austin Water Utility. Austin Water Utility is in process of implementing a comprehensive asset management program including a gap analysis and implementation plan for the first phase and methodology for condition, criticality and risk assessment for renewal and replacement planning for the second phase. Phase II activities included workshops to establish the methodologies and a pilot field condition assessment at one water and one wastewater treatment facility that include over 8,000 assets. Data from the assessments will be loaded into the INFOR EAM software package for renewal and replacement and asset management planning purposes.

Ms. Pomales is a licensed Professional Engineer and Project Management Professional, with a diverse and broad range of experience in program and project management, utility consulting and business advisory, procurement and strategic planning, feasibility and financial analyses, planning, and design. Ms. Pomales is the Florida Area Leader for our Water Business Line and is located in our Plantation office, providing ready access to the senior leadership team of the firm.

MELISSA POMALES, PE, IAM | INTEGRATED CIP PLAN - TASK LEAD

EXPERIENCE

Risk and Resilience Assessments for PRASA Large Water Systems | Puerto Rico Aqueduct and Sewer Authority, San Juan

Project Manager and QA/QC lead for the completion of risk and resilience assessments for five large water systems (total population served of approximately 1 million), in support of compliance with America's Water Infrastructure Act of 2018.

Wastewater Pump Station Asset Management and Master Plan | City of Plant City, Florida

Quality assurance and capital planning task technical advisor for asset management activities and development of a wastewater pump station master plan.

Planning, Engineering and Environmental Services for San Francisco Seawall Earthquake Safety and Disaster Prevention Program | Port of San Francisco, San Francisco

Program Controls Leader for the $450 million Seawall earthquake and resilience program, providing program-wide schedule, budget, contract administration and oversight.

Asset Management Framework Development | Miami-Dade Water and Sewer Department, Miami

Project Manager for the development of an enterprise-wide Asset Management (AM) Framework to implement across water and sewer with optimized business practices, an effective technology portfolio and high-level organizational awareness for staff knowledge and training.

Public-Private Partnership for Automated Metering Infrastructure and Customer Service Optimization | Puerto Rico Aqueduct and Sewer Authority, San Juan

Project Manager and Lead Technical Consultant for the development of a public-private partnership to optimize customer services and deploy an Automated Metering Infrastructure program.

Facility Assessments of Hurricane Maria Recovery Efforts for Water and Sewer Infrastructure | Puerto Rico Aqueduct and Sewer Authority, San Juan

Principal in Charge for team leading facility assessments and developing preliminary cost estimates for all water and sewer infrastructure owned and operated by the Puerto Rico Aqueduct and Sewer Authority (PRASA). Lead consultant providing support for insurance claims and FEMA requests.

Program Management of Hurricane Sandy Recovery and Resiliency Portfolio Project Controls | NYC Mayor's Office of Recovery and Resiliency (ORR), New York

Program Manager for embedded team within the New York City Mayor's Office of Recovery and Resiliency, charged with providing monitoring and oversight services of the Recovery and Resiliency program, totalling over 1,000 projects with a combined program budget of $23 billion. Managed a team of five full-time and eight part-time (remote) employees. Supported client in development of strategy and plan for transitioning program tracking, controls and monitoring activities to internal ORR team.

Program and Project Management - Capital Improvements Program | Puerto Rico Aqueduct and Sewer Authority, Puerto Rico

Principal in Charge for Program Management services for PRASA's operational regions (North and Metro Region). Managed resources and workload assignments and oversaw quality program for program team. Performed pre-construction management services including interagency coordination, stakeholder communication and engagement, coordination of planning and permitting, management of design process and quality assurance, and management and support of bid process.

EDUCATION

M.B.A. / M.S. Finance
Indiana University
Kelley School of Business (2014)

M.E. Civil (Structural) Engineering, Cornell University (2004)

B.S. Civil Engineering, Cornell University (2003)

YEARS OF EXPERIENCE

17

PROFESSIONAL REGISTRATIONS

Professional Engineer

Puerto Rico, Lic. 20405

Florida, Lic. 81761

Program Management for Consulting (Bond) Engineer Requirements | Puerto Rico Aqueduct and Sewer Authority, Puerto Rico

Program Manager of all Consulting/Bond Engineer annual responsibilities, including deliverables per Master Agreement of Trust with bondholders, supported issuance of more than $3 billion in municipal bonds to fund capital program. Managed communication with PRASA and other stakeholders, including legal counsel, banking team, rating agencies, and local government agencies.

Comprehensive Energy Management Program Development | Puerto Rico Aqueduct and Sewer Authority, Puerto Rico

Program Manager in charge for the development of PRASA's Comprehensive Energy Management Program. Managed procurement efforts for power purchase agreements and energy performance contracts. Led team in the development of due diligence and strategy development for regional operational initiatives. Supported PRASA in all interagency and stakeholder communication and engagement efforts.

Procurement Services – Various | Puerto Rico Aqueduct and Sewer Authority, Puerto Rico

Project Manager and lead consultant for various procurement processes for strategic operational initiates and projects including:

- DBF procurement for the Valenciano Regional Aqueduct System (a $250 million multi-component project that includes a dam, reservoir, 15 MGD water treatment plant, and transmission system).
- Procurement of a Program Manager for utility information technology services for PRASA's Global Technological Innovation and Renovation Program.
- Procurement and contract development of the operation and maintenance services for the Superaqueduct 100 MGD water treatment plant.
- Procurement and contract development of a customer Geodatabase and of AMR/AMI technologies.
- Procurement of a fleet management services provider.

Climate Change and Vulnerability Assessment | Puerto Rico Aqueduct and Sewer Authority, Puerto Rico

Project Manager for the development of a climate change vulnerability assessment and adaptation planning for PRASA's assets. Oversaw project development, led project strategy development, and oversaw quality control and quality assurance.

Climate Change and Vulnerability Assessment | Autoridad de Transportación Integrada, Puerto Rico

Principal in Charge for the development of a climate change vulnerability assessment and adaptation planning for ATI's assets. Oversaw project development, led project strategy development, and oversaw quality control and quality assurance.

Asset Condition Assessment | Puerto Rico Aqueduct and Sewer Authority, Puerto Rico

Project Manager for the bi-annual asset condition assessments of PRASA's assets. Conducted assessment of compliance records, operational practices and physical condition (visual inspections) of over 100 of PRASA's assets. Led team that has performed over 1,500 assessments of PRASA's assets.

Asset Condition Assessment for 100 MGD Superaqueduct System | Thames Water Puerto Rico, Inc., Arecibo, Puerto Rico

Project Manager for two facility condition assessments of the Puerto Rico North Coast Superaqueduct facilities. Conducted asset assessments of a 100 MGD raw water pump station and water treatment plant, and seven interconnection points that include storage tanks and pump stations.

Ms. DaCunha specializes primarily in water and wastewater-related design, water modeling, and infrastructure condition assessment. Specifically, she has assisted in several condition assessments; completed designs and calculations; performed data collection and analysis; completed hydraulic analysis of several water distribution systems and created GIS maps/figures; developed cost estimates and assisted in report, specification and contract writing; and several permitting and funding applications.

LAUREN DACUNHA, PE | DEMAND FORECASTING & MODEL CALIBRATION

EXPERIENCE

Model Update and Calibration | City of Hollywood, FL

Arcadis was tasked with upgrading the City's hydraulic water model to better represent the existing system. As a part of this model update and calibration, completed field C-factor and hydrant testing in the City's water distribution system with City staff. Assisted in the analysis of field data and existing SCADA data to determine a calibration day for the model. Reviewed population projection data up to the projected 2035 planning horizon and gathered proposed system improvements to be implemented into the model to apply demand for current and future scenarios and model calibration to provide the City with a realistic planning tool for the future and contributed to the training of City staff to use their newly calibrated model.

2020 Master Plan Update | City of Tallahassee, Tallahassee, FL

The City of Tallahassee uses an average of approximately 35 mgd from approximately 30 active wells. The distribution system includes more than 1,200 miles of piping and eight elevated storage tanks. Responsibilities on the master plan update project included reviewing, updating and calibrating the existing hydraulic model using GIS InfoWater; developing water demand projections for the next 20 years; evaluating the current water distribution system and water production capacity; developing alternatives for meeting increased water demands until 2040; and assembling the 20-year CIP and water master plan update report for the city.

Vertical Asset Condition | Tohopekoliga Water Authority, Kissimmee, FL

Entered information from field investigations assessment sheets for five water and wastewater treatment plants, contacted manufacturers, obtained information, and helped develop cost estimates for the associated equipment.

Lift Station Condition Assessment 2011 | Tohopekoliga Water Authority, Kissimmee, FL

Entered data from field investigations of sanitary lift stations.

Drinking Water Master Plan | Sewerage and Water Board of New Orleans, New Orleans, LA

As part of the water quality master plan development for the Algiers (40-mgd capacity) and Carrollton (160-mgd capacity) WTPs, analyzed the water system asset evaluations and notes from a site visit to the plants, helped to identify needs in the WTPs, prepared a detailed EOPCC for major components requiring attention, developed other costs for the projects over the 20-year CIP, and compiled the water quality master plan components for both of the WTPs over their 20-year planning periods.

Pinebrook Booster Station Evaluation | City of Venice, Venice, FL

The City of Venice owns and operates the Pinebrook Booster Station, which includes a 1.5-MG ground storage tank and two vertical turbine pumps. The original design of the pump station included autonomous control, but this control does not work effectively, resulting in control issues when running with the water treatment plant's high service pumps. As part of the modeling and design for the project, calibrated the city's hydraulic model, evaluated alternatives for the control issues for the Pinebrook pump station, and presented solutions in a report for the City.

Reverse Osmosis Water Treatment Plant Carbon Dioxide Feed System Replacement | City of Venice, Venice, FL

Performed preliminary take offs and developed a cost estimate for the carbon dioxide feed system replacement project for the city's reverse osmosis water treatment plant.

EDUCATION
BS Civil & Environmental Engineering University of South Florida 2014, Minor in Communication

YEARS OF EXPERIENCE
11

PROFESSIONAL REGISTRATIONS
Professional Engineer – FL

Howard F. Curren Water Reclamation Facility Permit Renewal | City of Tampa, Tampa, FL

In support of the facility's permit renewal effort of their 96 MGD permitted WRF, developed permit package components including permit application forms, which involved analyzing and reviewing data for the permit forms. Drafted a process flow diagram in CAD for the permit.

Citywide Environmental Review | City of Tampa, Tampa, FL

As part of a citywide environmental review, compiled information about the city to be incorporated into the review, such as airport clear zones, coastal areas, energy consumption, fire and medical emergency services, health care and social services, historic properties, wetlands, and wild and scenic river information.

SWWRF - Final Design and Permitting Services, Bidding Services | Orange County, Orlando, FL

As part of the design of the new Greenfield Wastewater Treatment Plant, responsible for odor sampling at a neighboring WWTP to design the new plant to the same standards. Responsible for the design of the pretreatment structure, including screens, grit removal tanks, and coordination items with other subconsultants on the project. Responsible for design of the reject pond and pump station.

Distribution System Water Quality Audit | Hillsborough County Public Utilities Department, Tampa, FL

Hillsborough County requested Arcadis to evaluate their distribution system operation and maintenance practices and treatment alternatives to improve distribution system water quality. As a part of this evaluation, reviewed historical water quality, analyzed water age in their distribution system using their hydraulic model, and assisted in distribution system water quality audit report writing to improve the distribution system water quality for the County.

Pump Station Master Plan | City of Plant City, FL

As a part of the City's Pump Station Master Plan, participated in the condition assessment of the lift station assets for the City's 44 wastewater lift stations, compiled assessment information and assisted with scoring, produced the mechanical asset EOPCC, assisted with the Master Plan writing and workshops with the Client.

Marc Killingstad is a Technical Expert (Groundwater Hydrologist) and is currently the Director of the Hydrogeology Community of Practice as well as the technical lead for the Remediation Hydraulics Practice Area for Arcadis North America (NA). He has extensive experience and knowledge in applying state-of-the-art concepts and principles of quantitative hydrogeology to support site investigation and remedial design work and to help resolve water supply issues/support water resources investigation work in a wide variety of geologic settings throughout North America, South America, Africa, Australia, and Europe. He has been principal investigator on numerous groundwater flow and solute transport modeling projects and has participated in regulatory meetings and provided litigation support in which modeling/quantitative hydrogeology was used to support negotiations.

MARC KILLINGSTAD, PE | WATER SUPPLY PLANNING

EXPERIENCE

Groundwater/Water Supply Resource Management | Hillsborough County, City of Tampa, City of Plant City, and City of Temple Terrace, Florida

Assisted in preparation of the Tampa Bay Regional Integrated Water Resource Partnership Feasibility Study, Phase II (i.e., regional reclaimed water feasibility/master plan). The project was a continuation of the evaluation of the water resource benefits to the region by recharging the groundwater system in the Southwest Florida Water Management District's (SWFMD) Water Use Cautionary Areas (WUCAs) in the Tampa Bay Region. The project included an evaluation of direct recharge within the Southern WUCA (SWUCA) and Most Impacted Area (MIA), utilizing reclaimed water from Hillsborough County and the City of Tampa, as well as recharging (direct and indirect) within the Northern Tampa Bay (NTB) area and Dover WUCAs utilizing reclaimed water from Hillsborough County and the City of Plant City. As part of this feasibility study, Arcadis coordinated, directed, reviewed, performed (along with sub-consultants), and documented a numerical modeling analysis to evaluate recharge potential in the selected areas. The numerical modeling analysis will include both surface water and groundwater analysis using a combination of models available for the region: including the Integrated Northern Tampa Bay (INTB) Hydrologic Model (a combination of MODFLOW [groundwater] and HSPF [surface water] models) and SWFMD's District Wide Regulation Model (DWRM) (MODFLOW [groundwater]).

Specifically, the numerical modeling analysis performed for the SWUCA and MIA evaluated the benefits of coastal aquifer recharge relative to mitigation of declining groundwater levels (e.g., freshwater head) across the region, which has resulted in salt water intrusion along the coast. As such, the modeling analysis for the SWUCA/MIA focused on simulating the application of direct recharge to the mineralized portion of the Upper Floridan Aquifer (UFA) system where saltwater intrusion has occurred along the coast with the objective of retarding saltwater intrusion and protecting drinking water resources located further inland. Numerous recharge scenarios were developed and performed, and the simulated water level changes resulting from the applied recharge were evaluate for each scenario using the SWFWMD saltwater intrusion minimum aquifer levels (SWIMAL) monitoring points distributed across the MIA.

The objective of the modeling analyses performed for the Northern and Dover WUCAs to determine whether beneficial reuse could effectively offset seasonal declines in groundwater levels due to crop production and frost-freeze events. The modeling analyses in this area also evaluated the effects that aquifer recharge has on minimum flows and levels (MFLs) and water resource concerns near Lake Thonotosassa and Cone Ranch incorporating both surface water and groundwater modeling utilizing the INTB Hydrologic Model.

Expert/Peer Review | Miami-Dade County, Florida

On behalf of Miami-Dade County, reviewed several groundwater flow and/or fate and transport analyses/models related to re-development of brownfield sites located throughout the county. Hydrologic analyses/modeling generally focused on evaluating potential impacts of subsurface stormwater management systems on contaminated groundwater beneath the sites. Peer reviews generally consisted of assessing applicability of the selected hydrologic model or approach, evaluating the hydrologic parameters (transmissivity, hydraulic conductivity, specific capacity, etc.), replicating model simulations and validating output, and, as necessary, verifying model calibration and sensitivity analysis.

EDUCATION

MS Civil Engineering Virginia Polytechnic Institute and State University 1996

BS Civil Engineering Pennsylvania State University-Main Campus 1989

YEARS OF EXPERIENCE

25

PROFESSIONAL REGISTRATIONS

Professional Engineer - MD

Former Chemical Storage and Distribution Facility | Confidential Client, Tampa, Florida

Lead hydrogeologist that managed/oversaw development of a complex three-dimensional numerical groundwater model capable of simulating groundwater flow (MODFLOW) and solute transport (MT3D) of chlorinated hydrocarbons at a site located within the Gulf-Atlantic Coastal Plain physiographic province—including groundwater flow within the surficial aquifer system, water-bearing zones of the Hawthorn Group, and the Floridan Aquifer System (FAS). An existing site groundwater model was previously developed by another consultant to help evaluate and select potential remedial alternatives for impacted groundwater beneath the former chemical storage and distribution facility. Based on data collected during additional site investigation work, the original model that was developed for the site was deemed to be deficient. Therefore, the conceptual site model (CSM) was refined and the existing site groundwater model was revised to formulate and support an effective remedial strategy for the site. The revised site model development consisted of development and calibration of a larger 'regional' flow model, which utilized the Southwest Florida Water Management District's (SWFWMD) District-Wide Regulation Model (DWRM) to be consistent with and integrate the dynamic groundwater flow conditions across this region, and then creating a smaller sub-model to represent and evaluate flow and contaminant transport within the immediate site vicinity.

Given the complex geologic environment and migration potential of site-related chlorinated contaminants within this setting as well as site-specific constraints, a planned phased (iterative) approach was adopted as part of the remedial and regulatory strategy development process. The preliminary modeling analysis, data gap identification, subsequent field investigation followed by model updates and recalibration resulted in a robust and representative site numerical model. Presentation of the model and corresponding analyses to the agency was an integral part of regulatory negotiations/discussions regarding remedial actions at the site.

VOC Remediation in Municipal Well Field | Confidential Client, Stuart, Florida

Lead hydrogeologist responsible for revising and refining existing three-dimensional numerical groundwater flow model (MODFLOW) to help evaluate and optimize groundwater recovery/hydraulic containment for a portion of a shallow drinking water aquifer used for municipal and private water supplies impacted by chlorinated solvents.

Due to the contamination, the municipality lost one-third (up to 1.3 million gallons/day) of its drinking water supply. Regulatory agencies (USEPA and Florida Department of Environmental Protection [FDEP]) suspected a nearby aerospace manufacturing facility as the source of the chlorinated solvent contamination. EPA Administrative Orders and FDEP Consent Orders were issued for the completion of site initial corrective actions, facility investigation, and a final corrective measures study, including active groundwater recovery/containment system, monitoring, and reporting.

On behalf of the aerospace facility, Arcadis developed, negotiated and implemented a streamlined remedial process to comply with the orders focusing the initial site efforts on the immediate restoration of private and municipal drinking water supplies. Development and application of a site-specific groundwater flow model along with supporting studies were utilized to design and implement a groundwater recovery and treatment system in strategic chlorinated solvent 'hot spot' locations to fully contain and reduce plume extent/magnitude and, at the same time, restore the drinking-water supply lost by private and municipal suppliers.

The site-specific groundwater flow model was originally developed by Arcadis in 1990 to serve as a design basis for the current Interim Corrective Measures (ICM) Recovery System and, consequently, it provides regional and local-scale simulation of the groundwater conditions in the study area. Since that time, the model has been utilized and updated a number of times (e.g., refinement of finite-difference grid and updated boundary conditions) to help evaluate site-specific groundwater flow questions (e.g., evaluate potential recovery scenarios and model predicted groundwater flow paths and influence on the VOC plumes).

Once plume containment/reduction was demonstrated and water supplies restored, reduced investigation/corrective measures were implemented by Arcadis. The streamlined approach to chlorinated solvent remediation in a municipal well field saved several years of closure and an estimated $0.5 million in implementation costs for federal RCRA investigation/corrective measures and State remedial cleanup. The development and application of the site-specific groundwater flow model was a critical component of this work.

Mr. Chaparro has experience in municipal drinking water and wastewater treatment master planning, design, and special evaluations. Experience in drinking water treatment includes condition assessments, plant optimization evaluations, water quality planning, treatment process evaluations, facility planning, Safe Drinking Water Act compliance assessments, corrosion control treatment evaluations, chemical feed system evaluations, and residuals handling and disposal evaluations and design.

SEAN CHAPARRO, PE | TREATMENT CAPACITY & PERFORMANCE EVALUATION

EXPERIENCE

Chlorine and Ammonia Feed System Assessments for Implementation of Four-Log Disinfection | City of Hollywood, Hollywood, FL

Lead engineer on study to determine necessary modifications to the existing chlorine and ammonia systems to achieve four-log virus inactivation at the City's water treatment plant.

20-Year Water Master Plan | City of Venice, Florida

Project manager and technical lead for a comprehensive water master plan and 20-year capital improvements program for the 4.2 mgd reverse osmosis water treatment plant (RO WTP). The project included a detailed assessment of raw water supply, treatment, pumping and distribution system needs (including hydraulic modeling) and improvements to meet future growth projections, address redundancy needs, meet increasingly stringent regulatory requirements, and to provide for the rehabilitation or replacement of equipment.

Collins Park Water Treatment Plant CIP Master Plan | City of Toledo, Toledo, OH

Served as Technical Lead for the regulatory, water quality, treatment process, condition and plant optimization assessments completed as part of the development of a comprehensive water master plan and 20-year needs assessment for the City of Toledo's 120 mgd Collins Park WTP. The project included inspecting, evaluating and assessing the suitability and condition of the City's source of supply and WTP to identify system deficiencies, equipment deterioration, operational constraints, and process issues related to compliance with long-term water quality goals and regulatory requirements. A detailed optimization assessment was completed to identify "low-hanging fruit" that could help the City improve treatment performance and/or reduce operating costs.

Water Treatment Plant Audit and Facilities Master Plan | Greater Cincinnati Waterworks, Cincinnati, OH

Developed situational audits for on-site residuals management and disposal options for each of GCWW's water treatment plants, which include a 220 MGD surface water treatment plant and a 40 MGD groundwater treatment plant. The situational audits provided a review of on-site residuals management and disposal practices as they relate to present and future regulatory requirements, and/or constraints which have the potential to impact treatment operations and maintenance at each of these plants.

Carrollton and Algiers WTPs Water Quality Master Plans | Sewerage and Water Board of New Orleans, New Orleans, LA.

Served as technical lead for the water quality, regulatory compliance, and treatment process assessments for the development of a comprehensive water quality master plan and 20- year capital improvement program for the City's Carrollton (144 mgd avg. flow) and Algiers (12 mgd avg/. flow) Water Treatment Plants. The project included a detailed assessment of all process mechanical equipment, systems and treatment performance with respect to water quality goals and key regulatory requirements

Water/Wastewater Infrastructure Master Plan and Comprehensive Energy Management Program | Puerto Rico Aqueduct and Sewer Authority, San Juan PR.

Served as planning specialist for the development of a comprehensive Infrastructure and Compliance Master Plan and 20-year CIP for all the water and wastewater systems in Puerto Rico. The assessment included 1 evaluating current operating and treatment practices and needs, 2 identifying potential service area expansion

EDUCATION

MS, Environmental Engineering, University of Wisconsin-Madison, 2002

BS, Environmental Engineering, Michigan Technological University, 2000

YEARS OF EXPERIENCE

18

PROFESSIONAL REGISTRATIONS

Professional Engineer – FL, GA, MI

Con Documents Technologist - State Issued - CDT

and system optimization/ consolidation opportunities, 3 identifying opportunities to improve reliability of service, 4 identifying improvements to ensure future regulatory compliance, 5 identifying improvements to ensure supply and treatment capacity needs are addressed and 5 developing alternatives and associated costs. Multiple types of water and wastewater treatment systems were assessed, including groundwater, conventional, package, and membrane systems for water treatment; and primary, secondary and advanced treatment facilities for wastewater treatment.

Water Treatment Plant Corrosion Control Treatment Update and Simultaneous Compliance Assessment | City of Bay City, Bay City, MI

Provided a lead role in completing a comprehensive evaluation of corrosion control treatment, softening/coagulation practices, and related simultaneous compliance issues at the Bay City Municipal Water Treatment Plant. The assessment assisted Bay City in identifying treatment modifications that were required to re-establish optimum corrosion control treatment while maintaining compliance with other critical regulatory requirements and water quality goals. The investigation included: 1 evaluation of existing water quality conditions; 2 evaluation of existing corrosion control treatment, disinfection, and softening/coagulation practices; 3 evaluation of various holistic water quality management strategies; and, 4 recommendation of improvements required to address corrosion control treatment, DBPs, and other simultaneous compliance issues.

Water Treatment Plant Audit and Facilities Master Plan | Greater Cincinnati Water Works: Cincinnati, OH.

Developed situational audits for on-site residuals management and disposal options for each of GCWW's water treatment plants, which include a 220 MGD surface water treatment plant and a 40 MGD lime softening groundwater treatment plant. The situational audits provided a review of on-site residuals management and disposal practices as they relate to present and future regulatory requirements, and/ or constraints which have the potential to impact treatment operations and maintenance at each of these plants.

Northeast Water Treatment Plant Needs Assessment and 10-Year CIP Program | Detroit Water and Sewerage Department, Detroit MI.

Completed a 10-year Capital Improvements Program for the Detroit Water and Sewerage Department 300-MGD Northeast Water Treatment Plant. A comprehensive condition assessment was conducted to identify critical infrastructure needs for treatment process equipment, electrical facilities, instrumentation and controls, building mechanical/HVAC, and structural/architectural rehabilitation. The project included a comprehensive water quality compliance assessment of the current status of treatment performance at the plant and identified key treatment infrastructure improvements necessary to maintain and improve treatment performance relative to existing and future SDWA regulatory requirements.

Joan Fernandez is a licensed Professional Engineer with a diverse and broad range of experience in the business consulting, civil, and environmental fields. She has over 15 years of experience in project management, planning, design, permitting, procurement and construction management. During her professional career Ms. Fernandez has worked closely with various internal and external stakeholders staff at all levels, consultants and contractors in conducting contract negotiations, presentations, workshops, and project implementation. Ms. Fernandez continues to be involved in the development and delivery of Capital Improvement Projects (CIP) for various clients valued at more than $15 million including City of Sunrise, City of Boynton Beach, City of Hollywood and Miami-Dade Sewer and Water Department.

JOAN FERNANDEZ, PE, IAM | ALTERNATIVES EVALUATION & COSTING

EXPERIENCE

Bond Engineering Services | Miami-Dade County Water and Sewer Department, Miami, Florida

Provided bond engineer consulting services for the largest water and wastewater utility in the Southeastern U.S., which serves nearly 2.3 million people each day, through the development of Miami-Dade WASD Bond Consultant's Reports. Organized and conducted inspections of water and wastewater infrastructure including water treatment facilities, wellfields, water storage and remote pumping facilities, wastewater treatment facilities, and wastewater pumping stations. Analyzed data in asset management software, Orion and AssetHound, to generate facility inspection reports elaborating on the physical and operating conditions of system components. Coordinated with WASD staff and operators to process and communicate data relating to water and wastewater parameters, current flows, and future flow projections. Incorporated information into reports which highlight the adequacy of the Department's capital improvement program, the adequacy of the renewal and replacement funding, the condition and operations of water and wastewater facilities, and the Department's compliance with bond covenants to debt service and other financial conditions.

Asset Management Framework | Miami-Dade County Water and Sewer Department, Miami, Florida

Deputy Project Manager. Served as the Deputy Project Manager to assist the Department with the development of the Asset Management Framework that will supports its staff and align work practices, decision making and overall operations with defined goals and objectives. This project evaluated existing business practices associated with existing Asset Management efforts and provided guidance to the Department about best practices and methods needed to achieve International Standards Organization (ISO) Series 55000 certification. The scope of the Phase 1 of the AM Framework included:

- Performed an assessment that provides a high-level review of M-D WASD's current asset management practices related to Practices and Processes, Information Systems and Data and Knowledge.
- Documented 'as-is' AM business processes and identified areas of improvement.
- Performed a Strategic Asset Management Gap (SAM GAP) Analysis to identify current gaps and set priorities for the three core elements – Practices and Processes, Information Systems and Data and Knowledge.
- Developed concept level 'to-be' AM business processes to align with ISO 55000 requirements.
- Identified relevant key performance indicators (KPIs) and developed benchmarks for these KPIs.

Lift Station and Force Main Master Plan | Plant City, Florida

Task Manager. Task lead for the development of a risk-based evaluation of 40 wastewater lift stations and force mains for informed, fact-based decisions to be made with respect to capital and maintenance expenditures. The master plan includes a 20-year planning horizon with a more detailed 5-year Capital Improvement Plan (CIP) for nearer term projects. Various tasks performed include: development of condition and risk assessment guidance documentation, development of equipment inventory at each lift station, and evaluation of asset condition and failure risk results for each lift station and force main.

EDUCATION

MS Environmental Engineering, Florida International University, 2007

BS Environmental Engineering Sciences, University of Florida 2004

YEARS OF EXPERIENCE

15

PROFESSIONAL REGISTRATIONS

Professional Engineer – MD, FL

PACP/MACP/ LACP Certified

Institute of Asset Management Certification

Institute of Asset Management Certification

AWIA Risk & Resilience Assessment | City of Hollywood, Hollywood, Florida

Served as the Project Manager for the City of Hollywood American Water Infrastructure Act (AWIA) Risk & Resilience Assessment project. Followed American Water Works Association (AWWA) J100-10 Standard Risk and Resilience Assessment Methodology, which has been endorsed by USEPA, to conduct a risk assessment of the physical and cyber assets of the City's water system. Oversaw project management activities and collaborated with the City and internal team members to schedule meetings, issue requests for information, prepare materials, facilitate workshops, develop meeting minutes, and provide project status updates. Worked with internal stakeholders to identify critical facilities, assets, and threats, as well as the consequences and vulnerability of the system to such threats. Reviewed the risk and resilience profile (financial and operational) of the water system and summarized results and recommendations to improve the City's understanding and preparedness for potential hazards.

Water and Wastewater Master Plan Update | City of West Palm Beach, FL

Project Manager/QAQC. Team leader on the update of water and wastewater demand forecasts, and hydraulic modeling to assess the impact of planned downtown developments on the adequacy of existing pumping and conveyance infrastructures.

A task of this project included the design and permitting for the connection from either the 8-in main (WSP28993) or the 12-in water main (WSP28987) to the 42-in DIP transmission main (WSP25671, WSP29646) located on the north side of Banyan Boulevard by the WTP to add redundancy to the system in case the 36-in transmission main fails.

Mr. Heltzel specializes in information management and application development related to asset management. He has extensive experience in managing IT projects, including implementations of geographic information systems, computer-aided design software, hydraulic modelling, computer maintenance management systems, financial information systems, and condition assessment software. Additional experience includes custom and retail software development, Local Area Network and Wide Area Network design and administration, corporate email, and relational database administration.

CHRIS HELTZEL, GISP, IAM | PLANNING DECISION SUPPORT TOOL

EXPERIENCE

Asset Management | Indian River County Department of Utility Services, Vero Beach, FL

Information management lead to support the IRCDUS asset management program. The SEMS CMMS asset inventory and work order data and several short-term changes were identified that would improve functionality, data capture and reporting for IRCDUS. These recommendations included using the new asset and hierarchy definitions to update the inventory; updating the work order type and reason codes; creating SOPs for work order generation through closeout; and developing report templates to track asset failures and maintenance KPIs. These changes were coordinated with the SEMS implementation team and a Microsoft Power BI dashboard was created to report metrics from the CMMS.

Large Diameter Pipeline Evaluation and Replacement Program | JEA, Jacksonville, FL

Technical lead for configuration or the risk-based capital improvement plan prioritizing rehabilitation and replacement of sanitary gravity and force mains and water transmission mains. Piping assets are assigned a consequence of failure score based on triple bottom line factors associated with economic, social and environmental impacts. Estimated useful life deterioration curves are coupled with nondestructive testing results to determine the pipes; current and future likelihood of failure based on a 1 (low) to 5 (high) scale. 30 -year budget scenarios were created to show how much funding would be needed to meet risk and condition service levels.

GIS Data Conversion | City of St Petersburg, St Petersburg, FL.

Mr. Heltzel provided technical support and quality control for the migration of the City water distribution and sanitary sewer and stormwater collection system datasets from an Autodesk AutoCAD Map Geographic Information System (GIS) platform to the Esri ArcGIS platform. This migration transferred the source data into the ArcGIS Local Government Information Model (LGIM). Additionally, ArcGIS Infrastructure Network Editing (INE) templates and the Attribute Assistant tools were configured to support maintenance of these datasets. The resulting data was in a City Oracle 10g R2 spatial database. Concurrent with this project, ICS is contracting with a separate firm for Esri software implementation, training, and support services. Arcadis coordinated with this firm to ensure that their implementation and the data migration went smoothly. The Arcadis Data Profiler tool was used to document all attribute values from the original source datasets. Extract, transform and load routines were used to migrate the data to the target LGIM database. The Data Profiler was then used to document the resulting attribute values and then verify that all appropriate data was transferred properly. As part of the final deliverable, a map document was created with feature symbology for water, sanitary sewer and stormwater features, similar to those in use with the Autodesk system.

Linear Asset Risk Assessment, Prioritization, and Asset Management | New York City Department of Environmental Protection (NYCDEP), New York, NY

Mr. Heltzel led the data management task of the water and sewer main risk assessment and capital planning activities to enhance current rehabilitation and replacement (R&R) planning and budgeting projections for this infrastructure. Data from the ArcGIS geographic information system, the Hansen computerized maintenance management system and other related sources were utilized to assess the current performance and condition of the sewer and Watermains versus the established service levels. The data analysis to assess current performance and assign consequence of failure provided the framework to evaluate risk and rank water and sewer mains for capital planning prioritization. Critical data gaps were identified and recommendations were provided for the DEP to initiate the most cost-effective inspection and assessment programs required to close the gaps and further enhance the risk evaluation over time. The pertinent data was compiled for use in the KANEW statistical model to produce 50-year cost projections for water and sewer main R&R needs.

EDUCATION

MA, Engineering, Technology Kent State University, 1987

BS, Aerospace Engineer, Kent State University, 1986

YEARS OF EXPERIENCE

32

PROFESSIONAL REGISTRATIONS

Asset Management - Institute of Asset Management

Water Master Plan | Client: City of Columbus, Columbus OH

Mr. Heltzel provided guidance to link the City GIS to the hydraulic model being developed as part of this project. The GIS and hydraulic model did not have a common ID to link the two systems. A process was developed and executed to establish globally unique ID for each water pipe, valve, hydrant and fitting. Those IDs were then associated with the water model feature. This allows sharing of data between the systems and refinement of the model based on GIS information. A condition and criticality analysis was also conducted to develop a 50-year rehabilitation and replacement (R&R) program. This program utilized historic main break data, recommended fire flow improvements from the hydraulic model and proximity to geographic features to determine R&R priority. The R&R planning was enhanced by using the Linear Extended Yule Process statistical analysis to better predict the deterioration of Watermains in the future.

Asset Management Support | Water Engineering Division, Akron, OH

Information management lead to support enhanced asset management practices at the water supply plant (WSP) and remote booster pumping stations (BPS) for compliance with Ohio Senate Bill 2 Asset Management Program (AMP) requirements as administered by the Ohio EPA. Arcadis staff conducted a detailed inventory and condition assessment of the assets at the plant and remote booster pumping stations. Assets were marked with aluminum tags stamped with a unique identifier and barcode that was then incorporated into the City's CMMS for asset tracking purposes. Arcadis is developing a Capital Improvement Plan (CIP) for the WSP and the BPS based on the risk assessment results. The final risk calculations allow the City to bundle assets into logical projects and then to rank those projects for funding and implementation. Going forward, as needs and budgets change, the City will be able to select projects to accelerate or defer to confidently understand and manage the overall risk profile for the City. A review of the GIS, Cityworks CMMS, and Riva software systems was conducted to ensure the appropriate data fields and configuration parameters were incorporated to best meet the City's asset management goals and requirements under Senate Bill 2.

Water Distribution Optimization | City of Flint, Flint, MI

Data Management Task Lead supporting coordination between the hydraulic modeling and the replacement planning model and supporting information sources such as GIS and survey work. There were numerous versions of supporting data that were reconciled to develop a final, best representation of the water distribution system. The GIS was updated to include this data in the Esri local government information model schema, so it could be effectively shared with the hydraulic model, replacement planning model and a new Cityworks CMMS. Mr. Heltzel developed the risk-based replacement planning model including 20-year funding scenarios. The replacement model utilized results from the hydraulic model to assign consequence of failure and performance condition in conjunction with other factors to arrive at a risk score for each watermain asset. The scenarios incorporated near-term budgets and projects that had already been defined and then predicted future replacements to achieve risk and service level goals.

Watermain Replacement Planning | City of Sugar Land, Sugar Land, TX

Data Management Task Lead on the risk-based replacement plan for approximately 500 miles of Watermains serving the City of Sugar Land residents. The project included the establishment of service levels to define pipe end of life, an evaluation of past failure history to determine the likelihood of failure by pipe cohorts, as well as an analysis of the social, environmental and financial impacts of pipe failure to assign the consequence of failure. The Arcadis renewal and replacement planning system, RRPS, was used to complete the short and long-term needs analysis and training and transfer was provided to City staff for future updates.

Asbestos Cement Pipe Replacement Master Plan | City of San Diego, San Diego, CA

Mr. Heltzel lead the risk-based replacement plan modeling effort for the City's asbestos cement Watermains. Water main replacement was prioritized based on the triple bottom line (economic, social and environmental) factors for Consequence of Failure and the Likelihood of Failure for each pipe. Likelihood of Failure was based on historic break data that was input to the Linear Extended Yule Process (LEYP) statistical model to produce deterioration curves. Additional field condition assessment was performed to determine remaining wall thickness on a variety of pipe sizes and locations. This data along with the inventory of AC pipes and replacement cost criteria was loaded into the Arcadis Rehabilitation and Replacement Planning System tool to develop funding scenarios. The scenarios show how the distribution system wide break rate and risk will change as different funding levels are applied to pipe replacement. Upon selecting the require funding to achieve the desired service levels, pipes were grouped into preliminary projects to be consider over the next 20 years. Each project included a business case detailing the cost and resulting reduction is break rate and risk.

Ms. Bishop has experience in the water, wastewater, and hazardous waste treatment fields. She has relevant project experience in the management and implementation of projects related to treatment systems, water distribution systems, force mains, and lift station design. She has been involved as Design Leader for various chemical system projects including sodium hypochlorite, sodium hydroxide, fluoride, ammonia, sulfuric acid, alum, chlorine dioxide, liquid lime, antiscalant, ferric sulfate, phosphoric acid and ozone and leads the Arcadis Chemical Knowledge Team. She has designed water treatment facilities including various pumps, storage tanks, and filters.

STEPHANIE BISHOP, PE | CHEMICAL SYSTEMS

EXPERIENCE

Chlorine and Ammonia Feed System Assessments for Implementation of Four-Log Disinfection | City of Hollywood, Hollywood, FL

Chemical system technical lead on study to determine necessary modifications to the existing chlorine and ammonia systems to achieve four-log virus inactivation at the City's water treatment plant.

On-Site Sodium Hypo Generation Systems Design and Construction | San Antonio Water System, Texas

Technical Advisor for the replacement of the chlorine gas system at three water production facilities with on-site generation of sodium hypochlorite for disinfection. The facility capacities are 72, 37, and 90 mgd. Each system includes two on-site generators, one brine tank, two day tanks and peristaltic metering pumps.

Richland Creek Water Treatment Plant | Paulding County, Georgia

Design Lead for chemical systems for a new 18 MGD water treatment plant including sodium hypochlorite (diluted to 6%), fluoride, chlorine dioxide, aluminum sulfate, polymer and liquid lime.

Oberly Pumping Station Chemical Injection | St. Petersburg, Florida

Design leader for the new sodium hypochlorite, liquid ammonium sulfate and sodium hydroxide storage and feed systems needed to boost disinfectant residual levels, minimize the potential for nitrification and optimize distribution system pH.

Kokomo Water Treatment Facility Improvements | Indiana-American Water Company, Inc., Kokomo, Indiana

Design lead for sodium hypochlorite storage and feed system at the 17 MGD plant to replace gas chlorination. Multiple injection points included the use of neat fed chemical and also softened carrier water.

Business Case Evaluation for Quarles WTP Disinfection System | Cobb County Marietta Water Authority, Marietta, Georgia

Technical advisor for a comparison of disinfection alternatives for the Quarles WTP to replace the existing on-site sodium hypochlorite generation system. The main alternatives considered were bulk sodium hypochlorite, on-site sodium hypochlorite, ozone, and ultraviolet light. Alternatives were compared based on health and safety, operation and cost, water quality, and space requirements.

Orthophosphate Feed Improvements | Fort Wayne, Indiana

Design leader for the design of a permanent orthophosphate storage and feed system for the City of Fort Wayne's Three River's Filtration Plant (72 MGD) that included double wall fiberglass bulk tanks, gravity feed to day tank and peristaltic metering pumps.

Country Club Water Treatment Plant Design | Seminole County, Florida

Design leader for the Country Club WTP upgrades that included sodium hypochlorite and fluoride systems, transfer pumps, and an ozone system for removal of hydrogen sulfide in raw water.

Coagulant and Corrosion Control Upgrades | City of Buffalo, New York

Design Lead for upgrades to the corrosion control and coagulant systems. The 84 MGD plant uses polyaluminum chloride (SternPAC) as a coagulant and a blended phosphate for corrosion control. Existing FRP tanks were replaced with site assembled FRP tanks due to limited access to the chemical storage areas. Transfer pumps and metering pumps were replaced.

Ingrams Mill WTP – Fluoride and Phosphate System Modifications | Aqua America, Inc., Philadelphia, Pennsylvania

Design leader for upgrades to the existing fluoride and phosphate system storage and feed systems at the 8 MGD Ingrams Mill WTP. Work included addition of a day tank and transfer pump for each system and replacement of piping.

EDUCATION
BS Environmental Engineering, University of Central Florida, 1988

YEARS OF EXPERIENCE
30

PROFESSIONAL REGISTRATIONS
Professional Engineer – FL

Mr. Palermo has over 16 years of experience in water resources engineering directly related to the Comprehensive Everglades Restoration Plan. His experience is comprised of many critical infrastructure projects in support of the South Florida Water Management District and U.S. Army Corps of Engineers (USACE). His is proficient in a wide range of functions including resident engineer, project management, design management, construction management, construction cost estimating and program planning. His specialty and area of expertise is of projects involving large-scale dams, reservoirs, pump stations, federal levees, spillways, gated structures, culverts, hydraulic and mechanical dredging, coastal structures and conveyance systems throughout south Florida. He has detailed knowledge of the SFWMD infrastructure, standard design specifications, design criteria memorandums, technical review procedures, project formulation and construction quality assurance and quality control procedures.

SAMUEL PALERMO II, PE | PUMP STATIONS

EXPERIENCE

C-139 FEB & Pump Station Design South Florida Water Management District | Hendry County, Florida

Providing Quality Control Design Review and Project management support for development of the Conceptual Design Options Memorandum, Geotechnical Data Report and the project delivery of Preliminary 30% Plans, Specifications and Design Documentation Report. The C-139 project is the development of a 2800 acre – 11,000 ac-ft impoundment, 690 cfs pump station, 100 cfs seepage pump station, and two outfall structures to manage the excessive flow associated with an event as water is conveyed to storage treatment area. The overall project includes the modeling, survey, geotechnical, engineering and design to support the development of the Final RTA package in September 2020. These pump stations utilize axial flow pumps, include vacuum priming, seal water pumps, and trash rake systems on the pump intake.

USACE – Rio Puerto Nuevo RPN Contract 2B and Contract 2DE | San Juan, Puerto Rico

Utilities Design Task Manager; providing Engineering support for the scoping, assignment, preliminary design report, plans and specifications for the RPN 2B Roosevelt Bridge and 2DE Walls. Utilities included a Siphon crossing, Water Mains, Electrical and Telecommunication connections to facilitate the widening of the RPN Channel.

USACE – Contract 2 – C-44 Reservoir | Barnard Construction Company, Inc., Indiantown, Florida

Contractor Resident Engineer/Alternate Quality Control Manager; The C-44 Reservoir and Stormwater Treatment Area (C-44 RSTA) is part of the Indian River Lagoon South (IRL-S) Restoration Project. The C-44 Reservoir is an above-ground water storage reservoir with a 3,400-acre footprint and a storage capacity of 50,600 acre-feet at a normal full storage level of 15-feet. The function of the C-44 RSTA will be to capture and store runoff from the C-44 Basin in the reservoir, and then release it to the C-44 (St. Lucie) Canal after passage through the STA. Responsibility included the development of the Contractors Quality Control Program, structural and earthwork engineering submittals, managing project inspectors and engineering staff, value engineering investigations, project specification modifications and development of constructability technical review plans. In addition, his responsibilities included the development of all preliminary construction submittals for the project definable features of work. Such features included a toe trench drain system, perimeter canal, seepage canal, borrow source processing; earthen embankment, chimney drain system, gated discharge tower and bridge, concrete spillway, double barrel concrete box culvert, and soil cement revetment. Responsibilities also include participating in monthly forecasting revenue and costs accrual meetings; operations of the cost control system and analysis of construction costs preparing monthly contractor cost reports in support of pay estimates; processing and estimating change orders, constructability cost analysis; developing RFIs; developing and reviewing shop drawings and submittals; maintaining current record of submittals, approvals, and resubmittals, submitting/managing material deliveries, developing a Quality Control daily inspection checklist for all features of work; verifying that materials received are properly inspected for quantity and quality and in compliance with contract documents; assisting in developing and updating project schedules; scheduling field construction inspection personnel; providing ongoing project information and project reviews; submission of In-Place Density tests; submission of borrow source approvals and making certain that the scope of work, schedule, and budget are clearly defined and understood by all project participants, including the Contractor, USACE, SFWMD, and Troup Indiantown Water Control District.

EDUCATION
BS Forest Engineering 2003

AS Engineering Science, 2001

YEARS OF EXPERIENCE
16

PROFESSIONAL REGISTRATIONS
Professional Engineer – FL

C-43 Reservoir – Type II Independent External Peer Review (IEPR) Safety Assurance Review (SAR) & Value Engineering | South Florida Water Management District, West Palm Beach, Florida

Assistant Project Manager and Civil/Constructability Reviewer; Responsible for facilitating the overall project management associated with peer review work activities to assess, analyse, interpret, and evaluate design/engineering and construction criteria through a process known as Type II Independent External Peer Review (IEPR) Safety Assurance Review (SAR) for the C-43 Design Package 4 (Embankment). The C-43 design package includes civil works during the design phase of the project in accordance with the Water Resources Development Act (WRDA) 2007 (Public Law110-114), Section 2035. Additional responsibilities include conducting a value engineering (VE) study to comply with USACE's policy ER 11-1-321. The design deliverables reviewed included existing design documents, intermediate design phase completion documents, 2008 final plans and specifications, technical memorandums and 2017 design updates. In addition, the value engineering study depicted a potential savings of over $40 million to the SFMWD.

Lake Hicpochee Shallow Storage and Hydrologic Enhancement | South Florida Water Management District, Glades County, Florida

Lead Quality Assurance Representative overseeing the management of construction management duties; created a project specific quality assurance inspection plan; daily verification of contractor quality control; periodic summary reports of production quantities and test data; review of all quality control test data and review of all submitted test data reports; daily/weekly communication with the on-site construction manager evaluating daily reports and progress photos. In addition, responsibilities included internal review and responses to submittals and shop drawings, RFI's, requests for clarification, change order requests; resolution for schedule impacts and internal review of contractor pay requests. The Lake Hicpochee Shallow Storage and Hydrologic Enhancement Project will consist of a 670-acre Flow Equalization Basin (FEB) and the Lake Hicpochee Spreader Canal which includes embankments, canals, a new pumping station (G-725), an outflow control structure (G726), and access roadways.

C.W. Bill Young Regional Reservoir Renovation | Tampa Bay Water, Tampa, Florida

Senior Dam Inspector assisting the construction team with dam safety inspections and providing monthly, quarterly, and annual embankment performance reports in accordance with the Florida Department of Environmental Protection review. These inspections are conducted using state of the art technology and online ArcGIS. Photographic documentation and visual inspection of embankment, soil-cement revetment and discharge control structures is documented as part of a 5-year maintenance agreement with Tampa Bay Water.

Boone Dam Exploratory Grouting Program | Tennessee Valley Authority, Sullivan County, Tennessee

Senior Geotechnical Engineer provided engineer services for TVA, Boone Dam, a 160- foot high, 1,532-foot-long composite concrete gravity and earth fill embankment dam situated on karst topography located in Tennessee's Ridge and Valley physiographic province. Responsibilities included logging of soil and rock samples obtained via sonic drilling methods and identification of strata interfaces, on-rock intervals and zones of water loss for use during design of a proposed composite seepage barrier. Responsibilities also include the development of gINT boring log template, data management, and addressing client concerns and comments in the field.

J. W. Corbett Levee Phase 1, Construction Inspection and Material Testing Services | SFWMD, Palm Beach County, Florida

Project Manager/ Lead Engineer responsible for the construction inspection services in connection with the construction of a 2.7-mile-long earthen levee located on the south side of the J. W. Corbett Wildlife Management Area (Corbett). Reviewed all contract documents to verify conformance of the contract plans and specifications with applicable SFWMD design standards and industry standards. Prepared daily reports documenting construction performance and inspections; verified measurement and payment applications; conducted photographic documentation of construction activities on a daily basis; facilitated project construction meetings; and provided updates on the status of construction performance, inspection, and materials testing. Reviewed and evaluated shop drawings, requests for information, requests for proposals, change orders, field orders, and value engineering proposals; provided quality control materials testing during the construction period, which included standard/modified proctor tests, density tests, and concrete testing; used Web based Oracle Primavera Contract Management (Expedition) application; reviewed as-built records, identified punch list items, and reviewed contract closeout documents.

Paul Walansky is a Principal Water Engineer with professional experience in the project management, design, and construction management of various water resource design projects. Mr. Walansky's engineering background includes inspection and condition assessment of marinas and water control structures, cost estimating, flood studies, pump station design, bridge scour analysis, economic analysis, port feasibility studies, port reconstruction, fishing pier design, retaining wall design, wetland restoration, reservoirs, stormwater treatment areas, public recreation area design and specifications. Niche expertise in water resources planning and design, local knowledge of South Florida Hydraulics and Hydrology, and familiarity with relevant regulatory and environmental requirements.

PAUL WALANSKY, PE | HYDRAULICS

EXPERIENCE

C-139 Flow Equalization Basin Design | South Florida Water Management District, Hendry County, Florida

Project Manager responsible for coordination of the design of a Flow Equalization Basin from the Conceptual Design through Ready to Advertise plans and specifications. The design elements included levees, seepage canals, access roadways, inflow pump station, outflow structures, canal improvements, water control structure modifications, land leveling, gravity seepage structure, and divide structure in the L-3 Canal.

Biscayne Bay Storm Surge Modeling | South Florida Water Management District, Miami, Florida

Project Manager responsible for development of a storm surge model for the structures and canals around Biscayne Bay. This model will be used to predict storm surge around the Miami area so that the SFWMD can better plan the need for future capital improvements in their water system. The goals of the project included the development and calibration of a hydrodynamic model using the DELFT3D system, to simulate and validate water level hydrographs at the structures downstream of the SFWMD structures in the bay for selected historical storms, and to simulate water level hydrographs near the structures under future conditions considering 3-4 ft sea level rise scenarios derived from the SE County Compact projections.

Scour Repair at Highway 736 | USACE Memphis District, St. Francis County, Arkansas

Project Manager responsible for coordination of topographic/hydrographic survey, Site Investigation Plan, Design Quality Control Plan, H&H Report, Design Report, VE Study, plans, specifications and cost estimate. Assisted in the design and preparation of engineering plans and specifications for excavation and stabilization of the banks and channel in the immediate vicinity of the Highway 736 bridge in Arkansas. After the 65% submittal, participated in a value engineering (VE) study and prepared sections of a report that documented the events and results of the VE study. The results of the VE workshop included design changes, a few additional cost-reducing alternatives, and design suggestions that provided additional solutions to address the challenges from scour and debris concerns experienced in this reach of the Madison-Marianna Floodway.

C-43 Basin Storage Reservoir | South Florida Water Management District, Labelle, Florida

Responsible for developing surface water and groundwater plans, Townsend Canal improvements, basis of design report, and storm preparedness plan. The C-43 Basin Storage Reservoir is one of the features of the Comprehensive Everglades Restoration Plan (CERP) Acceler8 projects. This project included design of an above ground reservoir with a total storage capacity of approximately 170,000 acre-feet located in the C-43 Basin in Hendry County. The design of the reservoir covered 20,000 acres with water levels fluctuating up to 25 feet above grade. The goal of the project was to capture excess runoff from the C-43 Basin and Lake Okeechobee flood control discharges by pumping into the proposed reservoir. The reservoir also provides environmental water supply deliveries to the Caloosahatchee Estuary, water quality benefits to reduce salinity and nutrient impacts of runoff to the estuary, water supply benefits, and flood attenuation.

OSDLF Pump Station Inspection and Design | Miami Dade County, Miami, Florida

Project manager responsible for coordination of pump station inspection including removal and inspection of both pumps. Prepared a report detailing the pump station condition and performed an analysis to determine if the surrounding swales could hold the design storm event. Prepared draft and final plans to implement the pump station modifications and permitting.

EDUCATION
BS Ocean Engineering
Florida Atlantic University 1998

YEARS OF EXPERIENCE
21

PROFESSIONAL REGISTRATIONS
Professional Engineer - FL

Professional Engineer - LA

Professional Engineer - MD

Professional Engineer - MI

Engineer - Virgin Islands

Engineer - Puerto Rico

Levee and Pump Station Inspections | United States Army Corps of Engineers (USACE), Okeechobee, Florida

Project manager responsible for coordination of project plan, system documentation collection, design criteria review, pre-inspection packets, field inspections, reports, and independent technical review. Project included preparing the pre-inspection packets, conducting levee inspections, and creating the periodic levee inspection reports. Pre-inspection packets consisted of detailed report of levee description, historical information about the levees system, and current condition of the levees and all structures. Levee inspection consisted of walking the levees and conducting a detailed inspection of existing deficiencies and identifying new deficiencies. Periodic levee inspection reports consisted of levee description, brief history, detail inspection findings, repair recommendation, inspection maps, and rating conditions. Team provided periodic inspection of levee systems in the Okeechobee and Clewiston Regions in South Florida. The general purpose of the periodic inspection was to verify proper operation and maintenance, evaluate operational adequacy, evaluate structural stability of individual structures and system segments, review design criteria, identify changes in current design standards, identify features to monitor over time, and improvement of communication of the overall condition individual systems through a standardized data base. The results from this inspection were an integral component in subsequent risk assessments and the determination of a Levee Safety Action Classification (LSAC) for the levee systems.

Bridge Scour Program | Puerto Rico Highway and Transportation Authority (PRHTA), Puerto Rico

Project manager responsible for coordination of data collection, site visits, hydrologic and hydraulic analysis, geotechnical and structural assessment, and preparing plans of action for recommending countermeasures at scour critical bridges. Performed scour evaluations of 200 existing bridges in four phases to provide a comprehensive scour evaluation. The evaluations were to identify potential problems and recommend a plan of action for each bridge to address the scour concerns. Services included site visits to all bridges and collection and review of bridge inspection reports, existing plans, geotechnical reports, and flood studies to determine the scour potential at bridge or culvert structures and to recommend them to the next phase of the analysis. The investigation also included verification of structural components such as bridge length and width, barrier and beam sizes and creating scour evaluation reports. Bridge channel profiles and cross-sections were created using computer software AutoCAD 2010, Civil 3D and ArcGIS 10. Data for the scour analysis of each bridge was entered into the HEC-RAS, River Analysis System, Version 3.0 software. The HEC-RAS system, developed by the United States Army Corps of Engineers Hydrologic Engineering Center, was used for calculating the water surface profiles for both steady and unsteady gradually varied flow. This system was chosen since it can handle a full network of channels, a dendritic system, or a single river reach. For culvert bridges the HY-8, Culvert Analysis program, Version 6.1 was used. HY-8 was developed for the Federal Highway Administration (FHWA) and automates the design methods described in FHWA publications HDS-5, “Hydraulic Design of Highway Culverts,” HEC-14, “Hydraulic Design of Energy Dissipators for Culverts and Channels,” and HEC-19, “Hydrology.” For floodplain analysis, the Watershed Modelling System, WMS 9.0 was used to delineate watersheds and sub-basins using digital terrain data. The WMS program was used to compute geometric basin data such as area, slope, mean elevation, and maximum flow distance, and to compute hydrologic basin data such as time of concentration, curve numbers, and infiltration parameters. During the geotechnical and structural assessment phase, performed detailed coupled axial/lateral load capacity analysis for the existing foundation conditions using the FB-MulitPier computer program for pile supported foundations or Mathcad worksheets for shallow foundations. Provided recommendations for countermeasures to be installed at scour critical bridges.

Water Plant Security Upgrade | City of Boynton Beach, Boynton Beach, Florida

Project manager responsible for client coordination and QA/QC of deliverables. The City of Boynton Beach scope was to develop Request for Qualification documents to retain a security systems integrator for a project involving the replacement and expansion of an existing analog CCTV camera system and controllers for an existing access control system at two water treatment plants. Team provided a new design for the new systems based on an open platform style internet protocol (IP) based camera and access control system with new cameras, network server video storage, and new access controllers with the flexibility for programming recording parameters that the existing system was not capable of. Conducted a site visit and discussed all required parameters of the desired system with the city to develop the most cost-effective approach. The city had limited budget, so they desired to enter into an extended agreement with a security integrator to allow cost control until the project could be completed over time with cost escalation and unit cost control.

Mr. Stepner has over 13-years of experience working on a wide range of civil and environmental engineering projects, specializing in asset management, operations monitoring, and construction oversight services water, wastewater, and solid waste projects. Project experience includes asset management, asset condition assessment, facility and system construction monitoring and start-up, operation, and maintenance, and equipment pilot testing. He also has experience with storm water and sanitary sewer collection systems, including inspection and sampling of collection systems for signs of inflow from illicit connections or infiltration to the system. He has assisted in evaluation of and assessed the efficiency of various types of energy programs including waste-to-energy for solid waste and cogeneration from digester gas at wastewater treatment plants. He also has assisted in the management of various project delivery types including design-build.

DANIEL STEPNER, PE | MECHANICAL

EXPERIENCE

Miami-Dade County | Water and Sewer Department (WASD), Miami, Florida

Provided condition assessments of MDWASD's water and wastewater infrastructure for the purpose of characterizing the physical condition and operating condition of major asset components. Infrastructure evaluated included waste treatment facilities, water storage and remote pumping facilities, wellfields, wastewater treatment facilities, and wastewater pumping stations. He led the team of engineering inspectors, using a state-of-the-art mobile data collection app and analyzed the data collected to develop a comprehensive deficient asset database. Developed cost estimates to repair or replace deficient assets. Inspection documentation included use of a 360-degree camera to document condition of assets. The 360-degree images will be used in conjunction with site plans to create a street-view-style walkthrough application of facilities. Walkthrough images will contain links on the images to equipment documentation, such as operations and maintenance manuals, standard operating procedures, etc. and can be used to time-track progress of construction.

Consulting Engineer Facilities Inspection Services | Port of Miami-Dade (PortMiami), Miami, Florida

Served as Project Consultant and lead inspector for the inspection of Port of Miami Facilities in order to meet the reporting requirements of Master Bond Ordinance 88-66. Coordinated with PortMiami project management, subject matter experts, and subconsultants to schedule and perform visual inspections of Port Miami Facilities including cruise terminals, storage facilities, parking structures, and exterior areas. Developed the PortMiami Facilities Order of Magnitude Cost Estimate Inspection Summary Master Spreadsheet, which provides a summary of the building or system components observed to be in Poor or Very Poor condition (referred to as deficiency assets) during the visual inspection of the PortMiami Facilities as well as presents an order of magnitude construction cost estimate for the repair/replacement of the deficiencies identified. The spreadsheet has since been used by PortMiami staff to coordinate maintenance activities at the Facilities.

East Sunrise Water Main Improvement | City of Sunrise, Sunrise, Florida

Provided daily construction management services for the replacement of aging potable water mains, valves, hydrants, and services in the area of East Sunrise, FL. Additional services included abandonment of the existing water distribution system and appurtenances, site restoration, roadway milling and overlay, and storm water drainage improvements.

Catskill/Delaware Ultraviolet Facility Construction Management | New York City DEP-Construction, Valhalla, New York

Provided construction management and start-up assistance for a two billion gallon per day (BGD) UV water treatment facility (UV Facility) as part of the Construction Management Joint Venture (CMJV) team. As part of the control room operations sub-team, coordinated construction activities of the four prime contractors to ensure that they did not impact the activities of the other prime contractors or with NYCEP's delivery of water through the UV Facility during facility start-up. Oversaw operation of the UV Facility during performance testing and commissioning of the 56 UV units (UVU) as the support and lead operator for the CMJV. Facilitated on-the-job training of NYCEP operations personnel. Prepared an equipment monitoring log in the form of an electronic tablet application, to be used during UV Facility rounds to monitor the operating status of all facility equipment and report any unanticipated alarms or conditions to the operations supervisor or maintenance staff.

EDUCATION
MS, Civil & Environmental Engineer, Duke University, 2006

BS, Engineering Management, Cornell University, 2005

YEARS OF EXPERIENCE
14

PROFESSIONAL REGISTRATIONS
Professional Engineer – NY, FL

Tallman Island WWTP Construction Management Services | New York City DEP-Construction, Queens, New York

Provided start-up services and training for biological nutrient removal (BNR) related systems for an 80 million gallon per day (MGD) wastewater treatment plant (maximum capacity of 160 MGD). Developed start-up plans, system training materials, and tracking logs of BNR system equipment, shop test, field test, operation and maintenance (O&M), training and lesson plan, and spare parts submittals. Reviewed project schedules for conformance with equipment start-up and testing. Coordinated and monitored the training program for vendor-provided equipment and systems.

Digester Gas Cleaning, Selective Catalytic Reduction and Catalytic Oxidizer Pilot Testing | Orange County Sanitation District, Fountain Valley, California

Evaluated the best available control technologies to remove NOx, CO, and VOC from engine generator exhaust utilizing a digester gas pre-treatment cleaning system and selective catalytic reduction and catalytic oxidizer system. Prepared contract documents provided negotiation and coordination with vendors and provided start-up and commissioning assistance. Throughout the pilot testing period, tasks include coordination with the sampling laboratories, managing sampling results, and preparation of technical memoranda and the pilot testing report.

Wards Island WPCP Staffing Assessment | New York City DEP Bureau of Water Supply, New York, New York

Assisted in the development of the Wards Island WPCP Staffing Assessment Report. Responsibilities included creating an equipment list for the entire plant, assigning preventative maintenance PM hours to each piece of equipment, determining staffing levels for PM based on total PM hours, and writing the Report.

Newtown Creek WPCP Asset Management and Information Access System (IAS): Online O&M Manual Management | New York City DEP, New York, New York

Developed asset identification numbers and tag names for the WPCP computerized maintenance management system (CMMS) for design plant modification contracts. Each asset in the WWTP was added to a hierarchy visual representation. Assisted in the development of Newtown Creek WPCP online IAS for client usability. Formatted and uploaded O&M manuals sections and other project documents to the IAS. Developed the IAS User Training Manual.

Ms. Dombroski has three years of civil and environmental engineering experience serving municipal and government clients in the water and wastewater industry. She has led in the development of 6 large community water system risk and resilience assessments (RRAs) per AWIA of 2018, including the City of Hollywood's. She has assisted in the condition assessments of large-scale water and wastewater infrastructure including water/wastewater treatment processes, storage facilities, pumping facilities, distribution/collection systems, and other supporting facilities. She has also been heavily involved in report writing focusing on local legislation, regulatory requirements, capital improvement programs, financial obligations, as well as permitting and construction oversight activities.

LIA DOMBROSKI, EIT | VULNERABILITY/RISK

EXPERIENCE

AWIA Risk & Resilience Assessment | City of Hollywood, Hollywood, Florida

Served as the lead engineer for the City of Hollywood America's Water Infrastructure Act (AWIA) Risk and Resilience Assessment. Followed the AWWA J100-10 Standard Risk and Resilience Assessment Methodology, which has been endorsed by USEPA, to conduct a risk assessment of the physical and cyber assets of the City's water system. Oversaw project management activities and collaborated with the City and internal team members to schedule meetings, issue requests for information, prepare materials, facilitate workshops, develop meeting minutes, and provide project status updates. Worked with internal stakeholders to identify critical facilities, assets, and threats, as well as the consequences and vulnerability of the water system to such threats. Conducted site visits inspecting critical facilities including elevated water tanks, ground storage tanks, and the water treatment facility including the WTP's deep injection wells. Developed a risk and resilience profile (financial and operational) of the water system and drafted results and recommendations to improve the City's understanding and preparedness for potential natural and malevolent hazards.

Financial Consulting and Bond Engineering Services | Water and Sewer Department (WASD), Miami-Dade County, Florida

Provided bond engineer consulting services for the largest water and wastewater utility in the Southeastern U.S., which serves nearly 2.3 million people each day, through the development of Miami-Dade WASD Bond Consultant's Reports for fiscal years 2015 through 2018. Organized and conducted inspections of water and wastewater infrastructure including water treatment facilities, wellfields, water storage and remote pumping facilities, wastewater treatment facilities, and wastewater pumping stations. Analyzed data in asset management software, Orion, AssetHound, and Fulcrum, to generate facility inspection reports elaborating on the physical and operating conditions of system components. Coordinated with WASD staff and operators to process and communicate data relating to water and wastewater parameters, current flows, and future flow projections. Incorporated information into reports which highlight the adequacy of the Department's capital improvement program, the adequacy of the renewal and replacement funding, the condition and operations of water and wastewater facilities, and the Department's compliance with bond covenants to debt service and other financial conditions.

Hollywood WTP High Service Pump Station Upgrades | City of Hollywood, Hollywood, Florida

Supported the lead mechanical engineer in the design and construction of pump station upgrades at the City of Hollywood Water Treatment Facility, including the removal and replacement of existing pumps with six (6) new high service pumps, modifications to existing piping and valves, and upgrades to instrumentation, controls, electrical equipment, and other pump station appurtenances. Carried out procurement activities including, but not limited to, writing specifications, drafting a preliminary engineering report, developing an opinion of probable construction cost, compiling bid documents, and obtaining construction permits. Provided engineering services during construction by processing requests for information, change orders, allowance authorizations, and other construction documents.

AWIA Risk & Resilience Assessments | Puerto Rico Aqueduct and Sewer Authority, Puerto Rico

Led as the deputy project manager for the AWIA Risk and Resilience Assessments project for the Puerto Rico Aqueduct and Sewer Authority (PRASA). Managed a team of experts to conduct RRAs for PRASA's five large water systems serving a total population of approximately 1.4M. Facilitated workshops with internal client stakeholders to identify PRASA's minimum acceptable water system missions, critical system facilities and assets, and relevant threats. Organized, scheduled, and conducted critical facility site visits, including reservoirs, dams, intakes, WTPs, pump stations, storage tanks, and administrative support buildings, to assess existing protective measures and facility resilience.

EDUCATION
BS, Environmental Engineering, SUNY College of Environmental Science & Forestry

YEARS OF EXPERIENCE
3

PROFESSIONAL REGISTRATIONS
Engineering Intern – Florida

Dr. Bolter is a senior planner with a growing resume in the areas of GIS modelling, adaptation planning, vulnerability analysis, green infrastructure, and outreach/engagement. Her doctorate dissertation compared perceived risk to actual risk of Sea Level Rise in South Florida. Dr. Bolter's success lies with her inner drive to increase awareness on environmental impacts in a positive way which inspires a call to action. She has managed a wide variety of projects within academic, private and local government sectors

KEREN BOLTER, PHD | RESILIENCY

EXPERIENCE

Hurricane Response Hub: Public Health Capacity Building | Florida Statewide

Currently managing this initiative, coordinated effort among federal, state, and local public health organizations to facilitate training, technical assistance, and information sharing to enhance ongoing environmental and occupational health recovery. Resources are aimed at public health workforce support in disaster-related health needs.

Adaptation Pathways: Sea Level Rise Strategy | Miami-Dade County Office of Resilience

Currently conducting a technical and economic assessment of a variety of future scenarios for Miami-Dade. In developing various feasible, cohesive adaptation "pathways", coupled with visuals to make them readily understood, decision-makers and the community can utilize results.

FEMA Hazard Mitigation Assistance Grant Development | Miami-Dade Water and Sewer Department

Led the development of two Hazard Mitigation Grant Program applications for FEMA DR-4337 (Hurricane Irma) to obtain ~$30M in funding for floodproofing twelve critical pump stations. Mitigation measures will significantly increase capacity and resilience of the County's wastewater infrastructure, reducing current and future flood risk.

Sustainability & Resilience Action Plan and Multi-Hazard Mitigation Plan Update | Indianapolis, IN

Led the research and analysis for the City Multi-hazard Mitigation Plan and supported work for solution oriented and actionable components of the Sustainability & Resilience Action Plan. These included a funding review, a vulnerability assessment, an asset management driven quantification of risks and opportunities, a community impact assessment, and numerous interviews and stakeholder outreach activities which included mapping and goal-setting.

Benefit –Cost Analysis for National Disaster Resiliency | Bridgeport, CT

Currently conducting analysis to assess the cost effectiveness of alternatives for a range of flood protection projects. By quantifying expected damages for various hazard scenarios and benefits of risk reduction, the City can review losses avoided versus added value from economic, social and environmental benefits of each project.

Sea Level Rise / Recurrent Flooding Analysis | Portsmouth, VA

Currently providing resiliency planning and analysis in coordination with City departments including Planning, Public Works, and Public Utilities. Projects include a Data Inventory, Preliminary Gap Analysis, Hazard/Asset Analysis and Mapping, and a Stakeholder Workshop.

Housing Resiliency and a Sustainable South Florida | Miami-Dade County, University of Miami Office of Civic & Community Engagement (CCE)

Currently conducting stakeholder engagement and benefit cost analyses for development of new mapping layer on CCE's existing Miami Affordability Project/MAP that will overlay resiliency indicators on the affordable housing tool. A toolkit will provide analysis of various scenarios and feasible solutions.

Adaptation Action Areas (AAA) Technical Assistance Project | Broward County and the City of Fort Lauderdale, FL

Project manager organizing a series of resources intended to steer Florida's coastal communities towards planning and adapting to sea level rise (SLR). This project highlighted a new policy tool, AAAs, which allows local governments to leverage funds and prioritize needs by designating high risk areas. Resources included a case study, a guidebook, a podcast series, and videos. Broward County and the City of Fort Lauderdale adopted the language written for AAAs into their coastal management elements.

EDUCATION

BS, Environmental Engineering, Tufts University, '03

MS, Environmental Studies, Florida Atlantic University, '10

PhD, Geosciences, Florida Atlantic University, '14

YEARS OF EXPERIENCE

11

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FHWA Climate Resilience: Storm Surge and Transportation Network Disruption | Palm Beach Broward, and Miami-Dade Counties, FL

Data analyst collecting and analyzing historic storm surge simulation data at various sea-level rise scenarios for transportation disruption models, with the intention to foster greater understanding of the role of critical evacuation routes in the broader network as an illustrative aid to emergency management. This project required the generation of novel methods for data fusion using both modeled and historic surge heights.

FHWA Transportation Vulnerability Assessment and Adaptation Pilot | Hillsborough County, FL

Data analyst conducting spatial modelling to intersect storm surge and sea level rise risk with transportation infrastructure. Transportation disruption modelling showed vulnerability hotspots to focus on for adaptation.

Southeast Florida Data Common | Broward, Miami-Dade, and Monroe Counties, FL

Project manager facilitating a series of meetings with key stakeholders to foster a collective interest in sharing and using data to create opportunity and provide a foundation for a regional Data Common. A website showcased data stories in six different sectors, which included economic development and transportation.

Miami Dade MPO Access to Healthy Living Plan | Miami-Dade County, FL

Project manager conducting data analysis to identify gaps in transit and mobility infrastructure which make it difficult or impossible for transportation system users to access educational resources, health care services, healthy foods, cultural, employment, etc. Results informed recommendations for creating opportunities which facilitate better access.

Public Health Impacts from Sea Level Rise on Vulnerable Populations | Palm Beach Broward, Miami-Dade, and Monroe Counties, FL

Data analyst conducting spatial modelling to overlay likelihood and consequence of a variety of vulnerabilities, including physical, socioeconomic, and health risks.

Mr. Finnicum is an experienced water and wastewater pipeline project manager, specializing in capital program development and management; condition and risk assessment; and data analytics and innovation. He has focused on large programs involving municipal water distribution and combined, sanitary and stormwater collection system planning, design and construction.

SETH FINNICUM, PE | GIS/CMMS

EXPERIENCE

JEA | Large Diameter Pipe Evaluation and Replacement Program

Deputy Program Manager for program to evaluate and prioritize the repair and/or replacement of almost 1,000 miles of 14"- 84" force, gravity, plant effluent, biosolid transfer, and water pipelines. Responsible for assisting Program Manager in oversight of all aspects of the program, including condition assessment, prioritization, and execution of operational and capital projects. Work included configuring and utilizing Arcadis-developed decision support tool, RRPS to prepare short- and long-term funding needs assessment based upon available inspection, maintenance and consequence of asset failure data.

Emerald Coast Utilities Authority | Assessment of ECUA Force Mains and Appurtenances

QC Reviewer and Condition and Risk Assessment Expert for program to evaluate and prioritize the repair and/or replacement of 315 miles of critical force mains for the minimization of sanitary sewer overflows (SSOs) caused by force main failures and appurtenance facilities.

Nationwide | Broadband Electromagnetic (BEM) Testing Lead

Technology Lead for non-destructive testing method for ferrous pipelines; responsible for proposal development, scope and budget, training, and oversite of inspectors. Developed innovative field prototype and then worked with equipment manufactures in Czech Republic and Australia for development of new BEM sensor and deployment configuration for taking a "virtual coupon" thickness test through minimally invasive excavations.

DC Water | Sewer Management Program: Annual Pipeline Condition Assessment

Project Manager responsible for team of 30+ staff conducting the physical condition assessment, preliminary rehabilitation design, and prioritization of nearly 300 miles of 6-inch to 240-inch sanitary, combined, and storm sewer conveyance pipes and related structures. Responsible for meeting client 2% annual assessment and 1% capital replacement KPIs. Work included configuring and utilizing Arcadis-developed decision support tool, RRPS to prepare short- and long-term funding needs assessment based upon available inspection, maintenance and consequence of asset failure data.

DC Water | Sewer Management Program: Inspection Prioritization

Task Manager responsible for working with client stakeholders to transition from anecdotal inspection, assessment, and rehabilitation prioritization process to data-driven, risk-based based prioritization for linear assets. Tasks included identification of likelihood and consequence of failure criteria to create a 25-year plan to inspect the entire system.

DC Water | Sewer Management Program: Sewer System Facility Plan

Task Lead responsible for development of the sections of the five-year capital plan related to condition assessment and risk-based prioritization of small and large gravity interceptors. Work included configuring and utilizing Arcadis-developed decision support tool, RRPS to prepare short- and long-term funding needs assessment based upon available inspection, maintenance and consequence of asset failure data.

Washington Suburban Sanitary Commission | Beaver Dam Roads Rehabilitation Design

Project Manager responsible for the physical condition assessment, prioritization and rehabilitation design of over 75,000 linear feet of sanitary sewer conveyance pipes in order to meet the Consent Decree with requirements. Project involved development 12 construction packages with an approximate total value of $10 million. Responsible for client customization and management of TRIAD design decision support toolkit and related best practice standards for program.

EDUCATION
BS Chemical Engineering, Cornell University 2005

YEARS OF EXPERIENCE
16

PROFESSIONAL REGISTRATIONS
Professional Engineer, FL

New Castle County | Brandywine Sewer Rehabilitation and Capacity Assurance Program

Design team leader and data manager on multiple projects to assist in identifying, prioritizing, designing, and constructing and implementing cost-effective solutions to the leaking sewer problems faced by client. Responsible for development of designs from inception to construction included the rehabilitation and replacement of 8- to 24-inch pipe.

Responsible for development and management of TRIAD design decision support toolkit and related best practice standards for program which lead to over a 25% cost efficiency increase though task automation and decreased need for rework.

New Castle County | Standardized Manhole Inspection Protocol and Decision Support Tool

Project Manager responsible for working with directly with County staff to develop a client specific set of manhole inspection standards for use by County staff and all subcontractors. Responsible for developing in electronic manhole condition assessment inspection tool, supporting documentation, and training protocols. Further responsible for incorporating engineering evaluation and client-specific preferences into electronic manhole condition assessment inspection tool to

Fairfax County MSM Division: Stormwater Catchment 126-1 Condition Assessment and Rehabilitation Design

Design engineer for the condition assessment and rehabilitation design of over 4,200 storm structures, 10 miles of open stormwater channels and 30,000 linear feet of stormwater conveyance pipes. Responsible for customization and management of pipeline and stormwater design decision support toolkit ands related best practice standards for program .

Mr. Ryall is a nationally recognized consultant with expertise in financial and strategic planning for water and wastewater utilities around the country. He has assisted with over $1 billion in water and wastewater financing and has extensive experience in utility rate-making, impact fees, bond feasibility studies and acquisition/valuation analysis, and the development and use of interactive financial models. In addition to his financial experience, Mr. Ryall is a professional engineer in the State of Florida and has been involved in many strategic planning studies for water and wastewater utilities, including master plans, capacity analysis, consolidation studies and asset management-related engagements. Mr. Ryall is a contributor to industry manuals of practice and is a frequent speaker at regional and national water events including the Utility Management Conference, American Water Works Association (AWWA) Annual Conference, Florida Section AWWA Conference and Florida Water Resources Conference.

ROBERT RYALL, PE | FINANCIAL ANALYSIS

EXPERIENCE

Rate and Cost of Service Services | Miami-Dade Water and Sewer Department (MDWASD), FL

Mr. Ryall serves as Project Manager for this engagement, which involves a comprehensive water and sewer cost-of-service and rate study for both retail and wholesale customers. MDWASD is the largest water system in Florida and serves approximately 2 million customers. MDWASD has more than 3,600 miles of sewage pipes, a service area of 341 square miles and 954 pump stations. This engagement includes the development of cost based rates for MDWASD's 15 water and 13 sewer wholesale customers. The rates to wholesale customers include an annual true-up as well as development of annual rates for the preceding year. Mr. Ryall works with MDWASD and wholesale customers to ensure understanding of the process for developing the cost based rates.

Review of Rate Structure and Customer Assistance Programs | District of Columbia Water, Washington DC.

Mr. Ryall lead an independent review of DC Water's rate structure and customer assistance programs. The engagement including preparing an Independent Review of DC Water's cost of service approach, water and sewer rate structure, and customer assistance programs. The primary objective of the engagement was to provide DC Water an independent review and provide recommendations for improving the cost of service approach used to develop the existing rate structure, and to provide options to improve customer assistant programs. The results of the engagement provided DC Water information used to help continue to provide rate equity and long-term financial sustainability. The engagements also included a benchmarking survey of the Nation's largest water and sewer utilities.

Cost of Service and Rate Structure Study | City of Ann Arbor, Ann Arbor, MI.

As a national recognized expert, the City retained Mr. Ryall to provide an independent review of the City's rate and cost of service study and to identify alternative rate structures which could mitigate some of the large bills customers were experiencing. Mr. Ryall completed this peer review which included the following elements:

- Review Rate Study Results for Compliance with Industry Best Practices
- Review customer classes of the water system
- Review of Cost Allocation Methodologies
- Review of Utility Operating Structures
- Identify Alternative Rate Structure Options
- Workshop with City Council

Impairment Loss Evaluation | Puerto Rico Aqueduct and Sewer Authority (PRASA) San Juan, PR.

Mr. Ryall lead efforts to conduct an analysis to estimate the adjusted value of PRASA's fixed assets as a result of impacts sustained from Hurricanes Irma and Maria in September 2017. The primary purposes of the analyses was to recognize the value of impairment loss for the affected assets and provide impairment adjustments for PRASA's use in their fiscal year 2018 financial statements. As part of this analysis, Arcadis relied upon post hurricane damage assessments and cost estimates that were developed from inspections conducted by Arcadis between October and December of 2017 and PRASA's Fixed Asset Registry. Arcadis also calculated impairment for facilities that were not inspected but were estimated to have incurred damage. Overall impairment losses were estimated at $330 million.

Water and Sewer Cost of Service Study | City of Virginia Beach, Virginia Beach, VA.

Completed several cost of service evaluations and rate, fee, and charge assessments to assist the City of Virginia Beach generate sufficient revenues to pay for upcoming water and sewer capital improvement and operation and maintenance programs. The projects included completing revenue sufficiency analyses to determine the City's future cash flow needs, cost of service evaluations to determine the cost responsibility of

EDUCATION
MBA Wake Forest University 2002

BS Environmental Engineering University of Central Florida 1998

YEARS OF EXPERIENCE
20

PROFESSIONAL REGISTRATIONS
Professional Engineer - FL

the City's customers, and rate structure evaluations to identify water and sewer rate structures that were closely aligned with the cost of providing service. Since 2006, continuing to provide comprehensive financial planning services to the City.

Water Bank Participation Assessment Model | Chino Basin Water Bank, Chino, CA

The Chino Basin Water Bank (CBWB) engaged Mr. Ryall to evaluate banking participate scenarios including developing operating frameworks and costs associated with the scenarios. The assessment model was developed to support CBWB pricing and financial evaluation of alternative banking scenarios. The model and evaluation focused on three key factors considered when evaluating participant scenarios:

1. Developing proposed Put and Take fees that recover functional costs of the water bank
2. Evaluating the life cycle cost of the participant scenario, cost per acre-foot of banked water
3. Evaluating the impact of other alternatives such as:

   — Contributed or Capital Investment of a Participant: evaluating the fee and life cycle cost impact if Participant's provide an initial investment in the CBWB,
   — Leave Behind Water: beyond capital and operating expenses, evaluating the impact of leave behind water,
   — Grants: evaluating the impact of grant on fee and life cycle costs, and
   — Alternative Put and Take Fee Structures: evaluating the feasibility of structured fees; building Put and Take fees around a Participants needs and capabilities.

The Chino Groundwater Basin (Chino Basin) is one of the largest groundwater basins in southern California. Located in the Inland Empire, it houses a total groundwater capacity of about six million acre-feet (MAF).

Lehigh County Authority (LCA) | Lehigh County Authority, Allentown, PA.

Mr. Ryall provides financial consulting services to LCA in accordance with the trust indenture which secures the bonds for LCA. These services include preparation of:

— Revenue Sufficiency Certificate: Opinion that LCA's proposed budget provides sufficient funds to cover O&M expenses and meet debt service coverage requirements. Arcadis continues to provide this service.
— Major Maintenance Reserve Fund Requirement Certificate: Opinion as to the required amount of the Major Maintenance Reserve Fund in accordance with the terms of the indenture.
— Consulting Engineer's Report: The report includes three primary components:
  - Financial Analysis: Analysis of actual performance as compared to the annual budget for preceding fiscal year, including review of budget to actual revenues and expenses, deviations from budget, and potential impact on ability to meet the trust indenture requirements
  - Major Capital Improvements Assessment: Opinion as to the Major Capital Improvements that should be made over the next five years.
  - O&M Evaluation: Analysis as to whether the properties of the Concessioned System have been maintained in good repair and sound operating condition and an estimate of the amount, if any, required to place such properties in such condition. Includes site visits to perform a visual observation of major components of the Concessioned System.

Mr. Ryall provided 15-year projections of revenues and expenses to support a refinancing of the Water and Sewer Revenue Bonds with a $18,575,000 payment due in 2018. The refinancing is consisted of a bank loan with the debt on parity with the remaining concession bonds.

Water Utility Rates and Contract Negotiations | City of Norfolk, VA.

Mr. Ryall prepared comprehensive studies of water and sewer utility rates in for the City of Norfolk, Virginia. The studies covered multi-year projections of revenue and revenue requirements, long-range financial planning, cost of service by customer class, design rate schedules of rates for the sale of water to retail and wholesale service customers, and inside City sewer service. Mr. also has prepared biennial true-up calculations of wholesale customer rates in using audited figures to test the formula driven rates included by provisions in the wholesale service contracts. In addition, Mr. Ryall has also prepared annual estimates of true-up for fiscal years for inclusion in year-end financial audits.

Management Audit | Emerald Coast Utilities, Pensacola, FL.

Project Manager for the Emerald Coast Utilities Authority (ECUA) Management Audit. Using Process Improvement skills, a study was done on specific aspects of management, to include: Customer Service, Sanitation, Private Laterals, etc. An analysis of manpower used, and company retention was completed. Further studies and comparisons of rates and fees were also conducted to ensure ECUA is remaining current with the needs of their utility.

Mr. Garcia has extensive experience in municipal infrastructure and resiliency project engineering and management as well as financial analysis and planning. He has managed diverse projects involving stormwater and sanitary sewers, water supply and wastewater treatment, neighborhood improvement and streetscapes, traffic engineering, civil/site engineering, highways and bridges, and coastal and riverine protection. He has also served in roles as financial analyst/planner and internal auditor for large multinational banks and engineering consulting firms. Mr. Garcia's most recent projects are comprised of infrastructure resiliency and rehabilitation projects for the City of Miami Beach and Miami-Dade Water and Sewer Department.

DANIEL IGNACIO GARCIA, PE | PIPELINES

EXPERIENCE

Large Diameter Pipe Evaluation and Replacement | JEA, Jacksonville, FL

Program Manager for the Large Diameter Pipe Evaluation and Replacement Program – a five-year Program to develop a comprehensive plan to maintain, rehabilitate, and, if necessary, replace JEA's most critical assets in a manner that maintains a high level of service to their customers and at the same time most efficiently utilizes their funding. The program includes over 800 miles of gravity sewers, force mains and water transmission mains from 16-inch to 72-inch diameter. Technical duties include design lead on cured-in-place pipe (CIPP) and air release valve evaluation and rehabilitation projects.

Design-Build Palm and Hibiscus Islands Right-of-Way Infrastructure Improvements | City of Miami Beach, FL

This comprehensive neighborhood infrastructure improvement project includes major improvements to the stormwater infrastructure on both islands, including replacement of piping and addition of three pump stations. A major component of this project is public outreach due to the significant amount of harmonization necessary to address newly-raised streets and existing residence elevations. Additional improvements include replacement of water main, lighting, utility undergrounding, landscaping, streetscape, and pavement and marking.

Architectural and Engineering Design Services for 1st Street (Alton Road to Washington Avenue) | City of Miami Beach, FL

The streetscape beautification component of the project includes greenspace, pedestrian safety, lighting, and pavement material improvements. Three key goals of the streetscape component of the project are to create a safer, more walkable neighborhood for residents, attenuate noise from commercial activities located on the south side of 1st Street from residential units located on the north side. The scope of the project not only includes stormwater and water main and service lateral improvements along 1st Street, but also stormwater trunk line improvements along Washington Ave and Alton Rd from 1st Street to 5th Street and the design of a pump station to service the First and Fifth Street Drainage Basin. The stormwater design project will incorporate new City stormwater management design criteria and result in a more resilient public infrastructure system.

Espanola Way Pedestrian Mall Conversion | City of Miami Beach, FL

Lead designer for streetscape improvement project. Project included water main and stormwater improvements, as well as landscaping, paving and electrical design. A sophisticated bollard system was also designed for robust security measures required by the City for pedestrian-only areas.

54-in Wastewater Line Replacement, Consent Decree Project Number 4.5 (1) | Miami-Dade County Water and Sewer Department, Homestead, FL

Installation of 4.1 Miles of 54-inch wastewater line from SW 280 Street and SW 127 Avenue to SW 248 Street and 107 Avenue by method of open trench and trenchless technology. Led permitting modification efforts for canal crossing and highway crossings. Led permitting modification efforts for canal crossing and highway crossings. The original design specified microtunneling as the method of crossing canal and highway ramps. An analysis was conducted on the cost/benefits of microtunneling versus open-cut method for crossings. Extensive coordination with contractor, FDOT, SFWMD, and Army Corp of Engineers led to successful approval of the permit modifications resulting in significant time and money savings to the Owner.

EDUCATION

MBA International Finance and Global Business New York University Leonard N. Stern School of Business 2009

MS Civil Engineering Oregon State University 2003

BS Civil Engineering, Coastal/Structural Engineering University of Florida 1997

YEARS OF EXPERIENCE

18

PROFESSIONAL REGISTRATIONS

Professional Engineer - FL

Professional Engineer - NY

Envision Sustainability Professional

LEED Accredited Professional Building Design + Construction

Replacement / Rehabilitation of 72-inch Sanitary Sewer Force Main on NW/NE 159th Street from NW 17th Avenue & NE 10th Avenue, Consent Decree Project Number 4.4 | Miami-Dade County Water and Sewer Department, Miami, FL

Led the design and project management efforts for an emergency design-build project to replace/rehabilitate more than 3 miles of 72-inch PCCP sanitary sewer force main. The design included 8-inch and 16-inch temporary bypass piping to ensure that wastewater service was maintained for the three municipalities that share the force main during construction. In addition, more than ¼-mile of new 60-inch force main was constructed to connect the areas of HDPE sliplined 72-inch pipe. Provided design, permitting, and construction support services for the design-build project. Responsibilities include managing the design team for this design-build project. The project includes emergency repairs using a sliplining approach for more than three miles of force main pipeline.

Design-Build Sunset Harbour Neighborhood Improvements | City of Miami Beach, FL

The City of Miami Beach was experiencing stormwater drainage challenges in the Sunset Harbour neighborhood, which is one of the lowest-lying areas in the City. As part of a Design-Build team, Wade Trim performed ICPR drainage modeling and evaluation of the system to provide fast-tracked recommendations for both collection and stormwater pumping improvements to reduce flooding in the neighborhood. The recommendations were approved by the City, the South Florida Water Management District (SFWMD), and Miami-Dade County Environmental Resource Management.

City of Miami Auger Hole Decommissioning | City of Miami Capital Improvements Program, Miami, FL

Work included production of engineering plans and specifications for the abandonment of auger holes, modification of the existing drainage system for continued collection and conveyance of stormwater, and swale and roadway restoration.

Consent Decree Program & Construction Management Services | Miami-Dade County Water and Sewer Department, Miami, FL

Subconsultant of program management team. Responsibilities include validation of 30 miles of force main for inclusion in program. The program management team will manage the overall delivery of all tasks required for development and implementation of a comprehensive and technically sound long-term capacity, management, operations and maintenance (CMOM) program, as well as for the design, procurement, construction, and commissioning of the capital projects required in the Consent Decree.

Mr. Hobi a Principal Structural Engineer in the South Region of the Water Business Line, he is a specialist in civil/structural engineering with over 25 years of experience. He has extensive experience as the structural discipline lead engineer responsible for all structural aspects of projects from start to project completion. During his career as a structural engineer Mr. Hobi worked with other disciplines on many water and wastewater projects and understands the design and construction of such facilities. He has a wealth of experience in the design and analysis of reinforced concrete, structural steel and reinforced masonry structures, and he is skilled in the design, analysis and construction of reinforced concrete structures above and below grade with deep or shallow foundations. Particular aspects of his expertise include the design of earth retaining structures and flood control structures for water resources projects. Mr. Hobi is proficient in the design and analysis of all types of low-rise buildings.

SAM HOBI, PE | STRUCTURAL ENGINEER

EXPERIENCE

NEWRF Disinfection Improvements Evaluation | City of St. Petersburg, St. Petersburg, FL

Mr. Hobi served as structural engineer conducting a physical non-destructive evaluation of the chlorine contact basin at the Northeast Water Reclamation Facility (NEWRF) in preparation to prepare a technical memorandum outlining the findings and providing repair recommendations.

Lift Station 87 Successor Engineer Evaluations | City of Sarasota, Sarasota, FL

Mr. Hobi served as project structural engineer in the evaluation of the City's LS 87 pump station design, to address construction issues. The project involved a comprehensive review of design and construction documents, as prepared by another engineering firm. The project also included preliminary recommendations for design modifications to overcome the problems at the lift station. Phase II of the project included the redesign documents and permitting services.

Summerhouse WWTP Minor EID/ER | Onslow County Water & Sewer Authority (ONWASA), Onslow County, NC

Mr. Hobi served as project structural engineer of record for the design, analysis and production of structural drawings for new headworks as part of the rehabilitation of the Summerhouse Water Reclamation Facility project. The concrete headworks had elevated channels, tank and cover slab supported by concrete walls and columns.

Lithia Ozone Treatment | Tampa Bay Water, Hillsborough County, Florida

Mr Hobi was the Structural Engineer of record for design, analysis and production of structural drawings for all cast-in-place concrete structures that included Pump Station, Ozone Generator Building Foundation, Ozone Dissipation Chamber.

Airport Wastewater Treatment Plant Expansion | Hernando County, Florida

Mr Hobi was the Structural Engineer of record for design, analysis and production of structural drawings for all cast-in-place concrete structures that included Headworks, Filters, Chlorine Contact Basin, Dewatering building and other structures.

Toho Water Authority Asset Management Implementation | Kissimmee, Florida

Mr Hobi assisted with ongoing asset management work for Toho Water Authorities overall asset management program, duties included performing inventory and structural condition assessment and engineering data analysis at two treatment facilities and 47 lift stations.

Lee County Utilities: Asset Management Plan | Fort Myers, Florida

Mr Hobi assisted with the implementation of a comprehensive asset management program for the County including an organizational assessment, software evaluation, inventory & condition assessment program for 10 treatment facilities and 600 lift stations, duties included performing inventory & structural condition assessment and engineering data analysis of four treatment facilities and 33 lift stations.

Miramar Water Treatment Plant, R/O Expansion Project | City of Miramar, Florida

Mr Hobi was Structural Engineer of record for the design of the supports for degasifier tower, odor control tanks and other structural modifications in the R/O building, he produced structural drawing and reviewed construction submittals and RFI's

Constructability Analysis and Value Engineering Services for WTP NO. 2 Filter Replacement | Palm Beach County Water Utilities Department, FL

Mr. Hobi was part of a VE team that held two 5 day workshops, the first was at 60% design and the

EDUCATION
MS Structural Engineering Oklahoma State University 1989

BS Civil Engineering Northeastern University 1985

YEARS OF EXPERIENCE
25

PROFESSIONAL REGISTRATIONS
Professional Engineer (FL, GA, MI, NC, TX)

second was at 90% design. The VE team generated comments that were discussed with the owner and project engineer and resulted in improved overall design and cost savings.

Dale Mabry Advanced Wastewater Treatment Plant Headworks | Hillsborough County Public Utilities Department, Tampa, FL.

Mr. Hobi was the Structural Engineer of Record, he Investigated the structural condition of existing headworks and conditioning tank. Recommended demolition of the headworks, and rehabilitation of the conditioning tank. Provided structural drawings for a new headworks and structural drawings for modification and rehabilitation of the existing conditioning tank.

Digester Building Rehabilitation at Marshal Street and Northeast WWTP Project | City of Clearwater, Florida

As Structural Engineer of Record Mr. Hobi performed design, analysis and production of structural drawings for additions to existing digester buildings at both plants, also new pump shelters were added with a new boiler building at the Marshal Street plant. The digester tanks were inspected recoated and refitted with new pipe supports. Two new pipe penetrations were added to the existing tank walls and carbon fiber was used to reinforce the openings.

W. E. Dunn Water Reclamation Facility | Pinellas County, Florida

Mr. Hobi was the Project Structural Engineer, he performed structural design analysis and production of structural drawings for a new 13.5-MGD reinforced concrete headworks structure supported by a mat foundation; Modification and enclosure of an existing reclaimed water facility; Concrete foundation and steel framing design for a new warehouse building.

Sludge Handling Facilities | Ormond Beach, Florida

Mr. Hobi was the Project Structural Engineer, he performed design, analysis and production of drawings for a new enclosure for the Centrifuge Platform. The enclosure consisted of hollow core slab roof supported by a perimeter beam and columns. The columns are anchored to a grade beam on top of pile caps and cast-in-place concrete piles.

Master Lift Station 39A | Manatee County, Florida

Mr. Hobi was the Project Structural Engineer, he performed design and Production of structural drawings for rehabilitation of wet well area. Design of an overhead bridge crane in the pump room and upgrading the overhead monorail crane in the control room.

Southwest Master Pump Station | Pasco County, Florida

Mr. Hobi was Project Structural Engineer, he performed structural design and drawings production for pump and surge tank foundations and a control building that consisted of hollowcore roof atop a 12” masonry wall supported by a continuous wall foundation.

Mr. Dawkins establishes the Arcadis water division's architectural design approach and technical direction and coordination of the architectural group. He is experienced in industrial, institutional, commercial, and municipal design and construction projects throughout the tri-state area of metropolitan New York. He is a member of award-winning design teams for schools, libraries, recreational facilities, and other municipal buildings. As an architectural project leader and manager, he has worked on various projects including public and private schools, water and wastewater treatment facilities, pools, laboratories and offices. As a LEED accredited professional, he incorporates sustainable building strategies into his design projects. He has a broad knowledge of the various building codes and standards, such as ICC, NFPA, OSHA, and ANSI, to conduct building code reviews for various types of projects and confers with both local and state code officials to resolve unique code conditions.

ERROL DAWKINS | ARCHITECTURAL DESIGNER

EXPERIENCE

Assembly Warehouse Project | Confidential Client, West Palm Beach, FL

Architect of Record on fast track design building assembly warehouse. Oversaw the design of 100,000-sq ft warehouse and assembly building with administration space and staff breakroom/ training room and locker facility. Facilitated permit approval with meeting with local code officials.

Toxic Release Inventory | Wyeth Corporation, Pearl River, NY

Architect performing a design evaluation of proposed laboratory addition to the Pearl River campus for LEED compliance. The building addition included pharmaceutical process space, and laboratory and office space. The evaluation included a LEED design charrette with the design team, a follow-up report of targeted and possible LEED credits available based in the current design. Recommendations were made to increase the total points of the project.

Palm Beach Renewable Energy Facility No. 2 | Solid Waste Authority of Palm Beach County, West Palm Beach, FL

Provided on site monitoring of architectural elements during the construction of the Renewable Energy Facility No. 2 which includes monthly on-site visits, walk down of construction progress and photographic reports of issues and concerns.

North County Resource Recovery Facility | Solid Waste Authority of Palm Beach County, West Palm Beach, FL

Architect on design team developing design criteria and aesthetic standards for new renewable energy facility which is to be one of the country's largest mass burn facilities which includes administration space, educational space, recovery and boiler facilities and air pollution control equipment facilities. The facility design criteria include LEED certification and sustainability components. Provided conceptual design layouts and general design specification and criteria for architectural elements. Performed evaluations of bidders' proposals and green enhancements designs for client's review.

Consulting Engineering for North County Resource Recovery Facility | Solid Waste Authority of Palm Beach County, West Palm Beach, FL

Provided the architectural design criteria and conceptual drawings for 125,000-sq ft combined residential and commercial recycling facility which replaces the existing facility.

Airport Wastewater Treatment Plant Modifications | Hernando County, Brooksville, FL

Architect for the addition of pre-engineered building containing dewatering equipment and associated existing facilities administrative changes.

Replacement Chloramination Building | Tampa Bay Water, Brandon, FL

Architect for replacement chloramination building. This building is 2,600 sq ft located within a residential zone. The structure was designed to blend in with the existing residential scale architecture. The building contents two chemical areas with containment as well as mechanical and electrical support spaces.

New FPF Design Building Project | Solid Waste Authority of Palm Beach County, West Palm Beach, FL

Provided design criteria services for the construction of new ferrous metal recovery facility. Provided architectural conceptual design plans and elevations as well as design criteria report the new facility project.

Bray Park Roof Replacements | Manatee County, Bradenton, FL

Senior Project Architect for the site visit and review of existing metal roofs on various buildings totalling 50,000 sq ft. Providing new metal roof design for both metal roof construction and wood frame construction.

EDUCATION
BA Architecture, CUNY City College 1989

YEARS OF EXPERIENCE
32

PROFESSIONAL REGISTRATIONS
Registered Architect – CT, DC, FL, GA, LA, MA, NY, OH

Leadership in Energy and Environmental Design – NY

Ms. Pilar has over 2 years of experience in a wide range of water resources and environmental projects. Her water resources experience extends from construction oversight of Class I injection wells, water supply wells, production wells, drainage wells, and restoration of storm drains and conveyance systems. Additionally, completing flow evaluations, well rehabilitation, mechanical integrity tests, following federal and state standards. Her environmental experience includes conceptual site models, quantitative and qualitative hydrogeologic analysis, infiltration testing, groundwater flow modeling, and slug testing utilizing programs such as AQTESOLV and Surfer. In addition, Ms. Pilar is responsible for soil and groundwater sampling in accordance with FDEP standards, and overseeing monitor well installations and excavations of contaminated sites. She has worked under a variety of public and private clients utilizing her knowledge to write proposals, work plans, and site assessment reports.

ESTEPHANIA PILAR | WATER SUPPLY PLANNING

EXPERIENCE

Class I Injection Well Systems | City of Miramar, Miramar, Florida

Provided ongoing supervision during the construction and completion of a Class I injection well and dual zone monitor well for membrane treatment reject concentrate disposal. Supervised drilling activities, packer tests, geophysical logs, and injection tests performed by the Contractor. Assembled lithological logs, core logs, and daily reports for the duration of the project. Continuously sampled monitor wells in accordance with FDEP SOP FS2200 and drafted summary reports for FDEP's weekly submittals. Additionally, Ms. Pilar was responsible for overseeing the replacement and testing of the water supply wells.

Bond Consultant's Inspection and Report | Miami-Dade County - Water and Sewer Department (WASD), Miami, Florida

Conducted inspections of water and wastewater treatment facilities, wellfields, water storage, pumping facilities and wastewater pumping stations to characterize the physical condition and operating condition of major asset components. Collected data using state-of-the-art mobile data collection technology and 360-degree camera to develop a comprehensive asset database.

Consulting Engineer Facilities Inspection Services | Port of Miami-Dade (PortMiami), Miami, Florida

Conducted visual inspections and recorded field observations of the PortMiami facilities including, but not limited to, cruise terminals, passenger boarding bridges, cargo gates and bridges, provisioning sheds, and other facility buildings. Collaborated with subconsultant to coordinate subaqueous inspections and process associated inspection findings. Analyzed structural, architectural, mechanical, civil, electrical, HVAC, fire protection, plumbing, and general maintenance inspection data to generate reports outlining system conditions and develop facility assessment deficiency documentation for the report.

Production Well System - Supply Well #3 | Tindall Hammock Irrigation and Soil Conservation District., Davie, Florida

Provided ongoing supervision during the construction of one Surficial (Biscayne) aquifer production well. The primary role consisted of onsite collection, examination, and description of the production-zone drill cutting samples. Ms. Pilar was also responsible fordocumenting and monitoring the supply well development, sand testing, and water quality sampling.

Class V Stormwater Drainage Wells | Tampa Electric Corporation People's Gas, North Miami Beach, FL

Supervised the installation of two Class V, Group 6 storm-water drainage (injection) wells. Maintained daily construction logs, collected, and described lithological samples, submitted daily reports, ran specific capacity tests, and oversaw well development, and casing installation. Conducted meetings with the Contractor and reviewed permits before submittal.

Springtree Water Treatment Plan R.O Well No.1 Rehabilitation | City of Sunrise, FL

Supported a chemical treatment plan for a Reverse Osmosis (RO) well. In early to mid-2018, the RO well chloride concentration gradually began to increase, and the RO pre-filter cartridges began plugging with black, sludge-like deposit. The cause of this was believed to be related to the increasing percentage of native water in the recovered mixture of brackish-native and fresh-recharge water. The native water was higher in sulfide ion concentrations and likely stripping iron from the formation near the borehole area. The treatment was completed in two phases. Phase 1 included the evaluation of the injection and recovery of potable water with high-sulfide ion compound. Phase 2 included the evaluation of a low strength high water-volume injection of dilute hydrochloric acid with the withdrawal of all injected fluids.

EDUCATION

BS, Geosciences, Florida International University, 2017

AA, Chemistry, Miami Dade College, 2014

YEARS OF EXPERIENCE

2.5

Tobon Engineering
Engineering and Utility Management

Maurice Tobon, P.E., PMP

President

Education

M.E. – Civil Engineering, University of Florida (92)

B.S. – Civil Engineering, University of Florida (90)

Registration

Professional Engineer: Florida (License No. 49373)

Project Management Professional (PMP)

President of ***Tobon Engineering*** and a professional water engineer with over 30 years of experience in water, wastewater, reclaimed water engineering, climate change and utilities management in south Florida and internationally. Served for over fifteen years at the highest management levels of two of the largest water utilities in south Florida **(Palm Beach County and City of Fort Lauderdale)** and was responsible for nearly $ 1 billion in program management capital improvements. Unique experience and insight from being in government for many years and understands the issues faced by water and wastewater utilities. Responsible for formulating sustainable infrastructure solutions in line with strategic visions and key intended outcomes and missions as defined by the Executive Administration.

Professional History

2016 to present *Tobon Engineering*, **President**

2007 to 2016 *Palm Beach County Water Utilities Department*, **Director of Engineering/Program Manager**

1997 to 2007 *City of Fort Lauderdale,* **Engineering Design Manager/Assistant Program Manager**

1990 to 1997 *Camp Dresser & McKee Inc.,* **Project Manager**

HYDRAULIC MODELING

Over 25 years of hydraulic modeling experience using KYPIPE, Cybernet, and Infowater software. Mr. Tobon has developed hydraulic models up to 75,000 pipes for both water and wastewater systems, including pump and booster stations. Experienced in model development from GIS databases, calibration based on field test data, capital planning, and evaluation. This experience includes steady state as well as extended period simulation of multiple water distribution systems and the generation of various scenarios to account for hourly demand patterns, seasonal variations as well as fire flow demands. For wastewater systems experience includes static as well as extended period simulation of multiple wastewater pump station and force main systems, incorporating knowledge on the simulation of collection area flow patterns, pump operations, and analysis of resultant force main pressures, flows and pump station cycling. The following is a list of water and wastewater hydraulic modeling projects:

- Royal Utility Water
- Avenir Development Water and Wastewater

  - Ancient Tree Development Water and Wastewater
- Seacoast Utility Authority Reclaimed Water

- Seacoast Utility Authority Potable Water
- City of Coral Springs Water and Wastewater
- City of Boca Raton Water and Reclaimed Water
- City of Port Charlotte Rotonda Area Water
- City of Miami Beach Wastewater
- City of Fort Lauderdale Water and Wastewater
- Palm Beach County Water, Reclaimed Water, Raw Water and Wastewater

WATER AND WASTEWATER MASTERPLANS

Consultant, Reclaimed Water Master Plan, Palm Beach County Water Utilities Department, ongoing. Mr. Tobon is responsible for reclaimed water system data analysis including historical and projected yearly, monthly, daily and hourly demands. Development of the reclaimed water hydraulic model which was integrated with the Broward County reclaimed model. The integrated hydraulic model is being used to determine pipe sizing, booster station location, storage requirements, and extent of reclaimed water availability.

Consultant, Town of Davie Water and Wastewater Master Plan, Town of Davie Utilities Department, ongoing. Mr. Tobon is responsible for water and wastewater system data analysis including historical and projected water yearly, monthly, daily and hourly flows from the treatment plants into the distribution and collection systems. Data analyses includes rainfall variations and their impact on wastewater flows. Serve as a technical advisor for the development of a 20-year capital improvement program.

Director of Engineering, 2012 Water and Wastewater Masterplan, Palm Beach County Water Utilities Department. This project was for the development of the 2012 Water and Wastewater Masterplan for Palm Beach County Water Utilities Department. Both masterplans recommended over 500 million dollars in capital projects which served as the basis for ongoing Capital Improvement Program. The masterplans were developed by consultants under the direction and supervision of Mr. Tobon.

Director of Engineering, 2014 Glades Region Water and Wastewater Masterplan, Palm Beach County Water Utilities. This project provided the creation of the first Water and Wastewater Masterplan for the municipalities of South Bay, Belle Glade and Pahokee. The masterplan summarized the existing conditions of the water and wastewater systems, created hydraulic models for water and wastewater collection systems and prioritized improvements including treatment systems. The masterplans were developed by consultants under the direction and supervision of Mr. Tobon.

Engineering Design Manager, 2007 Water and Wastewater Masterplan, City of Fort Lauderdale Public Services, Florida. This project provided for the 2007

Water and Wastewater Masterplans for the City of Fort Lauderdale. Both master plans developed over 550 million dollars in capital projects, which served as the basis for *Waterwork 2011 Program Management*. Consultants under the guidance, direction and supervision of Mr. Tobon developed the Masterplans.

Project Manager(CDM), Water and Wastewater Masterplan, City of Coral Springs. This project provided the Water and Wastewater Masterplan for the City of Coral Springs, Florida. Both master plans created the first hydraulic models of the water and wastewater systems for the City of Coral Springs. Mr. Tobon served the Project Manager for the effort and was fully responsible for all deliverables.

Project Manager(CDM), Wastewater Masterplan, City of Miami Beach. This project provided for the Wastewater Masterplan for the City of Miami Beach, Florida. Mr. Tobon was responsible for the hydraulic model of the wastewater system and analysis of population growth with subsequent capital improvements.

INFRASTRUCTURE ASSESSMENT

Director of Engineering, Condition Assessment of PCCP 36 and 42-inch Southern Regional Trunk Forcemain, Palm Beach County Water Utilities Department. This project was for the inspections and provides an overall condition assessment of several aerial crossings. Then nondestructive inspection and condition assessment techniques included; External Electromagnetic Survey;Sonic/Ultrasonic Non-Destructive Testing; Visual and Sounding Inspection; 3-Dimensional Non-linear Finite Element Modeling and Analysis; including a comprehensive PCCP design risk/performance analysis, and; Transient Pressure Monitoring. The analysis and report were developed by a consultant under the direction, supervision and technical review of Mr. Tobon.

PROGRAM MANAGEMENT

Director of Engineering/Program Manager, Water and Wastewater Masterplan, Palm Beach County Water Utilities Department. Mr. Tobon was at an Executive level position managing and providing leadership to a staff of 35 in the Engineering Division and consultant Program Managers for the Water Utilities Department $ 400 Million CIP. Staff includes a total of over 10 professional engineers, construction managers, engineering inspectors and support staff. Personally, responsible for creating the Program Management program (*WUD 2020 Capital Improvements Program*) by effectively managing staff and consultant partners. Responsible for developing organizational performance measures and structures that balance out competing interests while exercising established policies and procedures, streamlining production and enhancing department's cross functionality and efficiency.

Engineering Design Manager and Assistant Program Manager, City of Fort Lauderdale. Partially responsible for development and implementation of the City of Fort Lauderdale's 10 year $ 550 million Water and Wastewater Program Management (*Waterworks 2011*). Played a key role in the management of the *Waterworks* 2011 program and served as the assistant Program Manager within the City for this effort.

WATER DISTRIBUTION AND TRANSMISSION SYSTEMS

Technical Reviewer, City of Lake Worth, Lake Osborne Phase 1 Water Mains, 30, 60 and 90 percent design review including contract documents.

Director of Engineering, South County Water Service Replacement Phases I-III, Palm Beach County Water Utilities Department. Replacement of approximately 2,000 water services and replacement of AC water mains in the southern portion of Palm Beach County. Project was a multiyear multimillion dollar effort that involved a consultant design team and various construction contracts. Mr. Tobon was responsible for the directing and advising on the design and facilitating construction of the improvements.

Director of Engineering, Water and Sewer Service to North County Airport, Palm Beach County Water Utilities Department. Construction of a 3-mile water main and sewer force main to serve North County Airport. Project also consisted of a jack and bore under an active railroad track. Project was designed and managed during construction by County staff. Mr. Tobon was responsible for the directing and advising on the design and guidance during construction.

Engineering Design Manager, Poinciana Park 2 MG storage tank, City of Fort Lauderdale Public Services, Florida. Project was for the demolition of an existing steel standpipe and construction of a new 2MG ground storage tank and pump station at Poinciana Park. Mr. Tobon was responsible for the directing and advising on the design and also involved during construction.

WASTEWATER COLLECTION AND TRANSMISSION SYSTEMS

Director of Engineering, Lift Station Rehabilitation Phases 1-4, Palm Beach County Water Utilities Department. Rehabilitation of 38 lift stations during a 4 year period, rehabilitation included new wet well coatings, valves, piping, pumps and control panels. Mr. Tobon was responsible for the directing and advising staff from preliminary design through construction.

Director of Engineering, Booster Station 5241 Improvements, Palm Beach County Water Utilities Department. Rehabilitation of a major inline wastewater booster station, improvements included new valves and piping. The design build contract was carried out under the direction of Mr. Tobon.

Director of Engineering, South Bay Wastewater Lift Station Rehabilitation, Palm Beach County Water Utilities Department. Rehabilitation of 4 lift stations, rehabilitation included new wet well coatings, valves, piping, pumps and control panels. Under Mr. Tobon's direction all grant requirements were met and he was responsible for the directing and advising on the design and provided guidance during construction.

Director of Engineering, Pahokee I&I and Wastewater Lift Station Improvements, Palm Beach County Water Utilities Department. Mr. Tobon was responsible for ensuring successful in-house design and construction project which was ARRA Funded. All grant requirements were carried out under his direction by engineering division staff.

Engineering Design Manager, Pump Station Rehabilitation: Pump Stations No. A-11, B-8, D-39, D-47 and E-5, City of Fort Lauderdale Public Services, Florida. Rehabilitation of 6 major lift stations, some of the improvements included replacement of can stations for submersible stations. Rehabilitation included new wet well coatings, valves, piping, pumps and control panels. New sanitary sewer, manholes and force mains were also constructed. Mr. Tobon was responsible for the directing and advising on the design and guidance during construction.

Engineering Design Manager, Pump Station Rehabilitation: Pump Stations No. A-2, A-17, A-18, A-19 and A-21, City of Fort Lauderdale Public Services, Florida. Rehabilitation of major lift stations, rehabilitation included new wet well coatings, valves, piping, pumps and control panels. New sanitary sewer, manholes and force mains were also constructed. Mr. Tobon was responsible for the directing and advising on the design and facilitating construction of the improvements.

Engineering Design Manager, Pump Station Rehabilitation: Pump Stations No. D-41, A-9, B-5, B-6 and B-13, City of Fort Lauderdale Public Services, Florida. Rehabilitation of major lift stations, rehabilitation included new wet well coatings, valves, piping, pumps and control panels. Some of the duplex can stations were demolished and new submersible stations constructed. New sanitary sewer, manholes and force mains were also constructed. Mr. Tobon was responsible for the directing and advising on the design and facilitating construction.

Project Manager(CDM), Park City Wastewater Booster Station, City of Sunrise, Florida. Design Engineer for a 5 mgd inline wastewater booster station. The station was designed to repump wastewater from a decommission WTTP located in the Town of Davie to the Springtree WWTP in Sunrise.

LARGE DIAMETER RECLAIMED AND WASTEWATER TRANSMISSION PIPING

Director of Engineering, FPL 36 Inch Reclaimed Water Pipeline, Palm Beach County Water Utilities Department. Construction of an 18 mile 36-inch

Reclaimed Water Pipeline from the East Central Regional Wastewater Treatment Plant to the West County Energy Center. The project consisted of 11 direction drills including under the Florida Turnpike and thru the West Palm Beach Water Catchment Area. The total $ 52 million project was a Public Private Partnership between Palm Beach County and FPL. The pipeline portion of the project was designed by Palm Beach County staff under the supervision of Mr. Tobon who was also involved during construction, the total cost of the pipeline was $ 19 million.

Engineering Design Manager, A1A 24-inch Wastewater Force main, City of Fort Lauderdale Public Services, Florida. The project was for the construction of 3,600 feet of a new 24-inch force main along A1A and Seabreeze Blvd in Fort Lauderdale. The new force main relieved a hydraulic restriction in the wastewater system and reduced system pressures, which increased wastewater to flow to the wastewater treatment plant. The project was designed by City staff under the supervision of Mr. Tobon and constructed under his direction.

Engineering Design Manager, Oakland Park 48 and 36-inch Water Mains, City of Fort Lauderdale Public Services, Florida. Removal of 900 LF of existing 36" PCCP water main, fittings, valves and existing 54" steel casing. Installation of approximately 140 LF of 30" DIP pipe through an existing 54" Steel Casing and installation of 920 LF of 30" DIP water main including valves, fittings and appurtenances. Designed by City staff under the supervision of Mr. Tobon who was also involved substantially during construction.

Engineering Design Manager, Davie Blvd 24-inch Water Main, City of Fort Lauderdale Public Services, Florida. Construction of 5,000 feet of 24-inch water main along Davie Blvd from Federal Highway west. The project was designed by a consultant under the supervision of Mr. Tobon and was completed in 2005**.**

WASTEWATER AND WATER TREATMENT

Senior Project Engineer, Miccosukee Tribe of Indians, Miccosukee Service Plaza Wastewater Treatment Membrane Bio Reactor and Water Treatment Reverse Osmosis, Preliminary Design Report and Design Criteria Package. Responsible for the development of the Preliminary Design Report which evaluated wastewater and water treatment options to serve the proposed Miccosukee Service Plaza in Broward County Florida. Options considered for the wastewater system included several BNR and MBR systems including the use of an effluent reuse system for toilet flushing. Wastewater effluent disposal options were also evaluated based on permitting requirements, cost and operations. Water treatment options considered included nano and reverse osmosis filtration systems.

Director of Engineering, **Palm Beach County Water Utilities Department, WTP 2 MIEX System.** Replacement of existing ozone system with a water treatment system (MIEX) to treat the color and organic content of the potable water at WTP No.2. which increased plant capacity by 1.9 MGD to 16.4 MGD. Mr. Tobon was responsible for the directing and advising on the design and facilitating construction of the improvements.

Director of Engineering, **Palm Beach County Water Utilities Department, Lake Region WTP Energy Recovery.** Installed energy recovery devices (ERDs) and associated improvements for the 4-existing reverse osmosis (RO) skids at LRWTP. ERDs helped to enhance performance, save energy & reduce power costs. Responsible for the directing and advising on the design and facilitating construction of the improvements.

Director of Engineering, **Palm Beach County Water Utilities Department, WTP 2 Filter Replacement.** Construction of a two-level filter structure consisting of granular media filters, enclosed filter gallery, air scour blowers, electrical room, clearwell, transfer pumps, backwash pumps, a concrete lined backwash water pond and backwash water return pumping station. Responsible for the directing and advising on the design and facilitating construction of the improvements.

Engineering Design Manager, City of Fort Lauderdale, Peele Dixie Membrane Treatment Plant. Construction of a new 13 mgd membrane water treatment facility located adjacent to the existing Peele Dixie water plant. A new concentrate disposal well was also constructed, the existing water treatment plant was decommissioned. Mr. Tobon was responsible for the directing and advising on the design and facilitating construction of the improvements.

PUBLICATION

- Tobon M., Pettit C. (2017), *Toolkit for Climate-Water Utility Operations,* USAID.

PROFESSIONAL AND VOLUNTEER ACTIVITIES

Water Environment Federation (WEF)
American Water Works Association (AWWA)
American Society of Civil Engineers (ASCE)

ENGINEERS WITHOUT BORDERS Mentor and Technical Advisory Committee

- Engineers without Borders (EWB) Professional Mentor University of Florida Student Chapter, Shree Janahit Higher Secondary School water supply project Khanalthok, Nepal (ongoing)
- Engineers without Borders (EWB) Professional Mentor Rutgers University, village water supply project Karatu, Tanzania (ongoing)

- Engineers without Borders and Clinton Health Access Initiative, *Fluoride Treatment Evaluation for Drinking Water, Madhya Pradesh India, 2018,* Team and technical lead for the evaluation of treatment technologies for the removal of Fluoride in groundwater to prevent Fluorosis.
- ASCE/EWB International Development Conference, Panama City, Panama ***Special Topics Course-Water Treatment Instructor***. Water system assessment towns of San Francisco and La Paz, Panama (2014)

CONTACT INFORMATION

Maurice Tobon, P.E., PMP
5504 NW 86 Way
Coral Springs, FL 33067
954 415-5594
Toboneng@bellsouth.net

Aubrey Haudricourt, PE
Electrical Engineer

MCKIM & CREED

KEY QUALIFICATIONS

- ✓ Career focused on electrical and controls systems specific to water and wastewater facilities
- ✓ Versatile knowledge of water and wastewater facilities designs
- ✓ Knowledge of proper safety procedures for working on and around high-voltage electrical and water and wastewater utility treatment plants

EDUCATION

B.S.E.E., Electrical Engineering, Old Dominion University

LICENSURE

Professional Engineer, FL # 66861

Professional Engineer, TX, GA, VA

AFFILIATIONS

Institute of Electrical and Electronics Engineers (IEEE)

IEEE Power & Energy Society (PES)

Mr. Haudricourt brings 42 years of experience in both electrical and instrumentation engineering and construction. He has designed and overseen the installation of power generation, controls systems, lighting for large facilities. He has also been involved in security assessment and security design. His expertise includes evaluating existing conditions, treatment facility electrical systems, and both electrical and instrumentation systems. Most recently, Mr. Haudricourt served as the lead electrical and I&C designer for the City's high service pump station upgrades.

SELECT PROJECT EXPERIENCE

High Service Pump Upgrades | City of Hollywood, FL

McKim & Creed designed the rehabilitation and upgrade of a high-service pumping system with a maximum capacity of 45 mgd. The 30-year-old pump station was the primary water supply for the City of Hollywood; it consisted of 10 pumps ranging from 200 HP to 700 HP. For this project, our team looked at the current water demands and recommended changes to maximize efficiency, and then provided pumping control strategies as well as design services for upgrading the electrical and control systems. At least 80 percent of the pumping system and 100 percent of the motor and control elements were replaced.

Deep Injection Well MS/RO Conc Disp | City of Hollywood, FL

Lead design and project engineer for creation of a deep well injection pumping system at the City's' water treatment plant. Project included medium voltage service connection modifications with transformation, switchgear modifications, variable speed pump control and remote SCADA control network. Additional project work included demolition of existing low voltage standby generator system, complete replacement of low voltage switchgear and MCC's that supply 40mgd high service pumping for future variable speed drives for high service pumps. Design includes "Smart" MCC technology and remote power monitoring of switchgear. Project included all construction services.

Electrical Power Generator | City of Hollywood, FL

Complete electrical evaluation of the water treatment plant's electrical service and distribution systems. Evaluation included discussion with power utility on quality issues and review of dual power feed service. In addition, a complete power load review and mapping was performed on all motors and breakers greater than 1hp @ 480V and 240V and less distribution panels. This information was inputted into a database for analysis of fault, coordination and arcflash reports. The load information was used to determine the future needs of the plant for standby as well as electrical distribution upgrades.

Howard F. Curren Advanced WWTP Master Plan Phase I City of Tampa, FL

As senior electrical engineer for this project, Mr. Haudricourt reviewed and evaluated the electrical equipment comprising of both low and medium voltage distribution systems, electrical coordination studies and provided an analysis and evaluation for the AWTP electrical systems master planning. Future flows projections and resiliency focused scopes and budgets for CIP projects.

Design Criteria Professional for NWRWRF Expansion | Hillsborough County, FL

Mr. Haudricourt provided electrical engineering services for the planning and expansion phases of the Northwest Regional Water Reclamation Facility (NWRWRF). A facilities master plan was developed related to the Northwest Wastewater Consolidation program and a design criteria package (DCP) for the NWRWRF expansion.

Toho Water Authority Energy Master Plan | Orlando, FL

Analysis and planning team member for comprehensive energy study for all of Toho Water Authority water and wastewater facilities. Project criteria utilized EPA "Energy Management Guidebook for Water and Wastewater Utilities". Project assessed current energy usage and created baseline energy consumption. Energy priorities were established with paths for improvements.

Michael Fadini, PE
Electrical Engineer

MCKIM & CREED

KEY QUALIFICATIONS

- ✓ Experience in both medium voltage design and controls
- ✓ Experience designing MV VFDs with soft start bypasses where the construction was completed without downtime
- ✓ Designs consider future building expansion, and/or increased load requirements

EDUCATION

B.S., Electrical Engineering, Ohio State University

LICENSURE

Professional Engineer, FL # 87173

Professional Engineer, DE, NJ

** Project completed prior to joining McKim & Creed*

Mr. Fadini has over 30 years of experience specializing in medium voltage electrical systems in the industrial and municipal marketplace. Mr. Fadini has proven expertise of medium voltage switchgear; including generator controls, variable frequency drives, transformers, protection and cabling. He is adept at engineering designs, AutoCAD, and construction management, including startup, troubleshooting and commissioning. Additionally, Mr. Fadini excels at managing projects, mentoring designers and engineers, construction support and building client and trades relationships. He has recent experience and professional development in Ethics, Safety, 2017 NEC Code Changes, SEL Protective Relay Programming for Transformer and Motor Protection, Allen Bradley VFD and Smart MCC programming.

SELECT PROJECT EXPERIENCE

Design Criteria Professional for NWRWRF Expansion
Hillsborough County, FL

Mr. Fadini provided electrical engineering services for the expansion of the Northwest Regional Water Reclamation Facility (NWRWRF). A site master plan was developed related to the Northwest Wastewater Consolidation program and a design criteria package (DCP) for the NWRWRF expansion. The scope of services included site planning, design criteria package/procurement, and design/construction and implementation support.

Develop and Implement a SCADA Master Plan
Tampa Bay Water, FL

McKim & Creed developed a SCADA master plan to help Tampa Bay Water to reduce energy usage, decrease costs, mitigate risk and plan for the future operations of its utility systems.

Lake Park Generator Remote Start SCADA
Hillsborough County, FL

Mr. Fadini provided the electrical and controls design as well as the PLC and SCADA programming changes to meet this goal. We worked with the County and the electrical contractor in a turn-key approach to accomplish this with minimal downtime using the existing County standards in place at other facilities.

Paulsboro Refinery Multiple Projects*
Paulsboro NJ

Mr. Fadini served as project manager for the Capital Projects group. Responsible for $6MM Crude 7 Electrical Upgrades and $2MM Sub WC3 Upgrades. Projects included: switchgear reliability upgrades, extensive cable tray systems, MCC replacements, transformer upgrades with HRGs, cable replacements including PILC to CLX splices, UPS projects, power distribution systems including permanent and temporary generators for several substations, and detailed switching procedures.

Lake Park Bleach PLC Panel Rehab
Hillsborough County, FL

Mr. Fadini served as E&I senior project engineer. M&C provided all engineering and design, coordinated with the panel fabricator and electrical construction, modified all the PLC and SCADA programs and performed the startup in a turn-key fashion. The Lake Park Water Plant had an existing Bleach PLC control panel that was not maintained and many of the components were reaching the end of their supported life. M&C designed a replacement control panel subpanel and the replacement of the two panel doors with new doors to separate the 120V and 480V sides of the panel for arc flash safety purposes. Four new Yaskawa VFDs were provided using Ethernet communications. The existing 480V power cables for the panel were removed and a new 480V breaker was installed in the 480V distribution panel in the Bleach Building.

Mike Stoup, PE
I&C/SCADA

MCKIM & CREED

KEY QUALIFICATIONS

- ✓ Extensive E&I experience
- ✓ Knowledge of available technology
- ✓ Focus on practical application of automation

EDUCATION

B.S., Electrical Engineering, University of South Florida

LICENSURE

Professional Engineer, FL # 65702

Professional Engineer, NC, KY, CA

AFFILIATIONS

FS-AWWA Information Systems Division Chair

FS-AWWA Automation Past Committee Chair

ISA Tampa Chapter Vice President & Past Program Chair

Mr. Stoup's career spans over 25 years of design, implementation and management of SCADA system and process instrumentation and controls projects in the industrial and municipal marketplace. He offers extensive experience in the areas of project management, QA/QC, control system planning and design, PLC and HMI software implementation, communications and network planning and control systems implementation. His system hardware and software knowledge extends to platforms provided by Allen Bradley/Rockwell, Schneider Electric, Trihedral, Inductive Automation and Wonderware software.

SELECT PROJECT EXPERIENCE

Howard F. Curren Advanced WWTP Master Plan Phase I
City of Tampa, FL

Mr. Stoup served as SCADA project manager to provide engineering services for phase 1 of the project, which included review of the historical and ongoing projects, reports and studies; initial observation and familiarization of the plant; and a conceptual level assessment of major equipment within the facility and the current operations.

Develop and Implement a SCADA Master Plan
Tampa Bay Water, FL

McKim & Creed developed a SCADA master plan to help Tampa Bay Water to reduce energy usage, decrease costs, mitigate risk and plan for the future operations of its utility systems.

SCADA Master Plan, Charlotte County, FL
Port Charlotte, FL

Charlotte County enlisted McKim & Creed to develop a SCADA master plan that acts as a detailed roadmap to the County for enacting SCADA system improvements. Our team's scope of work included five key elements: project management, goals/objectives workshops, system data collection, information analysis and development of the master plan document.

SCADA Improvements at Hillsborough County Water Treatment Facilities - Phase 1
AECOM | Tampa, FL

McKim & Creed created an accurate, single set of piping and instrumentation diagram (P&ID) drawings from the existing P&ID drawings and verified these in the field to reflect actual conditions. After they were complete, the drawings were used to build the new graphical portion of the SCADA system using the PUD standard Citect genies and interface screen conventions. The scope of work included purchasing new or updated hardware and licenses required for the conversion; close coordination with the County, data collection, review and update of P&ID designs, review of existing Citect and PLC programs and databases to estimate the number of data points and complexity of the P&IDs and SCADA screens, and site visits to three different facilities.

SCADA Network Topology
Pinellas County, FL

Mr. Stoup served as project manager to provide engineering services to Pinellas County for the SCADA network topology documentation, back-up and recovery project. In order for the County to have a maintainable, up-to-date SCADA network, McKim & Creed performed project management, current-state hardware documentation, and current-state HMI software documentation. The presentation associated with this project won 1st place at the 2016 ISA Water Symposium and was featured as an article in Florida Journal.

Michael Tweedel, PE
I&C/SCADA

MCKIM & CREED

KEY QUALIFICATIONS

- ✓ Knowledgeable of many SCADA platforms
- ✓ Troubleshooting expertise
- ✓ SCADA Systems Planning and Design
- ✓ Instrumentation & Control Systems
- ✓ PLC & HMI Software Implementation
- ✓ Wireless Communications Systems
- ✓ Electrical Engineering

EDUCATION

B.S., Electrical Engineering, University of Southwestern Louisiana

LICENSURE

Professional Engineer, FL # 60940

Professional Engineer, NC

Mr. Tweedel's career spans more than three decades of design, implementation and management of SCADA system and process instrumentation and controls projects in the industrial and municipal marketplace. He offers extensive experience in the areas of SCADA and control system planning and design, telemetry and wireless communications systems, PLC and HMI software implementation, communications and network planning and control systems implementation. His system hardware and software knowledge extends to platforms provided by Allen Bradley PLCs and Rockwell Software SCADA software, Schneider Electric including Square D and Modicon PLCs and Wonderware and Citect SCADA software, Trihedral VTScada software GE PAX controllers and Proficy SCADA software.

SELECT PROJECT EXPERIENCE

Howard F. Curren Advanced WWTP Master Plan Phase I
City of Tampa, FL

McKim & Creed provided engineering services for Phase 1 of master planning efforts launched by the City of Tampa for its Howard F. Curren Advanced Wastewater Treatment Plant that is permitted to treat 96 mgd with a Type I two-stage, high rate (pure oxygen and fine bubble aeration) activated sludge biological nitrification/denitrification process. Our team provided review of historical and ongoing projects, reports and studies; initial observation of the plant; and a conceptual level assessment of major equipment within the facility and its current operations.

County-Wide SCADA Master Plan
Sarasota County, FL

Mr. Tweedel was project engineer for this countywide SCADA master planning effort. Sarasota County wanted an overall SCADA System Master Plan to act as a road map for system evolution. McKim & Creed conducted an overall SCADA system evaluation that included interviewing key departments related to or affected by the systems, formulating system standards and goals, studying existing system documentation and performing on-site investigations to develop a detailed SCADA accounting of all County facilities and systems. Based on the results of the meetings and review of the existing systems, as well as a review of the County's desired functionality and objectives, McKim & Creed developed a comprehensive Master Plan document to support the County's overall goals. The Plan included a detailed inventory of existing PLC/SCADA hardware and software, description of the County's vision and goals for its SCADA systems, description for 20+ targeted tasks to help the county move their SCADA systems forward, budgetary estimates and analysis for improvement tasks, and county-coordinated timelines for execution of the enhancements and SCADA system growth.

SCADA Master Plan, Charlotte County, FL
Port Charlotte, FL

Charlotte County enlisted McKim & Creed to develop a SCADA master plan that acts as a detailed roadmap to the County for enacting SCADA system improvements. Our team's scope of work included five key elements: project management, goals/objectives workshops, system data collection, information analysis and development of the master plan document.

City of Durham SCADA Master Plan – Multiple Phases
City of Durham, NC

Mr. Tweedel provided lead technical services for a multi-part/multi-phase SCADA System Master Planning effort that included a SCADA system hardware component inventory and assessment resulting in a technical memorandum detailing components, observations and recommendations. Activities included field investigations for two water treatment plants, two reclamation facilities, two raw water pump stations, seven booster pump/interconnect stations, six storage tanks and fourteen representative lift and collection stations.

Matt Daves, PE, LEED AP, CBCP

Energy Assessments

MCKIM & CREED

KEY QUALIFICATIONS

- ✓ Certified Building Commissioning Professional (CBCP)
- ✓ Business Unit Leader with LEED Accreditation
- ✓ Provided input for energy efficient on Operations Building Preliminary Engineering Report

EDUCATION

B.S., Mechanical Engineering, North Carolina State University

LICENSURE

Professional Engineer, FL # 76800

Professional Engineer, VA, NC

AFFILIATIONS

American Council of Engineering Companies of North Carolina (ACEC/NC) - Chair, Building and Infrastructure Committee

Mr. Daves has 19 years of experience and has completed professional assignments in project management and mechanical design for many commercial, institutional and industrial clients, along with state and local governments. Mr. Daves is an Association of Energy Engineers Certified Building Commissioning Professional, as well as a LEED Accredited design professional.

SELECT PROJECT EXPERIENCE

Lift Station 7 Successor Engineer Evaluations
City of Sarasota, FL

Mr. Daves served as mechanical engineer for the mechanical systems in the evaluation of the City's LS 7 pump station design, to address regulatory and safety issues. Lift Station 7, which handles approximately one-third of the city's wastewater flow was at the end of its useful life and has a history of mechanical failures and overflows. The evaluation outlined the need for a new lift station structure and pumping system to be designed. He subsequently was part of the team that designed the new lift station, and is currently under construction.

Davis Library Feasibility Study, University of North Carolina at Chapel Hill
Chapel Hill, NC

Matthew Daves was the project manager for the feasibility report that provided review and recommendations for mechanical upgrades, replacement of existing safety systems as identified by the report and as identified by the Authority Having Jurisdiction. A full review of applicable codes for the entire building was included in the report. Non-compliant code conditions were identified and solutions recommended. All recommended solutions for all upgrades and repairs were provided for CIP inclusion.

UNCSA Master Plan at Sanford-Moore R
NC School of the Arts, NC

McKim & Creed completed a master plan program for NC School of the Arts to evaluate Sanford and Moore Residence Halls. Matthew Daves as Project Manager and Lead Mechanical Engineer. The systems options were reviewed in the study and ranked based on facility requirements, space constraints, aesthetics and life cycle costs. Project also included structural evaluation for the different systems as well as electrical evaluation for power and life safety requirements. Budgets for the various defined projects were entered into the UNC capital improvement program.

Consolidated Academic Instruction Facility Phase II
Camp Lejuene, NC

Mr. Daves served as mechanical engineer for the two story addition to the Consolidated Academic Instruction Facility for the Marine Corps Combat Service Schools (MCCSSS) at Camp Johnson, MCB Camp Lejeune. The project was the second in a two phase project designed to consolidate four separate schools and related functions into a single facility. The phase two project added approximately 56,000 square feet to the phase one work.

FSU Flood Damage Assessment
Fayetteville, NC

Mr. Daves served as project manager in documenting the damage to the mechanical and electrical systems and, while still onsite, developed an opinion of probable cost. Scope and costs were finalized over the weekend and delivered to the university via email by lunchtime on Monday.

Don Pettigrew, PE
Energy Assessments

MCKIM & CREED

KEY QUALIFICATIONS

- ✓ Directs the manufacture, instillation, and testing of electrical equipment
- ✓ Works with the project manager on production efforts
- ✓ Experience designing electronic components and systems for a variety of clients

EDUCATION

B.S., Electrical Engineering, North Carolina State University

LICENSURE

Professional Engineer, FL # 84755

Professional Engineer, NC, SC, VA, MI, UT

AFFILIATIONS

Illuminating Engineering Society

National Fire Protection Association

National Society of Professional Engineers

Professional Engineers of North Carolina

Mr. Pettigrew has over 40 years of experience working with professional assignments in project management and electrical systems design for commercial, educational, military, multifamily facilities, industrial, institutional, manufacturing, laboratory, government, health care, retail and electrical/mechanical projects. His project management expertise extends to cost estimating, field observation, construction administration and design of interior power distribution, medium voltage distribution, emergency generators, lighting, energy management, motor control, fire alarm, security, sound, television distribution, as well as data and telecommunications distribution systems.

SELECT PROJECT EXPERIENCE

UNC Pembroke Primary Electrical Infrastructure Improvements
University of North Carolina at Pembroke, Pembroke, NC

Mr. Pettigrew served as project manager for the overall electrical master planning, design and construction of a two-phased plan to replace an existing electrical substation delivery that was antiquated and becoming increasing unreliable with a limited number 12.47 kV circuits. Electrical load studies and projections were used to prepare this two-phased plan that was implemented over five years for design and construction. The electrical master plan was developed to integrate the future electrical power needs that would be required to support the new facilities as well as site expansions identified within the overall campus master plan. Planning and construction documents for a new 12.47 kV substation site, 6,100 feet of underground electrical duct banks, erosion, control, electrical manholes, medium voltage cables, medium voltage pad mounted switches and medium voltage delivery structures to connect to a new electrical utility substation provided by Progress Energy as well as full construction services were provided.

UNC Charlotte Primary Electrical Infrastructure Improvements
University of North Carolina at Charlotte | Charlotte, NC

Mr. Pettigrew served as project manager for the overall electrical master planning, design and construction expansion for the primary electrical system required to support the new Charlotte Research Institute campus that included 1,500,000 square feet for academic research and classrooms. Electrical load studies and projections were used to prepare a multi-phased plan that was implemented with multiple contracts for design and construction.

2017 FSU Medium Voltage Study, Fayetteville State University
Fayetteville, NC

Mr. Pettigrew served as the electrical engineer to provide an evaluation of the existing medium voltage electrical distribution system on campus to determine the condition, age, configuration, recommended maintenance, and recommended replacement of existing cabling, pad-mounted switches, pad-mounted transformers, and metal enclosed switchgear to preserve the reliability.

UNC Charlotte Hunt Residence Hall
University of North Carolina at Charlotte | Charlotte, NC

Mr. Pettigrew served as principal in charge for this project. All fire protection, telecommunications, electrical, mechanical and plumbing engineering services were provided for the new construction of this multi-story Residence Hall building. The facility is a 400 bed student housing building consisting of suites. The building is approximately 170,000 gross square feet. The facility is designed with energy efficient systems using LEED elements to be environmentally friendly. The building was fitted with Class I standpipes located in each required exit stair as required by NC State Building Code – Fire Prevention.

ARCADIS Design & Consultancy for natural and built assets

APPENDIX B

Audited Financials
Proof of Insurance

AUDITED FINANCIALS

ARCADIS U.S., INC. AND SUBSIDIARIES

Consolidated Financial Statements

December 31, 2018 and 2017

(With Report of Independent Auditors Thereon)

pwc

Report of Independent Auditors

The Board of Directors
ARCADIS U.S., INC.:

We have audited the accompanying consolidated financial statements of ARCADIS U.S., INC. and its subsidiaries (the "Company"), which comprise the consolidated balance sheets as of December 31, 2018 and 2017, and the related consolidated statements of comprehensive income, stockholder's equity, and cash flows for the years then ended.

Management's Responsibility for the Consolidated Financial Statements

Management is responsible for the preparation and fair presentation of the consolidated financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on the consolidated financial statements based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on our judgment, including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, we consider internal control relevant to the Company's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the consolidated financial statements referred to above present fairly in all material respects, the financial position of ARCADIS U.S., INC. and its subsidiaries as of December 31, 2018 and 2017, and the results of their operations and their cash flows for the years then ended, in accordance with accounting principles generally accepted in the United States of America.

PricewaterhouseCoopers LLP

May 21, 2019

PricewaterhouseCoopers LLP, 1900 16th Street Suite 1600 Denver, CO 80202
T: (720) 931-7000, F: (720) 931-7100, www.pwc.com

ARCADIS U.S., INC. AND SUBSIDIARIES

Consolidated Balance Sheets

December 31, 2018 and 2017

(Dollar amounts in thousands)

Assets		2018	2017
Current assets:			
Cash and cash equivalents	$	27,163	25,746
Accounts receivable, net		355,512	336,182
Related-party receivables		220,772	305,361
Other current assets		9,782	12,462
Total current assets		613,229	679,751
Property and equipment, net		33,126	28,996
Goodwill and intangible assets		285,993	286,902
Other assets		13,411	16,974
Total assets	$	945,759	1,012,623
Liabilities and Stockholder's Equity			
Current liabilities:			
Accounts payable	$	116,288	112,535
Accrued expenses		93,873	70,960
Related-party payables		134,878	126,556
Related party - Income taxes payable		66,369	63,967
Deferred revenue		5,567	1,944
Billings in excess of cost		57,733	54,991
Other current liabilities		3,353	2,038
Total current liabilities		478,061	432,991
Deferred revenue		—	1,028
Deferred compensation		12,577	16,059
Deferred tax liabilities		30,130	29,663
Other liabilities		4,310	8,697
Total liabilities		525,078	488,438
Commitments and contingencies (notes 6 and 12)		—	—
Stockholder's equity:			
Preferred stock, $0.01 par value. Authorized, 1,000 shares; none issued		—	—
Common stock, $0.01 par value. Authorized, 9,000 shares; issued 387 shares		—	—
Additional paid-in capital		371,017	371,012
Retained earnings		49,664	153,173
Total stockholder's equity		420,681	524,185
	$	945,759	1,012,623

See accompanying notes to consolidated financial statements.

ARCADIS U.S., INC. AND SUBSIDIARIES

Consolidated Statements of Comprehensive Income

Years ended December 31, 2018 and 2017

(Dollar amounts in thousands)

	2018	2017
Gross revenue	$ 1,254,703	1,163,757
Less outside services, at cost	477,922	436,577
Net revenue from services	776,781	727,180
Personnel costs	579,561	541,395
Other operating expenses	135,410	125,271
Depreciation and amortization expense	11,172	11,288
Income from operations	50,638	49,226
Other income (expense):		
Interest income	4,564	2,117
Interest expense	(4,931)	(6,647)
Income from operations before provision for income taxes	50,271	44,696
Provision/(Benefit) for income taxes	7,780	(5,262)
Net income	$ 42,491	49,958

See accompanying notes to consolidated financial statements.

ARCADIS U.S., INC. AND SUBSIDIARIES

Consolidated Statements of Stockholder's Equity

Years ended December 31, 2018 and 2017

(Dollar amounts in thousands)

	Common stock		Additional paid-in capital	Retained earnings	Total
	Shares	Amount			
Balances at December 31, 2016	387	$ —	$ 371,075	$ 121,215	$ 492,290
Net income	—	—	—	49,958	49,958
Dividends	—	—	—	(18,000)	(18,000)
Stock exercises and excess tax benefit	—	—	(63)	—	(63)
Balances at December 31, 2017	387	—	371,012	153,173	524,185
Net income	—	—	—	42,491	42,491
Dividends	—	—	—	(146,000)	(146,000)
Stock exercises and excess tax benefit	—	—	5	—	5
Balances at December 31, 2018	387	$ —	$ 371,017	$ 49,664	$ 420,681

See accompanying notes to consolidated financial statements.

ARCADIS U.S., INC. AND SUBSIDIARIES

Consolidated Statements of Cash Flows

Years ended December 31, 2018 and 2017

(Dollar amounts in thousands)

	2018	2017
Cash flows provided by operating activities:		
Net income	$ 42,491	49,958
Adjustments to reconcile net income to net cash provided by (used in) operating activities:		
Allowance on receivables	4,479	2,433
Depreciation and amortization	11,172	11,288
Deferred income taxes	467	(15,854)
Changes in assets and liabilities:		
Receivables	(24,220)	(18,787)
Other current assets	2,680	1,371
Other assets	3,563	1,468
Accounts payable	(21,776)	24,533
Accrued expenses	20,533	688
Billings in excess of cost	2,742	4,488
Income taxes payable	2,407	9,819
Deferred revenue	2,595	683
Deferred compensation	(3,482)	(1,469)
Other liabilities	(1,127)	1,408
Net cash provided by operating activities	42,524	72,027
Cash flows from investing activities:		
Capital expenditures	(12,237)	(7,992)
Proceeds from sale of property and equipment	224	79
Payments for acquisitions, net of cash received	(1,945)	(8,481)
ARCADIS cash pooling arrangement	85,000	(23,000)
Net cash provided by / (used in) investing activities	71,042	(39,394)
Cash flows from financing activity:		
Payment of dividends	(21,000)	(18,000)
Payment on Intercompany Loan	(91,149)	—
Net cash used in financing activity	(112,149)	(18,000)
Net increase in cash and cash equivalents	1,417	14,633
Cash and cash equivalents, beginning of year	25,746	11,113
Cash and cash equivalents, end of year	$ 27,163	25,746
Non-cash investing and financing activities:		
Leasehold improvements paid by landlord	$ 2,380	3,380

See accompanying notes to consolidated financial statements.

(1) Business and Summary of Significant Accounting Policies

(a) Description of Business

ARCADIS U.S., INC. and subsidiaries (the Company) provide a full spectrum of consulting, engineering, and contracting services in the public and private business sectors. The majority of the Company's revenue is generated in the United States. The Company is owned by ARCADIS North America, a Colorado general partnership (ANA). ANA is owned by ARCADIS N.V. (ARCADIS) and ARCADIS USA B.V. (a wholly owned subsidiary of ARCADIS). The Company is part of the ARCADIS group of companies. ARCADIS is a global environmental, water, infrastructure, and buildings firm based in the Netherlands. ARCADIS stock is traded on the Amsterdam Exchange.

(b) Principles of Consolidation and Intercompany Charges

The consolidated financial statements include the accounts of the Company, its wholly owned subsidiaries, and those entities that the Company controls. The Company considers an entity to be under its control if it manages day-to-day operations or controls the activities that most significantly impact the entity's economic performance. All significant intercompany balances and transactions have been eliminated.

(c) Cash and Cash Equivalents

Cash equivalents include highly liquid short-term investments with original maturities of three months or less, readily convertible to known amounts of cash. The Company's policy is to invest cash in excess of operating requirements in highly liquid investments under the ARCADIS Cash Pooling Agreement.

Under the ARCADIS Cash Pooling Agreement, amounts the Company has deposited into its short-term investment account can be used to satisfy obligations of each other debtor (other ARCADIS Companies) under the agreements. As of December 31, 2018 and 2017, the Company had approximately $9,882,000 and $4,274,000, respectively, deposited into the account, which is classified as cash and cash equivalents in the accompanying consolidated balance sheets.

The cash and cash equivalents are exposed to concentrations of credit risk. The Company invests cash with high-credit quality institutions. Cash balances invested in money market accounts are not insured and cash balances held at banks may exceed the amount covered by Federal Depository Insurance. The Company has not realized any losses in such investments or accounts and believes that the Company is not exposed to any significant credit risk.

(d) Revenue and Cost Recognition

Revenue is generally recognized as services are rendered. Revenue from fixed fee contracts is recognized on the percentage of completion method, measured generally by estimating the status of completion of the project and recognizing the related estimated percentage of revenue and gross profit expected from the project. Revenue from cost-plus contracts is recognized as costs are incurred plus applicable fees. Revenue from time-and-material contracts is recognized at contract rates as work is performed and material costs are incurred. Revenue is recognized on additional services requested by clients for whom a formal change order has not been obtained when the realization is probable, and the amount can be reasonably estimated. Provisions for estimated losses on uncompleted contracts are recorded in the period when identified.

Gross revenue represents amounts billed and to be billed to clients. All direct subcontractor costs are recognized as outside services costs, which are deducted from gross revenue to arrive at net revenue in the consolidated statement of comprehensive income.

Unbilled fees, at estimated billable amounts, represent revenue recognized for which billings had not yet been presented to customers. Billings in excess of costs represent the excess of billings to date in excess of revenues recognized on contracts in progress. Deferred revenue represents cash collected in advance of billings.

Under contracts with the U.S. government and certain other government entities, contract costs, including indirect costs, are subject to audit by and adjustments by negotiations with government representatives. Revenue is recorded in amounts expected to be realized on final settlement of any such audits.

(e) Use of Estimates in Preparation of Financial Statements

The preparation of the consolidated financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and related disclosures at the balance sheet date and the reported amounts of revenue and expenses during the reporting period. Significant items subject to such estimates and assumptions include accounting for long-term contracts, valuation of receivables, and determination of fair values of assets and liabilities acquired during a business combination. Actual results could differ from those estimates.

(f) Accounts Receivable

Accounts receivable includes billed receivables, unbilled receivables and retainage. Billed receivables are recorded at the invoiced amount and do not bear interest. Unbilled receivables represent reimbursable costs and amounts earned and reimbursable under contracts in progress. Retainage represents amounts withheld from progress billings by customers and may not be paid until the completion of a project and, in some instances, longer. The allowance for doubtful accounts is the Company's best estimate of the amount of probable credit losses in the Company's existing accounts receivable. The Company determines the allowance based on historical write-off experience and evaluation of specific past-due balances. Account balances are charged off against the allowance after all means of collection have been exhausted and the potential for recovery is considered remote. The Company does not have any off-balance-sheet credit exposure related to its customers.

(g) Business Combinations

The Company accounts for business combinations using the purchase method. The cost of an acquired company is assigned to the tangible and intangible assets purchased and the liabilities assumed on the basis of their fair values at the date of acquisition. The determination of fair values of assets and liabilities acquired requires the Company to make estimates and use valuation techniques when market value is not readily available. Any excess of purchase price over the fair value of net tangible and intangible assets is allocated to goodwill. The transaction costs associated with business combinations are expensed as incurred.

(h) Goodwill and Intangible Assets

Goodwill represents the excess of costs over fair value of assets of businesses acquired. Goodwill and intangible assets acquired in a purchase business combination and determined to have an indefinite useful life are not amortized, but instead tested for impairment at least annually. The Company reviews the fair value of the Company's reporting units compared to its carrying value (including goodwill). The Company performs a qualitative assessment of goodwill analyzing whether it is more likely than not that the fair value of its reporting units are less than the carrying amounts. If we determine that an impairment is more likely than not, we are then required to perform a quantitative impairment test, otherwise no further analysis is required. If the fair value of the reporting unit is less than its carrying value, an indication of goodwill impairment exists. An impairment loss is recognized for any excess of the carrying amount of the reporting unit's goodwill over the implied fair value of that goodwill. Intangible assets with estimable useful lives, ranging from one to ten years, are amortized over their respective estimated useful lives to their estimated residual values, and reviewed for impairment along with the Company's long-lived assets (note 1(j)). No impairments were recorded for the years ended December 31, 2018 and 2017.

(i) Property and Equipment

Property and equipment are recorded at cost. Depreciation and amortization are computed for financial purposes on the straight-line method, while accelerated methods are used, where applicable, for tax purposes. Leasehold improvements are amortized over the shorter of the life of the related asset or the life of the lease. The costs of additions and improvements are capitalized and expenditures for repairs and maintenance are expensed as incurred. The costs and accumulated depreciation applicable to assets retired or otherwise disposed of are removed from the asset accounts and any gain or loss is included in the consolidated statements of operations. The following estimated useful lives are used for financial statement purposes:

Office equipment, furniture, and fixtures	3 – 8 years
Field equipment	3 – 7 years
Leasehold improvements	1 – 12 years

The Company leases various property and equipment. Leased property that meets certain criteria, as required by accounting standards, is capitalized and the present value of the related lease payments is recorded as a liability. All other leases are accounted for as operating leases and the related payments are expensed utilizing the straight-line method over the shorter of the remaining lease term or the estimated useful life. Amortization of assets under capital leases is computed utilizing the straight-line method over the shorter of the remaining lease term or the estimated useful life.

(j) Impairment of Long-Lived Assets

Long-lived assets, such as property and equipment, and purchased intangibles subject to amortization are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. Recoverability of assets to be held and used is measured by a comparison of the carrying amount of an asset to estimated undiscounted future cash flows expected to be generated by the asset. If the carrying amount of an asset exceeds its estimated undiscounted future cash flows, an impairment charge is recognized by the amount by which the carrying amount of the asset exceeds the fair value of the asset less costs to sell. Fair value is determined through various valuation techniques, including discounted cash flow models, quoted market values, and third-party independent appraisals, as considered necessary. No impairments were recorded for the years ended December 31, 2018 and 2017.

(k) Income Taxes

The Company is included in the consolidated tax return of ANA. The provision for income taxes are calculated by using a "separate return" method. Under this method, the Company is assumed to file a separate return with the tax authority, thereby reporting taxable income or loss and paying the applicable tax to or receiving the appropriate refund from ANA. The current provision is the amount of tax payable or refundable on the basis of a hypothetical, current-year separate return. Deferred tax assets and liabilities are recognized for the hypothetical future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases and operating loss and tax credit carry forwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date. The Company recognizes the effect of income tax positions only if those positions are more likely than not of being sustained. Recognized income tax positions are measured at the largest amount that is greater than 50% likely of being realized. Changes in recognition or measurement are reflected in the period in which the change in judgment occurs. The Company records interest and penalties related to unrecognized tax benefits in income tax expense.

(l) Share-based Compensation

The Company participates in ARCADIS's share-based incentive plans. The fair value of the share-based compensations at grant date under the ARCADIS long-term incentive plan is cross-charged to the Company on a quarterly basis, in the year of the grant. The Company records the compensation expense on a straight-line basis over the vesting period.

The tax benefit of Nonqualified Stock Options (NSOs) is recognized in the period in which the option is exercised. The tax benefit of Incentive Stock Options (ISOs) is recognized in the period the options are sold provided the option holder sells the exercised shares within 12 months of exercising the ISO.

(m) Financial Instruments

The recorded values of cash and cash equivalents, accounts receivable, related-party receivables, other current assets, accounts payable, and accrued expenses approximate fair values because of the short maturity of these instruments.

New Accounting Pronouncements

Revenue Recognition

In May 2014, the FASB issued ASU No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*, as amended by multiple standards updates. The pronouncement established a principles-based model that provides a single framework for recognizing revenue from contracts with customers. This guidance is effective for the Company for its annual period beginning January 1, 2019, with early adoption permitted for the annual reporting period beginning January 1, 2017. The Company is currently evaluating the potential impact of this guidance.

Leases

In February 2016, the FASB issued ASU No. 2016-02, *Leases (Topic 842)*, which requires entities that lease assets to recognize, on the balance sheet, the assets and liabilities for the rights and obligations created by those leases. This ASU will replace most existing leasing guidance in U.S. generally-accepted accounting principles when it becomes effective. This guidance is effective for the Company for its annual period beginning January 1, 2020, with early adoption permitted. The Company is currently evaluating the impact of this guidance on its consolidated financial statements and expects the new guidance to significantly increase the reported assets and liabilities on its consolidated balance sheets.

Stock-Based Compensation

In March 2016, the FASB issued ASU No. 2016-09, *Compensation–Stock Compensation (Topic 718): Improvements to Employee Share-Based Payment Accounting*, which makes several modifications to the accounting for employee share-based payment transactions, including the requirement to recognize the income tax effects of awards that vest or settle as income tax expense. This guidance also clarifies the presentation of certain components of share-based awards in the statement of cash flows. This guidance is effective for annual reporting periods beginning after December 15, 2017, and interim periods within those annual periods, and early adoption is permitted. Adoption of this ASU did not have a material effect on the Company's financial statements.

(2) Revision of Previously Issued Consolidated Financial Statements

In connection with the preparation of the Company's consolidated financial statements for the year ended December 31, 2018, the Company identified that it did not record certain unbilled receivables and related payables for subcontractors in the Company's previously issued consolidated financial statements as of and for the year ended December 31, 2017. The Company has concluded that the items were not material to any of its previously issued consolidated financial statements. However, the Company revised its consolidated financial statements as of and for the year ended December 31, 2018, to correct these immaterial items.

The following table summarizes the impact of the revision on our previously issued consolidated balance sheet as of the year ended December 31, 2017:

ARCADIS U.S., INC. AND SUBSIDIARIES

Notes to Consolidated Financial Statements

December 31, 2018 and 2017

	31-Dec-17		
	As Reported	Adjustments	As Revised
		(in thousands)	
Assets			
Current assets			
Accounts receivables, net	$ 313,249	$ 22,933	$ 336,182
Total current assets	656,818	22,933	679,751
Total assets	$ 989,690	$ 22,933	$ 1,012,623
Liabilities and Stockholder's Equity			
Current Liabilities			
Accounts payable	$ 89,602	$ 22,933	$ 112,535
Total current liabilities	410,058	22,933	432,991
Stockholder's equity			
Retained earnings	465,505	-	465,505
Total stockholder's equity	524,185	-	524,185
Total liabilities and stockholder's equity	$ 989,690	$ 22,933	$ 1,012,623

The table in Footnote 3 was also updated to reflect the revision to accounts receivables noted above.

(3) Accounts Receivable

Accounts receivable, including retainage of $4,987,000 and $3,476,000 in 2018 and 2017, respectively, consisted of the following at December 31, 2018 and 2017 (amounts in thousands):

	2018	2017
Accounts receivable, including retainages	$ 217,575	188,238
Unbilled receivables at estimated billable amounts	149,117	154,728
Total	366,692	342,966
Less allowance for doubtful accounts	11,180	6,784
	$ 355,512	336,182

For certain larger and long-term contracts, the Company requires a portion of the contract value be deposited in an escrow account. As of December 31, 2018 and 2017, amounts deposited in escrow, which the Company does not have ownership of or control over and are not recorded in the accompanying consolidated balance sheets, were approximately $6,279,000 and $6,563,000, respectively.

(4) Fair Value Measurements

The Company determines the fair values of the financial instruments based on inputs or assumptions that market participants would use in pricing an asset or liability. Instruments are categorized using a valuation hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. The hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1

measurements) and the lowest priority to measurements involving significant unobservable inputs (Level 3 measurements). The three levels of the fair value hierarchy are as follows:

- Level 1 inputs are unadjusted quoted prices in active markets for identical assets or liabilities that the Company has the ability to access at the measurement date.
- Level 2 inputs are inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly or indirectly.
- Level 3 inputs are unobservable inputs for the asset or liability.

The level in the fair value hierarchy within which a fair value measurement in its entirety falls is based on the lowest level input that is significant to the fair value measurement in its entirety.

Included in other assets are deferral amounts related to the Company's executive deferral plan, see note 8(b). Assets held in this plan are measured using unadjusted quoted market prices in active markets (Level 1). There were no transfers between fair values hierarchy levels in 2018 and 2017.

(5) Property and Equipment

Property and equipment consisted of the following at December 31, 2018 and 2017 (amounts in thousands):

		2018	2017
Office equipment, furniture, and fixtures	$	60,883	56,530
Field equipment		11,601	9,629
Leasehold improvements		28,822	22,311
Total cost		101,306	88,470
Less accumulated depreciation and amortization		68,180	59,474
	$	33,126	28,996

(6) Leases

The Company is obligated under noncancelable operating leases covering its office space, vehicles, and office equipment. Future minimum annual lease payments under operating leases at December 31, 2018 are as follows (amounts in thousands):

Year ending December 31:		
2019	$	22,890
2020		19,437
2021		14,349
2022		7,611
2023 and thereafter		8,735
	$	73,022

Rent expense was approximately $19,686,000 and $22,670,000 for the years ended December 31, 2018 and 2017, respectively, and was recorded in other operating expenses on the consolidated statements of comprehensive income.

(7) Income Taxes

Income tax expense from operations consisted of the following for the years ended December 31, 2018 and 2017 (amounts in thousands):

	2018	2017
Current:		
Federal	$ 6,434	7,051
State	879	3,677
	7,313	10,728
Deferred:		
Federal	346	(15,762)
State	121	(228)
	467	(15,990)
	$ 7,780	(5,262)

Income tax expense for the years ended December 31, 2018 and 2017 is computed by applying the federal statutory rate of 21% and 35%, respectively, to income from operations before provision for income taxes as follows (amounts in thousands):

	2018	2017
Computed at federal statutory rate	$ 10,557	15,644
State income taxes, net of federal benefit	2,705	1,979
Tax credits, deduction for tax purposes	(5,327)	(10,554)
Nondeductible expenses	(155)	2,339
Change in tax rate	—	(14,670)
	$ 7,780	(5,262)

The tax effects of temporary differences that give rise to significant portions of the deferred tax assets and liabilities at December 31, 2018 and 2017 are as follows (amounts in thousands):

	2018	2017
Deferred tax assets (liabilities):		
Allowance for doubtful accounts	$ 2,949	1,790
Deferred compensation	2,990	3,909
Accrued expense and other	9,507	10,464
Unbilled services	(14,714)	(20,231)
Depreciation	(2,935)	(1,215)
Goodwill and intangible assets	(27,927)	(24,380)
Net deferred tax liability	$ (30,130)	(29,663)

For the years ended December 31, 2018 and 2017, the Company recognized a tax benefit of approximately $(5,000) and $(63,000), respectively, related to NSOs, including disqualified dispositions of ISOs. This amount was recorded as a reduction to income taxes payable with a corresponding credit to additional paid-in capital.

On December 22, 2017, the Tax Cuts and Jobs Act of 2017 ("TCJA") was enacted. Among other things, the TCJA, beginning January 1, 2018, reduced the federal statutory rate from 35% to 21% and extended bonus depreciation provisions. In addition, the application of net operating loss carryforwards generated in 2018 and beyond will be limited, 100% asset expensing will be allowed through 2022 and begin to phase out in 2023, and the amount of interest expense we are able deduct may also be limited in future years. As a result of the enactment of TCJA and other state effective rate changes, we reduced the carrying value of our net deferred tax liability at December 31, 2017 by $14.7 million to reflect the revised federal statutory rate which will be in effect at the time those deferred tax assets are expected to be realized. Effective for tax years beginning after December 31, 2017, new Section 451(b) all events test amends IRC §451 to require accrual method taxpayers to recognize income for tax purposes no later than the year in which revenue is recognized for book purposes; as such, the company's deferred tax liability for unbilled revenue will be recognized ratable over the next four years.

In assessing the realizability of deferred tax assets, management considers whether it is more likely than not that some portion or all of the deferred tax assets will not be realized. The ultimate realization of deferred tax assets is dependent upon the generation of future taxable income during the periods in which those temporary differences become deductible. Management considers the scheduled reversal of deferred tax liabilities, projected future taxable income, and tax planning strategies in making this assessment. Based upon the level of historical taxable income and projections for future taxable income over the periods, which the deferred tax assets are deductible, and the scheduled reversal of timing differences, management believes it is more likely than not the Company will realize the benefits of these deductible differences.

As of December 31, 2018, the Company had $8,623,000 of unrecognized tax benefits.

The Company files income tax returns in numerous tax jurisdictions, including the U.S., and numerous U.S. states and non-U.S. jurisdictions around the world. The statute of limitations varies by jurisdiction in which the Company operates. Because of the number of jurisdictions in which the Company files tax returns, in any given year the statute of limitations in certain jurisdictions may expire without examination within the 12 month period from the balance sheet date. With the normal closures of statutes of limitations, the Company anticipates that the amount of unrecognized tax benefits will not materially change within the next 12 months. With limited exceptions, the Company is no longer subject to U.S. (including federal, state, and local) or non-U.S. income tax examinations by tax authorities for years before fiscal year 2015.

The Company files consolidated federal and state income tax returns. Periodically, the Company is subject to tax examinations however, such examinations are not anticipated to result in a material change to its financial position.

(8) Employee Benefit Plan

(a) Retirement Savings Plan

The Company maintains a contributory retirement savings plan for substantially all employees under Section 401(k) of the Internal Revenue Code. Under this plan, the Company provides a matching contribution in addition to employee's contributions up to a maximum of 4% of the employee's annual base compensation.

Contributions under this plan for the years ended December 31, 2018 and 2017 totaled approximately $17,225,000 and $16,568,000, respectively.

(b) Deferred Compensation

The Company has an executive deferral plan (the Plan). Under the Plan, participants, as determined by the Company's CEO, may defer annual amounts, which are computed as a percentage of the participant's compensation. These amounts plus investment earnings, as defined, are held in an investment account and will be paid to the participant, generally upon leaving the Company for retirement or other reasons as defined by the Plan. At December 31, 2018 and 2017, approximately $12,577,000 and $16,059,000, respectively, is included in the investment account, which is included in other assets in the accompanying consolidated balance sheets. The associated liability of approximately the same amount is recorded as deferred compensation liability in the accompanying consolidated balance sheets.

(c) Share-based Compensation

ARCADIS maintains a long-term incentive plan (2014 Plan), which provides for the issuance of ISOs, stock appreciation rights, and restricted share awards, and restricted share unit awards (RSU) to employees of ARCADIS and its subsidiaries. The granting of shares, or rights to shares, can be based on performance criteria as set by the ARCADIS Supervisory Board at an exercise price of not less than the fair market value of ARCADIS stock at the date of grant. Options vest three years after the date of grant and generally expire ten years from the date of grant. The total numbers of shares reserved and available for issuance pursuant to awards granted under the 2014 Plan is 10,000,000. In 2018 and 2017, shares under the LTIP were solely granted in the form of RSUs. Share-based compensation cost from the 2014 plan included in income from operations amounted to $1,988,000 and $2,045,000 for the years ended December 31, 2018 and 2017, respectively. Total remaining compensation costs related to RSUs outstanding at December 31, 2018 was $2,620,000. Such cost is expected to be recognized over a weighted average period of 1.7 years.

ARCADIS maintains a long-term incentive plan (2010 Plan), which provides for the issuance of ISOs, stock appreciation rights, restricted share awards, and RSUs to employees of ARCADIS and its subsidiaries. The granting of shares, or rights to shares, can be based on performance criteria as set by the ARCADIS Supervisory Board at an exercise price of not less than the fair market value of ARCADIS stock at the date of grant. Options vest three years after the date of grant and generally expire ten years from the date of grant. The total numbers of shares reserved and available for issuance pursuant to awards granted under the 2010 Plan is 10,000,000. As of December 31, 2018 and 2017, employees of the Company held options to purchase approximately 319,000 and 378,000 shares, respectively, of ARCADIS common stock, of which all were vested.

ARCADIS maintains a long-term incentive plan (2005 Plan), which provides for the issuance of ISOs, stock appreciation rights, and restricted share awards to employees of ARCADIS and its subsidiaries. The granting of shares, or rights to shares, can be based on performance criteria as set by the ARCADIS Supervisory Board at an exercise price of not less than the fair market value of ARCADIS stock at the date of grant. Options vest three years after the date of grant and generally expire ten years from the date of grant. The total numbers of shares reserved and available for issuance pursuant to awards granted under the 2005 Plan is 7,500,000 with an annual maximum of 1,800,000 shares. As of December 31, 2018 and 2017, employees of the Company held options to purchase approximately 211,000 and 262,000 shares, respectively, of ARCADIS common stock, of which all were vested.

The following summarizes stock option activity for the years ended December 31, 2018 and 2017:

	options	price	term (years)
Balance at December 31, 2016	1,064,000	$ 20.86	3.36
Exercised	(265,000)	18.97	—
Canceled/transferred	(158,000)	25.56	—
Balance at December 31, 2017	641,000	20.48	3.02
Exercised	(63,000)	19.41	
Canceled/transferred	(48,000)	20.23	
Balance at December 31, 2018	530,000	20.63	2.08

The total intrinsic value of options exercised during the years ended December 31, 2018 and 2017 was $208,000 and $1,542,000, respectively.

(9) Goodwill and Other Intangible Assets

(a) Amortizable Intangible Assets

	December 31, 2018		December 31, 2017	
	Gross carrying amount	Accumulated amortization	Gross carrying amount	Accumulated amortization
Intangible Assets	$ 12,754,000	(11,973,000)	12,754,000	(11,064,000)

Aggregate amortization expense for amortizing intangible assets was $909,000 and $624,000 for the years ended December 31, 2018 and 2017, respectively. Estimated amortization expense for the next five years is: $781,000 in 2019.

(b) Goodwill

The carrying amount of goodwill as of December 31, 2018 and 2017 was $285,212,000.

(10) Acquisitions

On July 26, 2017, the Company acquired all of the issued share capital of E2 ManageTech, Inc. (E2). E2 is a globally recognized Environmental Management Information Systems (EMIS) implementation firm. As a result of the acquisition, the Company expanded its existing EMIS business adding critical capabilities to be top EMIS provider and to scale to a market leading position. The aggregate cost of E2 was approximately $15,274,000, including deferred payments of $6,000,000. The deferred payment represents additional acquisition consideration based on certain performance targets over a three-year period through March 1, 2020. The purchase resulted in goodwill of approximately $12,028,000, which was assigned to the environment management reporting unit. The goodwill is deductible for tax purposes.

Following is a summary of the estimated fair values of the assets acquired and the liabilities assumed as of the date of acquisition (amounts in thousands):

Cash	$	793
Accounts receivable, net		2,856
Property and equipment		63
Goodwill		12,028
Intangible assets		1,890
Other assets		98
Total assets acquired		17,728
Accounts payable and accrued expenses		2,447
Other liabilities		6,007
Total liabilities assumed		8,454
Net assets acquired	$	9,274

(11) Supplemental Cash Flow Information

Approximately $4,981,000 and $6,647,000, respectively, was paid for interest during 2018 and 2017. Cash paid for income taxes, net of refunds received, was approximately $4,044,000 in 2018 and $167,000 in 2017.

The Company declared a special dividend of $125,000,000 in December 2018 which was paid in Q1 2019.

(12) Commitments and Contingencies

The Company is contingently liable for commitments and performance guarantees arising from its contracts. Certain fixed price contracts include a contractual requirement that the Company remediate contaminated soil and/or ground water to levels acceptable by the cognizant regulatory agency. Some of our contracts require us to provide surety bonds to support the Company's project execution commitments.

The Company, in the ordinary course of its business, has been named as a party to litigation and has been advised of claims and possible assertions arising from work it performed. Management believes that, based upon analysis of the facts underlying these matters and upon opinions of in-house and outside counsel, the outcome of such claims, litigation, and assertions will not have a material adverse effect on the Company's consolidated financial position, results of operations, or liquidity.

(13) Related Parties

The Company has a short-term receivable from its parent related to the ARCADIS cash pooling agreement. Under the agreement, short-term deposits are transferred to ARCADIS and are generally settled in less than 30 days. As of December 31, 2018 and 2017, the Company had approximately $215,000,000 and $300,000,000, respectively, receivable from its parent, which is classified in related-party receivables in the accompanying consolidated balance sheets.

As of December 31, 2017, the Company had an outstanding loan with its parent in the amount of approximately $91,149,000. This amount was paid back in 2018. The interest rate on the loan was 7% per

annum, payable quarterly in arrears. This amount is classified in related-party payables in the accompanying consolidated balance sheet.

ARCADIS charges the Company an HQ support service fee and royalty fee. During the years ended December 31, 2018 and 2017, total ARCADIS charges were approximately $31,762,000 and $21,765,000, respectively, and are classified in other operating expenses in the accompanying consolidated statements of comprehensive income.

The Company enters into transaction on an arm's length basis with ARCADIS and its subsidiaries which comprise of operational project related transactions and other transactions in the normal course of business activities. For the years ended December 31, 2018 and 2017, the company recognized revenue from affiliates of approximately $5,815,000 and $5,870,000, respectively, and incurred expenses with affiliates of approximately $12,145,000 and $8,487,000, respectively.

(14) Subsequent Events

The Company has evaluated subsequent events from the balance sheet date through May 21, 2019, the date at which the consolidated financial statements were available to be issued, and determined there were no items to disclose.

PROOF OF INSURANCE

ARCADIS Design & Consultancy for natural and built assets

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CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY) 10/23/2019

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

Holder Identifier :

PRODUCER
Aon Risk Services South, Inc.
Franklin TN Office
501 Corporate Centre Drive
Suite 300
Franklin TN 37067 USA

CONTACT NAME:
PHONE (A/C. No. Ext): (866) 283-7122
FAX (A/C. No.): 800-363-0105
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE		NAIC #
INSURER A:	Greenwich Insurance Company	22322
INSURER B:	XL Specialty Insurance Co	37885
INSURER C:	XL Insurance America Inc	24554
INSURER D:		
INSURER E:		
INSURER F:		

INSURED
Arcadis U.S., Inc.
630 Plaza Drive
Suite 200
Highlands Ranch CO 80129 USA

COVERAGES **CERTIFICATE NUMBER:** 570078928171 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

Limits shown are as requested

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY			GEC001076118	10/01/2019	10/01/2020	EACH OCCURRENCE	$1,000,000
	CLAIMS-MADE X OCCUR			SIR applies per policy terms & conditions			DAMAGE TO RENTED PREMISES (Ea occurrence)	$1,000,000
	X Contractual Liability						MED EXP (Any one person)	$10,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						PERSONAL & ADV INJURY	$1,000,000
	POLICY X PRO-JECT X LOC						GENERAL AGGREGATE	$2,000,000
	OTHER:						PRODUCTS - COMP/OP AGG	$2,000,000
B	AUTOMOBILE LIABILITY			AEC001075818	10/01/2019	10/01/2020	COMBINED SINGLE LIMIT (Ea accident)	$1,000,000
	X ANY AUTO						BODILY INJURY (Per person)	
	OWNED AUTOS ONLY / SCHEDULED AUTOS						BODILY INJURY (Per accident)	
	HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	
	X Property Damage to Oth							
B	X UMBRELLA LIAB X OCCUR			UEC001075918	10/01/2019	10/01/2020	EACH OCCURRENCE	$1,000,000
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$1,000,000
	DED X RETENTION $10,000							
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY			RWD943516314 All Other States	10/01/2019	10/01/2020	X PER STATUTE / OTH-ER	
B	ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N: N (Mandatory in NH)	N/A		RWR943516714 AK, WI Only	10/01/2019	10/01/2020	E.L. EACH ACCIDENT	$1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE-EA EMPLOYEE	$1,000,000
							E.L. DISEASE-POLICY LIMIT	$1,000,000

Certificate No : 570078928171

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
Evidence of Insurance.

CERTIFICATE HOLDER

Arcadis U.S., Inc.
630 Plaza Drive, Suite 200
Highlands Ranch CO 80129 USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Aon Risk Services South, Inc.

ACORD 25 (2016/03)

ARCADIS Design & Consultancy for natural and built assets

ACORD®

CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY)
05/31/2019

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

Holder Identifier :

PRODUCER	CONTACT NAME:	
Aon Risk Services South, Inc. Franklin TN Office 501 Corporate Centre Drive Suite 300 Franklin TN 37067 USA	PHONE (A/C. No. Ext): (866) 283-7122	FAX (A/C. No.): (800) 363-0105
	E-MAIL ADDRESS:	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Arcadis U.S., Inc. 630 Plaza Drive Suite 200 Highlands Ranch CO 80129 USA	INSURER A: Indian Harbor Insurance Company	36940
	INSURER B: Lexington Insurance Company	19437
	INSURER C:	
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES **CERTIFICATE NUMBER:** 570076449691 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS. **Limits shown are as requested**

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	COMMERCIAL GENERAL LIABILITY ☐ CLAIMS-MADE ☐ OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☐ PRO-JECT ☐ LOC ☐ OTHER:						EACH OCCURRENCE	
							DAMAGE TO RENTED PREMISES (Ea occurrence)	
							MED EXP (Any one person)	
							PERSONAL & ADV INJURY	
							GENERAL AGGREGATE	
							PRODUCTS - COMP/OP AGG	
	AUTOMOBILE LIABILITY ☐ ANY AUTO ☐ OWNED AUTOS ONLY ☐ SCHEDULED AUTOS ☐ HIRED AUTOS ONLY ☐ NON-OWNED AUTOS ONLY						COMBINED SINGLE LIMIT (Ea accident)	
							BODILY INJURY (Per person)	
							BODILY INJURY (Per accident)	
							PROPERTY DAMAGE (Per accident)	
	☐ UMBRELLA LIAB ☐ OCCUR ☐ EXCESS LIAB ☐ CLAIMS-MADE ☐ DED ☐ RETENTION						EACH OCCURRENCE	
							AGGREGATE	
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N ☐ (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A					☐ PER STATUTE ☐ OTH-ER	
							E.L. EACH ACCIDENT	
							E.L. DISEASE-EA EMPLOYEE	
							E.L. DISEASE-POLICY LIMIT	
A	Env Contr Poll			US00090310EO19A Professional & Pollution SIR applies per policy terms & conditions	06/01/2019	06/01/2020	Each Claim Annual Aggregate	$1,000,000 $1,000,000

Certificate No : 570076449691

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

RE: Evidence of Insurance. For Professional Liability coverage, the Aggregate Limit is the total insurance available for claims presented within the policy period for all operations of the insured. The Limit will be reduced by payments of indemnity and expense.

CERTIFICATE HOLDER

Arcadis US, Inc.
630 Plaza Drive, Suite 200
Highlands Ranch CA 80129 USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Aon Risk Services South, Inc.

ACORD 25 (2016/03)

The ACORD name and logo are registered marks of ACORD

AGENCY CUSTOMER ID: 570000005571
LOC #:

ACORD®

ADDITIONAL REMARKS SCHEDULE

AGENCY	NAMED INSURED
Aon Risk Services South, Inc.	Arcadis U.S., Inc.
POLICY NUMBER	
See Certificate Number: 570076449691	
CARRIER / NAIC CODE	EFFECTIVE DATE:
See Certificate Number: 570076449691	

ADDITIONAL REMARKS

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,
FORM NUMBER: ACORD 25 **FORM TITLE:** Certificate of Liability Insurance

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER	
INSURER	
INSURER	
INSURER	

ADDITIONAL POLICIES If a policy below does not include limit information, refer to the corresponding policy on the ACORD certificate form for policy limits.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YYYY)	POLICY EXPIRATION DATE (MM/DD/YYYY)	LIMITS	
	OTHER							
	[X] Claims-Made							
	[X] Professional Liabil							
	[X] and Contractors							
	[X] Pollution Liability							

ARCADIS Design & Consultancy for natural and built assets

Arcadis U.S., Inc.

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Plantation, Florida 33324

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www.arcadis.com