STATEMENT OF QUALIFICATIONS FOR

WATER MASTER PLAN UPDATE

CITY OF HOLLYWOOD | PROJECT NO. 20-1336

FIRM NAME & ADDRESS
Black & Veatch Corporation
3111 N. University Drive, Suite 700
Coral Springs, FL 33065

CONTACT PERSON
Rafael Frias, PE
(754) 229-3049
FriasRE@bv.com

June 8, 2020

BLACK & VEATCH

BLACK & VEATCH CORPORATION
Rafael Frias, PE
3111 N. University Drive, Suite 700
Coral Springs, FL 33065
P +1 754.229.3049 | E FriasRE@bv.com

June 8, 2020

Clece Aurelus, PE
Interim Assistant Director
Department of Public Utilities
1621 N. 14th Avenue
Hollywood, FL 33020

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

Dear Clece:

The City of Hollywood's Department of Public Utilities (City) is a forward-thinking utility that has established a culture of continuous improvement to ensure the delivery of reliable and cost-effective water service to all its customers. The City's Water Treatment Plant (WTP) supplies a retail service area extending over most of the City's jurisdiction and a wholesale service area covering Broward County Water and Wastewater Services Districts 3A, 3B, and 3C.

The City's last comprehensive Water Master Plan was developed in December 2007, with the "Water Demand Projections and Capacity Expansions" section of the plan updated in November 2012. In addition, the City recently calibrated its InfoWater hydraulic water model in 2017.

The City has made great progress with the completion of major capital improvement projects, such as the replacement of the City's WTP's high service pumps as well as galvanized pipes in the distribution system. However, **similar to other utilities across Florida, the City is faced with aging water infrastructure; the increased cost to maintain it; and the need to continue to deliver a high level of service.** To proactively address these challenges, the City is embarking on updating its Water Master Plan.

The needs of the City's water system into the future are not necessarily the same as they were in 2007. In fact, the updated Water Master Plan will need to consider the following challenges:

- Aging infrastructure of the City's wellfields, WTP and distribution system
- Pressure and flow issues resulting from deteriorated infrastructure and redevelopment
- Replacement of increasingly-corroded galvanized pipes
- Water quality and water age issues across the system
- Relocation of water meters to the front of properties
- Staying in front of funding opportunities to maximize the implementation of capital projects

Black & Veatch will provide the City with an updated Water Master Plan that will consider these challenges, while also supporting the City in proactively managing its assets through best-practice asset management and reliability-centered maintenance.

To ensure the delivery of these benefits, **Black & Veatch provides the City with a local team of professionals with first-hand knowledge of the City's water system and expertise in master planning.** Our team is comprised of the following resources**:**

- A local Project Manager, Chris Barlow, PE, with intimate knowledge of the City's WTP and proven experience successfully delivering projects for the City. **Chris served as Project Manager for the replacement of the City's WTP High Service Pump Station and other capital projects at the WTP.**
- A Technical Director, Amanda Schwerman, PE, who has completed more than 15 master plans across Florida and the developer of Black & Veatch's Adaptive & Dynamic Master Planning approach. **Amanda was the hydraulic modeler during the development of the City's 2007 Water Master Plan.**
- A linear system partner with intimate knowledge of the City's distribution system in Tetra Tech. Tetra Tech's lead engineer, **Janine Alexander, PE, supported the City with the Water Main Replacement Program and other pipeline improvements.**
- An electrical partner with detailed knowledge of the condition of the City's WTP electrical systems in McKim & Creed. McKim & Creed's lead electrical engineer, **Aubrey Haudricourt, PE, led the maintenance of the electrical gear throughout the WTP.**

The City will benefit from our proven asset management, master planning and condition assessment experience by receiving an Adaptive & Dynamic Water Master Plan that will prioritize its CIP based on risk to ensure proper allocation of City funds and timely implementation water system improvement projects, before any failure occurs.

We will provide the City with an Adaptive & Dynamic Master Plan that incorporates asset management principles to deliver the following benefits:

1. Better understanding of Utility performance through the development of levels of service (LOS) and key performance indicators (KPIs).
2. Consistency in risk and condition assessment through the development of consequence criteria.
3. Better collection of condition assessment data and development of an asset registry through Cityworks.
4. Cost savings from a master plan that recommends improvements only when indicators drive the need for a project.
5. Reduction of risk from an optimized capital improvement plan (CIP) that prioritizes projects based on risk of failures.
6. Trained City staff on a user-friendly, CIP prioritization tool, **iCIP**, which will allow the City to update its CIP continuously –
7. Improved communication of Utility performance and decision making through the development of Utility Management Dashboards.
8. Cost and time savings from improved coordination of Utility projects with other City CIP projects.

We welcome the opportunity to discuss the details of our proposal and invite you to contact us with any questions at (954) 465-6872. Thank you for your consideration; we look forward to partnering with the City of Hollywood on this important contract.

Very truly yours,

BLACK & VEATCH

Rafael E. Frias III, PE
Project Director

Chris Barlow, PE
Project Manager

Amanda Schwerman, PE
Technical Director

TABLE OF CONTENTS

EVALUATION CRITERIA CROSS REFERENCE

CATEGORY	CRITERIA	RESPONSE LOCATION (S)
1. Expertise of Designated Staff (25 pts)	Experience related to the type of work	page 53
	Designated staff & employment status	page 1
2. Previous Performance on Related Projects (30 pts)	Relevant project experience of staff	page 5 Appendix A: Resumes
3. Current & Projected Workload and Time Schedule to Complete Project (10 pts)	Workload both currently and projected for the Firm	page 69
	Work previously awarded to the firm by the City in the last five years	page 72
4. Principal Location (5 pts)	Ease of contract administration and responsiveness	page 3
	Distance to City offices	page 3
5. Ability to Complete Project on Time (15 pts)	References for the last ten projects	page 68
	Bar chart of projected vs actual completion time frames	page 70
6. Ability to Complete Project on Budget (15 pts)	Chart of the costs on previous projects as compared to the estimated cost prior to commencing work	page 71

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

Per Addendum 2, the envelope has been addressed to:
City of Hollywood
Office of the City Clerk
2600 Hollywood Blvd., Room 221
Hollywood, FL 33020

✓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:

Black & Veatch Corporation

Signature and Title:

Associate Vice President

Date:

June 8, 2020

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"

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

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

RECEIVED

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 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.

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

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

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

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

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 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

RECEIVED

PROJECT SUBMITTAL

FROM: Black & Veatch Corporation
3111 N. University Drive, Suite 700
Coral Springs, FL 33065

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 8th day of May, 2020, in the County of Broward, in the state of Florida.

Black & Veatch Corporation
Respondent's Firm or Trade Name

Corporation, Sole Proprietorship, Partnership (Circle One)

Phone No.: (754) 229-3049

Address 3111 N. University Drive, Suite 700

City and State Zip Coral Springs, FL 33065

BY: Rafael Frias, III
Typed and Written Signature

Associate Vice President
Title

INSURANCE REQUIREMENTS

The insurance policy shall not contain any exceptions that would exclude coverage for risks that can be directly or reasonably related to the scope of goods or services in this bid/proposal. A violation of this requirement at any time during the term, or any extension thereof shall be grounds for the immediate termination of any contract entered in to pursuant to this bid/proposal. In order to show that this requirement has been met, along with an insurance declaration sheet demonstrating the existence of a valid policy of insurance meeting the requirements of this bid/proposal, the successful proposer must submit a signed statement from insurance agency of record that the full policy contains no such exception.

The City reserves the right to require additional insurance in order to meet the full value of the contract.

The City reserves the right to require any other insurance coverage it deems necessary depending upon the exposures.

HOLD HARMLESS AND INDEMNITY CLAUSE:

Lockton Companies Kurt Colden Kurt Colden

(Company Name and Authorized Signature, Print Name),

the contractor shall indemnify, defend and hold harmless the City of Hollywood, its elected and appointed officials, employees and agents for any and all suits, actions, legal or administrative proceedings, claims, damage, liabilities, interest, attorney's fees, costs of any kind whether arising prior to the start of activities or following the completion or acceptance and in any manner directly or indirectly caused, occasioned or contributed to in whole or in part by reason of any act, error or omission, fault or negligence whether active or passive by the contractor, or anyone acting under its direction, control, or on its behalf in connection with or incident to its performance of the contract.

Lockton Companies Kurt Colden Kurt Colden

(Company Name and Authorized Signature, Print Name),

further certifies that it will meet all insurance requirements of the City of Hollywood and agrees to produce valid, timely certificates of coverage.

OTHER CONSIDERATIONS

Copies submitted may not be viewed until 30 days after opening date or notice of intent to award is posted.

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 11/1/2020 — 5/13/2020

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).

PRODUCER Lockton Companies 444 W. 47th Street, Suite 900 Kansas City MO 64112-1906 (816) 960-9000	**CONTACT NAME:** **PHONE (A/C, No, Ext):** **FAX (A/C, No):** **E-MAIL ADDRESS:**
	INSURER(S) AFFORDING COVERAGE — **NAIC #**
INSURED 1456545 BLACK & VEATCH CORPORATION 11401 LAMAR OVERLAND PARK KS 66211 MCBRAYER, CYNTHIA	**INSURER A :** Zurich American Insurance Company — 16535 **INSURER B :** American Zurich Insurance Company — 40142 **INSURER C :** Lexington Insurance Company — 19437 **INSURER D :** **INSURER E :** **INSURER F :**

COVERAGES BLAVE01 **CERTIFICATE NUMBER:** 16745753 **REVISION NUMBER:** XXXXXXX

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.

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**	Y	N	GLO 4641358	11/1/2019	11/1/2020	EACH OCCURRENCE	$ 1,000,000
A	CLAIMS-MADE X OCCUR			GLO 4641367	11/1/2019	11/1/2020	DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 500,000
A	X CONTRACTUAL			GLO 0139245	11/1/2019	11/1/2020	MED EXP (Any one person)	$ 10,000
	X PD & C/O & XCU						PERSONAL & ADV INJURY	$ 1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 2,000,000
	POLICY PRO-JECT LOC						PRODUCTS - COMP/OP AGG	$ 2,000,000
	OTHER:							$
A	**AUTOMOBILE LIABILITY**	Y	N	BAP 4641355 (AOS)	11/1/2019	11/1/2020	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$ XXXXXXX
	X OWNED AUTOS ONLY; SCHEDULED AUTOS						BODILY INJURY (Per accident)	$ XXXXXXX
	X HIRED AUTOS ONLY; X NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$ XXXXXXX
								$ XXXXXXX
	UMBRELLA LIAB OCCUR			NOT APPLICABLE			EACH OCCURRENCE	$ XXXXXXX
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$ XXXXXXX
	DED RETENTION $							$ XXXXXXX
B	**WORKERS COMPENSATION AND EMPLOYERS' LIABILITY**		N	WC 4641353 (AOS)	11/1/2019	11/1/2020	X PER STATUTE; OTH-ER	
A	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? **(Mandatory in NH)** Y/N: N	N / A		WC 4641354 (ID, MA, WI)	11/1/2019	11/1/2020	E.L. EACH ACCIDENT	$ 1,000,000
A	If yes, describe under DESCRIPTION OF OPERATIONS below			WC 0139244	11/1/2019	11/1/2020	E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000
C	PROFESSIONAL LIABILITY	N	N	026030198	11/1/2019	11/1/2020	$1,000,000 PER CLAIM $1,000,000 ANNUAL AGGREGATE	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

PROPOSAL NUMBER: 907291.0004, PROJECT NO. 20-1336; PROJECT NAME: PROFESSIONAL ENGINEERING SERVICES FOR CITY OF HOLLYWOOD WATER MASTER PLAN UPDATE; PROJECT MANAGER: MCBRAYER, CYNTHIA ; UPON AWARD OF CONTRACT, CITY OF HOLLYWOOD IS INCLUDED AS AN ADDITIONAL INSURED ON THE GENERAL AND AUTO LIABILITY POLICIES.

CERTIFICATE HOLDER

16745753
CITY OF HOLLYWOOD
2600 HOLLYWOOD BLVD., ROOM 221
HOLLYWOOD FL 33020

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

EQUAL EMPLOYMENT OPPORTUNITY

Proposer shall provide a written statement that it does not and will not discriminate against any person, employee, or applicant for employment, because of race, creed, color, religion, sex, national origin, ancestry, age or disability.

PROMPT PAYMENT: LATE PAYMENTS BY CONTRACTOR TO SUBCONTRACTOR AND MATERIAL SUPPLIERS; PENALTY:

When a contractor receives from the City of Hollywood any payment for contractual services, commodities, materials, supplies, or construction contracts, the contractor shall pay such moneys received to each Subcontractor and Material Supplier in proportion to the percentage of work completed by each Subcontractor and Material Supplier at the time of receipt. If the contractor receives less than full payment, then the contractor shall be required to disburse only the funds received on a pro rata basis with the Subcontractors and Material Suppliers, each receiving a prorated portion based on the amount due on the payment. If the contractor without reasonable cause fails to make payments required by this section to Subcontractors and Material Suppliers within 15 working days after the receipt by the contractor of full or partial payment, the contractor shall pay to the Subcontractors and Material Suppliers a penalty in the amount of one percent of the amount due, per month, from the expiration of the period allowed herein for payment. Such penalty shall be in addition to actual payments owed. Retainage is also subject to the prompt payment requirement and must be returned to the Subcontractor or Material Supplier whose work has been completed, even if the prime contract has not been completed. The Contractor shall include the above obligation in each subcontract it signs with a Subcontractor or Material Suppler.

ADA COMPLIANCE

Persons with disabilities who require reasonable accommodation to participate in City programs and/or services may call the Equal Opportunity Manager, Office of Human Resources and Risk Management at (954) 921-3218 (voice). If an individual is hearing or speech impaired, please call Florida Relay Service 1-800-955-8771.

PUBLIC ENTITY CRIMES

"A person or affiliate who has been placed on the convicted vendor list following a conviction for public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list."

A NOTICE AND INVITATION TO ALL PROFESSIONALS AND APPLICANTS
STEVE EDWARDS, CHAIRMAN AND CEO

AFFIRMATIVE ACTION AND EQUAL EMPLOYMENT OPPORTUNITY POLICY STATEMENT

Black & Veatch Corporation has been and will continue to be an equal opportunity employer. To assure full implementation of this equal employment policy, we will take steps to assure that:

a) Persons are recruited, hired, assigned and promoted without regard to race, religion, color, national origin, citizenship, sex, sexual orientation, gender identity, veteran's status, age, pregnancy status, disability, genetic information or other status protected by law.

b) All other personnel actions, such as compensation, benefits, transfers, layoffs and recall from layoffs, access to training, education, tuition assistance and social recreation programs are administered without regard to race, religion, color, national origin, citizenship, sex, sexual orientation, gender identity, veteran's status, pregnancy status, age, disability. genetic information or other status protected by law.

c) Professionals and applicants shall not be subjected to harassment, intimidation, threats, coercion or discrimination because they have: (1) filed a complaint; (2) assisted or participated in an investigation, compliance review hearing or any other activity related to the administration of any federal, state or local law requiring equal employment opportunity; (3) opposed any act or practice made unlawful by any federal, state or local law requiring equal opportunity or (4) exercised any other right protected by federal, state or local law requiring equal opportunity.

I have appointed the Director of Employee Relations to take on the responsibilities of EEO Coordinator. As EEO Coordinator, she will be responsible for the day to day implementation and monitoring of this Affirmative Action Plan. As part of that responsibility, she will periodically analyze the Company's personnel actions and their effects to insure compliance with our equal employment policy.

If you, as one of our professionals or as an applicant for employment, have any questions about this policy or would like to be considered under our Affirmative Action Plan, please see the Director of Employee Relations during regular business hours. This is also a reminder that professionals may update their disability status at any time by contacting their Human Resources Business Partner.

I have reviewed and fully endorse our Affirmative Action and Equal Employment Opportunity program. In closing, I ask the continued assistance and support of all of the Company's personnel to attain our objective of equal employment opportunity for all.

STEVE EDWARDS| Chairman and CEO
Black & Veatch | 11401 Lamar Ave., Overland Park, KS 66211
Building a World of Difference.®

DECLARATION

The aforementioned, as Proposer (herein used in the masculine singular, irrespective of actual gender and number), declares, under oath that no other person has any interest in this Proposal or in any resulting agreement to which this Proposal pertains, that this Proposal is not made with connection or arrangement with any other persons, and that this Proposal is made without collusion or fraud.

The Proposer further declares that he has complied in every respect with all the instructions to Proposers, that he has read all addenda, if any, issued prior to the opening of Proposals, and that he has satisfied himself fully relative to all matters and conditions with respect to the general conditions of the agreement and all relevant information to which this proposal pertains.

DISCLOSURE OF CONFLICT OF INTEREST

Vendor shall disclose below, to the best of his or her knowledge, any City of Hollywood officer or employee, or any relative of any such officer or employee as defined in Section 112.3135, Florida Statutes, who is an officer, partner, director or proprietor of, or has a material interest in the vendor's business or its parent company, any subsidiary, or affiliated company, whether such City official or employee is in a position to influence this procurement or not.

Failure of a vendor to disclose any relationship described herein shall be reason for debarment in accordance with the provisions of the City of Hollywood Purchasing Ordinance.

Name	Relationship
N/A	

In the event the vendor does not indicate any name, the City shall interpret this to mean that no such relationship exists.

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: Black & Veatch Corporation

Mailing Address:
Street/PO Box: 3111 N. University Drive, Suite 700
City: Coral Springs **State** FL **Zip** 33065

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

Phone (754) 229 - 3044 Ext: Fax (754) 229 - 3044

Primary E-Mail Address: FriasRE@bv.com

Web Site Address: www.bv.com

Contacts:
1. Name: Rafael Frias, PE Title: Project Manager
2. Name: Chris Barlow, PE Title: Technical Director

2. TYPE OF ORGANIZATION

A. Check One:

- ☑ 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: 16 November 1998

State in which Incorporated: Delaware

If an out-of-state corporation that is currently authorized to do business in the State of Florida, give the date of such authorization: 22 December 1998

Name and Titles of Principal Officers	Date Elected
See Attached	

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
b. Resumes of Principal Staff
c. Corporate Family Tree
d. Company Brochure/Annual Report

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.

Corporate (National)

Permanent Office Staff	Number	Avg. Years With Firm		
		1-5	5-10	10+
Administrative	454	234	99	154
Project Management	1020	341	291	474
Engineers	3300	1747	928	942
Design/Drafting	949	420	256	356
Computer Services	136	80	31	25

Permanent Office Staff	Number	Avg. Years With Firm		
		1-5	5-10	10+
Clerical /Technicians	949	445	167	334
Procurement	249	132	70	64
Project Control and Estimating	332	191	67	72
Construction Management	120	82	16	22
Research and Development	****			

Local Office Location:
Coral Springs, FL

Personnel in Organization by Discipline.

Discipline	Engineers		Designers
	Reg	Total	Total
Civil	479	903	949
Sanitary	0	0	
Structural	46	179	
Mechanical	208	445	
HVAC	**	**	
Process	11	138	
Electrical	234	736	
Instrumentation	3	124	
Industrial	3	10	

Notes:

1. Black & Veatch does not classify designers by discipline. This number indicates the total number of designers.
2. HVAC staff are included in the Mechanical discipline.
3. Black & Veatch as 2436 Registered Professional Engineers.
4. Black & Veatch encourages Research and Development throughout the organization.

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

Black & Veatch does not breakdown its staff by these categories. Please see attachment for a breakdown of Procurement and Construction Management staff.

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

Maximum Man-Hours Available Per Year: 12,811,968

Current Estimated Man-Hours Per Year: 4,270,656

4. FINANCIAL INFORMATION

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

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	☑	☐

State of Florida

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	18	9	4	5
Project Management	40	13	11	27
Engineers	94	58	23	13
Design/Drafting	22	10	3	9
Computer Services	1	1	-	-

Permanent Office Staff	Number	Avg. Years With Firm		
		1-5	5-10	10+
Clerical /Technicians	22	11	2	9
Procurement	9	7	1	1
Project Control and Estimating	16	15	-	1
Construction Management	7	7	-	-
Research and Development	****	-	-	-

Local Office Location:
Coarl Springs, FL

Personnel in Organization by Discipline.

Discipline	Engineers		Designers
	Reg	Total	Total
Civil	15	39	22
Sanitary			
Structural	1	1	
Mechanical	2	5	
HVAC			
Process		2	
Electrical	13	29	
Instrumentation		2	
Industrial			

Notes:
1. Black & Veatch does not classify designers by discipline. This number indicates the total number of designers.
2. HVAC staff are included in the Mechanical discipline.
3. Black & Veatch as 2436 Registered Professional Engineers.
4. Black & Veatch encourages Research and Development throughout the organization.

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

Black & Veatch does not breakdown its staff by these categories. Please see attachment for a breakdown of Procurement and Construction Management staff.

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

Maximum Man-Hours Available Per Year: 1,344,096

Current Estimated Man-Hours Per Year: 448,032

4. FINANCIAL INFORMATION

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

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	☑	☐

LOCAL OFFICE - CORAL SPRINGS

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		
Project Management	4	1	1	2
Engineers	7	5	1	1
Design/Drafting				
Computer Services				

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

Local Office Location:
Coral Springs, FL

Personnel in Organization by Discipline.

Discipline	Engineers		Designers
	Reg	Total	Total
Civil	2	4	
Sanitary			
Structural			
Mechanical			
HVAC			
Process		1	
Electrical		1	
Instrumentation			
Industrial			

Notes:
1. Black & Veatch does not classify designers by discipline. This number indicates the total number of designers.
2. HVAC staff are included in the Mechanical discipline.
3. Black & Veatch as 2436 Registered Professional Engineers.
4. Black & Veatch encourages Research and Development throughout the organization.

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

Black & Veatch does not breakdown its staff by these categories. Please see attachment for a breakdown of Procurement and Construction Management staff.

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

Maximum Man-Hours Available Per Year:	20,592
Current Estimated Man-Hours Per Year:	6,864

4. FINANCIAL INFORMATION

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

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

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:

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)

Automation and SCADA Improvements for Oxygen, Chlorination and Effluent Systems

City of Hollywood's Souther Regional Wastewater Treatment Plant

Data gathering, programming and commissioning to replicate the Siemens PLC and HMI for the Oxygen Generation Plant. At the same time, Black & Veatch worked on data gathering and review, development of control strategies, programming, commissioning, and training of Operations staff for PLC 3 (Chlorine Facility) and PLC 6 (Effluent Pump Station).

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

Automation & SCADA Improvements - Phase III | 17-1324 | Nov 2021 | Hollywood |
General Engineering Consultant Services for Water Treatment Plant and Wastewater Treatment Plant Projects

Phase I Implementation of Cityworks Server Asset Management (AMS) Premium Software within the City of Hollywood, Utilities Department| 17-1324 | Nov 2021 | Hollywood | General Engineering Consultant Services for Water Treatment Plant and Wastewater Treatment Plant Projects

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 Condition Assessment and Master Planning
Tetra Tech	Water Main Condition Assessment and Risk Prioritization

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

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)

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.

_____

_____

_____

_____

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.: CA8132

Date: Exp. 2/28/2021

Primary Classification: Professional Engineers

10. QUALIFICATION FORM PREPARED BY:

Name (print or type): Rafael Frias, PE

Title: Associate Vice President

Signature:

Address: 3111 N. University Drive, Suite 700 | Coral Springs, FL 33065

Telephone Number: (754) 229-3049

Submittal Questionnaire Attachments

2B. PRINCIPAL OFFICERS

NAME AND TITLE OF PRINCIPAL OFFICERS	DATE ELECTED
Steve Edwards | CEO	November 2013
Cindy Wallis-Lage | President-Water	January 2012
Ken Williams | CFO, President-Finance	January 2018
Angela Hoffman | Senior Financial Officer	January 2006
Timothy Triplett | President - LRMGA & Secretary	June 2008

** This only represents a partial list of Black & Veatch Corporation's officer list, which is available upon request.*

2G. RELATED PARENT COMPANY, DIVISIONS, AND SUBSIDIARIES

Black & Veatch Corporation is a subsidiary of Black & Veatch Holding Company (BVHC). Black & Veatch Holding Company is privately held through an Employee Stock Ownership Program (ESOP). We have more than 10,000 professionals located in over 110 offices worldwide, and we are the 11th largest employee-owned company in the U.S. Our ownership structure gives us the distinct advantage of being free from the pressures that drive publicly held companies (valuing short-term profits over long-term client service). We are our own stockholders, with corporate strategies supporting the continued long-term interest of our global clients.

Black & Veatch Corporation was incorporated in Delaware in 1998. The legal address for Black & Veatch Holding Company is 11401 Lamar Ave. Overland Park, KS 66210.

US LEGAL ENTITIES

Below is a list of U.S. subsidiaries and companies owned by Black & Veatch Holding Company. These entities were established to support our offices throughout the United States (and elsewhere), and to help facilitate successful project management and execution. Our objective is to help our local clients, wherever they may be located, meet their business needs.

Black & Veatch Construction, Inc.
Black & Veatch Corporation
Black & Veatch International Company
Black & Veatch LLP
Black & Veatch Ltd. Of Michigan
Black & Veatch Service Corporation

Black & Veatch Special Projects Corp.
Black & Veatch LLC
Black & Veatch Pritchard, Inc.
Black & Veatch Property Management Services
BVP Holding, LLC

Convergent Group Corporation
Enspiria Solutions Inc.
Global Procurement Corporation
infraManagement Group LLC
Overland Contracting Inc.
Tech2Staffing Inc.

Divisions

Black & Veatch serves clients in the power, oil & gas, water, telecommunications, management consulting, government, environmental and security markets. Within these markets are businesses that provide services and solutions to their respective markets. Black & Veatch's six operating businesses include:

- Power
- Water
- Management Consulting
- Telecommunications
- Special Projects
- Oil & Gas

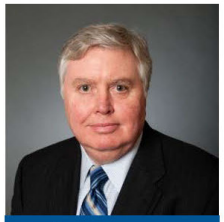
On the following pages, please find the Corporate Organization Chart, Resumes of Principal Staff, the Corporate Family Tree, as well as a company brochure.

Steve Edwards
Chairman & CEO

Human Relations
Lori Kelleher, President

Legal, Risk Management, Governmental Affairs
Tim Triplett, President

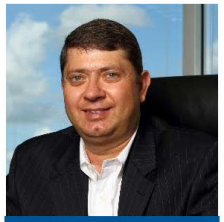
Management Consulting



John Chevrette
President

- Industry/Client Exec - Power
- Industry/Client Exec – Oil & Gas
- Industry/Client Exec - Water
- Service Offerings
- Finance & Ops Support
- Human Resources
- Marketing & Business Devel.

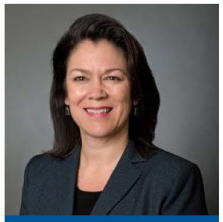
Power



Mario Azar
President

- Business Devel.
- Operations
- EPC
- Power Gen. Svcs
- Nuclear
- Power Delivery
- Renewable Energy

Water



Cindy Wallis-Lage
President

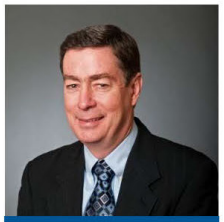
- Americas P&L
- Global P&L
- Operations
- Strategic Svcs.
- Finance & Operations
- Human Resources
- Marketing

Oil &Gas

Hoe Wai Cheong
President & CEO

- Operations
- EPC
- Americas
- Asia
- India
- EMEA
- FOG Solutions
- Tech Manager

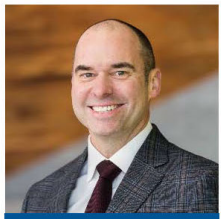
Federal



Marty Travers
President

- Safety & Security
- Legal
- Shared Services
- Operations
- Business Devel.
- Americas & Asia
- Europe / Africa Middle East
- Project Management

Telecom



John Janchar
President

- Networks
- Smart Integrated Infrastructure
- Operations
- Finance
- Safety
- Legal
- Business Devel.
- Project Management

Steve Edwards, PE

CHAIRMAN & CEO

OFFICE LOCATION
Overland Park, KS

EDUCATION
Bachelor of Science, Electrical Engineering, University of Missouri, 1979

YEARS EXPERIENCE
42

PROFESSIONAL REGISTRATION
PE - FL, MO

Steve Edwards is Chairman and Chief Executive Officer of Black & Veatch. Edwards assumed this position in November 2013 and has overall responsibility for the company's engineering, consulting, construction and related infrastructure businesses in the energy, water, telecommunications, and security markets worldwide. With revenues of $3.5 billion, Black & Veatch is consistently ranked in the top ten categories for power generation, power delivery, water infrastructure development and telecommunications in Engineering News-Record magazine and is ranked in the Top 150 of the Forbes list of Largest Private Companies. The company is the 10th largest Employee-Owned Corporation in the United States according to the National Center for Employee Ownership.

Since joining Black & Veatch in 1978 Edwards has been responsible for a variety of global projects and business lines. He was named Chief Operating Officer in March 2013 in a transition role before becoming Chairman and CEO. He was appointed to the Black & Veatch Board of Directors in 2012. Edwards is a registered professional engineer and graduated with a Bachelor of Science degree in Electrical Engineering from the University of Missouri.

Chief Executive Officer; Overland Park, KS

Chairman & Chief Executive Officer. Edwards has overall responsibility for the company's engineering, consulting, construction and related infrastructure businesses in the energy, water, telecommunications, and security markets worldwide.

Company Operations; KS

Chief Operating Officer. Acting as Chief Operating Officer during the transition period before officially assuming the responsibilities of Chief Executive Officer November 26, 2013.

Executive Director - Global Expanded Scope Business; KS

Executive Director. Responsible for global expanded scope business on a P&L basis, including business development, proposals, contracts, and project execution for generation, transmission and distribution (T&D), and oil and gas clients / projects.

Member of Executive Committee, Region Executive - Americas; KS

Executive Vice President. Responsible for Americas region on a P&L basis, including business development, proposals, contracts, and project execution for generation, T&D, consulting, and Gas, Oil & Chemicals (GOC) clients / projects.

Director and Region Executive - Americas; KS

Senior Vice President. Responsible for Americas region on a P&L basis, including business development, proposals, contracts, and project execution for generation, T&D, consulting, and GOC clients / projects.

Various Projects; Energy Engineering & Procurement (E&P) Business; KS

Senior Vice President. Responsible for direction of all engineering and procurement activities for Energy E&P business.

Project Management; KS

Senior Vice President Manager of Projects. Responsible for project oversight; project implementation / standardization issues; coordination of project controls, estimating, and procurement procedures for projects; and management of the ASSIST team.

Tenaska; Frontier; TX

Partner. Responsible partner/project manager for EPC 800 MW 3-on-1 "F" combined cycle project.

Tenaska; Gateway; TX

Joint Venture (JV) Management Committee. Responsible for oversight on an EPC 800 MW 3-on-1 "F" combined cycle project.

Energy Initiatives; Mid-Georgia; GA

Project Executive - Black & Veatch. Responsible for overall EPC project coordination for a 300 MW cogeneration project.

Nippon Steel; 145 MW Coal Fired Development Project; Japan

Project Manager. Responsible for supervising design and general project coordination for a 145 MW coal fired development project.

Tenaska; Frederickson; Washington

Engineering Manager. Responsible for supervising engineering design and general EPC project coordination for a 250 MW combined cycle project.

Bangladesh Power Development Board (BPDB); Sylhet; Sylhet, Bangladesh

Engineering Manager. Responsible for supervising engineering design and general EPC project coordination for a 100 MW combined cycle project.

Kissimmee Utility Authority (KUA); Cane Island; FL

Engineering Manager. Responsible for supervising engineering design and general project coordination for a 120 MW combined cycle project.

KUA; Cane Island; FL

Engineering Manager. Responsible for supervising engineering design and general project coordination for a 40 MW simple cycle project.

Applied Energy Services (AES); Cedar Bay; FL

Project Engineer - Control and Electrical. Responsible for supervising electrical and control related design for a 285 MW fluidized bed boiler cogeneration plant.

Sarawak Electricity Supply Corporation (SESCO); Bintulu; Malaysia

Project Engineer - Control. Responsible for control design of the 3 x 35 MW simple cycle generating plant.

Cindy L. Wallis-Lage, PE

PRESIDENT - WATER

OFFICE LOCATION
Kansas City, MO

EDUCATION
MS, Envir Health, Univ Kansas, 1990
BS, Civil Engineering, Kansas St Univ Manhattan, 1985

YEARS EXPERIENCE
33

PROFESSIONAL REGISTRATION
PE - KS

Wallis-Lage is an active leader and a frequent speaker at many industry forums and events. She serves on several committees for various water industry associations. She is currently on the Board of Directors for the WateReuse Association. Additionally, Wallis-Lage has authored more than 50 papers, 20 technical articles and 10 textbook chapters. She served as editor of the Fifth Edition update of the Handbook of Chlorination and Alternative Disinfectants book.

Wallis-Lage has also been a moderator, facilitator and speaker at many global Black & Veatch roundtable events developed to confront the world's most vexing water industry issues, including Overcoming Barriers to Water Reuse and Dealing with Economic Pressures in the Water Industry.

Her leadership has earned her recognition in the industry and business communities. In October 2006, she received the Professional Engineering Award from Kansas State University in 2006. In the same year she was also honored with the WEF George Bradley Gascoigne Medal for Research in Wastewater Treatment Plant Operational Improvements. In September 2009, Wallis-Lage was honored as a recipient of the Top 100 Under 50 DIVERSE EMERGING LEADERS Award from DiversityMBA Magazine. In 2013, Wallis-Lage received the Pearl Award from the central region Girl Scouts of America for STEM leadership.

Wallis-Lage is also an active supporter of educational initiatives. She has served on the Civil Engineering Advisory Council for Kansas State University and has been an invited speaker to both the KSU and University of Missouri Schools of Engineering. She is currently on the Board of Directors for the WateReuse Association and she serves on the Engineering Advisory Council for Kansas State University which provides input to all engineering disciplines. In 2013, Wallis-Lage received the Pearl Award from the central region Girl Scouts of America for STEM leadership and she was named the Alumnae Fellow for the College of Engineering at Kansas State University. An invited speaker on careers in engineering to local grade and high schools, Wallis-Lage was quoted in the book 21 Things Every Future Engineer Should Know, A Practical Guide for Students and Parents.

Wallis Lage earned a bachelor's degree in civil engineering from Kansas State University in 1985, and she holds a master's degree in environmental health engineering from the University of Kansas from 1990.

Orange County Sanitation District; Secondary Treatment Expansion and Upgrade; Fountain Valley, CA

Task Leader. TM2, Facility Operation and Maintenance. As part of this task, a plant wide process model was developed to size the new 80 mgd activated sludge basins and final clarifiers. The model included all of the liquid and solids processing facilities to develop sludge quantities to account for the impact of the thickening and dewatering sidestreams on the new basins as well as assess a variety of operating conditions. The new activated sludge basins are designed to provide OCSD with the following operating flexibility: complete nitrification or BOD removal only.

Public Utilities Board; 16 mgd MBR Changi Water Reclamation Plant; Singapore

Process Specialist. PUB selected Black & Veatch to study and design the conversion of a portion of the plant which treats 106 mgd to incorporate a 16 mgd MBR within the basin to increase the plant capacity and improve water quality. Two individual basins will be converted to MBR. The MBR plant will be designed to use a biological nitrogen reduction activated sludge process with membranes for solids separation.

City of Flagstaff; 6 MGD Wildcat Hill Water Reclamation Plant Process Upgrade; Flagstaff, AZ

Process Engineer. Design/Bid/Build project to upgrade an existing 6 mgd trickling filter facility to incorporate biological nitrogen removal. Provided process design to upgrade existing 6 mgd trickling filter facility to incorporate biological nitrogen removal. An initial evaluation considered five upgrade alternatives. The alternatives included second stage trickling filters with denitrification filters, second stage activated sludge with denitrification filters, conventional MLE process with disk filters, IFAS with denitrification filters, and an MBR. The final selection was a MLE configuration with IFAS followed by disk filters.

Irvine Water Ranch District; Michelson Water Reclamation Plant Solids Facility; Irvine, CA

Process Specialist. Evaluation and design of various processes for a greenfield solids treatment facility at the Michelson Water Reclamation Play to treat solids from 33 mgd reuse plant which has PC and MBR. Processes include centrifuge thickening, acid – gas anaerobic digestion using egg-shaped digesters for the gas digesters, centrifuge dewatering, heat drying and sidestream treatment. An in-depth study and testing of WAS disintegration technology was conducted to identify the potential for increased WAS destruction/ gas production as well as to serve as a carbon source for liquid stream denitrification. Space allocated for future WAS disintegration. Various sidestream processes such as Demon, Sharon, conventional nitritation, and SBR nitritation were also evaluated. An SBR will be used. FOG addition to enhance gas production will also be included.

Melbourne Water; Eastern Treatment Plant (ETP) Tertiary Upgrade Project; Melbourne, Australia

Process Consultant. Black & Veatch is providing process, preliminary design, cost-estimation and construction expertise for Phase 1 of this project. In Phase 1, a complex pilot program evaluated various tertiary and advanced treatment technologies in various configurations to assess the optimum treatment train to meet the treatment goals. Treatment goals based meeting "fit for purpose" reuse quality water included reducing color, odor, turbidity, ammonia, viruses, bacteria and protozoa. The upgrade will be completed in two phases and is expected to be completed in 2012. In addition to the provision of design services, B&V also prepared various materials to support Melbourne Water's negotiations with its stakeholders, and assist Melbourne Water with the preparation of material supporting its business case based on a preferred final project scope. B&V is also working with the Victoria Department of Health to establish the final regulatory requirements.

Brent Reuss, PE

VICE PRESIDENT

OFFICE LOCATION
Charlotte, NC

EDUCATION
MS, Civil Engineering, University of Missouri-Columbia, 1987
BS, Civil Engineering, Bradley University, 1980

YEARS EXPERIENCE
40

PROFESSIONAL REGISTRATION
PE - NC
PE – TN
PE – NY
PE - MO
PE - VA

Brent is Senior Vice President and Managing Director of the East Region and is located in the Charlotte office. He has extensive experience serving as project manager, project engineer, and resident engineer for the design and construction of both water and wastewater treatment plant and pipeline projects.

Winston-Salem/Forsyth County Utility Commission | R.A. Thomas Water Treatment Plant; Winston-Salem, NC

Principal-in-Charge. Designed new 18 mgd water treatment plant to replace the existing plant. Design includes new operation building, basin and filter complex (rapid mix, flocculation, sedimentation, and filtration), wash water and residuals facilities (equalization basin, clarifier, residuals pumping station improvements, and residuals storage lagoons improvements), finished water pumping station, wash water supply tank, and finished water reservoirs.

Charlotte-Mecklenburg Utilities | Water Distribution System Master Plan; Charlotte, NC

Principal-in-Charge. Study services to complete a comprehensive water distribution system Master Plan for the Charlotte-Mecklenburg Utilities distribution system. Project includes water demand projections, establishment of system performance and level of service criteria based on regulatory and industry standards, installation of flow monitoring at all system pumping station, extensive field testing (insitu pump testing, c-factor testing, hydrant flow testing and system demand testing), hydraulic model development and calibration of an existing InfoWater model and development of a detailed capital improvements program for three planning periods spanning 25 years.

Charlotte Water | Water Distribution System Master Plan Update; Charlotte, NC

Project Director. Study services to complete a comprehensive water distribution system Master Plan update for the Charlotte Water distribution system. Project includes water demand projections, establishment of system performance and level of service criteria based on regulatory and industry standards, extensive field testing (In-situ pump testing, c-factor testing, hydrant flow testing and system demand testing), hydraulic model development and calibration of an existing InfoWater model.

Bedford Regional Water Authority | Smith Mountain Lake Water Treatment Plant and Forest to Lakes Pipeline; Bedford County, VA

Project Director. This Progressive Design-Build project provides engineering and construction services for a 4 MGD WTP and pipelines. Major components include: raw water intake and pump station; water treatment plant utilizing low-pressure ultra-filtration first and second stage membranes; UV disinfection of second stage permeate; GAC contactors; twenty-six miles of pipelines; new electrical equipment; and instrumentation and controls.

JEA | Main Street WTP Ozone Implementation; Jacksonville, FL

Project Director. This water plant modification project was constructed under a design-build delivery system. Responsible for the study, design, bidding, permitting and construction phase services associated with a new 3 million gallon ground storage tank and an ozone system for hydrogen sulfide treatment at this 20 mgd facility. The existing 100 year-old reservoir was replaced with a new pile supported prestressed concrete tank. Preliminary design included study of treatment technologies for hydrogen sulfide removal, comparing ozone systems to packed tower systems. Site limitations included proximity to historical buildings and flood plain encroachments.

Town of Mooresville | Water and Wastewater Master Plan Update; Mooresville, NC

Principal-in-Charge. Study services to complete a comprehensive water and wastewater system master plan for the Town of Mooresville. Project includes the development of a comprehensive sewer system model for all pipes 12" and larger using InfoWorks CS, development of a water distribution system model using MWHSoft Infowater, development of water and wastewater demand projections, system inventory updates, flow monitoring, model calibration, evaluation of existing sewer and water distribution systems and development of a detailed capital improvement plan for three future planning periods.

Charlotte-Mecklenburg Utilities | South Transmission Main; Charlotte, NC

Project Director. Provided design memorandum, drawings, specifications, permitting assistance, and construction phase services for 14,270 lf of new 36-inch, 47,300 lf of 48-inch, and 7,700 lf of 64-inch DIP finished water transmission main divided into five separate construction contracts to facilitate the best competition among contractors.

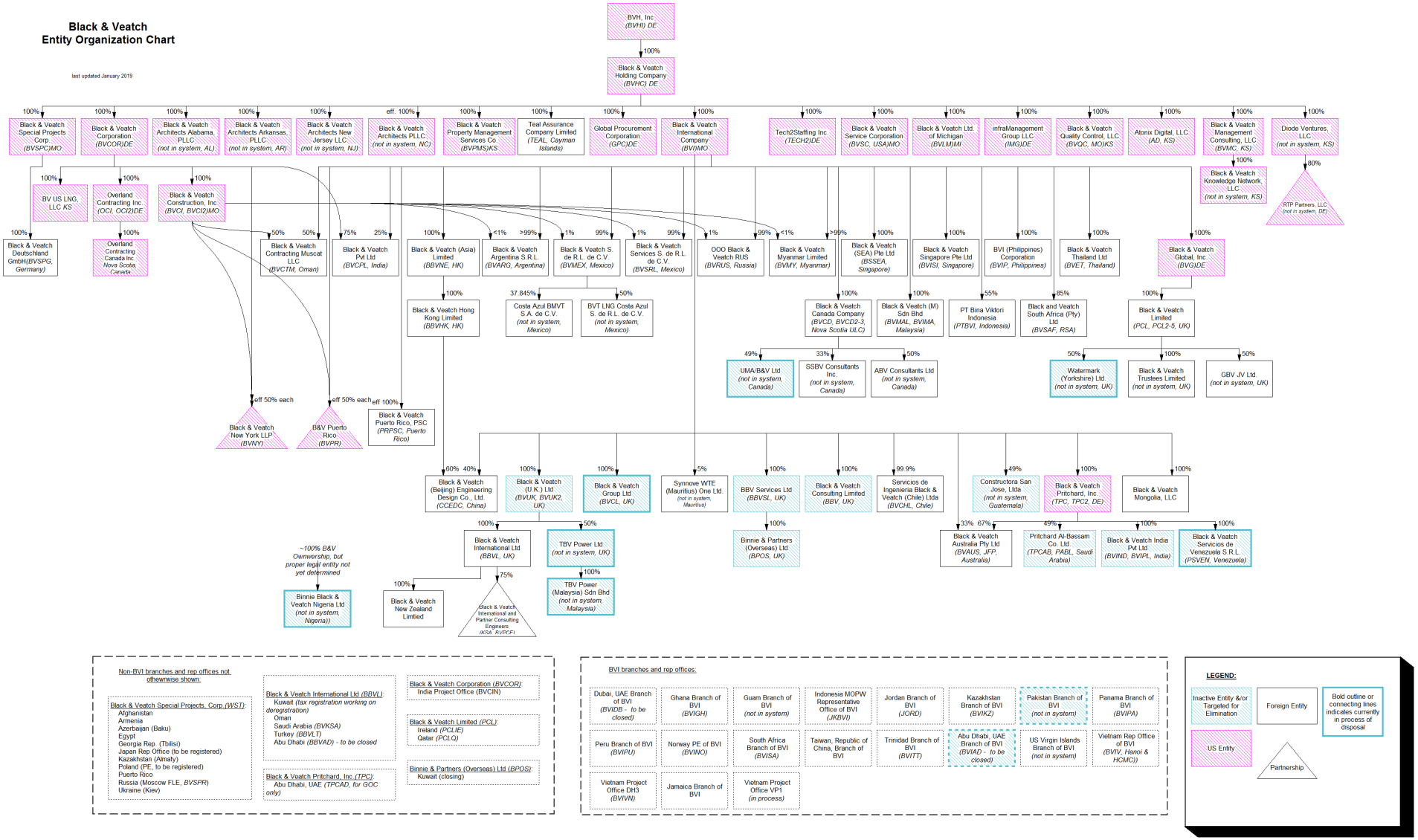
Cape Fear Public Utility Authority | Sweeney Water Treatment Plant Expansion; Wilmington, NC

Principal-in-Charge. Expansion of the existing Sweeney Water Treatment Plant to a rated capacity of 35 mgd with ability to be rerated following a period of operation to 44 mgd without further construction based upon performance. A portion of the plant with conventional treatment will be demolished and replaced with high rate clarification using Superpulsators. The existing 10 mgd portion of the plant will remain in service. Facilities include ozone preliminary treatment, coagulation using alum and polymer ahead of Superpulsators, disinfection with ozone to meet CT requirements, biological filters using granular activated carbon, UV disinfection, new finished water pumping station, and residuals storage and handling.

Cape Fear Public Utility Authority | Raw Water Transmission Main Assessment and System Master Planning; Wilmington, NC

Principal-in-Charge. Conducting both a physical condition assessment and a hydraulic assessment of the raw water transmission mains connecting the CFPUA's raw water intake/pumping station and the Sweeney WTP. The aging raw water transmission system consists of 21.5 miles of 30-inch concrete cylinder piping, 2 miles of twin 24-inch cast iron piping, and 0.5 mile of twin 48-inch concrete cylinder piping. Also conducting a raw water system master plan of the Authority's overall supply system. Alternative facility layouts for new and/or expanded intakes, pumping stations, and transmission main systems are being developed and evaluated as capacity expansion options for the Authority's Kings Bluff supply.

CORPORATE FAMILY TREE



3. EMPLOYEES AND PERSONNEL (PROCUREMENT AND CONSTRUCTION)

Black & Veatch does not breakdown its staff by these categories. Below is a breakdown of Procurement and Construction Management staff for both the United States and Florida.

ROW LABELS	#
Administrative/Office	4564
Admin Support Assistant	78
Admin Support Coordinator	24
Admin Support Supervisor	7
Administrative Coordinator	15
Administrative Manager	5
Closeout Administrator	5
Copy Editing Associate	1
Copy Editing Specialist	2
Database Administrator	12
Dept. Admin Support Specialist	8
Document Assistant	4
Document Associate	39
Document Section Leader	1
Document Specialist	13
Document Supervisor	2
Executive Support Specialist	11
Field Office Coordinator	19
General Clerk	48
Insurance Coordinator	3
Librarian	3
Library Services Manager	1
Mailroom Associate	3
Office Services Manager	3
Project Support Assistant	84
Project Support Coordinator	13
Project Support Manager	3
Project Support Specialist	5
Public Relations Coordinator	3
Receptionist	5
Regional Office Coordinator	24
Translator	6
Travel Specialist	1
Word Processing Associate	1
Word Processing Specialist	2

ROW LABELS	#
Architecture/Planning	27
Architect	23
Facilities Planner	1
Interior Designer	3
Business Development	118
Bus Development Mgr	3
Business Dev Coordinator	4
Business Dev Specialist	4
Business Devlp Director-Water	1
Client Relationship Mgr-Energy	2
Client Services Dir - Water	1
Client Services Mgr - Water	7
Dir, Strategy & Initiatives	3
Director, Global Sales -Energy	1
Mgr, Strategy & Initiatives	1
Project Development Manager	1
Proposal Specialist	21
Reg Dir, Client Serv - Water	2
Reg Dir, Client Services Water	1
Reg Gen Mgr Associate	5
Reg General Mgr - Energy	8
Sales Dir, Energy	6
Sales Dir, SE Asia - Energy	2
Sales Director	5
Sales Engineer	1
Sales Manager - Energy	2
Sales Manager - SPC	3
Sales Manager - Telecom	16
Sales Operations Specialist	2
Senior Project Development Dir	1
Senior Sales Manager	1
Sr Business Line Mgr - Energy	3
Sr Director, Sales & Marketing	3
Sr Reg General Mgr - Energy	4
Sr Sales Director - SPC	2

ROW LABELS	#
Sr Sales Mgr Bus Dev - Telecom	2
Commissioning	134
Commissioning Engineer DCIS	4
Commissioning Engineer Elec	27
Commissioning Engineer I&C	21
Commissioning Engineer Mech	20
Commissioning Engineer Proc	3
Commissioning Manager	26
Commissioning Ops Manager	3
Commissioning Ops Supv	17
Commissioning Support Mgr	5
Commissioning Tech	8
Construction Field	910
Agent	4
Area M&E Manager	1
Construction Manager	311
Constructn Engineer	12
Constructn Technician	334
Field Engineer Civil	26
Field Engineer Electrical	15
Field Engineer I&C	8
Field Engineer Mechanical	17
Field Engineering Manager	9
General Foreman Civil	2
M&E Coordinator	6
Project Field Manager	39
Section Foreman Civil	3
Section Foreman Mechanical	1
Senior Works Manager	2
Sub Agent	3
Superintendent	1
Superintendent Boilermaker	5
Superintendent Civil	22
Superintendent Electrical	38
Superintendent Mechanical	27
Superintendent Millwright	2
Superintendent Piping	10
Superintendent Struc Steel	2
Superintendent Structural St	1

ROW LABELS	#
Technical Author	4
Technical Manager	1
Works Manager	4
Technical Author	4
Technical Manager	1
Works Manager	4
Construction Support	120
Asst Field Engineer Civil	2
Asst Field Engineer Mech	3
Construction Associate	29
Construction Coord Civil	6
Construction Coord Elec	5
Construction Coord I&C	3
Construction Coord Mech	7
Construction Coord Piping	2
Construction Coord Tech	3
Construction Group Manager	7
Construction Operations Dir	1
Construction Operations Mgr	24
Construction Supp Mgr	3
Construction Support Manager	6
Construction Support Mgr	5
Construction Technician	3
Plant Auxiliary Operator	3
Project Coordinator	6
Sr Union Labor Relations Spec	1
Union Labor Relations Director	1
Consulting	207
Analyst, Consulting	17
Consultant	23
Director, Consulting	16
Executive Consultant	1
Manager, Consulting	40
Managing Director	16
Managing Principal	1
Principal Consultant	49
Sr Analyst, Consulting	28
Sr Executive Consultant	1
Sr. Managing Director	15

ROW LABELS	#
Contract Support	66
Asst Subcontracts Mgr	1
Claims Mgr	1
Claims Operations Mgr	3
Claims Support Specialist	1
Contract Adminstr	15
Contract Services Mgr	2
Contracts Coordinator	7
Contracts Manager	1
Contracts Specialist	1
Dir, Proposal Mgmt - Energy	4
Field Contract Admin	1
Proposal Coordinator	4
Proposal Manager	6
Proposal Manager - Govt	1
Proposal Mgr - Energy	8
Sr Claims Mgr	1
Sr Contracts Specialist	4
Sr Field Contract Mgr	1
Sr Proposal Mgr - Energy	3
Subcontracts Mgr	1
Craft/Operative	895
Boilermaker - Helper	1
BVCI Elec Sub Tech Inspector	1
BVCI Elec Substation Spec	2
BVCI Laborer - Foreman	2
BVCI Utility - Foreman	3
BVCI Utility - Groundman	1
BVCI Utility - Jrnymn Lineman	1
BVCI Utility - Substation Tech	1
Carpenter - Foreman	3
Carpenter - General Foreman	1
Carpenter - Helper	45
Carpenter - Journeyman	28
Carpenter - Leadman	3
Civil Foreman	6
Civil General Foreman	4
Concrete Finisher - Journeyman	6

ROW LABELS	#
Crane Operator - Cert Heavy	5
Crane Operator - Heavy	1
DAS Lead Installer	4
Electrician - Certified	1
Electrician - Foreman	14
Electrician - General Foreman	12
Electrician - Helper	51
Electrician - Journeyman	48
Electrician - Leadman	10
Electrician - Licensed	17
Equipment Specialist	14
Fiber Optic Splicing Tech	8
Ganger	6
Groundman	4
Instrument Fitter - Foreman	1
Instrument Fitter - Journeyman	5
Ironworker Struct - Gen Fore	1
Ironworker Struct - Journeyman	3
Laborer	46
Lineman - st Class	1
Mechanic - Leadman	1
Millwright - Certified	4
Millwright - General Foreman	1
Millwright - Helper	1
Millwright - Journeyman	1
Operator Equipment - Foreman	5
Operator Equipment - Gen Fore	7
Operator Equipment - Heavy	69
Operator Equipment - Leadman	5
Operator Equipment - Light	46
Operator Equipment - Medium	40
Operator Truck Driver - Heavy	2
Pipefitter - Certified	4
Pipefitter - Foreman	7
Pipefitter - General Foreman	5
Pipefitter - Helper	17
Pipefitter - Journeyman	20
Pipefitter - Leadman	1

ROW LABELS	#
Rigger - Certified	9
Rigger - Foreman	1
Rigger - Journeyman	4
Rodbuster - Foreman	2
Rodbuster - General Foreman	1
Rodbuster - Journeyman	18
Rodbuster - Leadman	1
Scaffolder	1
Skilled Labourer	2
Solar - Foreman	11
Solar - General Foreman	4
Solar - Installer	76
Solar - Leadman	5
Solar - Technician	27
Sr General Foreman	2
Substation - Leadman	6
Substation Foreman	11
Substation Helper	9
Substation Journeyman	9
Substation Welder	1
Surveyor - Helper	1
Surveyor - Instrumentman	3
Surveyor - Party Chief	7
Surveyor - Rodman	1
Telecom Operator - Foreman	4
Telecom Operator - Heavy	3
Telecom Operator - Light	2
Toolroom	1
Tower - Site Foreman	13
Tower Site General Foreman	4
Tower Tech - Helper	6
Tower Technician	18
Warehouse Foreman	3
Warehouse General Foreman	3
Warehouse Helper	9

ROW LABELS	#
Warehouse Journeyman	5
Warehouse Leadman	1
Welder - Combo Pipe	12
Welder - Structural	1
Wireman	2
Warehouse Journeyman	5
Warehouse Leadman	1
Welder - Combo Pipe	12
Welder - Structural	1
Wireman	2
Eng Tech/Designing/Drafting	949
Engineering Technician	949
Engineering	3299
Architectural Engineer	2
Chem Engineering Specialist	1
Chemical Engineer	50
Civil Engineer	871
Civil Engineering Specialist	7
Elec Engineering Specialist	18
Electrical Engineer	736
Engineer	233
Engineering Manager	10
Engineering Specialist	89
Environmental Engineer	10
Environmental Scientist	114
Envn Engineering Specialist	5
Equipment Engineer	7
Geologist	22
Geotechnical Engineer	48
GIS Specialist	41
Hydraulics Engineer	14
Hydrogeologist	5
I/C Engineering Specialist	2
Instrument Engineer	4
Instrument/Control Engineer	118

ROW LABELS	#
Irrigation Engineer	1
Materials Handling Eng	11
Mech Engineering Specialist	11
Mechanical Engineer	431
Networks Engineer	1
Nuc Engineering Specialist	1
Nuclear Engineer	1
Piping Engineer	56
Process Engineer	136
Project Engineer	15
Project Scientist	7
Safety & Risk Engineer	3
Services Consultant	39
Struc Engineering Specialist	1
Structural Engineer	178
Engineering Services	50
Design Technologist	2
Design Technologist Spec/Mgr	20
Design Technologist Sr Spc/Mgr	13
Sr/Lead Design Technologist	9
Technology Manager	6
Estimating	87
Associate Estimator	5
Chief Estimator	1
Director of Estimating	5
Estimating Analyst	3
Estimator	9
Principal Estimator	20
Principal Proposals Engineer	1
Project Estimator	17
Project Proposals Engineer	1
Senior Proposals Engineer	2
Sr Estimator	23
Faculty	61
Facilities Maintenance Mgr	1
Facilities Maintenance Spec	6
Heavy Equip & Diesel Tech	4
Warehouse Associate	33

ROW LABELS	#
Warehouse Coordinator	7
Warehouse Lead	9
Warehouse Supervisor	1
Finance/Accounting	389
Accountant	21
Accounting Associate	6
Accounting Manager	7
Accounting Operations Manager	1
Accounting Ops Accountant	8
Accounting Ops Accountant: Ben	1
Accounting Ops Assistant	4
Accounting Ops Associate	16
Accounting Ops Supervisor	4
Accounting Specialist	1
Accounting Supervisor	7
Assistant Controller	1
Assistant Dir of Gov't Admin	1
Assistant Director of Finance	17
Assistant Director of Tax	1
Asst Dir of Investor Relations	1
Asst Dir of Treasury Ops	1
Audit Specialist	2
Business Process Analyst	1
Business Process Manager	1
Chief Financial Officer	1
Corp Credit Card Sr Analyst	3
Corporate Controller	4
Corporate Finance Director	2
Corporate Planning Director	1
Cost Accountant	1
Director of Finance	4
Director of Internal Audit	1
Director of Tax	1
Division Finance Director	5
Equity Specialist	1
Expat Tax Analyst	1
Financial Analysis Manager	7
Financial Analysis Specialist	6

ROW LABELS	#
Financial Analysis Supervisor	2
Financial Analyst	4
Financial Appl Analyst	2
Financial Appl Specialist	10
Financial Associate	2
Global Payroll Manager	1
Gov't Compliance Specialist	1
Payroll Accountant	8
Payroll Associate	2
Payroll Supervisor	4
Project Accountant	42
Project Accounting Associate	14
Project Accounting Supervisor	6
Project Acctg Manager	20
Project Acctg Specialist	3
Project Billing Associate	7
Project Billing Lead	6
Sr Accountant	20
Sr Accounting Manager	7
Sr Accounting Ops Manager	1
Sr Audit Manager	1
Sr Auditor	1
Sr Business Process Analyst	1
Sr Expat Tax Specialist	1
Sr Finance Officer	4
Sr Financial Analysis Manager	8
Sr Financial Analyst	9
Sr Financial Appl Manager	3
Sr Gov't Admin Specialist	1
Sr Gov't Compliance Manager	1
Sr Payroll Accountant	1
Sr Payroll Manager	1
Sr Project Accountant	25
Sr Project Acctg Manager	7
Sr Tax Analyst	5
Sr Tax Manager	4
Sr Treasury Analyst	4
Sr Treasury Manager: Treas Op	1
Tax Analyst	3
Tax Associate	1
Tax Specialist	2
Treasury Analyst	2
Treasury Ops Specialist	1
General Management	127
Area Managing Director	2
Business Line Dir	7
Business Line Director	33
Business Strat Planning Mgr	1
Chief Executive Officer	1
Corp Services Director	1
Corp Services Mgr - ERM	1
Corporate Real Estate Dir	2
Div Operations Director	20
Division Operations Manager	13
EVP & President of B&V SPC	1
Mgr, Business Strat Planning	3
Office Operations Manager	9
President & CEO B&V Water	1
President, Mgmt Consulting	1
President, Oil & Gas	1
President, Power	1
President, Telecom Div	2
Region Managing Director	7
Region Operations Director	9
Region Operations Manager	1
Regional Ops Manager	7
Staff Member Senior	1
Technical Services Dept Head	1
VP & President, Atonix Digital	1
Human Resources	185
Div Human Resources Director	7
Human Resources Analyst	15
Human Resources Associate	4
Human Resources Director	12
Human Resources Generalist	32
Human Resources Manager	20

ROW LABELS	#
Human Resources Specialist	29
Sr Human Resources Analyst	31
Sr Human Resources Associate	20
Sr Human Resources Specialist	15
Information Systems	139
Appl. Portfolio Director	1
Appl. Portfolio Manager	11
Application Portfolio Lead	3
Application Sup Analyst - Lead	5
Application Sup Analyst-Senior	3
Application Support Analyst	6
Audio Visual Coordinator	1
Bus Proc Tech Analyst	2
Bus Proc Tech Mgr	1
Bus Proc Tech Spec	4
Bus Proc Tech Sr. Analyst	3
Bus Proc Tech Sr. Mgr	2
Chief IT Architect	1
Data Architect Sr Analyst	1
Data Science Director	1
Dir of Enterprise Tech Implem	2
Implemen Analyst - Assoc	2
Information Security &Risk Dir	1
Information Security Analyst	2
Information Tech Intern	2
Integration Development Mgr	1
IT Asset Administrator	4
IT Managing Director	1
IT Performance Mgr	8
IT Procurement Administrator	2
IT Procurement Manager	1
IT Program Manager	7
Product Director	2
Project Coordinator - General	2
Scrum Master	1
Software Analyst	10
Software Analyst - Associate	4
Software Analyst - Lead	1

ROW LABELS	#
Software Analyst - Senior	15
Software Analyst - SME	5
Solutions Architect	4
Sr IT Performance Mgr	6
Sr Network Manager	1
Sr Product Manager	1
Systems Administrator	1
Systems Sup Analyst - Assoc	5
Test Analyst	2
VMO Manager	1
Intern/Co-Ops/Trainees	45
Architecture Intern	1
Chem Eng Intern	2
Civil Eng Intern	15
Construction Intern	1
Elec Eng Intern	12
Eng Tech Intern	10
Estimating Intern	1
Intern	1
Mech Eng Intern	2
Legal	36
Assoc. Director Govt Affairs	2
Attorney	28
General Counsel	1
Paralegal	5
Marketing	134
Asst Proposals Manager	1
Creative Services Manager	4
Creative Specialist	9
Market Research Analyst	1
Market Research Manager	2
Mktg & Comm Consultant	17
Mktg & Comm Director	7
Mktg & Comm Manager	24
Mktg & Comm Representative	4
Mktg & Comm Specialist	60
Mktg & Comm Sr Director	3
Technical Communicator	1

ROW LABELS	#
Technical Editor	1
Procurement	249
Asst Project Procurement Mgr	12
Construction Equip Program Mgr	1
Diversity Program Mgr	1
DOT Administrator	1
Expediter	9
Expediting Mgr	2
Field Procurement Mgr	3
Field Procurement Rep	6
Industrial Specialist	1
Lead Sourcing Specialist	2
Logistics Analyst	4
Logistics Mgr	2
Materials Admin	5
Materials Controller	5
Materials Coordinator	16
Materials Mgr	14
Principal Project Proc Mgr	1
Procurement Coordinator	22
Procurement Director	1
Procurement Ops Mgr	5
Procurement Rep	34
Procurement Supervisor	4
Project Procurement Mgr	19
Sourcing Specialist	5
Sr Expediter	3
Sr Field Procurement Rep	2
Sr Logistics Analyst	1
Sr Materials Controller	5
Sr Procurement Coordinator	3
Sr Procurement Ops Mgr	23
Sr Procurement Rep	22
Sr Procurement Specialist	6
Sr Project Procurement Mgr	8
Sr Sourcing Specialist	1
Proj Mgmt/Commercial Mgt	1021
Assistant Quantity Surveyor	2

ROW LABELS	#
Commercial Analyst	1
Commercial Director	3
Commercial Manager	5
Deputy Program Manager	1
Insurance & Proj Risk Mgmt Dir	1
Land Services Specialist	16
Managing Quantity Surveyor	4
Project Centre Commercial Mgr	4
Project Controls Analyst	47
Project Controls Associate	34
Project Controls Lead Analyst	49
Project Controls Manager	23
Project Controls Prin Manager	6
Project Controls Specialist	2
Project Controls Sr Analyst	70
Project Controls Sr Associate	41
Project Controls Sr Manager	16
Project Controls Sr Specialist	2
Project Director	70
Project Facilitator I	35
Project Facilitator II	29
Project Facilitator III	7
Project Manager	527
Project Quantity Surveyor	4
Quantity Surveyor	1
Regional Cost Admin	3
Sr Commercial Manager	4
Sr Commercial Specialist	1
Sr Cost Administrator	4
Sr Project Controls Technician	1
Sr Project Quantity Surveyor	5
Sr Quantity Surveyor	3
Quality Assurance/Control	164
Bus Excellence Blackbelt	5
Dir Quality Management Service	1
Director, Business Excellence	1
Field Quality Control Manager	1
Lead Quality Auditor	2

ROW LABELS	#
Manager - QMS	2
Manager Project Quality Mgmt	1
Process Improvement Specialist	2
Project Quality Manager	7
Q&E Systems Manager	1
QC Supervisor	1
Quality Associate	2
Quality Auditor	1
Quality Control Coordinator	4
Quality Control Inspector	13
Quality Control Support Mgr	2
Quality Inspector	27
Quality Manager - Office/Site	2
Quality Manager-Specialized	2
Quality Specialist	2
Quality Technician	7
Resident Const Inspector	22
Site QC Inspector	8
Site QC Supervisor	14
Site Quality Control Manager	6
Site Quality Manager	10
Sr Field Quality Control Mgr	1
Sr Site QC Inspector	14
Sr Site QC Manager	3
Rotation Program	81
EDGE Associate	53
Sr EDGE Associate	28
Safety/Health/Envir Svcs	116
Division Safety & Health Mgr	12
Safety & Health Analyst	2
Safety & Health Coord	1
Safety & Health Manager	64
Safety & Health Spec/Advisor	36
Safety and Health Tech	1
Sciences	42
Asset Mgt Consultant	14
Environmental Planner	5
Hydraulics Consultant	2

ROW LABELS	#
Mgmnt Analyst	9
Networks Consultant	3
Safety & Risk Consultant	9
Security/General Services	15
Driver	7
Sec Assurance & Intel Spec	1
Security Director	1
Security Manager	6
Strategy and Innovation	13
Growth Accelerator Team Mbr	11
Growth Initiative Project Mgr	2
Telecommunications	128
Execution Manager	22
Land Services & Acq Dept Head	2
Land Services & Acq Prog Mgr	4
Land Services Associate	1
Land Services Manager	26
Land Services Supervisor	9
Land Svcs Assoc Program Mgr	1
Right of Way Agent	1
Right of Way Manager	2
ROW Permitting Specialist	1
Senior Right of Way Agent	3
Sr Land Services Associate	10
Sr Land Services Manager	15
Sr Land Services Specialist	21
Sr ROW Permitting Specialist	1
Sr Wireless Regulatory Mgr	2
Sr Wireless Regulatory Spec	2
Wireless Regulatory Associate	1
Wireless Regulatory Manager	1
Wireless Regulatory Specialist	3

4. FINANCIAL REPORT

Black & Veatch Corporation is a leading global engineering, consulting and construction company specializing in infrastructure development in the fields of energy, water and information. In our most recently completed fiscal year ended December 31, 2017, the company generated over $3.3 billion in revenues and had assets of $1.5 billion. Black & Veatch has had a long track-record of profitability during the 100 years that it has been in business. Our employee-owned company has more than 100 offices worldwide. The company's Web site address is www.bv.com.

The financial information is submitted in confidence and should be considered as proprietary information. Respectfully, we request that these documents do not receive public distribution or disclosure.

Condensed consolidated financial information for Black & Veatch Holding Company and related companies is presented below in millions.

FOR YEAR ENDED DECEMBER 30	2019	2018	2017
Revenues on Contracts	$3,654	$3,480	$3,364
Costs of Contracts	2,949	2,848	2,739
Overhead Expenses	579	533	520
Operating Income	**$126**	**$99**	**$104**
Other Expenses & Taxes	20	$19	$16
Net Earnings	**$106**	**$80**	**$87**
AT DECEMBER 30			
Cash & Cash Equivalents	$482	$383	$344
Contract Receivables	398	461	480
Costs & Estimated Earnings in Excess of Billings	342	450	437
Other Current Assets	53	67	48
Total Current Assets	**$1,266**	**$1,361**	**$1,309**
Buildings, Equipment & Other Noncurrent Assets	274	$274	$264
Total Assets	**$1,540**	**$1,635**	**$1,573**
Notes Payable & Current Portion of Long-Term Debt	7	$6	$4
Billings in Excess of Cost & Estimated Earnings	605	481	458
Accounts Payable & Other Current Liabilities	686	766	$758
Total Current Liabilities	**$1,298**	**$1,253**	**$1,220**
Long-Term Debt & Other Noncurrent Liabilities	78	$235	$234
Equity	164	147	119
Total Liabilities & Equity	**$1,540**	**$1,635**	**$1,573**
REVENUE BACKLOG	**$3,920**	**$3,727**	**$4,274**

5. WORK EXPERIENCE

Stock Island Reverse Osmosis (SIRO) Facility

FLORIDA KEYS AQUEDUCT AUTHORITY | KEY WEST, FLORIDA

RELEVANCE TO CLIENT
- Water Treatment Plant Facility Plan
- Reverse Osmosis Membranes Experience
- Raw Water Supply Analysis

ORIGINAL SCHEDULE
July 2018 - November 2018

ACHIEVED SCHEDULE
July 2018 - November 2018, Achieved

NUMBER AND DESCRIPTION OF CHANGE ORDERS
No change orders were requested

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATION
Not applicable as project did not include construction services

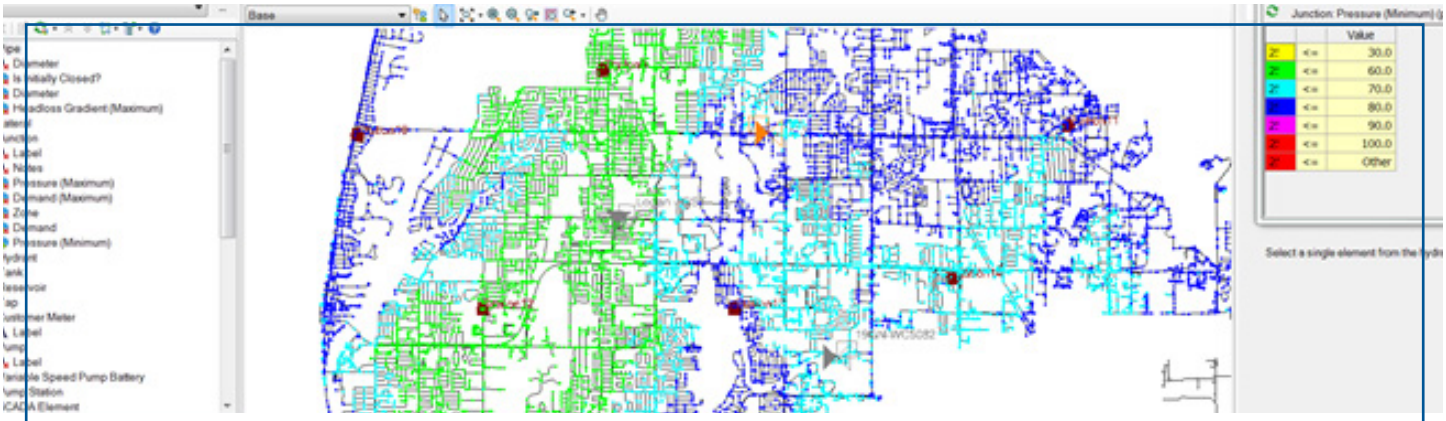
OWNER'S REFERENCE
Jolynn Reynolds
1100 Kennedy Drive
Key West, FL 33040
(305) 295-2141

The FKAA supplies an average of 17 mgd of potable water to the Florida Keys. The FKAA currently provides all its water through 130 miles of transmission pipe from its water supply source in Florida City to Key West. Due to the long length of the transmission pipeline and its numerous water crossings, water service is highly susceptible to interruptions due to hurricanes or other emergencies. The FKAA is focusing on establishing a more resilient system by proactively planning for improvements to the seawater treatment systems to manage risk and improve supply reliability. Part of these improvements includes upgrades and expansion of the KHLSDF and consideration of new building codes and standards.

The FKAA requested Black & Veatch to conduct a facility planning assessment for the KHLSDF provide:

1. A review of water demands tributary to the KHLSDF to determine optimal plant size
2. An assessment of facility operational mode (e.g. emergency standby or baseload) and power supply (FKAA owned facility at KHLSDF or shared with Keys Power)
3. Associated lifecycle costs (capital and operating) and non-economic factors for these scenarios to better determine the optimal and cost-effective approach for the KHLSDF

Black & Veatch utilized a holistic approach to accomplish FKAA goals for the facility planning, conceptual design and its associated cost estimate for the KHLSDF project, which resulted in FKAA's optimal plant size selection, sized to maximize supply (with anticipated demand) while minimizing cost and providing construction cost certainty.



Water System Master Plan

PINELLAS COUNTY | CLEARWATER, FLORIDA

RELEVANCE TO CLIENT

- Model Update and Calibration
- Performance Criteria
- Demand Projections
- Treatment Capacity Evaluation
- Water Quality Analysis
- Capital Improvement Planning

ORIGINAL SCHEDULE

October 2020

ACHIEVED SCHEDULE

Ongoing

NUMBER AND DESCRIPTION OF CHANGE ORDERS

No change orders have been requested

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATIONS

Not applicable as project did not include construction services

OWNER'S REFERENCE

Margaret (Becky) Cook
14 South Fort Harrison Blvd, 6th Floor,
Clearwater FL
(727) 453-3343

Pinellas County's water system serves more than 675,000 residential, commercial, industrial, institutional, and wholesale users, providing an average of more than 50 million gallons a day (mgd) of potable water drawn from groundwater, surface water, and desalinated sources. Black & Veatch was selected to update the County's master plan for the system, including its source waters and pumping, distribution, and treatment facilities.

For the update, Black & Veatch implemented an adaptive master planning approach that leveraged the latest technologies in hydraulic and water quality modeling, GIS, and asset management, and used Black & Veatch's custom, interactive CIP planning tools. The dynamic approach allowed reassessment of projects and optimization of plans as changing drivers and conditions influenced project decisions and schedules. Some unique an innovative planning approaches and tools provided to the County included:

- Demand allocation figures to illustrate the demand concentrations and future growth patterns.
- Development of multiple levels of system performance criteria based on industry benchmarks and state/local regulations that are used to assess system adequacy and determine system improvement needs and priorities.
- Water quality assessments and iterative improvement planning to minimize water quality/age/chlorine residual impacts that can be associated with hydraulic capacity driven improvements.
- R&R Risk-Based Prioritization including Facility, Security, Level of Service, and Water Conservation assessments.

Potable Water System Master Plan

CITY OF TAMPA | TAMPA, FLORIDA

RELEVANCE TO CLIENT

- Model Update and Calibration
- Demand Projections
- NRW Seasonality
- Performance Criteria
- Fire Flow Analysis
- Water Quality Analysis
- Asset Management Gap Assessment and Roadmap
- Risk Based Prioritization of Pipeline R&R Needs
- CIP Prioritization

ORIGINAL SCHEDULE

Sept. 2015 - June 2016

ACHIEVED SCHEDULE

Sept. 2015 - July 2018
Schedule Delay due to finding a 36-inch closed valve during calibration and the City reconfiguring the distribution system from one pressure zone to three in the middle of the project.

NUMBER AND DESCRIPTION OF CHANGE ORDERS

One change order was requested for recalibration once the 36-inch valve was opened and the system reconfiguration was completed.

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATIONS

Not applicable as project did not include construction services

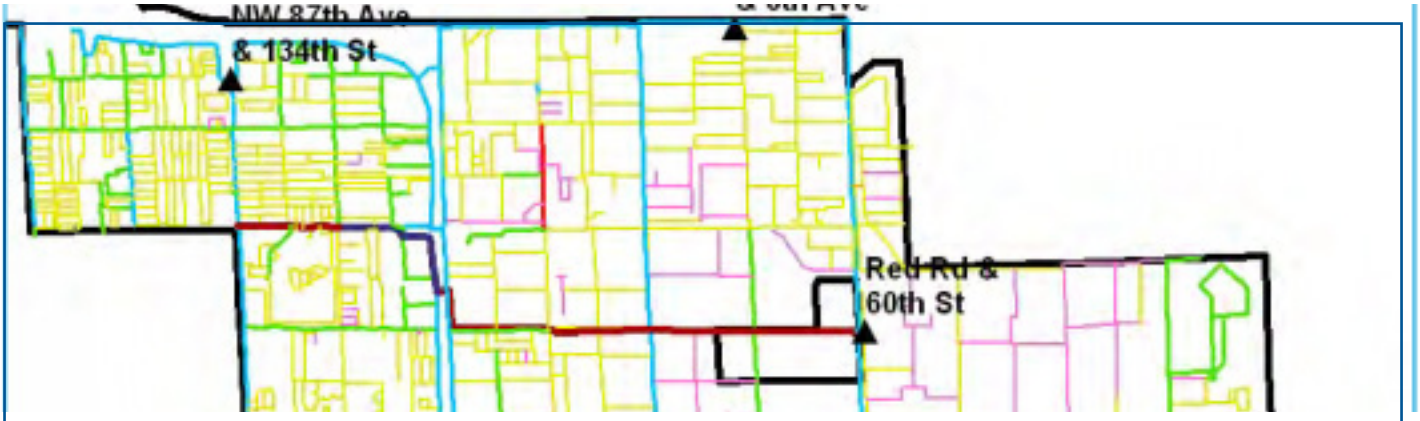
OWNER'S REFERENCE

Brian Pickard
306 E. Jackson St.
Tampa, FL 33602
(813) 274-3282

The City of Tampa provides water service to more than 590,000 people in Tampa, Florida, at an average day demand of 70 mgd. The water distribution system is supplied from a surface water supply and treatment facility (Hillsborough River and the D.L. Tippin WTP) and through interconnections with Tampa Bay Water, which is a regional wholesale water supply authority in the area. The distribution system has one primary pressure zone and includes six storage tanks, five repump stations, and more than 2,400 miles of water main.

The Potable Water System Master Plan project involved many traditional system planning elements, including: water demand projections, hydraulic model update and calibration (using Innovyze's InfoWater software), hydraulic capacity evaluation, capital improvements program (CIP) development, and preparation of a master plan report. However, the project also included some unique an innovative planning approaches and tools to provide the City with a comprehensive and adaptable master plan. This included:

- Development of multiple levels of system performance criteria based on industry benchmarks and state/local regulations.
- Resiliency and reliability assessments including identification of critical infrastructure, asset failure analyses, and defining improvements to increase system resiliency.
- Water quality assessments and iterative improvement planning to minimize water quality/age impacts that can be associated with hydraulic capacity driven improvements.
- Asset Management Program Framework Development, including a gap assessment based on ISO 55000 standards and developing an Asset Management Program Implementation Roadmap Plan.
- Risk Based Prioritization for Pipeline R&R needs using Innovyze's InfoMaster software.



Hialeah Water System Modeling and Pressure Study

MIAMI-DADE WATER AND SEWER DEPARTMENT | MIAMI, FLORIDA

RELEVANCE TO CLIENT
- Hydraulic Modeling
- Planning

ORIGINAL SCHEDULE
1 month

ACHIEVED SCHEDULE
1 month

NUMBER AND DESCRIPTION OF CHANGE ORDERS
None

AVERAGE TURNAROUND TIME FOR REQUESTS FOR INFORMATION
Not applicable as project did not include construction services

OWNER'S REFERENCE
Peter Jelonek, PE
3071 SW 38 Avenue
Miami, FL 33146
(786) 552-8117

The Miami-Dade Water & Sewer Department (MDWASD) supplies water to the City of Hialeah through interconnections at four locations. After a new interconnection was installed with the City of Hialeah, MDWASD decided to model the distribution system network of the City of Hialeah. MDWASD had developed an all-pipes model of the Miami-Dade distribution system and it is desirable at this time to construct and incorporate the distribution system network of the City of Hialeah into this model.

There are existing concerns expressed to the Department by the City of Hialeah. The City is currently experiencing low pressures on the northwest portion of the City, as well as the local hospital. There is not an existing system model of the piping network for the City of Hialeah, therefore the Department considers it necessary to develop a basic model that can be used to make decisions about the supply to this customer.

Planning services performed by Black & Veatch included:

City of Hialeah Distribution System Model Construction

This task included the construction of the hydraulic model for the City of Hialeah.

Model Evaluations

The following evaluations were performed:

- Evaluations using observed flow information at a point in time where supply to Hialeah is being fed through the three meters: the meter at the Hialeah Water Treatment Plant (WTP) 2nd Ave and 7th Street, the meter at 13th Street and 2nd Avenue, and the meter at W 4th Ave and 68th Terrace.
- Evaluation using observed flow information when the meter near West 80th Street and 24th Court was added to the system.

Asset Inventory Survey and Renewal Forecasting

PEACE RIVER MANASOTA REGIONAL WATER SUPPLY AUTHORITY | ARCADIA, FLORIDA

RELEVANCE TO CLIENT

- Asset Inventory and Condition Survey
- Facility Asset Risk Assessment
- Pipeline Asset Risk Assessment
- Asset Replacement Cost Estimating
- Replacement Planning Model
- Asset Management Plan Development
- Power BI Dashboard

ORIGINAL SCHEDULE

Oct. 2019 - March 2020

ACHIEVED SCHEDULE

Oct. 2019 - March 2020, Achieved

NUMBER AND DESCRIPTION OF CHANGE ORDERS

No Change orders were requested

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATION

Not applicable as project did not include construction services

OWNER'S REFERENCE

Mr. Kevin Morris
9415 Town Center Parkway
Lakewood Ranch, FL 34202
(941) 316-1776

Peace River Manasota Regional Water Supply Authority (the Authority) supplies drinking water to more than 900,000 people across Charlotte, DeSoto, Manatee and Sarasota counties in Florida. The Authority's assets include 70 miles of transmission main, a 51 mgd Water Treatment Plant, a 6-billion-gallon reservoir, pumping stations and ASR wells.

As part of its rate study the Authority had to determine the sufficiency of its Renewal and Replacement (R&R) fund, so Black & Veatch was contracted to develop an R&R forecast as part of an asset management plan for the Authority's facilities. The project consisted of the following tasks:

- Asset inventory survey and condition assessment of the facility assets
- Risk assessment of the facility and pipeline assets
- Useful life assessment and forecasting rehabilitation and replacement costs
- Development of a dynamic asset management plan using Power BI

For the inventory survey Black & Veatch developed a Survey123 form to collect asset and condition data, and a multidisciplinary team spent 3-4 days on site collecting data and assessing asset condition and performance. Consequence of failure was also assessed and combined with the condition score to assess facility asset risk. A desktop risk assessment was performed on the pipeline assets.

A replacement planning model was developed in Power BI, using the asset inventory, condition and risk scores to calculate remaining life. Replacement costs were estimated for all the assets and added to the model to forecast the R&R.

WWTF Data Collection

POLK COUNTY | WINTER HAVEN, FLORIDA

RELEVANCE TO CLIENT

- Facility Condition Assessment
- Data Collection
- Connecting condition data to CMMS systems

ORIGINAL SCHEDULE

Nov. 2019 - Feb 2020

ACHIEVED SCHEDULE

Nov. 2019 - Feb. 2020, Achieved

NUMBER AND DESCRIPTION OF CHANGE ORDERS

No Change orders were requested

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATION

Not applicable as project did not include construction services

OWNER'S REFERENCE

Chuck Nichols
1011 Jim Keene Blvd.
Winter Haven, FL 33880
(863) 298-4215

The County owns and operates seven wastewater treatment facilities (WWTFs) within six regional utility service areas, including four regional facilities and three smaller "package" plants. As part of a comprehensive asset management program, the County wished to collect asset inventory data from these facilities for use in a computer maintenance management system (CMMS). Additionally the County wished to assess asset condition in conjunction with the collection of asset inventory data.

Black & Veatch provided field data collection services to collect the desired asset inventory and condition data. The following tasks were included:

- Data Collection Plan
  - Update Survey123 Forms
  - Develop Data Collection Plan
- Data Collection: WWTF Asset Surveys
- Data Submission
  - Data Analysis and Quality Control
  - Data Submission

Bond Consulting Engineering

MIAMI-DADE WATER AND SEWER DEPARTMENT | MIAMI, FLORIDA

RELEVANCE TO CLIENT
- Water system master planning
- Water treatment facilities assessments
- Prioritization and criticality evaluations

ORIGINAL SCHEDULE
2009 - 2015

ACHIEVED SCHEDULE
2009 - 2015

NUMBER AND DESCRIPTION OF CHANGE ORDERS
None

AVERAGE TURNAROUND TIME FOR REQUEST FOR INFORMATION
Not applicable as project did not include construction services

OWNER'S REFERENCE
Frances Morris
3071 SW 38 Avenue
Miami, FL 33146
(786) 552-8620

Black & Veatch served as the Bond Consultant Engineer for MDWASD since 2009. Bond Consultant Engineering services are provided to ensure that the Department remains in compliance with the Master Bond Ordinance 93-134, which specifies a number of operational and financial requirements that the Department must meet on a recurring basis and for the issuance of additional bonds. Black & Veatch has been responsible for the preparation of two reports annually.

The Annual Bond Consultant Report, which assesses the Department's overall operations and financial performance services to document the physical status of system assets, the adequacy of the Renewal & Replacement (R&R) deposit and the adequacy of the capital improvement program. As required by the Bond Ordinance, the condition of approximately one-third of MDAWSD's major water and wastewater system facilities must be evaluated. The facilities inspected include:

- Three regional wastewater treatment plants (NDWWTP, CDWWTP, and SDWWTP)
- Approximately 80 of the largest sewer system pumping stations in the system
- Three water treatment plants
- Five wellfields (93 Biscayne aquifer wells) and the five South Dade Water Systems
- Six water booster/storage facilities

In order to comply with the inspection of the entire system every three years, approximately one-third of the major assets and a representative sampling of pump stations are scheduled to be inspected as part of this report. The Bond Consultant's Annual Report focuses on the following eight (8) primary areas of the Department:

- Department Organization and Management
- Department Accomplishments and Challenges
- Customers and Sales
- Water System
- Wastewater System
- Capital Improvements Program

Hydraulic Modeling in Support of Planning Activities

MIAMI-DADE WATER AND SEWER DEPARTMENT | MIAMI, FLORIDA

RELEVANCE TO CLIENT
- Hydraulic Modeling
- Water System Planning
- Capacity Evaluations

ORIGINAL SCHEDULE
12 months

ACHIEVED SCHEDULE
12 months

NUMBER AND DESCRIPTION OF CHANGE ORDERS
None

AVERAGE TURNAROUND TIME FOR REQUEST FOR INFORMATION
Not applicable as project did not include construction services

OWNER'S REFERENCE
Daniel Edwards
3071 SW 38 Avenue
Miami, FL 33146
(786) 552-8354

Black & Veatch performed multiple capacity studies initiated by the Miami-Dade Water & Sewer Department's Planning Division (Department).

The services performed by Black & Veatch included:

- Water and Wastewater Capacity Analysis Orientation – Black & Veatch staff met with the Department's staff for a one week period to familiarize them with the current processes that are utilized to perform capacity analyses.
- Water Hydraulic Model Operation and Maintenance – This task provided for fire flow / capacity analysis for new developments requesting connection to the water distribution system.
- Incorporate the plans of the new developments into the hydraulic model.
- Performed hydraulic analysis under steady state Maximum Day Demand + Fire Flow conditions to assess the performance of the system.
- Determined the extent (diameter and configuration) to which water piping, pumps, and or reservoirs must be up-sized to accommodate the new development loadings and meet Department performance standards.
- Incorporated distribution system improvements and re-ran the model to confirm that adequate performance was achieved.

Water Infrastructure Improvements to Non-Residential Zoned Properties in the Miami-Dade Service Area

MIAMI-DADE WATER AND SEWER DEPARTMENT | MIAMI, FLORIDA

RELEVANCE TO CLIENT
- Hydraulic Modeling
- CIP Planning
- Funding and financing review

ORIGINAL SCHEDULE
6 months

ACHIEVED SCHEDULE
6 months

NUMBER AND DESCRIPTION OF CHANGE ORDERS
None

AVERAGE TURNAROUND TIME FOR REQUESTS FOR INFORMATION
Not applicable as project did not include construction services

OWNER'S REFERENCE
Peter Jelonek, PE
3071 SW 38 Avenue
Miami, FL 33146
(786) 552-8117

As a result of a resolution from Board of County Commissioners of Miami-Dade County, the Water and Sewer Authority (WASD) engaged Black & Veatch to provide a plan, including planning level cost estimates and project schedules, to proactively upgrade the deficient local distribution system in non-residential areas to meet current system standards as a way of encouraging economic development and to provide a more reliable distribution system that meets non-residential fire flow needs. The plan used MDWASD's water system model in InfoWater and their integrated GIS to identify deficient infrastructure and to provide a plan to upgrade water service to commercial and industrial areas which included proposed funding in the water and sewer 5-year capital program.

Planning services performed by Black & Veatch included:

Corridor Selection – Deficient Infrastructure Identification. The GIS layers provided by the Department were utilized to update the current model pipe network and to identify the non-residential corridors/parcels that were lacking the appropriately sized water main infrastructure.

Improvements. Single pipe deficiencies that were in close proximity were grouped together to create individual construction projects, then the projects were grouped within one of thirteen commissioning Districts by geographical proximity.

Opinion of Probable Construction Costs. The opinion of probable construction cost covers the improvements identified and includes the construction, engineering, and land acquisition costs as needed.

Scheduling. In general, it has been assumed that all of the projects will be completed within a 10-year time frame.

MDWSD Infrastructure Assessment and Replacement Program

MIAMI-DADE WATER AND SEWER DEPARTMENT | MIAMI, FLORIDA

RELEVANCE TO CLIENT

- Prioritization Planning
- Prioritized all pipelines 16-inch diameter and larger for future inspection
- Condition assessment and determined if rehabilitation or replacement
- The complete list of all pipe segment prioritization was provided

ORIGINAL SCHEDULE

Jan 2013 – Dec 2013

ACHIEVED SCHEDULE

Jan 2013 – Dec 2013, Achieved

NUMBER AND DESCRIPTION OF CHANGE ORDERS

No change orders were requested.

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATION

Not applicable as project did not include construction services

OWNER'S REFERENCE

Daniel Edwards
3071 SW 38 Avenue
Miami, FL 33146
(786) 232-5257

The Miami-Dade Water and Sewer Department ("Department") experienced failures on large water mains and implemented a program for inspection and condition assessment. Inspections focused primarily on prestressed concrete cylinder pipe. Recognizing that other pipelines in the system may be at risk for failure, the Department contracted with Black & Veatch to provide a prioritization of all system pipelines 16-inch diameter and larger. These prioritized pipelines served as Stage 1 of a larger four stage program to improve the facilities within the Department. The program is summarized as follows:

1. Stage 1 – Prioritization Planning (this study)
2. Stage 2 – Inspection
3. Stage 3 – Condition Assessment
4. Stage 4 – Implementation of Solutions

The Department recognized that a prioritization program was necessary to prioritize which facilities should be inspected, evaluated with condition assessment, and potentially rehabilitated or replaced.

Black & Veatch prioritized all pipelines 16-inch diameter and larger for future inspection and condition assessment and determined if rehabilitation or replacement was required. Beyond the immediate purpose of establishing a prioritized list, an added benefit of this study was development of information that can easily be used to devise a systematic approach to conducting condition assessments using asset management principles. The results of this prioritization provided the basis for a program to plan and implement condition assessment inspections as part of an overall asset management plan which will allocate the limited available funding resources to those pipelines that pose the greatest risk.

Energy Efficiency Master Planning Services

CITY OF HOLLYWOOD DEPARTMENT OF PUBLIC UTILITIES | HOLLYWOOD, FLORIDA

RELEVANCE TO CLIENT

- Energy Efficiency Master Plan
- Development of CIP
- Business Case Evaluations
- Water Treatment Process Evaluations

ORIGINAL SCHEDULE

18 months

ACHIEVED SCHEDULE

18 months

NUMBER AND DESCRIPTION OF CHANGE ORDERS

A small amendment for $6,908 was approved by the City to implement minor updates to the Master Plan Report.

AVERAGE TURNAROUND TIME FOR REQUESTS FOR INFORMATION

Not applicable as project did not include construction services

OWNER'S REFERENCE

Francois Domond
1621 N. 14th Ave.
Hollywood, FL 33022
(954) 921-3258

The Energy Efficiency Master Plan resulted in a CIP for the implementation of 19 ECMs for combined annual energy savings of 7 GWh or 15% of the Utility's energy use.

Energy Efficiency Master Plan

Black & Veatch developed a comprehensive Energy Efficiency Master Plan for the City of Hollywood Department of Public Utilities, including the Water and Wastewater Treatment Systems. The master plan resulted in the development of a capital improvement plan (CIP) for the implementation of 19 energy conservation measures (ECMs) for combined annual energy savings of 7 GWh or 15% of the Utility's total energy use. The CIP also results in a net present value of $4.7 million over the life of the improvements. Specific tasks included:

- Development of an existing energy use baseline for the City's water and wastewater facilities and equipment.
- Evaluation of the current and potential alternate electric utility rate structures at each facility.
- Energy efficiency assessments, including efficiency evaluations of equipment, processes, pumping systems and the buildings at each facility.
- Development and analysis of over 50 ECMs. The analyses included capital cost estimates, energy use and cost impacts, other O&M cost impacts, and non-economic factors, such as operational complexity, water quality or regulatory impacts and public acceptance.
- Development and use of an Energy Project Decision Cash Flow Model to define an implementation strategy consistent with the City's overall CIP planning and project funding capabilities.
- The Energy Efficiency Master Plan is the first step for the City's Department of Public Utilities to become a model of energy efficiency and management in the United States.

Cityworks Implementation for Utilities

CITY OF HOLLYWOOD DEPARTMENT OF PUBLIC UTILITIES | HOLLYWOOD, FLORIDA

RELEVANCE TO CLIENT
- Asset Management
- Geographic Information Systems

ORIGINAL SCHEDULE
18 months

ACHIEVED SCHEDULE
18 months

NUMBER AND DESCRIPTION OF CHANGE ORDERS
None

AVERAGE TURNAROUND TIME FOR REQUEST FOR INFORMATION
Not applicable as project did not include construction services

OWNER'S REFERENCE
Francois Domond
Deputy Director
1621 N 14th Avenue
Hollywood, FL 33020
(954) 921-3930

To more effectively and efficiently manage its water and wastewater utility infrastructure as part of an overarching asset management program, the City of Hollywood Department of Public Utilities sought assistance to implement a new Computerized Maintenance Management System (CMMS). CMMS solutions are utilized in a variety of industries - manufacturing, pharmaceuticals, public works, and public utilities to name a few. However, to effectively support water/wastewater operations, the selected solution must support unique industry specific functions such as water line flushing, valve exercising, and CCTV inspections.

The benefits of implementing a modernized CMMS solution include:

Increased Level of Maintenance Information. Developing the historical database that becomes readily available as critical maintenance information is used, turning data into information that can be used to manage maintenance as a business. Improved Work and Service Request Control: streamlining the work order and service request modules, providing the basis for work management, cost tracking, equipment history, and performance reporting.

Improved Planning and Scheduling. Providing the systems and procedures to establish a more effective day-to-day maintenance planning and scheduling function, which is a key contributor to improved craft labor utilization and customer service.

Extend Equipment Life. Automatic scheduling of repetitive preventive maintenance (PM) activities through a well implemented CMMS solution. PM tasks and inspection frequencies can be documented on the PM module and failure trends monitored to highlight major causes of equipment breakdowns and unscheduled repairs.

SCADA Evaluation and System Improvements

CITY OF HOLLYWOOD DEPARTMENT OF PUBLIC UTILITIES | HOLLYWOOD, FLORIDA

RELEVANCE TO CLIENT
- Existing System Evaluation
- SCADA Planning Services
- SCADA Standards Development
- SCADA Programming

ORIGINAL SCHEDULE
2013 - 2014; 2019 - Ongoing

ACHIEVED SCHEDULE
2013 - 2014; 2019 - Ongoing

NUMBER AND DESCRIPTION OF CHANGE ORDERS
N/A

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATION
Not applicable as project did not include construction services

OWNER'S REFERENCE
Francois A. Domond
Deputy Director
1621 N 14th Ave.
Hollywood, FL 33020
(954) 921-3930

SCADA System Evaluation

As part of the Energy Efficiency Master Plan, the Black & Veatch Team performed a high-level review and evaluation of the SCADA systems at both the Water and Wastewater Treatment Plants. The SCADA evaluation included automation and control system improvements related to energy conservation measures, as well as, long term SCADA recommendations for enhanced performance and optimized operations.

The existing SCADA system consists of programmable logic controller (PLC) interconnected using Ethernet network, with supervisory monitoring and control from a human machine interface (HMI) system of servers and workstations. This concept of PLC/HMI-based control system is a sound approach to SCADA and common in the water industry.

SCADA System Improvements

The SCADA system is being modified to improve automation. Black & Veatch provided the facility's operators with a step-by-step guide on the HMI and the ability to monitor the automatic or semi-automatic startup and shutdown sequences for multiple processes at the wastewater plant.

Black & Veatch developed process control strategies and I/O lists, which served as the basis for the PLC and HMI programming. To provide consistency for future programming by the City, the control strategies also included:

- PLC and HMI Standards and Conventions (including tagging and naming conventions)
- Screen Layouts
- Text Font and Color Conventions
- Analog Value Displays
- Standard Graphics
- Alarms and alarm handling
- PLC Program languages, layout and documentation

Proposed Project Team & Organization

The City will receive a clear, concise and usable trigger-based dynamic master plan that will result in defensible project alternatives and business cases, through Black & Veatch's team proven experience delivering successful Water Master Plan projects for utilities in Florida and beyond.

We have selected the "stars" from successful water infrastructure projects relevant to the City's projects to work in collaboration with City staff – An Integrated Team.

Our Team brings to the City a wealth of experience in all aspects of water infrastructure projects including studies, conceptual, preliminary and final design, permitting, construction administration management, reviews, QC and Value Engineering, best practices for optimization of existing operations, and other technical services needed to implement the City's Capital Improvement Plan (CIP).

Our Team members have been selected for their experience working together on similar projects – delivering water infrastructure projects that are comprehensive, innovative, implementable, and with long-term sustainable benefits.

We have developed an organizational chart that reflects how we will closely integrate City Staff, our subconsultants and the specific support of technical experts, who will work together to identify solutions that will best meet the interests of the City. We are providing the City with a highly-qualified team and **Proven Experience for Successful Delivery** of all water infrastructure projects under this contract.

HYDRAULIC MODELING IN SUPPORT OF PLANNING

Miami Dade Water & Sewer Department

Bertha Goldenberg, Retired Assistance Director, rated the Black & Veatch team the highest available rating of Excellent on the work performed for WASD on the Hydraulic Modeling in Support of Planning and Commercial Properties.

Date of Service: 2013 - 2015

CITY OF
HOLLYWOOD

PROJECT DIRECTOR
Rafael Frias, PE

PROJECT MANAGER
Chris Barlow, PE

TECHNICAL DIRECTOR
Amanda Schwerman, PE, ENV SP

QA/QC
Isabel Botero, PE

COMPREHENSIVE INTEGRATED UTILITIES MASTER PLANNING SERVICES

CONDITION ASSESSMENT

LEAD: Olena Lytvyn, PE

Process Mechanical
Tammy Martin, PE
Steven Scott
Melissa Velez, LEED AP, PE

Structural
Brad Vanlandingham, PE

Electrical
Aubrey Haudricourt, PE[1]
David Garcia

Instrumentation & Controls/SCADA
Laurie Kusmaul
Larry Brouillette, PE

Pump Stations
Bobby Burchett, PE, ENV SP
Chris Barlow, PE

Water Mains Inspections
Ken Caban, PE, BCEE[2]
Janine Alexander, PE[2]
Ricardo Vieira, PE

Production Wells
Ed Rectenwald, PG
Anamaria Sarmiento, PG

WATER TREATMENT PLANT

LEAD: Chris Barlow, PE, CDT

Process Specialist
Dr. Arturo Burbano, PhD, PE, PMP, BCEE

Membrane Specialist
Pablo Gala-Serra
Dr. Arturo Burbano, PhD, PE, PMP, BCEE

Water Treatment Design
Melissa Velez, LEED AP

Operations & Maintenance
Ron Parker
Ari Copeland, PO

Chemical Feed Systems
Erin Briggeman, PE

Regulatory
Steve King, PE
Emily Tummons, PhD, PE

GIS Integration
Nick Wyatt

R&R Sufficiency Planning
Martin Jones, CEng

DISTRIBUTION SYSTEM

LEAD: Amanda Schwerman, PE

Hydraulic Modeling
Brandy Thigpen, PE
Casey Marika, PE

Transient Modeling
Amanda Schwerman, PE

R&R Risk Prioritization
Amanda Zarazua, PE

Population and Demand Projections
Casey Marika, PE

Emergency / Resilience Planning
Amanda Schwerman, PE

Field Data Collection
Kevin Cevallos, PE

CAPITAL PLANNING

LEAD: Robert Chambers

Capital Project Prioritization
Martin Jones, CEng
Matt Powis, PE

Cost Estimating
Chad Barker

State Revolving Fund Compliance
Francesca McCann

Financial & Funding Plan
Robert Chambers
Giovanna Rivera

Adaptive Planning Tools
Casey Marika

Training
Amanda Schwerman, PE

ASSET MANAGEMENT

LEAD: Matt Morey, GISP

Cityworks Specialist
Mark Seastead

Gap Assessment
Jeff Stillman, PE, BCEE
Martin Jones, CEng

Asset Management Framework
Will Williams

Level of Service Standards
Martin Jones, CEng

Utility Platform Dashboards
Casey Marika, PE
Ben Cownie

GIS Integration
Nick Wyatt

SUBCONSULTANTS

McKim & Creed[1]
Tetra Tech[2]

Members of our project leadership team and task lead live in Palm Beach, Broward or Miami-Dade Counties.

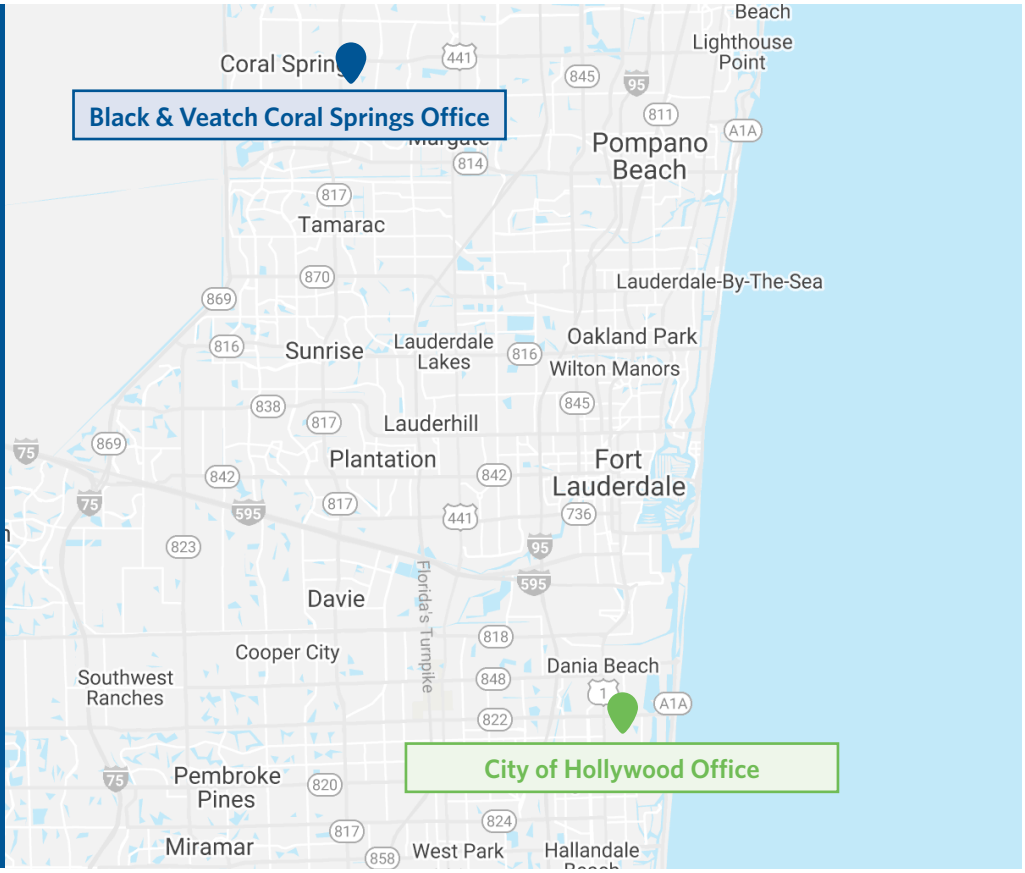
PRINCIPAL OFFICE LOCATION

Black & Veatch will serve this contract from our local Broward County office, backed by tremendous firm-wide and global resources that are available to the City for technical expertise in the implementation of master planning projects. We will coordinate and provide our dedicated service to the City from **our full-service planning and design office, which is less than a 30-minute drive from the City's WTP.** Additional nearby expertise and support will be provided from our other Florida office locations as required to bring the best and latest technology to the City that we have to offer. We will not hesitate in making available our best technical resources to the City.

Black & Veatch has been serving clients in Florida for over 60 years, providing engineering services from our seven Florida offices, located in Coral Springs, Miami, Lake Worth, Fort Myers, Tampa, Orlando and Jacksonville. **The firm has over 340 professionals in Florida with more than 95 professional engineers registered in the state.** These engineers are backed by Black & Veatch's more than 100 years of experience providing services in a wide range of disciplines including water, wastewater, reclaimed water, planning, asset management, condition assessment, civil, environmental, structural, geotechnical, electrical, I&C, SCADA, and mechanical engineering, as well as construction, operations, environmental science, economics, planning and finance.

The combination of having our local leadership directly engaged with City staff and our extensive global technical resources fully accessible for water infrastructure projects will result in significant value to the City when projects exceed expectations.

Coral Springs is a Black & Veatch Florida regional office, where senior leadership for the state are based, allowing our Florida clients the ability to easily reach out to the global Black & Veatch organization as needed.



TEAMING AND SUBCONSULTANT UTILIZATION

We have selected the "stars" from past City projects as well as from other successful water master plans in Florida and beyond. Our team is a combination of staff with institutional knowledge and a fresh perspective. We bring the best of both worlds to give the City to have the most effective master plan with long lasting benefits. Beyond providing access to Industry Leaders, we provide access to Industry Leaders with experience with the City of Hollywood.

Our team is comprised of two subconsultants well known to the City; Tetra Tech and McKim & Creed. The project will be executed based on our respective expertise as well as experience with the City.

- Black & Veatch will lead the Overall Master Planning and Asset Management tasks.
- Tetra Tech will lead the water distribution tasks with a focus on water main rehabilitation and replacement.
- McKim & Creed will lead the electrical assessment at the water treatment plant both for determining the existing condition and the future needs.

BLACK & VEATCH

Founded in 1915, our employee-owned company now has more than 100 offices worldwide. Black & Veatch has been serving clients in Florida for over 55 years. We provide complete engineering services from our offices in Coral Springs, Lake Worth, Miami, Fort Myers, Tampa, Orlando and Jacksonville. With more than 340 professionals in Florida, including 95+ registered professionals, we are staffed to support any size project. These engineers are backed by our global resources and experts who can be engaged on assignments as needed.

Our success is based on principles of sustainable development, which means, we serve public and private clients of every size with a strong focus on life-cycle economy, efficiency and reliability. **We are committed to provide the City of Hollywood with a Water Master Plan delivered on time and on budget.**

TETRA TECH

Tetra Tech is highly ranked by Engineering News-Record (ENR), including being ranked No. 1 in numerous categories including Water for 17 consecutive years. Tetra Tech is also ranked the No. 4 Design Firm in the United States by ENR. Over the past 53 years, Tetra Tech has substantially increased the size and scope of its business becoming a more diverse company, including individuals with expertise in science research, engineering, construction, and information technology through a network of more than 450 offices and 20,000 associates.

While their global presence is relevant, the local office philosophy creates the best of both worlds—local, dedicated, personalized service with nationally recognized resources. It is their core belief that these professionals will serve as an extension of our client's staff. They place a large emphasis on serving the specific project needs and tasks, while maintaining and updating an in-depth knowledge of various programs that are important to their clients.

McKIM&CREED

McKim & Creed plans and designs systems that treat, preserve and conserve the earth's finite water resources. Systems that include water treatment facilities that prevent water loss, meet stringent regulations and improve drinking water quality. Open-source I&C/SCADA systems and hydraulic models that help communities leverage their infrastructure. Water reuse systems that conserve potable water. Stormwater programs that manage entire watersheds. Wastewater treatment plants that produce safe, clean effluent. And survey data for floodplain mapping, surge models, sea level rise studies and pre- and post-storm surveys.

McKim & Creed works to solve clients' most complex, demanding challenges. Their integrated approach connects global expertise with local perspective, bringing together the right disciplines and resources to deliver innovative solutions that service both clients and communities.

PROJECT LEADERSHIP

The Black & Veatch management team combines a highly experienced local Project Manager, Chris Barlow, who has worked for the City for over five years, with an industry-leading Technical Director, Amanda Schwerman, to provide the City with a world-class, adaptive and dynamic master plan. **These managers will provide the City with an efficient and knowledgeable team who can execute the Water Master Plan on time, on budget and with a realistic and adaptable capital improvement plan.**

CHRIS BARLOW, PE, CDT

PROJECT MANAGER

Chris focused the past 5 years of his 22 year career on serving the City of Hollywood as the Engineer of Record at the Water Treatment Plant. Chris has developed a great trustworthy relationship with the City of Hollywood, including staff at all levels through the successful execution of number projects and ad-hoc assignments. Chris brings a productive prospective to serving clients by listening to their needs and expectations, and collaborating with the stakeholders necessary to provide solutions that are based on sound engineering practices that will meet the objectives of the client's mission.

Chris has demonstrated his commitment to the City by resolving issues at the water treatment plant associated with compliance of the plant's aerators, warranty work on the deep injection well booster pump station, warranty work on the odor control system, and managing the City's Risk and Resiliency Assessment. Chris delivered the water plant's most recent and premier improvement in the High Service Pump Station Upgrades that allows the plant to discharge water at a constant pressure. There is no other individual who would better serve Hollywood for the delivery of this Water Master Plan.

BENEFIT TO THE CITY:

Chris understands the City's processes and water facilities. The City will have a project manger who knows its water system and the City's objectives necessary to deliver this project. The City will acquire this new Water Master Plan that builds on the Black & Veatch innovations delivered since 2011.

REFERENCE:

Name: Tim Welch, PE, Director of Utilities
Project: Sunrise – ASR: Wellhead and Booster Pump Station
Telephone Number: (954) 888-6055

AMANDA SCHWERMAN, PE, ENV SP

TECHNICAL DIRECTOR & DISTRIBUTION SYSTEM LEAD

Amanda Schwerman brings insights, experience and a cutting edge master planning approach to the City. She's honed her skills from work on nearly 60 planning and asset management studies and projects , which include over 20 full master planning projects. Amanda has spent her entire career located in Florida, but has also worked on systems across the globe. She specializes in the nuances of Florida water distribution systems and uses software like InfoWater to analyze capacity, energy optimization and water quality concerns for utilities. She currently serves on the AWWA Engineering Modeling Applications Committee and was one of the authors of AWWA's M32 Computer Modeling of Water Distribution Systems.

As things have evolved in the industry, asset management has become more necessary and master plans have become a conduit to expand asset management programs. Amanda is a passionate champion of combining hydraulic modeling, condition assessment and asset management tasks into comprehensive master plans and delivering holistic capital improvement plans for her clients.

BENEFIT TO THE CITY:

Amanda tirelessly fights for the highest quality deliverables for her clients to enable them to adapt to future conditions. The City will receive a pre-eminent master plan meeting all of the needs of a municipal water system.

REFERENCE:

Name: Rolando Nigaglioni
Project: Broward County, Planning and Development Manager
Telephone Number: (954) 831-0882

Our team has a deep history with and comprehensive knowledge of the City of Hollywood's Water System.

Project Leadership and Water Treatment Plant Knowledge

Chris Barlow has served in the role of project manager on numerous City projects and was responsible for the delivery of the latest improvements to the WTP and 2017 hydraulic model updates. Over the last five and a half years, Chris has successfully provided engineering services to the water system, which has given him a unique experience to lead this work. Most recently, Chris was responsible for the delivery of the High Service Pump Station Upgrades at the City's WTP. This project consisted of replacing the existing variable size finished water pumps with variable speed pumps, including the coordination of the several specialty disciplines necessary for this project.

Water Treatment Plant Electrical System Knowledge

The electrical and instrumentation discipline for the Water Treatment Plant upgrades was provided by **Aubrey Haudricourt**, with McKim & Creed. Aubrey was the lead engineer on the Generator Replacement project and has been working on City projects for over a decade, including the electrical and instrumentation engineer associated with the High Service Pump Station Upgrades. His participation on the team will allow for the continuation of electrical and instrumentation disciplines for modernization of this facility.

The McKim & Creed electrical team will also support the team, as they have been involved with maintaining the electrical gear throughout the plant. They will bring an understanding of the existing system, constructability, status of past improvements, and R&R efforts that will enhance the electrical future of this facility.

Utility-wide SCADA Knowledge

Laurie Kusmaul is the lead SCADA integrator on the City's system-wide SCADA Improvements Project. The Team has started the improvements at the wastewater treatment plant and are slated to start work at the WTP later. For this reason, Laurie and her team are the best resources for the City to conduct condition assessment of the instrumentation and control system and then provide recommendations for future improvements. They will provide consistency with the City's ongoing project, standards and goals.

Water Main Knowledge

Tetra Tech has joined the Black & Veatch team bringing a unique depth of knowledge of the condition of the City's water mains and an understanding of the rehabilitation and replacement (R&R) needs within the distribution system. Led by **Ken Caban** and **Janine Alexander**, Tetra Tech brings years of experience with pipelines and the City of Hollywood.

Hollywood Hydraulic Model Knowledge

Amanda Schwerman worked on the City's hydraulic model in 2013 to assess water quality and age concerns along the North A1A corridor. She is familiar with the configuration of the hydraulic model and the City's distribution system. She is also an industry leader having completed over 40 modeling studies and master plans and is one of the authors of the AWWA M32 manual on Computer Modeling of Water Distribution Systems.

Asset Management System Knowledge

Mark Seastead, Matt Morey and their team are the Cityworks implementors for the City of Hollywood and are uniquely positioned to assist with the connection between the master plan tasks, Cityworks and building an overall asset management program for the City.

Rafael Frias, **PE**

PROJECT DIRECTOR

Rafael will provide corporate oversight to make sure the team is properly resourced and help to establish critical success factors to measure performance.

Rafael serves as a Client and Project Director with the global water business of Black & Veatch Corporation and is responsible for the management of the Company's operations in Florida and the Caribbean. He specializes in the management of water resources projects, including water supply, water treatment, hydropower and stormwater planning and design.

Energy Efficiency Master Plan; City of Hollywood, FL

Senior Project Manager. Black & Veatch developed a comprehensive Energy Efficiency Master Plan for the City of Hollywood's Water and Wastewater systems and facilities. The master plan resulted in an implementation plan for 20 recommended energy cost savings projects and with a net positive value of $4.4 million to the City.

Water & Wastewater Master Planning for Commercial Properties; Miami, FL

Project Director. Black & Veatch assisted with developing a plan, including cost estimates and project schedules for the addition of sewer infrastructure to commercial properties within the service area currently not connected to these systems. Services included sewer system extensions; pump station basin capacity assessments; and capital improvement plan level of cost.

EDUCATION
MS, Civil Engineering, University of Kansas, December 2002

YEARS EXPERIENCE
23

PROFESSIONAL REGISTRATION
PE - FL, PR, KS

OFFICE LOCATION
Coral Springs, FL

Chris Barlow, **PE, CDT**

PROJECT MANAGER

Chris will be dedicated to delivering a dynamic and adaptive Water System Master Plan that meets all of the City's goals and needs.

Chris is an experienced engineer who has focused his practice on the analysis and designs of municipal water utility projects, primarily in south Florida. This experience has been developed through the execution of numerous water, wastewater, and water reclamation projects.

Risk and Resiliency Assessment of the American Water Infrastructure Act, Water System; City of Hollywood, FL

Project Manager. Delivery of the Risk and Resiliency Assessment required by the American Water Infrastructure Improvement Act. Utilized the methods provided in AWWA J-100 Standard Practices to deliver this comprehensive assessment of the City's water system.

High Service Pump Station Upgrades, Water Treatment Plant; City of Hollywood, FL

Lead Design Engineer and Construction Administration Engineer. Evaluation, design and permitting of the upgrades to the pump station. The project will provide for the installation of six 8,000 gpm variable speed pumps to replace ten existing constant speed pumps that range in size from 2,500 gpm to 14,000 gpm pumps.

EDUCATION
BS, Environmental Engineering, University of Florida, 1998

YEARS EXPERIENCE
22

PROFESSIONAL REGISTRATION
PE - FL

OFFICE LOCATION
Coral Springs, FL

Isabel Botero, **PE**

QA/QC

Isabel is a Project Manager with proven experience delivering projects for the City. She supported the development of the City's Energy Efficiency Master Plan.

Isabel is a Project Manager and environmental engineer with 20 years of experience and knowledge of water and wastewater systems. She has served as project manager, engineering manager, and project engineer on many environmental engineering projects including water and wastewater treatment plant facilities design.

Energy Efficiency Master Plan; Hollywood, FL

Engineering Manager. Isabel has been closely involved with the City, including the execution of tasks related to the Southern Regional Wastewater Treatment Plant operations optimization with the implementation of SCADA improvements for multiple treatment facilities.

Hialeah WTP Feasibility Evaluation

Engineering Manager. Led the decommissioning of the Hialeah Water Treatment Plant Feasibility Evaluation. The purpose of this evaluation was to determine the feasibility of removing the existing Hialeah WTP from service and decommissioning of the facility.

Water Service Improvement to Non-Residential Properties; Miami, FL

Project Manager. Ms. Botero assisted the Miami-Dade Water & Sewer Department (MDWASD) with developing a plan, including planning level cost estimates and project schedules.

EDUCATION
MS, Environmental Engineering, University of Kansas, 2004

YEARS EXPERIENCE
20

PROFESSIONAL REGISTRATION
PE - FL, MO, PR

OFFICE LOCATION
Coral Springs, FL

Olena Lytvyn,**PE**

CONDITION ASSESSMENT LEAD

Olena specializes in large diameter pipelines condition assessments and sewer systems and was chosen specifically for her experience with linear projects and ability to manage multiple projects simultaneously.

Olena has over nine years of experience in civil engineering designs, including composing preliminary engineering reports, route analysis, pipeline design of various sizes, developing cost estimates, and inspections. Olena also was the Civil Engineer Lead for the Miami Dade County Water and Sewer Department SDWWTP — ST-2D Electrical Building Project at the Miami-Dade County Water and Sewer Department's South District Wastewater Treatment Plant .

Condition Assessment of the 42-inch/48-inch PCCP Force Main; West Palm Beach, FL

Engineering Intern. Olena assisted in reviewing Condition Assessment of 42-inch and 48-inch Diameter PCCP Force Main report prepared by Pure Technologies and providing recommendations on rehabilitation methods. Additionally, Ms. Lytvyn assisted in providing technical support for this project.

SL-2.1; Miami, FL

Engineering Manager. Responsible for managing and coordinating the execution of design of 60-inch PCCP force main. Olena was responsible for the horizontal and vertical alignment. Additionally, she was responsible for managing subconsultants.

EDUCATION
BS, Civil and Environmental Engineering, Florida State University, 2012

YEARS EXPERIENCE
9

PROFESSIONAL REGISTRATION
PE - FL, IL

OFFICE LOCATION
Coral Gables, FL

Arturo Burbano, **Ph.D., P.E., PMP, BCEE**

WATER TREATMENT PLANT LEAD

Dr. Burbano has extensive experience as project and program manager delivering a variety of infrastructure projects, including design and construction of treatment facilities ranging from 20 gpm to 750-mgd in capacity.

Arturo is a Program Director and Water Treatment Technology Business Line Leader with Black & Veatch in Miami, FL. He is a Senior Project and Program Manager and senior technologist with 28 years of experience in the water industry, including water, wastewater, water reuse and stormwater for municipal, industrial and federal clients.

CD2.17 Chlorination Facilities Detailed Design; Miami, FL

Project Manager. Project Manager for the detail design of the $22M chlorination facilities for the 143-mgd Central District Wastewater Treatment Plant (CDWWTP). The objective of this Consent Decree (CD) project was to replace the existing chlorine gas system with a new liquid sodium hypochlorite system.

Peace River Master Plan, Lakewood Ranch, FL

Task Manager / Technical Advisor. Arturo served as Task Manager/Technical Advisor for the update of the PRMRWSA Master Plan and Cost Estimation Development. PRMRWSA updates their Water Supply Master Plans every five years to refine long-term water supply goals and evaluate projects to provide additional water capacity for member governments.

EDUCATION
PhD, Environmental Engineering, University of Cincinnati, 2003

YEARS EXPERIENCE
28

PROFESSIONAL REGISTRATION
PE - FL, NV, CA
PMP

OFFICE LOCATION
Coral Gables, FL

Amanda Schwerman, **PE, ENV SP**

DISTRIBUTION SYSTEM LEAD

Amanda has access to and knows the right resources to bring to the project as she serves as the Planning & Asset Management Lead for all of Florida.

Amanda has a MS in Environmental Science and Engineering and a BS in Engineering. She has been employed by Black & Veatch since 2013 and has 15 years of experience. Some of her relevant experience includes serving as Engineering Manager on the Pinellas County Water and Sewer Optimization Program.

Venice Water Master Plan Update; Venice, FL

Engineering Manager. The goal and objective of the Water Supply Master Plan (Project) is to assist City staff in providing a reliable and robust water system with adequate capacity to accommodate future growth within the City's water service area.

Pinellas County | Water System Master Plan Update; Clearwater, FL | 2019-2020

Planning Manager. The purpose of this Water System Master Plan Update was to evaluate the existing water system, including the source waters, water treatment facilities, pump stations and the distribution system. The project included: Hydraulic and System Analysis using **WaterGEMS,** Water Quality Evaluations, Asset Management (risk prioritization using **iCIP,** condition assessment using **Survey123,** CMMS analysis in **Cityworks**, water conservation), adaptive capital improvement planning and documentation.

EDUCATION
MS, Environmental Science and Engineering, Colorado School of Mines 2006

YEARS EXPERIENCE
15

PROFESSIONAL REGISTRATION
PE - FL

OFFICE LOCATION
Tampa, FL

Robert Chambers, **MBA**

CAPITAL PLANNING LEAD

Robert's utility knowledge covers a wide range of utility management and operating issues, including cost of service and rate analysis, financial planning, capital financing, acquisitions and valuations.

Robert contributes over 20 years of professional experience serving large and complex utilities across the United States. He has earned an MBA with a concentration in Finance.

Strategic Sustainability Plan; Palm Beach County, FL

Project Manager. Black & Veatch assisted the Palm Beach County, FL Water Utilities Department (WUD) with the development its Strategic Sustainability Plan (SSP). The SSP is the WUD's 3rd generation plan and is intended to be the utility's strategic roadmap. Robert served as the project manager through the entirety of this engagement.

Water and Sewer Financial Consulting Services; Miami, FL

Multiple Roles. Black & Veatch supported the City in completing multiple water and sewer rate studies that included the implementation of conservation based rates in order to be compliant with the South Florida Water Management District water use mandates. In addition, Black & Veatch supported the City in successfully retaining $30.0 million in State Revolving Loan funding to upgrade the City's water treatment plant.

EDUCATION
MBA, Finance, Rollins College, 2006

YEARS EXPERIENCE
20

OFFICE LOCATION
Coral Springs, FL

Matt Morey, **GISP**

ASSET MANAGEMENT LEAD

Matt specializes in CMMS solution requirements development, systems implementation and refinement, report writing, and systems integration requirements development.

Matt is a Solutions Lead who supports Black & Veatch's Water Division. He has over 15 years of program management, consulting, and system implementation and integration experience on projects for municipal government public works and water, wastewater, and stormwater utilities clients.

CMMS Implementation; City of Hollywood, FL

Asset Management and Information Systems Lead. Leading the implementation of the City's CMMS for Utilities. Implementation focused on the migration from the City's legacy system for linear and facility assets, and included historic data migration for all past work.

CMMS Implementation; City of Delray Beach, FL

Asset Management and Information Systems Lead. Leading the implementation of the City's CMMS for Utilities, Parks and Recreation, and Right-of-Way divisions. Implementation focused on the migration from the City's legacy system and included historic data migration for all past work.

EDUCATION
BS, Marine Science, Coastal Geology, Coastal Carolina University, 2003

YEARS EXPERIENCE
17

PROFESSIONAL REGISTRATION
GIS

OFFICE LOCATION
Charlotte, NC

Project Understanding & Approach

PROJECT UNDERSTANDING

The City of Hollywood is investing in a comprehensive Water System Master Plan with several focus areas that go beyond traditional capacity driven master planning approaches. The master plan must provide a roadmap for making smart investments in the water system that will allow the City to continue providing reliable and cost-effective services to its customers. Success will require an approach and team that aligns with the City's vision for developing a well-thought-out, comprehensive water system master plan. This includes innovative planning approaches and dynamic planning tools that will continue to provide value to the City long after the master plan report is submitted.

Black & Veatch has supported many utilities in taking their water system planning to the next level, and we are ready to support the City of Hollywood in achieving its key goals for this project.

Becoming "South Florida's top city to live, learn, work, invest and play."

We will align our recommendations and strategies with the City's Strategic Plan (Vision Hollywood 2020) adopted on Jan. 15, 2020. We are in full agreement that "vibrant neighborhoods are essential to the overall sustainability of the City of Hollywood." We also believe safe, reliable and affordable water is essential to the City's sustainability.

Black & Veatch will ensure that the recommendation from the Water Master Plan are in aligned with the City's goals, strategies and mission. We will prepare deliverables that can be easily understood by and take into consideration the needs of all stakeholders.

Similar to the Neighborhood Master Plans, **our Water Master Plan will guide City leaders in redevelopment, budgeting, strategic planning, and capital improvement.**

Provide Safe, Reliable and Sustainable Drinking Water

The City will leverage Black & Veatch's experience in all facets of water system planning and asset management to support the City's mission of delivering first class services to its customers. We will work together to make optimized decisions that set the City up for long term future success. **We take an iterative approach to all of our tasks ensure recommendations in one section are in harmony with other sections of the overall system and do not affect its overall effectiveness.**

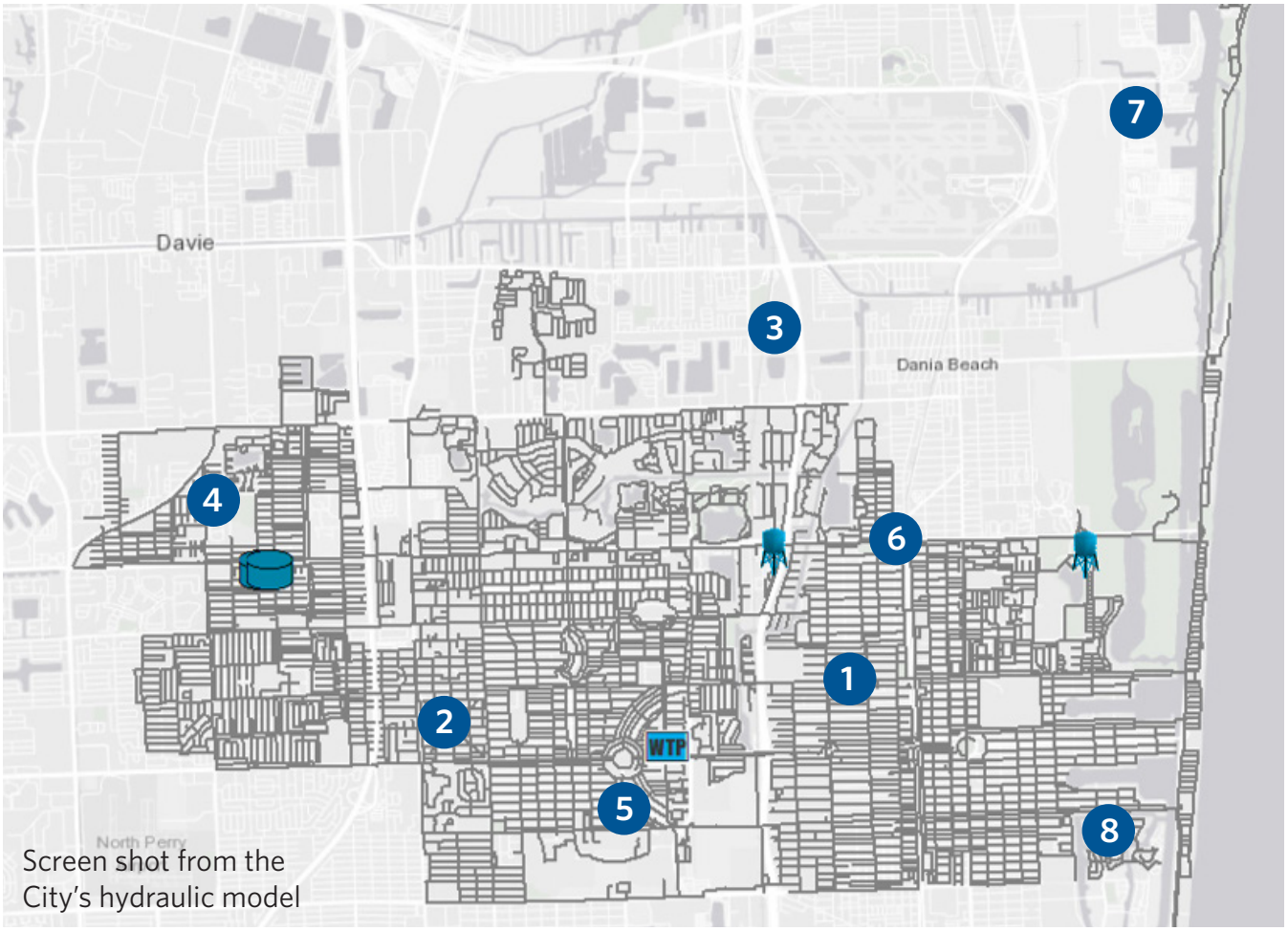
Comprehensive Assessment for the Entire Water System

A holistic understanding of the water system, from the water supply, to the treatment plant, to the customer, is required to further the City's goals and mission. Our team members, including our Project Manager, Chris Barlow, and asset management team have been working with the City for years and have a thorough understanding of the issues facing the City. **Our detailed understanding of the City's water systems and staff will allow us to define innovative and sound solutions for securing safe, reliable and cost efficient delivery of potable water for years to come.**

Prioritized Capital Improvement Plan projects

Black & Veatch will support the City in developing a prioritized CIP plan that is backed by robust business case evaluations that consider risks and life cycle costs. Our approach will provide the City with **a CIP plan that represents the optimum investment strategy, and one that can be confidently presented to the City Commissioners and the public.**

KEY PLANNING CONSIDERATIONS



Screen shot from the City's hydraulic model

1. Water Supply and Water Use Permitting
2. Water Main Replacement Program
3. Potential PFAS contamination from nearby sources
4. System resilience and optimization opportunities
5. WTP Aging Infrastructure: membranes, tanks, electrical
6. Water Main Aging Infrastructure: breaks, rear lot easement, intercoastal crossings
7. Water quality concerns along the beaches and upsized mains
8. Coordinating CIP needs between systems: W, WW, ST

CITY'S ONGOING ACTIVITIES, NEEDS AND BENEFIT TO THE CITY

Our team will capitalize on our knowledge of the City's systems and our relationships with City staff to provide the City with an optimized master plan that exceeds the City's expectations and needs for years to come.

Cityworks Implementation

The Black & Veatch Team is aware of and have either been involved with or are currently involved with many ongoing activities and projects for the City of Hollywood.

The Black & Veatch Team implemented the Public Utilities' computer maintenance management system (CMMS), Cityworks. The project was designed for flexibility and enterprise architecture that can be adapted to a Citywide program.

The implementation specific to the Public Utilities department covered increasing functionality, standard business process mapping with facility and asset types, improved data collection and availability, standard reporting and robust preventative maintenance scheduling, and the implementation covered the water treatment plant, wastewater treatment plant, distribution system, collection system, lift stations and the pump station. We are also currently negotiating with the Public Works department to provide them with Cityworks access and support.

Black & Veatch took a hands on approach to workshops and training for the City of Hollywood.

BENEFIT OF THE BLACK & VEATCH TEAM TO THE MASTER PLAN:

Due to our knowledge and experience with the City's Cityworks implementation, our team will provide seamless incorporation of data, recommendations and CIP projects resulting from the Water Master Plan into Cityworks and the City's decision support tools. No other team will be as efficient as the Black & Veatch Team.

Water Main Replacement Program

Our team member, Tetra Tech, is one of the City's engineers providing surveying, geotechnical evaluations, design, permitting, and construction administration services on multiple projects concurrently for the Water Main Replacement Program.

The improvements included replacing existing aged cast iron water mains with both DIP and PVC water mains, ranging from 4- to 24-inch in diameter. The program also includes extensive maintenance of traffic (MOT), asphalt pavement, and pavement markings restoration and improvements.

Black & Veatch has provided support services for water main replacement programs to utilities through master planning contracts. Our team, led by Amanda Schwerman, helped the City of Venice, FL prioritize the water main replacement and rear lot easement relocation efforts through their water master plan using risk prioritization and remaining useful life. The City's hydraulic model was used to estimate the impacts on water quality from the larger pipe sizes and volume within the distribution system.

Tetra Tech managing the installation of a water main.

BENEFIT OF THE BLACK & VEATCH TEAM TO THE MASTER PLAN:

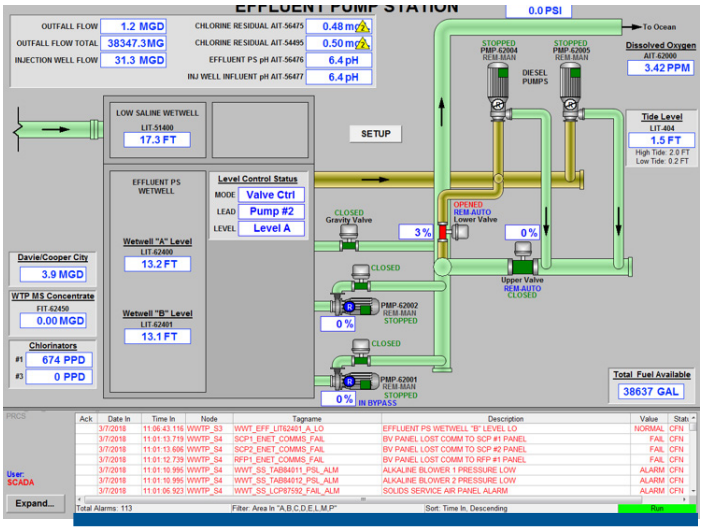
The Black & Veatch Team will use our experience with the City of Hollywood's distribution system and program, combined with our experience for other utilities to ensure that changes made to the system during the Program do not negatively affect other aspects of the system such as water age.

SCADA Evaluation and Improvements

As part of the Energy Efficiency Master Plan, the Black & Veatch Team performed a high level review and evaluation of the SCADA systems at both the Water and Wastewater Treatment Plants. The SCADA evaluation included automation and control system improvements related to energy conservation measures, as well as long term SCADA recommendations for enhanced performance and optimized operations.

The existing SCADA system consists of programable logic controller (PLC) interconnected using Ethernet network, with supervisory monitoring and control from a human machine interface (HMI) system of servers and workstations. This concept of PLC/HMI-based control system is a sound approach to SCADA and common in the water industry. While the system architecture concept and approach are sound, many hardware and software components were nearing obsolescence. The City recognized this need and is in the process of implementing a number of SCADA system hardware and software upgrades that will ensure continued vendor support, ease of maintenance, and reliability.

The Black & Veatch team is now in the process of implementing those changes throughout the City's infrastructure.



Black & Veatch improvements included a new screen display. Electric pumps, upper valve, and lower valve can be operated in remote manual and remote automatic to achieve level control of pump station.

BENEFIT OF THE BLACK & VEATCH TEAM TO THE MASTER PLAN:

The Black & Veatch team provides consistency and removed the potential for having "too many cooks in the kitchen." Our team brings efficiency and seamless continuity to the SCADA system upgrades and recommendations.

The upgrades implemented include GE iFix HMI software, server redundancy, replacing PLCs and radios. Also to provide consistency for future programming, Black & Veatch has developed:

- PLC and HMI Standards and Conventions (including tagging and naming conventions)
- Screen Layouts
- Text Font and Color Conventions
- Analog Value Displays
- Standard Graphics
- Alarms and Alarm Handling
- PLC Program Languages, Layout and Documentation
- PLC Standard Logic

Transformer Refurbishment

The City has been recently engaged in the refurbishment of the existing medium voltage transformers 5 & 6. There are other transformers in need of the same work, though it is unknown if the City has them scheduled. Preventive maintenance is vital for electrical distribution health.

Throughout the plant there is a need for the monitoring of electrical systems. From transformer temperature monitoring, to power usage at various locations in the plant, to the scheduling of partial discharge testing for installed medium voltage cabling. Real time trending of power information could help in identifying areas where energy savings may be realized and where possible problem could arise. Additionally, in order to maintain the health and safety of plant personnel, a complete and thorough Coordination and Arc Flash Study with personnel training should be performed. From this study, mitigation methods can be identified to reduce exposure to the incident energy of Arc Flash and allow maintenance staff to work safely.

The training and work Black & Veatch completed on the City of Tampa's Water Master Plan was the foundation of the City's PIPES program.

Project Implementation Coordination Between Water, Wastewater and Storm Water

The City will shortly be undergoing at least four separate master efforts for Neighborhoods, Water Systems, Wastewater Systems and Stormwater Systems. It is an excellent and admirable undertaking, but it also creates a need to coordinate CIP projects between all of the master plans. To most efficiently use the City's funds, it would be advantageous to coordinate as many activities as possible. Activities include things like pipeline replacement for all water systems in the same right of way at the same time (if replacement is needed) rather than tearing up the pavement and interrupting traffic more than once. The City will need the master plan deliverables to be flexible and adaptive to allow full coordination with other systems.

Over the past 10 years, the City has undertaken upgrades to their various electrical systems through its EORs. Starting with upgrades to the main FP&L power feed to the plant, that has been modified to provide a more reliable switching capability, between the two separate Utility power feeds into the plant. This was done by installing a fast acting medium voltage switch, to reduce power transients that were plaguing the facility with outages, when changing of power feeds by the Utility to the plant. FP&L routinely switches feeds depending on power grid loading. This is now done without interruption to the plant processes.

BENEFIT OF THE BLACK & VEATCH TEAM TO THE MASTER PLAN:

Our team has successfully included items such as paving plans and CIP programs for other departments for other utilities and we will efficiently and effectively be able to do the same for the City of Hollywood.

This team, also led by Amanda Schwerman, executed a water master plan for the City of Tampa where we used the public works paving schedule to help prioritize the water main replacement program. The team also provided tools and training such that the City staff took over the process and expanded the program to include the wastewater and stormwater improvements.

Our team will provide tools and training to enable the City to be able to coordinate CIP projects and repeat the planning processes annually. The City will be able to adapt to changing conditions, funds and goals well into the future.

Additional medium voltage stand power was added with a new 1500kW generator, along with replacement of the ASCO transfer equipment process logic controller, with a newer unit capable of Ethernet communication for monitoring, that controls the transfer between Utility and standby power. Changes to the transfer logic was included for the new generator along with additional monitoring of downstream transformers, and the removal of an existing 480V five standby generator bank logic that was no longer needed.

Further upgrades to the water treatment facility included the replacement of the main switchgear for the control building and installation of variable speed motors and drives for six new high service pumps, and the addition of a medium voltage power and electrical building for the new deep well injection pumping station. Motor control center replacement in the high service pump station was also performed as part of the upgrades.

CITYWORKS WORKS COLLABORATIVELY WITH THE UTILITY MANAGEMENT PLATFORM

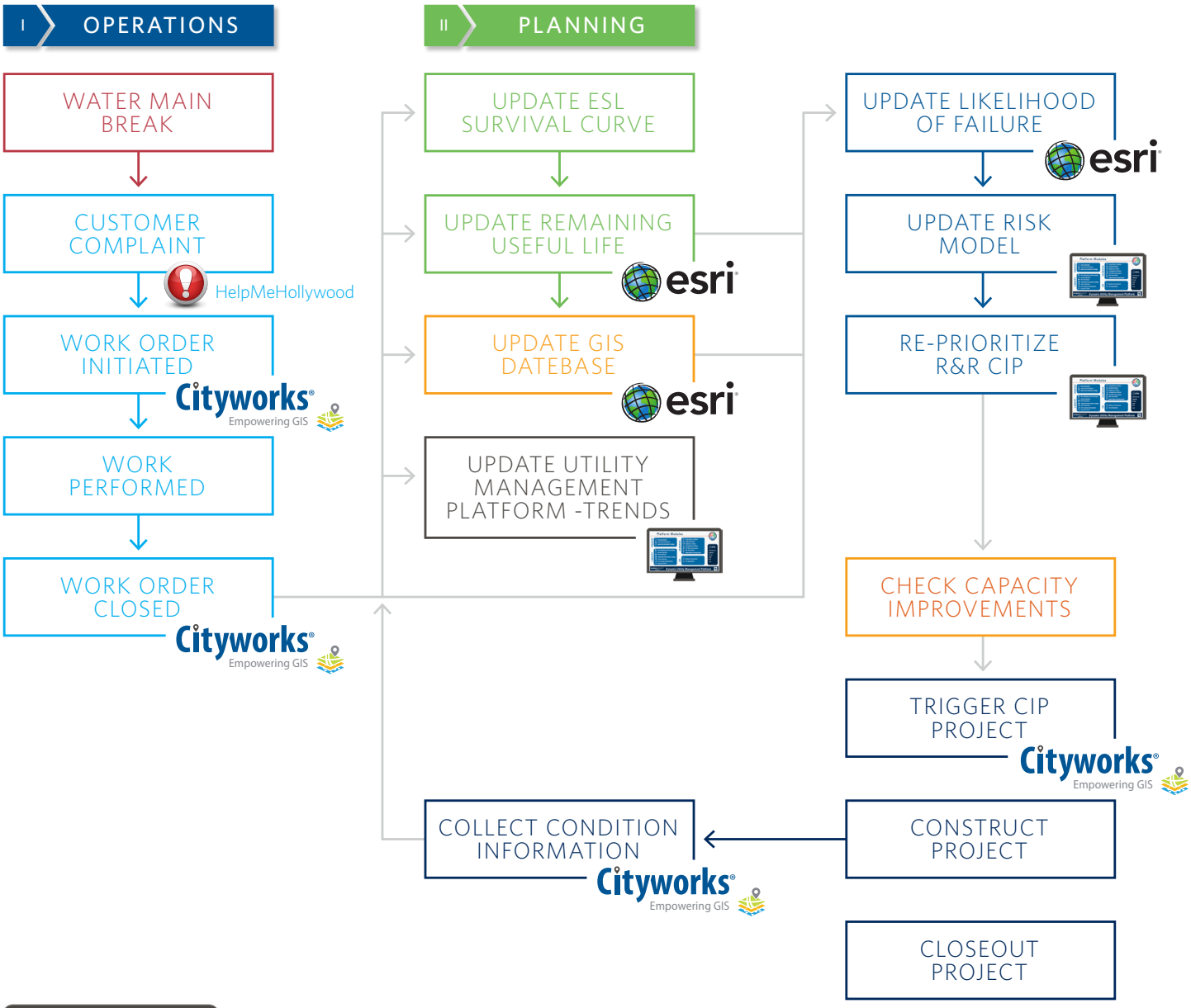
The City's Utilities Department has made a fundamental investment in its asset management program with the implementation of Cityworks and the establishment of GIS as the source of truth of asset data. The enterprise architecture encourages data sharing and access across multiple platforms including an integrated utility management platform.

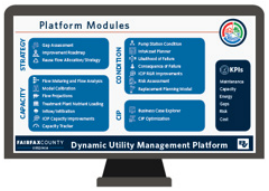
Black & Veatch's implementation of Cityworks for the Utility Department has opened the door to more tightly integrate Operations, Planning and Capital Improvements by providing a single platform using commonly shared data. This will facilitate transparency and increased confidence in asset data across the Utility.

Combining the utility management platform with real-time operations management and Cityworks will allow planners to visualize the direct impact of work. This work could include routine preventive maintenance, condition inspections on critical metrics that impact rehabilitation and replacement, capacity, and long-term capital planning in a manner not previously available. This concept will help transform Utilities into data driven decisions as a function of everyday operations. The ability to prioritize maintenance, rehab, and replacement of assets based on risk, predictive technologies and strategic asset management framework constitute the core pillars of adaptive planning which utilize your existing Cityworks implementation as the base.

CITYWORKS CONNECTS TO ALL FACETS OF PLANNING

Cityworks is an integral component to the City's Asset Management Program and long-term system planning needs as shown in the main break flow diagram on this page. Black & Veatch is uniquely qualified to ensure the processes and workflow is configured properly for the City's needs and goals.





MASTER PLAN COMPONENT

ADVANCING ASSET MANAGEMENT THROUGH MASTER PLANNING

The City of Hollywood has made important progress in advancing its asset management program by implementing the Cityworks computer maintenance management system (CMMS) and initiating this master plan which includes many elements needed to deploy an asset management program. **The City is now ready to expand and enhance its asset management program to bring it in line with global best-practices and meet the requirements of the State Revolving Fund.** The program should meet asset performance requirements through the appropriate evaluation of risk, with a primary focus on managing infrastructure to minimize total ownership costs while continuing to deliver a high level of service to customers.

Although the prospect of enhancing an asset management program to meet the current best-practices can seem daunting, a good plan can help you take the first steps in the right direction.

Using Master Planning to Advance Asset Management

The tasks highlighted to the right are a summary of an Asset Management Plan components as recommended by the EPA. Many of these tasks were already addressed when the City implemented Cityworks and many more will be completed as part of the Water Master Plan. The City may consider adding a couple scope items to the Master Plan to complete the few remaining items and efficiently expand its asset management program.

To highlight which tasks are covered by the Cityworks implementation and the Master Plan, and which tasks would be remaining, we have added a column to the far right and placed symbols to illustrate the mechanism the City has or many use to further the asset management program. The computer screen symbol illustrates where the Utility Management Platform and business intelligence dashboards will become useful tools.

EPA ASSET MANAGEMENT PLAN COMPONENTS	EXECUTION MECHANISM
SET TARGET LEVELS OF SERVICE (LOS)	OPTIONAL TASK
ASSESS PERFORMANCE, FAILURE MODES	CONDITION ASSESSMENT (MP)
DEVELOP ASSET REGISTRY	Cityworks® Empowering GIS
LIFE CYCLE & REPLACEMENT COSTS	COST ESTIMATING (MP)
DETERMINE BUSINESS RISK (CRITICALITY)	R&R RISK EVALUATION (MP)
DETERMINE RESIDUAL LIFE	ESTIMATED USEFUL LIFE (MP)
BUILD ASSET MANAGEMENT PLAN	OPTIONAL TASK
OPTIMIZE O&M INVESTMENT	OPTIONAL TASK
OPTIMIZE CAPITAL INVESTMENT	10-YR CIP PRIORITIZATION (MP)
DETERMINE FUNDING STRATEGY	FINANCE AND FUNDING PLAN (MP)

APPROACH SUMMARY

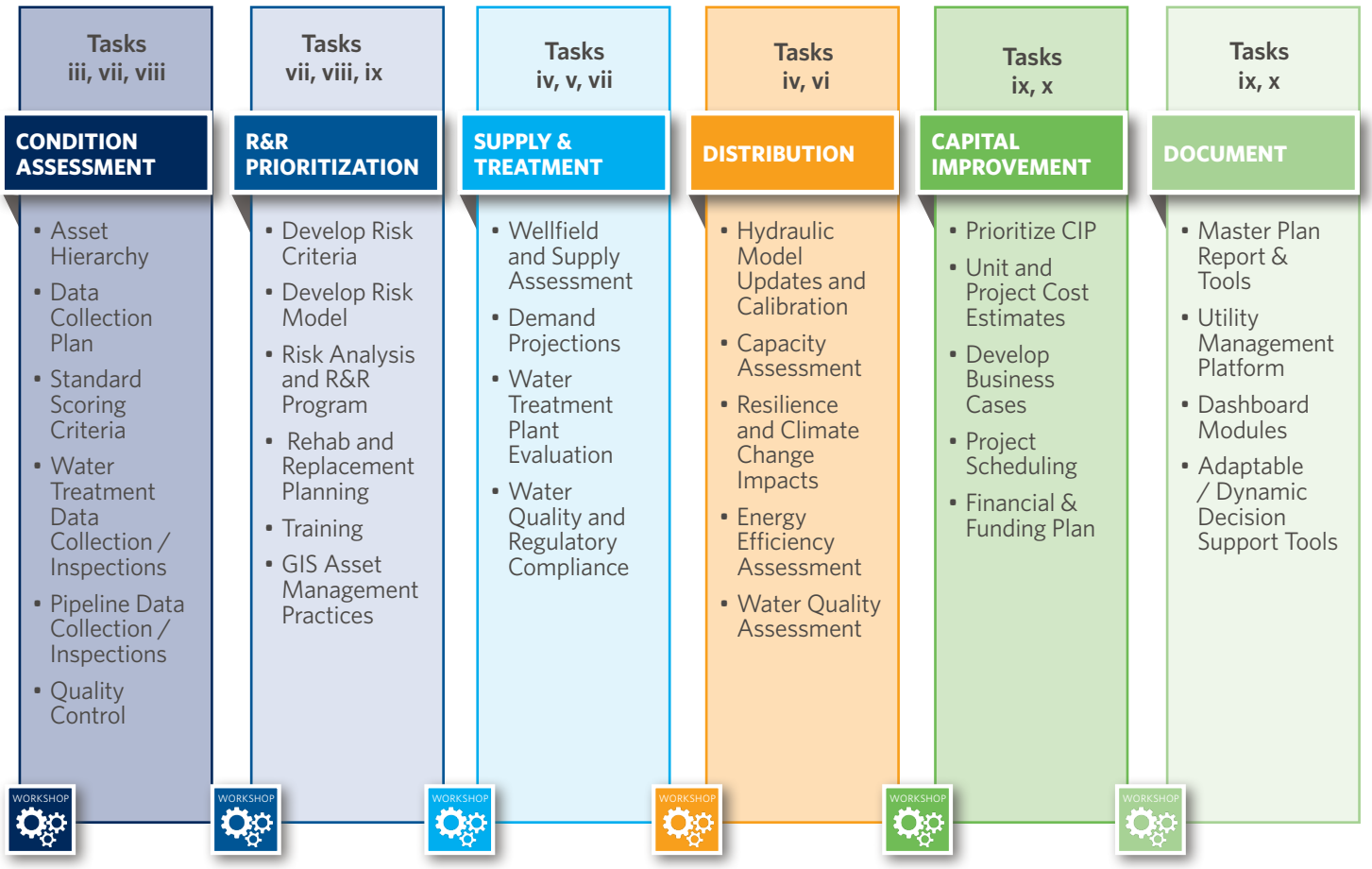
The City of Hollywood Water Master Plan will support the City in proactively addressing the needs of the water supply, treatment and distribution system for the next planning horizon and beyond. Black & Veatch understands the City has identified 10 tasks in the RFQ scope of services to complete the master plan. Our understanding of the City's needs has identified the following key goals for successful development of the Water Master Plan:

- Address immediate and long-range needs in the water system with a comprehensive capital improvement plan.
- Understand the current condition of the WTP and Water Mains to properly prioritize capital funds.
- Identify critical assets through risk-based prioritization.
- Coordinate between capacity needs and rehabilitation and replacement (R&R) needs.
- Identify the condition assessment needs of the water mains, if any.

Black & Veatch's innovative master planning approach and dynamic planning tools will allow the City to continue using and benefiting from the Water Master Plan for many years to come.

The following sections explain in detail the 10 tasks identified in the RFQ and how each will be executed by our project team to ensure a successful project.

Our approach includes six Phases: Condition Assessment, R&R Prioritization, Supply & Treatment, Distribution, Capital Improvement and Document, as shown in the graphic below. There are several phases which will occur simultaneously for expedited Water Master Plan development. Each proposed project phase and the respective associated tasks identified in the City's RFQ is illustrated below.



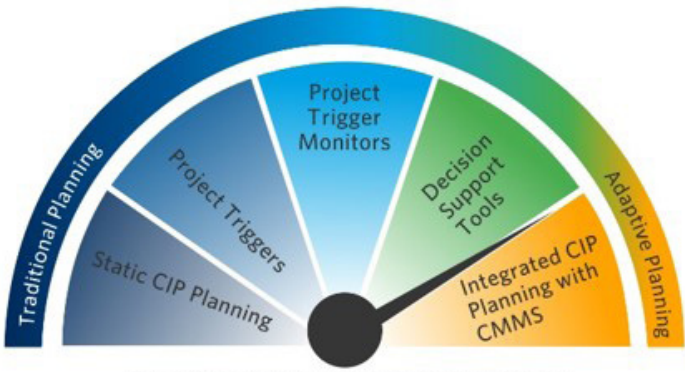
Adaptive Master Planning Approach

We understand that the City's CIP planning is dynamic, with budgets and priorities changing regularly as issues and opportunities arise. No longer will the City need to wonder if the Master Plan's recommended CIP projects and schedules are still valid in five years, struggle to decide how to adapt with changing conditions, or worry that the implementation schedule for projects is behind or ahead of the actual system needs. Now, the City can easily adapt to the changing conditions, have a continuously updated CIP and effectively communicate changes with the City's leadership.

Black & Veatch has developed an adaptive and dynamic planning approach for our master plans. This approach will allow the City to make regular updates and optimize the CIP after the initial master planning effort is completed. This is made possible through Black & Veatch's innovative approach and use of project triggers and dynamic planning tools as part of the master planning process.

The Adaptive Planning approach combines project triggers and decision support tools to provide the City with information on why a project needs to be implemented (the "trigger"), combined with a method to track the trigger (the "decision support tools"). With these two items, the City can easily re-assess planned CIP projects on an annual basis to optimize and re-prioritize the CIP plans when project drivers or conditions change.

The City will benefit from our experience with adaptive and dynamic tools and training approach. Black & Veatch has adopted adaptive and dynamic master planning as our standard approach for utilities. We have successfully delivered adaptive plans to over 20 utilities and will bring that world-class experience to the City.



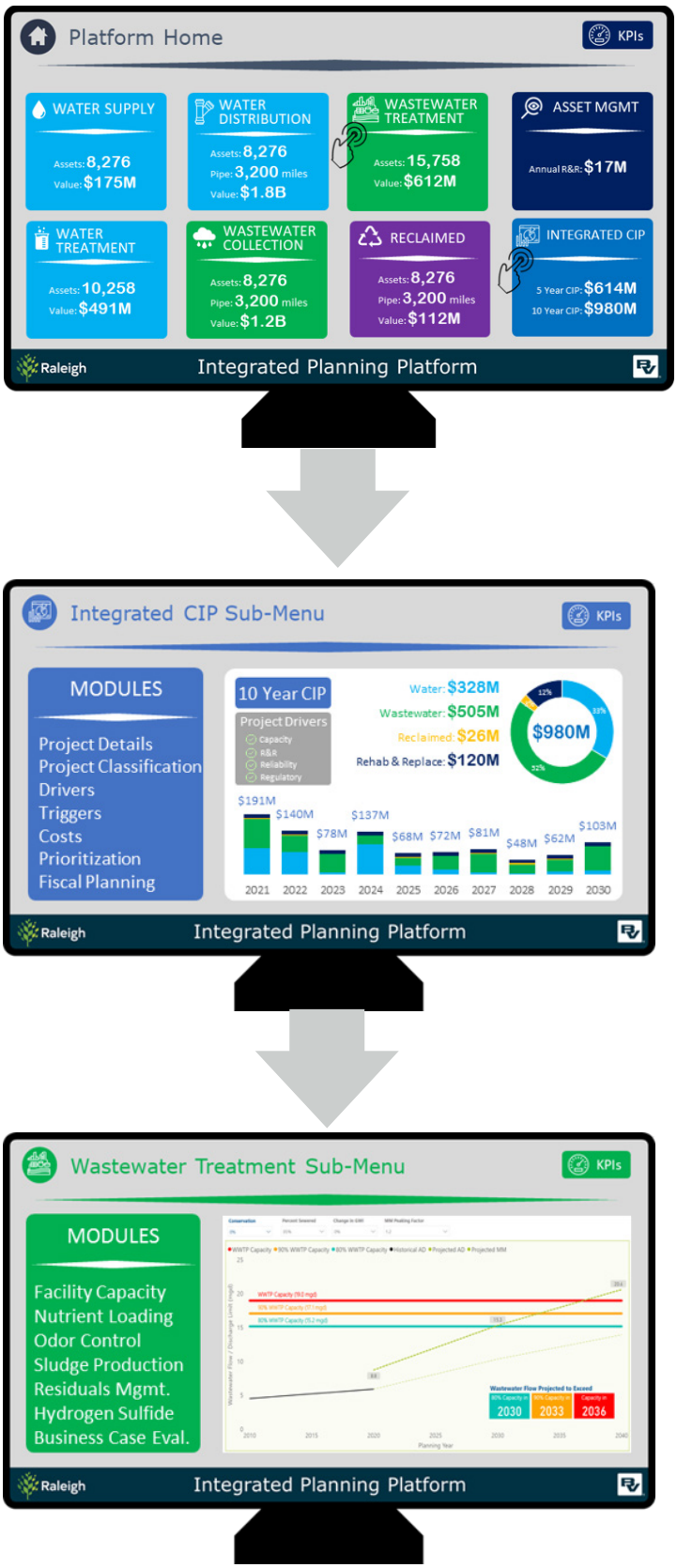
Adaptive & Dynamic Planning Gauge

Utility Management Platform

One of the fastest and easiest ways to monitor triggers is through our most powerful decision support tool, the Utility Management Platform. This is a compilation of dashboards designed to monitor system conditions, monitor project triggers and present data in a dynamic and easy to understand manner. The final deliverable will connect directly to the City's data and system conditions will be updated automatically.

UTILITY MANAGEMENT PLATFORM

UTILITY MANAGEMENT PLATFORM



Accessible at the click of a button

Each component of the ***Utility Management Platform*** features a sub-menu which consolidates key info and links to focused Platform Modules

Smart Triggers

Specific KPIs are identified to enable the implementation of smart triggers, which will automatically alert City staff when KPIs are in exceedance of their threshold even if they are not viewing all KPIs on a daily basis.

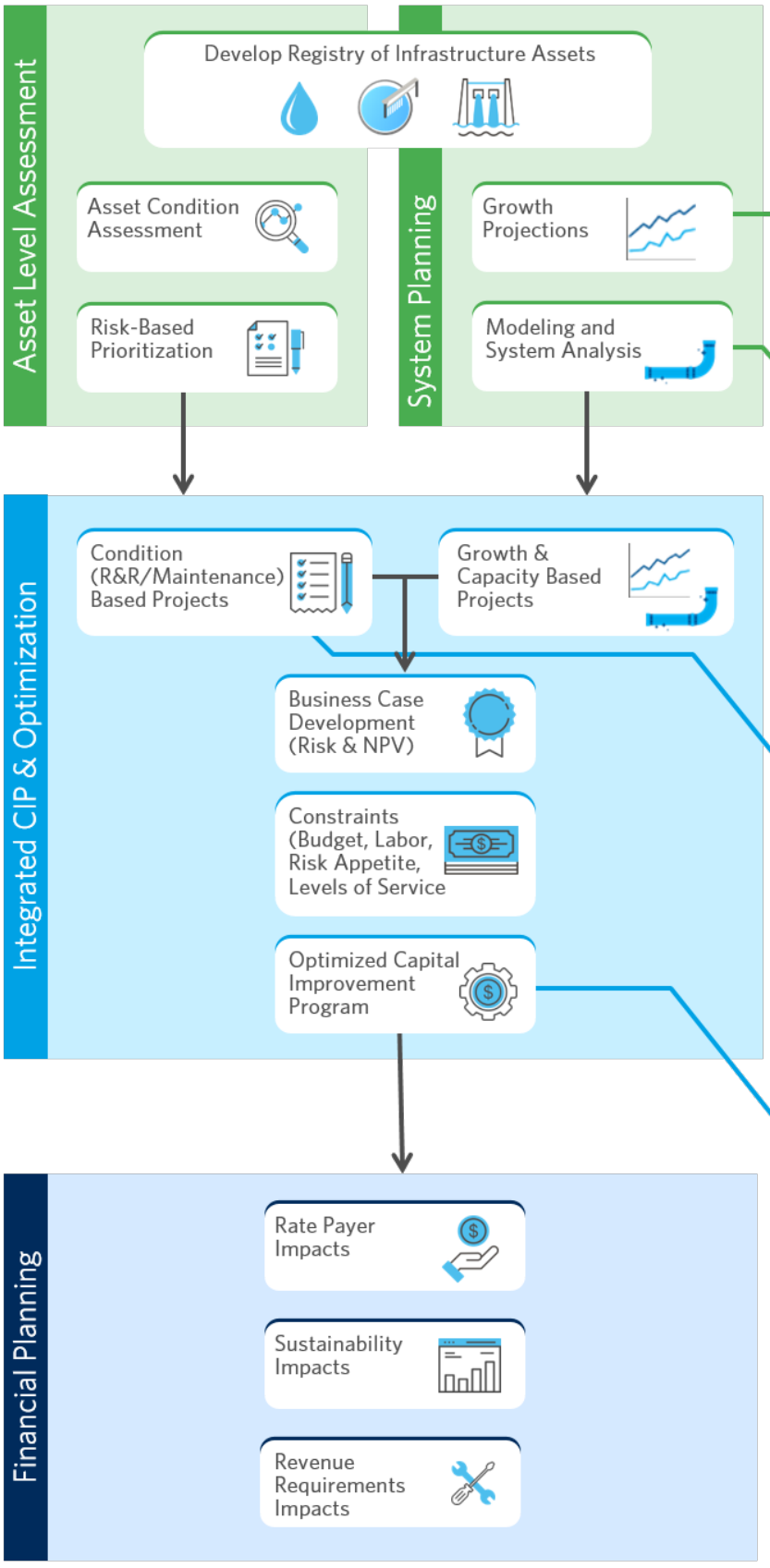
User and Experience and Accessibility

Black & Veatch understands that the key to leveraging data and succeeding with adaptive utility planning is the human element. All too often we have seen utilities with access to tools that can technically do the job but are difficult to access or cumbersome to use — as such they are rarely used. Modules are designed with the end user experience in mind, and the knowledge that the easier they are to use, the more often they will be used, and the greater value delivered. Modules will be purpose-built and designed to aggregate complex information and data sources into concise and impactful visualizations and KPIs which will deliver the key insights, while minimizing their cognitive load and maximizing their productivity.

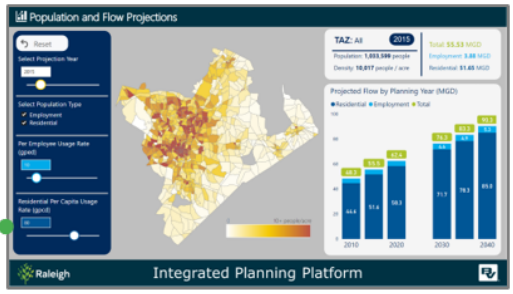
Modular and Expandable Design

As illustrated above, the Utility Management Platform launch screen is a compilation of modules which are focused on managing all aspects of the utility and can be added over time, enabling the gradual development of a fully comprehensive utility-wide Utility Management Platform.

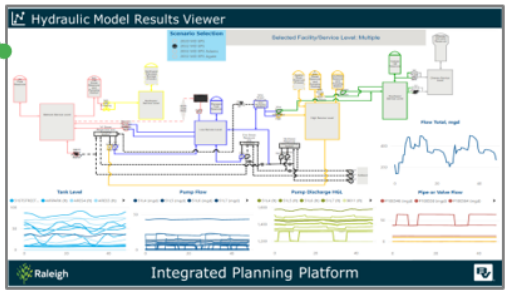
CIP DEVELOPMENT PROCESS



PLATFORM MODULES



Water demand projections based on a consistent source of population projections.



Viewing hydraulic model results will no longer require specialized software.

A detailed, risk-based Rehab and Replacement Forecast will help Raleigh maintain existing assets at the lowest life-cycle cost.

The portfolio of Water CIP and R&R projects will be brought together in a single dashboard.

PHASE 1 Condition Assessment

Condition assessment starts with the right plan and tools. Black & Veatch has worked with hundreds of utilities collecting condition information on assets. Our plans clearly document what data is to be collected (condition scores, asset management data for CMMS systems, criticality and urgent needs), and we always include a safety plan to ensure everyone on the team is safe while on-site. **This is a key step in developing the City's Asset Management program and the requirements of the State Revolving Funds.** We have also embraced technology to help us do the job faster, more efficiently and with more connectivity to the City's existing systems.

Black & Veatch will perform the following subtasks to align with the City's condition assessment needs, ongoing efforts and projects.

Condition Assessment of all water system components such as:

- Water Treatment Processes
- Storage Facilities
- Pumping Facilities
- Wells
- Water Mains

We will use a multi-discipline approach including the following:

- Process Mechanical
- Electrical
- Instrumentation and Controls
- Structural
- Architectural
- Site Civil

REVIEW ASSET INVENTORY AND HIERARCHY

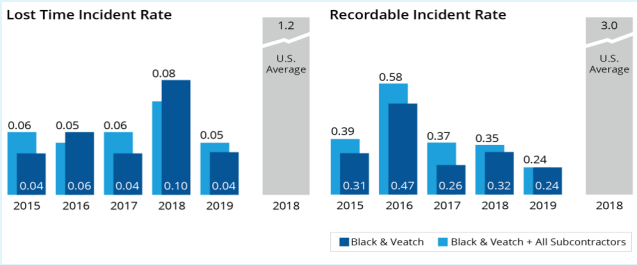
We will ensure all of the data collected is in a format consistent with the City's CMMS system, Cityworks. We will follow the asset hierarchy standards and ensure we are collecting all the necessary data, and will include our findings in the asset inventory. Black & Veatch is perfectly aligned to bring the most efficiency in the task and the most connectivity to ongoing efforts to minimize the investment required by the City.

The Health & Safety of Our Team and Yours is a Priority, ALWAYS.

Black & Veatch places the highest priority on the safety and health of its professionals and contractors during the performance of their work. The Condition Assessment Tasks have a higher risk of injury. Our goal is to provide an efficient and productive effort that incorporates safe working methods and strong safety consciousness by all our professionals, supervisors, contractors, and suppliers. Our safety and health programs, policies, and procedures incorporate best practices and lessons learned based on our understanding of regulatory and legal considerations as well as our experiences from all over the globe.

With a history of outstanding safety and health performance, Black & Veatch continues to be an industry leader as illustrated in the incident rates below. Our rates are based on global work hours, which include Black & Veatch and subcontractor hours. When compared to our peers and Bureau of Labor Statistics rates, Black & Veatch remains an industry leader in safety and health.

Our Team will implement Safety Planning Checklists, wear appropriate personal protective equipment (PPE) and hold each other accountable for safety. Additional measure will be take to protect against the spread of COVID 19.



Efficient and Consistent Data Collection Forms

Black & Veatch has adopted the use of Survey123 to standardize the numerous data collection forms required to collect condition information on all of the assets at a water treatment plant. The forms are divided into disciplines and a team of experts will spend several days onsite collecting the data.

Data Collection Plan

Our experience has reinforced the importance of pre-planning and organization before our staff ever step foot on site. The first thing Black & Veatch will do is prepare a Data Collection Plan. We will solicit feedback and approval from each discipline inspector and from the City's staff. The Data Collection Plan will contain field procedures describing:

- Approach to data collection
- Data fields to be collected
- Facilities/processes to be assessed
- Condition scoring criteria
- Quality Control Plan
- Safety protocols to be followed on-site
- Inspection team contact information
- Schedule

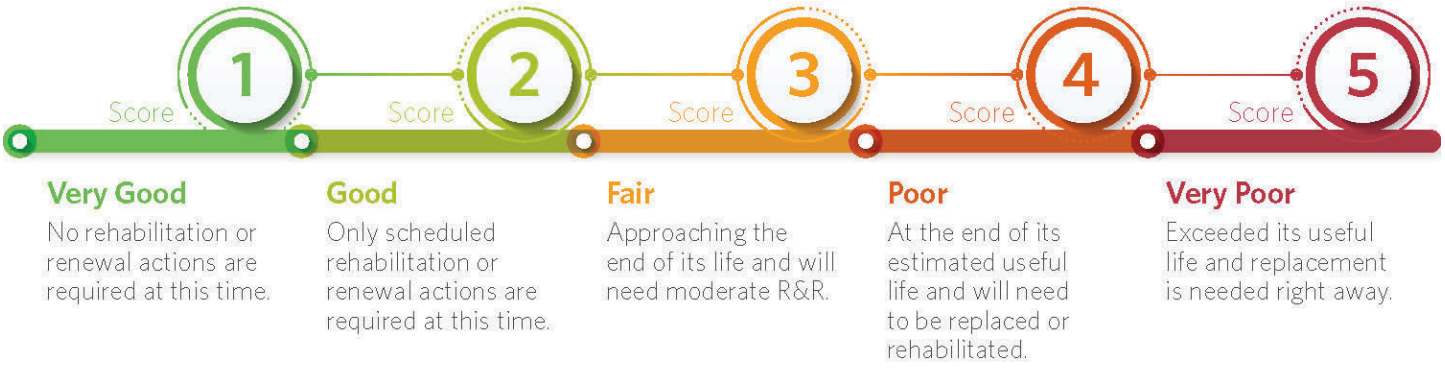
Electronic Data Collection Reduces Errors in Data

Standardized Condition Scoring

Prior to the field data collection, Black & Veatch will work with the County to create a standard condition assessment score applicable to all asset types. This will be discussed in workshops with operations and maintenance and provided in a technical memorandum. All discipline leads will follow the Condition Scoring Guidelines.

Quality Control

At the end of each data collection day and before any data is provided to the City for upload to the Cityworks CMMS system, the data will under go two levels of quality control. The daily quality control ensures all forms are completely filled out, and photos have been captured to document the condition and specific data. The second step is reviewing the data in the office for outliers, inconsistencies and adherence to the Condition Scoring Guidelines.



Pipeline Condition Assessment

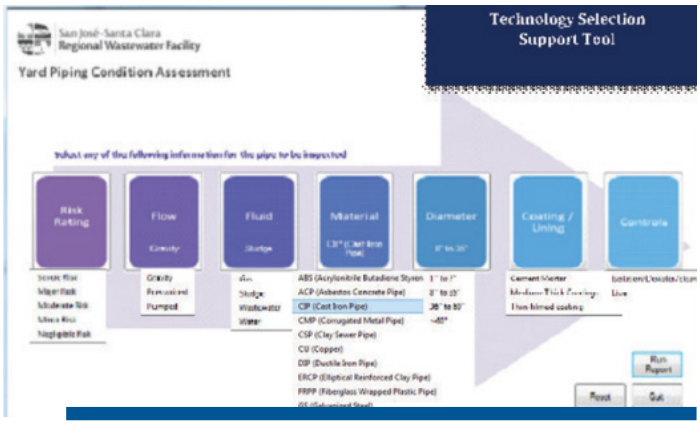
Black & Veatch will use the results of the risk-based prioritization work during the Master Planning tasks to prioritize the condition assessment of the pipelines and to select the right inspection technology for the level of risk.

Specific to preparing and conducting a Condition Assessment Program for the Water Mains, Black & Veatch will complete the following tasks:

- Develop Inspection Parameters
- Technology Selection
- Coordination and Inspection Scheduling
- Procurement of Inspection Technologies
- Coordinate Pre-Inspection Activities with the City
- Execute Inspection Plan
- Analyze Inspection Data
- Technology Selection

Black & Veatch has developed a risk-based GIS tool for use in selecting the appropriate inspection technologies for a pipeline given specific elements such as: Risk Ranking, Flow Type, Pipe Material, Pipe Size, Presence of Coatings or Linings and Accessibility.

The City will get cost savings, a repeatable and defensible, fast technology selection, by utilizing our open source software, a risk-based tool, coupled with Black & Veatch's technology suitability evaluation.

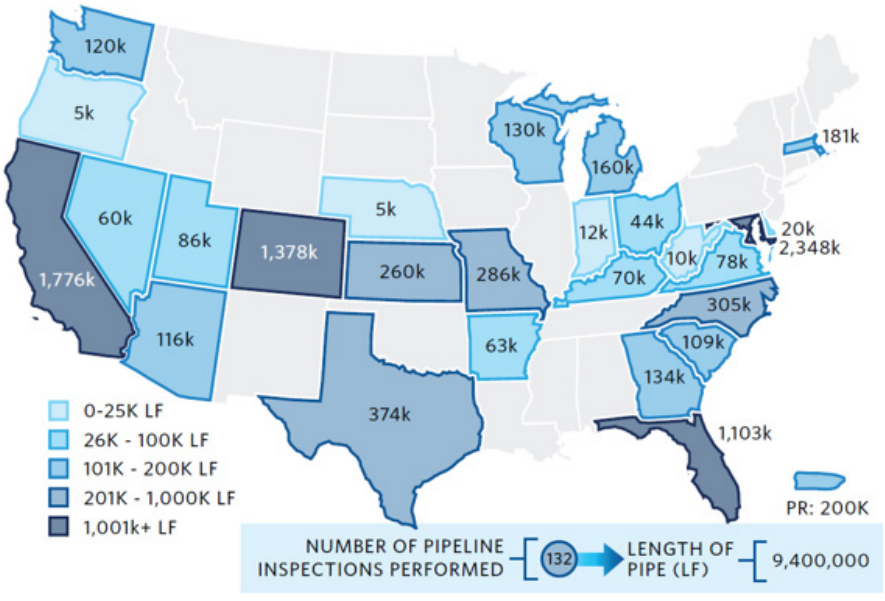


This risk-based tool, combined with our technology suitability evaluation, allows us to select the most appropriate and cost-effective technologies.

The goal is to develop a phased inspection strategy to utilize noninvasive, low-impact inspection techniques early in the process as a way to screen for more costly invasive tools. These lower risk and lower cost pipe assessments will provide a better understanding of risk and uncertainty for a given pipeline, reserving the highest resolution inspection techniques for only the highest risk pipe.

Additionally, data collected from higher resolution inspection can be utilized to extrapolate condition of uninspected pipe or pipe inspected with lower resolution techniques. This will reduce uncertainty allowing for more effective management solutions.

Black & Veatch leads the competition with 9.4 million pipes inspected in 130+ condition assessments in the past 20 years. Our proven inspection process will facilitate a transparent data management process for reliable business case evaluations and capital planning. Our team's experience and qualifications provide the depth and breadth of qualifications to address key challenges of the City of Hollywood..



COMPREHENSIVE WATER SYSTEM EVALUATION: 3X3 CHECK-UP

Condition assessment goes beyond just equipment useful life. Our Team understands the role of functions and components involved in the complex water treatment systems that the City requires. Our Team will evaluate how the water treatment plant (WTP) is currently being operated to develop strategies that continue to further enhance the WTP over time.

Black & Veatch may perform a thorough review of the WTP water system operations in a short period of time, conducted by water treatment and operations experts. The Team will deliver a report that informs the City how the system is operating and where the City might consider strengthening the processes to assure reliable, efficient, and cost-effective operations in the future. A 3X3 Check-Up is a comprehensive evaluation of an entire water system. In this exercise, Black & Veatch reviews:

Black & Veatch Innovative 3x3 Program

BLACK & VEATCH REVIEWS:

3X3 CHECK-UP	FUNCTIONS AND COMPONENTS
3 Key Functions of the Water System's Operations	■ Supply ■ Treatment ■ Distribution
3 Critical Components of Each Function	■ Water Quality ■ Management ■ Operations and Maintenance

A review of these functions and components will reveal critical information that may be used to help the City make important cost-saving decisions by:

- Comparing the existing system operations to best operating practices. (Benchmarking)
- Identifying where the system is meeting best practices.
- Identifying where the City might consider strengthening its operations to meet best practices.
- Developing an action plan to make necessary improvements.

In summary, a 3X3 Check-Up will involve the following steps:

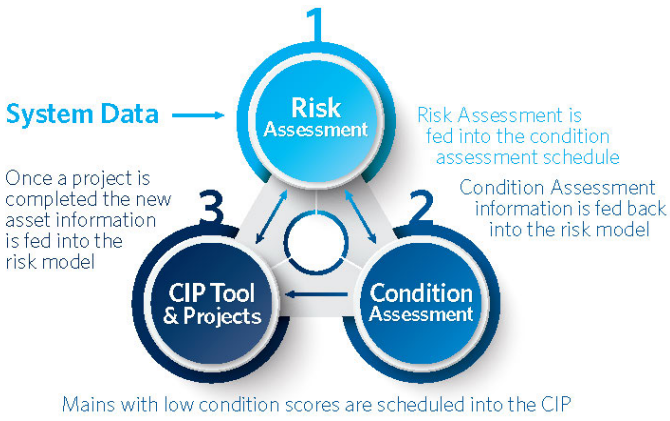
- Obtaining and reviewing existing information and data about the utility and its operations.
- Conducting a 3 to 5 day site visit of the utility to tour the water system, primarily the treatment facility, review additional data, and interview key utility staff.
- Preparing a brief PowerPoint presentation on our observations and recommendations for review with the City staff at the end of the site visit.
- Preparing a brief report summarizing our visit.

PHASE 2 R&R Risk Based Prioritization

Black & Veatch will perform the following subtasks to align with the City's asset management needs, ongoing efforts and projects.

- Risk analysis and R&R Program Development
- Risk and Prioritization Criteria
- Rehabilitation and Replacement Planning
- GIS Asset Management Practices
- Training

Risk based prioritization is iterative and will be closely tied to the City's planning activities and condition assessment activities.



DEVELOPING RISK AND PRIORITIZATION CRITERIA

A risk model will be developed and based on the GIS network used to build the hydraulic model. This will provide consistency between the City's GIS system, hydraulic model, and risk based prioritization assessment tool, which will help the City avoid issues with future CIP planning updates.

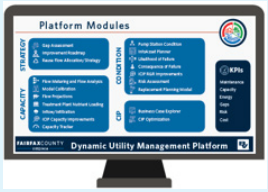
The risk-based methodology will be a function of likelihood of failure (LOF) and consequence of failure (COF) criteria to determine a risk score (LOF x COF = Risk) and risk classifications. Black & Veatch will review available data and identify initial LOF and COF criteria, scoring strategy, and weighting factors to support the risk calculations for rehabilitation planning. Black & Veatch will conduct collaborative review sessions with the City to review the criteria and results to support the risk model development.

Integrated Capital Improvement Plan (iCIP), Risk Module

Black & Veatch has developed a risk analysis tool which is non-proprietary, GIS and spreadsheet based and will connect to the City's capital improvement plan tool. The iCIP Risk Module uses weighted consequence and likelihood of failure criteria to calculate the risk of failure of pipelines, valves and any distributed asset. The module can pull in any geospatial data for use in the risk calculation and associates to the City's GIS database so it can be connected to Cityworks and all of the City's asset management programs.

The City will be able to use this decision support tool to provide data driven results and recommendations and will be able to use it on a yearly basis to update the Capital Improvement Plan.

Risk Assessment Module developed for the Milwaukee Metropolitan Sewerage District (MMSD) which includes a summary or LoF, CoF and Risk for more than $1.5B of sewer pipeline and pump station assets.



RISK ANALYSIS AND R&R PROGRAM DEVELOPMENT

When selecting the risk criteria, we will provide a repeatable, consistent, and defendable framework for determining asset criticality that will provide a foundation for the City to use long-term. Management strategies will be developed with the City to support rehabilitation planning efforts for continuous improvements to the water system.

System Risk Understanding. Knowing the likelihood of an asset failing, as well as the consequence of failure, can help define strategies for more proactive rehabilitation planning and improve coordination with emergency response plans for critical pipe failures.

Definitive Rehabilitation Plans. Defining consistent rehabilitation methods and using decision trees that incorporate the risk criteria to define, repair or replace options will position the City to make quick and informed decisions on a consistent basis.

Optimized Capital Plan. Focusing improvements on high risk areas and hydraulic capacity needs, we will be able to develop a manageable and achievable CIP plan. Having the right plan in place to address long-term needs will allow the City to build confidence with your customers.

Collaborative System Improvements. Communicating high risk areas to other departments will provide opportunities to collaborate improvements with other infrastructure systems (such as street paving projects), can save time and money, and reduce impacts to the community.

PRMRWSA – Asset Inventory Survey and Renewal Forecasting

Black & Veatch recently completed a similar study for the Peace River Manasota Regional Water Supply Authority to determine the sufficiency of its renewal and replacement (R&R) fund.

For the inventory survey Black & Veatch developed a Survey123 form to collect asset and condition data, and a multidisciplinary team spent several days on site collecting data and assessing asset condition and performance. Consequence of failure was also assessed and combined with the condition score to determine facility asset risk. A desktop risk assessment was performed on the pipeline assets.

A replacement planning model was developed in Power BI, using the asset inventory, condition and risk scores to calculate remaining life. Replacement costs were estimated for all assets and added to the model to forecast the R&R.

> Black & Veatch has capably met our needs on a tight, demanding schedule. I could not be happier with their level of effort and commitment."
>
> **KEVIN MORRIS**
> ENGINEERING & PROJECTS MANAGER, PEACE RIVER MANASOTA REGIONAL WATER SUPPLY

REHABILITATION AND REPLACEMENT PLANNING

In coordination with the City, Black & Veatch will develop a decision tree to support rehabilitation improvement planning. The decision process will help guide rehabilitation (repair or replacement) and/or condition assessments/ inspection activities. For each of the management strategies, priorities can be defined, and project costs estimated.

TRAINING

Black & Veatch will develop a customized training guide based on the risk model and will document the set-up and configuration process, specific risk criteria, prioritization parameters, and rehabilitation methods. Our team will provide on-site training to City staff for the selected risk prioritization tool. We will also provide training materials to allow the City to to share the knowledge with new staff in the future.

GIS ASSET MANAGEMENT PRACTICES

As part of our asset management assessment during the City's Water Master Plan Update, we will review the GIS hierarchy (geodatabase) used by Cityworks, the associated GIS asset attributes, and business rules maintained within the GIS to understand and recommend improvements to maintaining effective asset data that is supported by your Cityworks and asset management program.

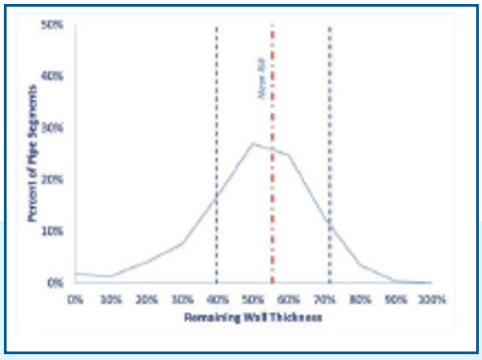
We will review the Cityworks configuration to identify opportunities to optimize measuring, recording, and viewing Key Performance Indicators (KPI), key asset condition observations, and Cityworks configurations that may allow the City to further leverage its investment in Cityworks and Esri.

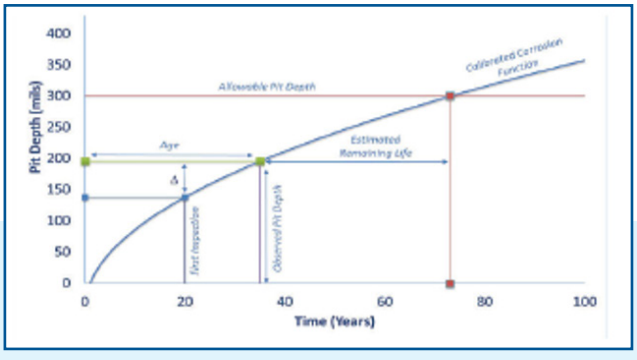
We can easily do the same thing for the wastewater assets. This will reduce the effort on the City's staff to grant additional access to Cityworks and provide data again.

MODELING TO OVERCOME UNCERTAINTY

Estimated Remaining Service Life

Black & Veatch will prepare a statistical analysis tool to analyze the data collected from the City's various condition assessment activities. This data will enable calibration of a time-based probabilistic mode to characterize pipe deterioration and predict the remaining useful life.





Statistical analyses of assessment data will characterize the range and distribution of key parameters, which will support probabilistic analysis and communication of confident results.

Multiple data points will provide the basis for calibrating the corrosion model, which will then be used to estimate the remaining life of each pipe segment. A Monte Carlo simulation will characterize the range and confidence in the results.

PHASE 3

Water Supply & Treatment Analysis

WATER SUPPLY ANALYSIS

Black & Veatch has extensive experience with the design, permitting, rehabilitation, and construction of water supply wells in Florida, for both fresh and brackish aquifers. Black & Veatch has spent over 40 years supporting the management of aquifers in Florida specifically for water supply, potential saline water intrusion, future issues, and declining water levels to support wellfield development, impact assessment, and groundwater modeling efforts. We specialize in being problem solvers that can rehabilitate older facilities and wellfields and prolong the life of utility assets.

Existing and New Wellfield Assessments

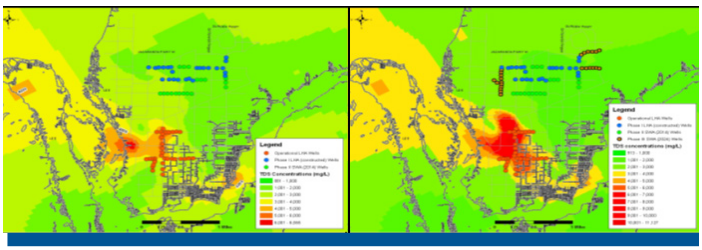
We provide hydrogeological and engineering services during construction. We test the new wells to appropriately assess geophysical logging results, compare formation cuttings, create lithologic descriptions for correlation, analyze pumping test data, and evaluate water quality information to define the local aquifer characteristics. Our specialized hydrogeological characterization, modeling, designs, specifications, and testing methodologies during well construction provide for optimum well performance and water quality, reducing the number of wells and minimizing well maintenance and rehabilitation.

Evaluation of Brackish and Fresh Aquifers

Black & Veatch has assisted Florida clients with their evaluation of the brackish Upper Floridan aquifer, and fresh aquifers such as the Lower Tamiami and Biscayne aquifer, as sustainable water supply sources. The Black & Veatch team has planned, designed, and implemented surficial and brackish aquifer production well projects for clients across Florida.

Our Team is currently supporting Miami-Dade WASD on a 20-year WUP modification requesting an additional 30 mgd from the Biscayne aquifer that currently supplies an average of 304 mgd. To obtain an additional 30 mgd, Miami-Dade has retained Black & Veatch services to identify alternate water supply sources by not only expanding the existing wellfield, but also including the C-51 reservoir for an additional 15 mgd and utilizing Aquifer Storage and Recovery (ASR) technology to better manage excess flows during the wet season. We are also supporting Bonita Springs Utilities for a 20-year WUP renewal on both their 7 mgd Lower Tamiami aquifer wellfield and 16 mgd Upper Florida aquifer wellfield.

> Mr. Rectenwald and the Black & Veatch team's excellent technical expertise has enabled WASD to obtain operation changes to our regulatory UIC permit that will be critical component to the County's water resource management."
>
> **DR. VIRGINIA WALSH, PG, PHD**
> CHIEF HYDROGEOLOGY SECTION
> MIAMI-DADE WASD



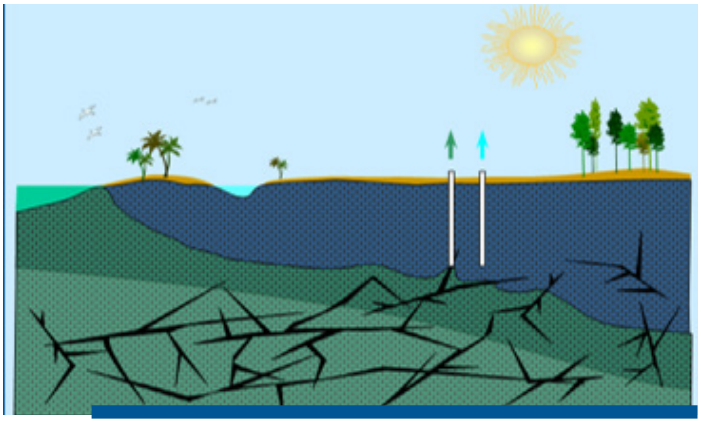
The City of Cape Coral has Black & Veatch on their team to support them with their brackish wellfield water quality changes that includes a wellfiedl expansion and future expansions up to 58 mgd.

Black & Veatch recently was able to successfully obtain a 20-WUP renewal for a total maximum allocation of 15.25 mgd for the City of Fort Myers Eastwood Wellfield. Our team has linked the spacing of the wells in close of proximity to each other and fractures in the aquifer to production wells with degrading water quality. With the existence of existing salinity changes in the Eastwood wellfield, and predictions of more severe water quality changes to come, we are currently assisting the City with wellfield management/expansion and operational changes applying a SMART Wellfield approach to mitigate these salinity changes, protect the City's resources and protect invested capital.

Geophysical Logging Experience

Production wells are a significant capital investment for utilities and maintaining them for long-term optimized performance is critical. For existing and/or aging production wells, it is important to understand current subsurface conditions so a proper rehabilitation plan may be implemented. Black & Veatch hydrogeologists have extensive experience developing comprehensive and complex geophysical logging plans for production wells, injection wells and ASR wells for evaluating permeable zones or casing cement seals, etc. Black & Veatch has a standard specification for geophysical logging that can be modified for almost any well drilling and evaluation project. We have provided geophysical log interpretations for many wells in Florida that have aided in successful completion of new wells and rehabilitation of aging wells. We have used geophysical log interpretation to determine confining and permeable intervals in formations, salinity changes with depth, areas with fracturing and potential for hydraulic communication, development of acidization plans, and to aid in formation classification for regional geologic interpretations.

Black & Veatch hydrogeologists have overseen geophysical logging contractors to ensure the correct logs are performed, the equipment is satisfactory calibrated and the proper parameters are used. We have worked with the major geophysical logging companies in Florida and have the software and knowledge to manipulate raw file data to better interpret and present logging data.

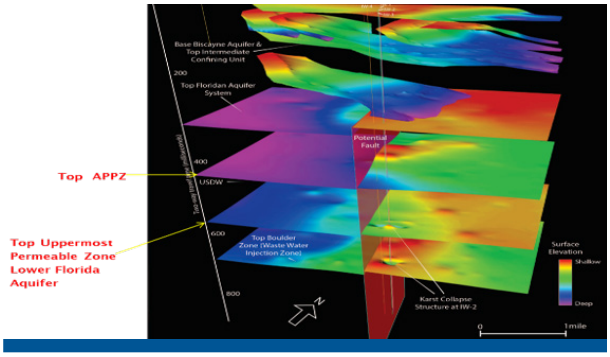


Black & Veatch has been instrumental with helping utilities understand subsurface conditions and overall management of wellfields

As part of the well completion report, the logging data is interpreted and displayed in a manner that allows straightforward explanation of the evaluation and leads to quick decisions by regulatory agencies.

Hydrogeologic Data Collection and Analysis

Black & Veatch hydrogeologists have many years of experience in using hydrogeologic and geophysical data to discern geologic and hydrogeologic units and determine permeable and confining units. Our hydrogeologists have collected and compiled lithologic, water quality, water level, hydraulic parameter, geophysical logs, and drilling performance data from numerous production wells, monitor wells, ASR wells, and injection wells in Florida. Accurate and complete documentation is critical so a historical record is maintained of each well when it is constructed. Initial condition performance data is critical for future well analyses.



Black & Veatch uses hydrogeologic cross sections based on geophysical and seismic data which are powerful tools to understand existing conditions.

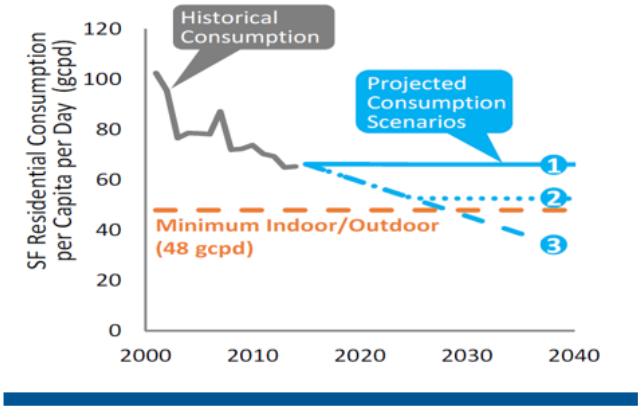
Demand Projections

Understanding growth, development, and redevelopment trends in the City's services area is a critical first step in preparing water demand projections. Our approach to the population and employment projections will consider the development goals of the city and the 2020 Vision, as well as leverage available data from the Census Bureau, Traffic Area Zone (TAZ), University of Florida's Bureau of Economic and Business Research (BEBR), South Florida Water Management District (SFWMD), and the City's Planning Department. Our proposed tasks include:

- Review and identify trends using historic consumption data: Per capital demands, diurnal patterns, seasonal patterns, peaking factors
- Determine current and projected annual average day demands
- Determine current and projected non-revenue water demands

Existing Customer Demands

Black & Veatch will update the model with current customer demands based on historic maximum day billing records. These are the most accurate spatial information records available. All future projections will build upon these records to maintain accuracy.



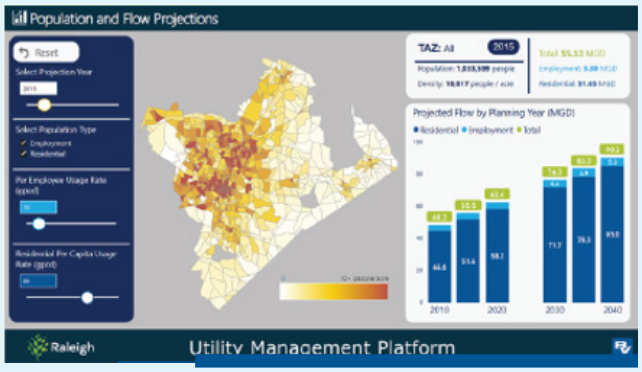
Historical unit consumption trends and research derived "fully conserving" usage rates will be used to develop more accurate water demand projections for Hollywood's service area

Projected Water Demands

Black & Veatch will utilize the City's historic trends to predict future projections and trends. Across the County, utilities are experiencing declining per capita demands due to water conservation, high efficiency appliances, etc. If this is a trend for the City of Hollywood, then sensitivity analyses can be performed to determine the extent the trend might impact demand needs.

POPULATION AND DEMAND PROJECTION MODULE

With spatial population distribution as provided by customer meter records, TAZ analyses, parcel data from the SFWMD, or the City's Planning Department, a simple population and demands dashboard will be created. Black & Veatch will build the dashboard to illustrate the existing customer consumption information and future growth. The information on the existing consumption will help enable the City to track down high water users. Then a sensitivity analysis can be performed on the population growth areas with varying per capita demand trends and triggers for system redevelopment.



In the past, Black & Veatch built these heat maps in GIS and would prepare the total demand projection summaries in GIS. Now, we can view the spatial distribution and total projections in the same dashboard.

WATER TREATMENT PLANT EVALUATION AND PROPOSED UPGRADES

Black & Veatch has a local team of water treatment experts who will focus on bringing to the City reliable water treatment solutions that will improve the facilities' already successful performance. These solutions will be recommended by a comprehensive adaptive and dynamic Water Master Plan.

Our local Black & Veatch team is supported by a world-class network of technical experts across the nation. The coordination of the subject matter experts will be led by Chris Barlow out of our Coral Springs office. Chris has extensive knowledge of the water treatment plant that has been gained over the past five years, while serving as the engineer of record for this facility.

Our Understanding and Approach

The water treatment plant is the City's sole source of supply for its customers. The facility combines two raw water supplies and three treatment processes to deliver up to 59.5 mgd from a compact site centralized within the City's boundaries. The Black & Veatch team will analyze the two raw water supplies, in conjunction with the three treatment processes, the blending and final disinfection options, the plant's storage, and new pump facility to establish the best direction for the City's residential, commercial, and municipal customers.

Raw Water Supply

The two water supplies the City relies on will be analyzed from a capacity, water quality, and permitting perspective. The Biscayne Aquifer supplies water that is of high quality with the lowest capital and operating costs. The Floridian Aquifer is a viable alternative water supply with higher capital and operating costs due to its brackish nature.

Black & Veatch understands and appreciates the City's history and position in utilizing these resources in the most cost effective manner. We understand the City's decision to delay the development and investments into expanding the Floridian Aquifer supply until additional technology and regulatory assessments are completed. Black & Veatch is currently working with Miami-Dade County to bring regulatory acceptance of more reliance on the Biscayne Aquifer. This approach can also be applied on behalf of Hollywood, as this is the cornerstone of the new Water Master Plan.

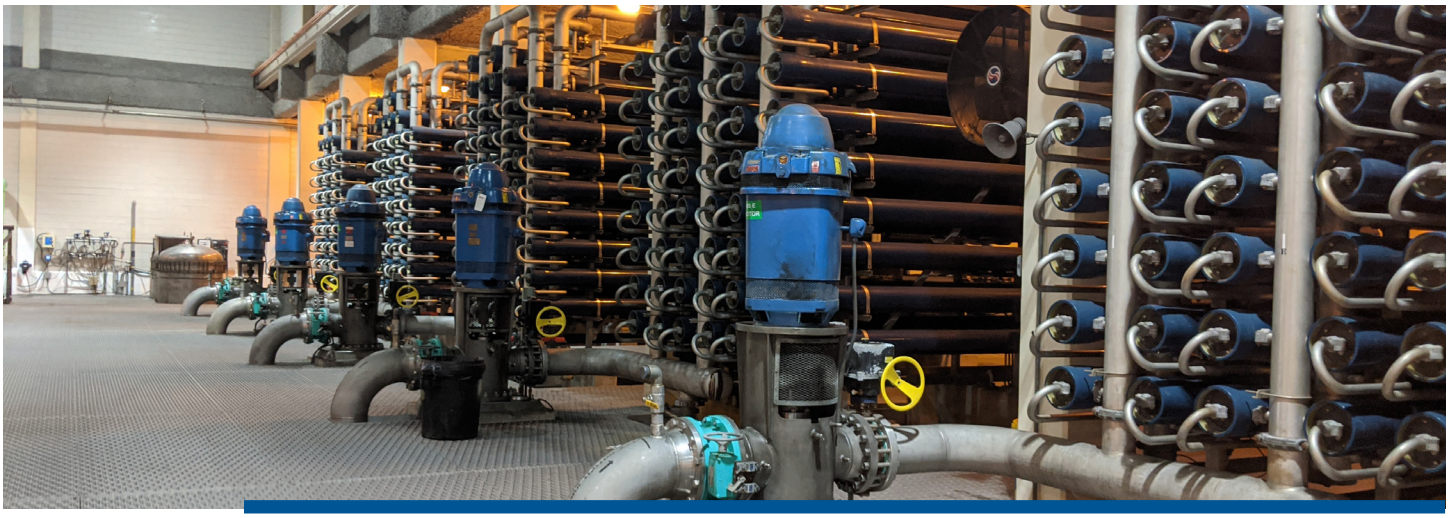
Project Manager Chris Barlow will lead coordination of the subject matter experts. He has extensive knowledge of the Hollywood Water Treatment Plant that has been gained over the past five years while serving as the engineer of record for this facility.

Water Treatment Technologies

Black & Veatch will apply our technical expertise for the evaluations of the existing treatment processes for the development of this new Water Master Plan. The plan will ensure that the water plant meets current and upcoming regulatory requirements by utilizing the most efficient and effective treatment technologies currently available.

This effort will integrate the results of the condition assessment, the Energy Efficiency Master Plan evaluations, and our technical knowledge of viable treatment technologies into a vision that will make the best use of the existing space at the water treatment plant.

Raw water piping entering the water plant. Our team will evaluate the raw water supplies alternatives to ensure the redundancy and resiliency of the potable water system for the City's customers.



Both membrane treatment systems can be optimized with modifications demonstrated by pilot studies. These studies can verify the modifications that will reduce operation and maintenance costs while maintaining quality of treatment.

The treatment plant evaluations will consider the rehabilitation and/or replacement of the existing process systems, with the right treatment technologies and operational improvement that will put the City in a better position of managing potential upcoming changes to the regulations and addressing emerging contaminants currently under legislative scrutiny. This effort will be synthesized into an adaptive and dynamic Master Plan that will be readily available for the City's staff to implement.

The improvements and recommendations that the Black & Veatch team will prepare through these evaluations will highlight the modifications that will allow the City to confidently face potential regulatory and capacity scenarios over the next 20 years.

Membrane Treatment

The WTP's Reverse Osmosis (RO) and Nanofiltration (NF) membrane systems have remained unchanged since they were placed into service, with general upkeep of the ancillary systems, such as chemical systems, cleaning systems, and aeration systems. The membrane vessels have become obsolete and the replacement of membranes utilizing the existing vessels would be cost prohibitive, and perhaps physically impossible.

The three-stage NF process, which provides membrane treatment process, provides softening of the Biscayne Aquifer water supply, will be evaluated to establish the feasibility of its replacement with a more robust two-stage process. The conceptual analysis will recommend this process be piloted, projected, and analyzed to utilize scale inhibitors which would eliminate the use of acid in the pre-treatment scheme of the plant.

Similarly, the RO process, which treats the Florida Aquifer water supply, requires efficiency improvements, which similarly to the NF process, will also require piloting as the first step. The RO process will utilize new low pressure RO membranes, combined with the earlier recommendation from the Black & Veatch Energy Efficiency Master Plan of operational modifications to the RO feed pumps, will dramatically decrease the chemical and power operating costs of this process. The membrane processes, especially the NF process, can be expanded to improve the blended water quality of the finished water.

Lime Softening System

The lime softening process uses Spiractors, a technology commercialized by Permutit, which allows high process rates in a reduced footprint. A conventional lime softening system delivering the same capacity would not fit in the same space.

The lime softening process uses Spiractors, a technology commercialized by Permutit, which allows high process rates in a reduced footprint. Our team has multiple innovative ideas to improve the existing lime softening system that will bring reliability to the current water treatment process at the plant.

The advantage of the compressed footprint is certain, along with a very economical water treatment process. The disadvantages include the typical concerns of a lime softening process, such as the delivery of the quick-lime, the slaking process, the catalyst sand deliveries and feed system, management of the process by-products residual, the constant descaling of the components throughout the process, along with the ferrous metal deterioration and rehabilitation that requires upkeep through welding and painting. Although the spiractors are close to the end of their useful life, they continue to be highly valued assets to the WTP, and their service life and adherence to modern design standards may be expanded with some modifications and upgrades. The structural resilience of this system compared to the risks of catastrophic weather events may be incorporated into the Master Plan Evaluations.

Filtration Considerations

The original valveless or self-backwashing filters at the plant are also in need of rehabilitation. Our Master Plan will take into consideration the continued rehabilitation or replacement of these filters, since they are over six decades old.

Treatment Enhancements Considerations

While the lime softening process provides acceptable softening of the water, there is little removal of the naturally occurring organic matter (NOM) present in the water.

This NOM results in the formation of disinfection by-products in the finished water delivered to the City's customers. These disinfection by-products are managed by utilizing chloramines as primary disinfectant, and to provide a chlorine residual in the water distribution system. For this reason, the use of chloramines is common in South Florida, and the surrounding water systems also use this disinfection method. However, the use of chloramines may cause operational issues in the water distribution system, which will also be evaluated.

The Black & Veatch Master Plan may include a desktop analysis of increasing the capacity of the NF system and replacing some or all of the lime softening processes with alternative technologies such as ion exchange (IX), which will more efficiently soften the water and remove NOM.

The existing Spiractors are close to the end of their useful life. The structural resilience of this system will be evaluated.

West Hollywood Pumping & Storage Facility

The ultimate advantage and goal of this analysis is to provide a blended water that meets water quality resulting in lower NOM. That result could potentially allow the plant to utilize free chlorine for disinfection and residual disinfection in the water distribution system if at some point needed in the future. The use of chlorine would be limited by the current interconnections with neighboring systems that use chloramines, but it would be useful nonetheless to have flexibility for change.

Other advantageous treatment technologies worthy of analyses, such as ion exchange, have the capacity for treatment of per- and polyfluoroalkyl substances (PFAS) contaminants that could potentially impact the Biscayne Aquifer water supply.

There are other technologies worthy of analysis, such as Ion Exchange (IX), which has the capacity of removing specific contaminants, including PFAS compounds. This group of compounds is currently subject of intense regulatory discussions, and it is among the constituents that may pose a threat to the Biscayne Aquifer water quality.

The existing deep injection well at the water treatment plant provides many additional treatment process options that may require the disposal of treatment by-products.

The replacement of chloramines for UV light for primary disinfection, especially if treating effluent from the membrane processes, would substantially reduce the amount of chlorine/chloramines needed for disinfection, with the corresponding decrease in disinfection by-products.

There are other treatment technologies that may be worthy of consideration and the analyses that will be provided by Black & Veatch will provide the City with justifiable recommendations for the water treatment plant's plan for the future.

In all these cases, the evaluation of these alternatives will include key aspects such as cost, constructability, operability, regulatory requirements, etc., to justify its selection or dismissal from further consideration.

> "Throughout the duration of these projects, [Water Master Plan Update, Energy Efficiency Study, and RO WTP Recovery Study] Black & Veatch has developed a close rapport with our staff and offer complete access to all Black & Veatch staff and experts. This policy allows City staff to solicit and received quick feedback and responses when questions or new tasks arise. Thus, the City is able to make confident and well-informed decisions based on Black & Veatch's recommendations and input. Based on their performance on this Contract, I would not hesitate to recommend Black & Veatch to other utilities."
>
> **JOHN BANKS, PE**
> FORMER UTILITIES CIP MANAGER, CITY OF VENICE, FL

WATER QUALITY AND REGULATORY COMPLIANCE

Black & Veatch recently completed a study for the Hannibal Board of Public Works that defined a detailed plan for transitioning from a chloramine to free chlorine distribution system and are currently designing the treatment process improvements to support this change.

Black & Veatch provides comprehensive services for water treatment and distribution system water quality solutions. Our professionals are experienced in all water treatment processes and technologies. This includes piloting, selecting, and implementing advantageous strategies for the removal of emerging contaminants like PFAS as well as the removal of organics, color inducing compounds, and other disinfection byproduct (DBP) precursors to meet current and future drinking water regulations.

Black & Veatch has a dedicated Water Technology Group comprised of Masters and PhD level engineers, whose sole goal is to determine the best technical solutions for our client's specific water quality needs. We also employ water system operations specialists who will work closely with your O&M staff to define practical solutions and optimized operating strategies. We will combine this expertise to ensure the water quality solutions identified are both technically sound and practical.

DBP Understanding and Experience

Black & Veatch has assisted numerous utilities in developing tailored strategies for compliance with the Stage 2 Disinfection Byproducts Rule (DBPR). We understand the complex chemistry that causes organics and other compounds to form DBPs and provide focused solutions for mitigating DBP formation pathways. We understand the difficulties with maintaining a chloraminated system while avoiding nitrification and we can explore options to switch disinfectants.

Future Regulations

Black & Veatch routinely completes regulatory reviews for utilities to ensure they are proactively positioned to meet future regulations (completed for Pinellas County in 2020). Two of the critical future regulations that could impact Hollywood's system include revisions to the Lead and Copper Rule (LCR) and PFAS. Black & Veatch has conducted desktop, pilot and full-scale evaluations to determine the optimal treatment process for both removal of PFAS and optimized corrosion control treatment.

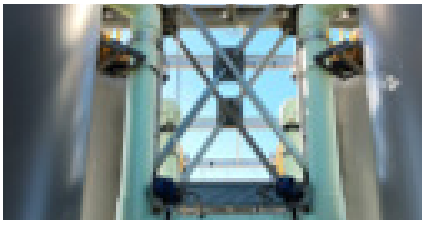
PFAS | PER - AND POLYFLUOROALKYL SUBSTANCES

PFAS | Per - and Polyfluoroalkyl Substances

- Understanding the prevalence of PFAS chemicals is the first step in determining potential impacts to the City's water supply and treatment.
- Black & Veatch will assist the City in establishing a robust sampling and analysis program to determine whether the City's water supply has PFAS contamination.

Regulatory Overview & Outlook

- Black & Veatch has been tracking federal and state regulatory actions to address PFAS, including EPA's PFAS Action Plan and FDEP's investigations.
- With our knowledge of potential regulatory changes, we are well-positioned to help the City proactively address potential impacts on water supplies and treatment systems.



Treatment Evaluation

- Should source water monitoring and regulatory determinations warrant the need for PFAS control, we will identify potential strategies, such as wellfield management and/or treatment.
- Black & Veatch has conducted PFAS pilot studies for Fountain, CO and Cape Fear Public Utility Authority to evaluate and select viable treatment systems.

HOLLYWOOD WATER SYSTEM WATER QUALITY GOALS AND NEEDS	BLACK & VEATCH APPROACH	VALUE TO HOLLYWOOD WATER SYSTEM
Plan for existing and future regulations (PFAS, LCR, cyanotoxins, etc.)	Leverage national expertise (Emily Tummons, PhD) with future changes to the LCR and (Dustin Mobley and Arturo Burbano, Ph.D.) with PFAS regulations and treatment.	A plan that proactively identifies and addresses future regulations. Knowledge of how treatment changes could require testing to optimize corrosion control treatment. Experienced staff to aid in a distribution system materials inventory.
Opportunity to further improve WQ with treatment process modifications	Our combined group of water treatment, operations, and planning specialists will use our extensive understanding of Hollywood's system to work with Hollywood's staff to identify current O&M practices and issues and define solutions that are technically sound and practical.	Recommendations are based in science with understanding of O&M activities and impact on regulations (current and proposed) to achieve the highest water quality while minimizing O&M.
Evaluate opportunity to change to free chlorine (minimizes nitrification and difficulty with maintaining optimal chlorine to ammonia ratio)	As existing equipment is assessed and upgrades or alternative treatment processes are recommended, there is a potential to evaluate switching secondary disinfectants to free chlorine to simplify operations, decrease cost, limit nitrification mitigation activities, and improve finished water quality if DBP precursors are limited.	Nitrification is a nearly unavoidable problem for chloraminated systems, and a switch to free chlorine would eliminate the cost of feeding ammonia and the hassle of achieving an optimal chlorine to ammonia ratio. Removal of DBP precursors would predict DBPR compliance and the solubility of lead would decrease with free chlorine to improve LCR compliance.

PHASE 4

Water Supply & Treatment Analysis

EXISTING SYSTEM UNDERSTANDING

The City's retail water service area corresponds with most of its corporate limits. The City's primary water service area consists of approximately 31 square miles that extend throughout the City and to Broward County. In 2017, the water system served approximately 45,000 accounts, providing approximately 16.0 million gallons per day (mgd) of water service within the City limits and approximately 6.5 mgd to Broward County through a bulk user agreement.

The City's water transmission / storage / distribution systems consist of the following:

- Over 600 miles of pipe with diameters ranging from 2-inches to 36-inches
- 2 elevated 1-MG storage tanks
- 1 booster pump station and ground storage tanks
- Approximately 40,200 connections
- Over 2,400 fire hydrants
- Over 7,500 valves

The distribution system piping is constructed of various materials including cast iron (CI), galvanized iron (GI), polyvinyl chloride (PVC), ductile iron (DI), high density polyethylene (HDPE), and asbestos cement (AC). The vast majority of these facilities are over 35 years old. The WTP has three discharge mains, a 24-inch water main (South header), a 30-inch water main (West header), and a 20-inch water main (Bypass header) that supply water into the distribution system transmission lines. However, due to flow metering and chlorine monitoring issues with the 24-inch water main, the WTP utilizes the single 30-inch main (West Header), 42-inch main (South Header), and 20-inch main (Aeration BLDG) for the distribution of finished water.

The City began the Water Main Replacement Program in 2010. The Water Main Replacement Program is coordinated with other infrastructure projects and programs, including FDOT roadway projects and other City infrastructure programs.

The City has designed, permitted, and constructed over 540,000 linear feet of water main replacements. The City also plans to replace approximately 530,000 linear feet of water main through 2027.

The City's **Water Main Replacement Program** is being implemented to improve the supply, pressure, and quality of water being delivered to its customers. The challenges being faced by the City currently includes the following:

- Aged and undersized pipes in the existing water system
- Water quality concerns in the system extremities
- Transmission system pipe breaks
- Water loss
- Others

Water master planning must consider improving the system to address the challenges above, but must also consider future water needs, in particular, increased redevelopment of existing areas. One area of interest in the City is the Federal Highway and Florida East Coast Railway corridor, which will likely experience increased density when portions are redeveloped. Understanding redevelopment patterns in the City, and the timing and impact on the water system is a key consideration in water planning, which our team comprehends thoroughly.

16-Inch DIP water transmission main construction along N. 19 Avenue in the City of Hollywood

TETRA TECH

DISTRIBUTION SYSTEM ASSESSMENT APPROACH

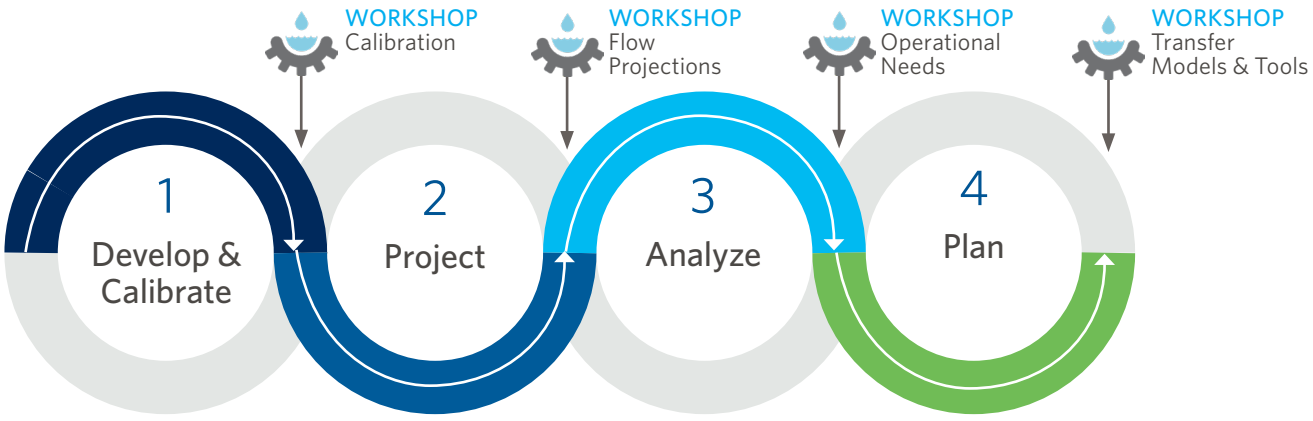
The System Capacity Analysis is important to establishing the existing and future distribution system needs. Capacity assessment begins by evaluating the current system with flow and pressure monitoring and updating the existing hydraulic model to ensure an accurate hydraulic model that represents existing conditions. The approach then focuses on the next steps for the City, including a demand projections methodology that focuses on the growth drivers specific to the area and future year capacity assessment levering the hydraulic model. The capacity assessment methodology is designed to coordinate with the other plan activities to yield an optimized, trigger-based CIP.

Field Test Data to Support Model Calibration

The City must be confident in the accuracy of the updated model, as the modeling results will be the basis for making key decisions that will impact system operations and costs into the future. In order to effectively calibrate the hydraulic model, some field data may need to be collected to supplement the readily available operating data. Black & Veatch has a detailed and robust field data collection and calibration plan, which will be customized for the City.

The Black & Veatch team will provide expedited services to the City by reusing and building upon existing knowledge of the distribution system including water main condition information and hydraulic modeling.

> The Black & Veatch team listened to our needs, communicated well with City staff and provided high quality work products allowing the City to make confident, well-informed decisions based on their recommendations, training and decision support tools."
>
> **BRIAN D. PICKARD, PE**
> CHIEF PLANNING ENGINEER
> CITY OF TAMPA WATER DEPARTMENT



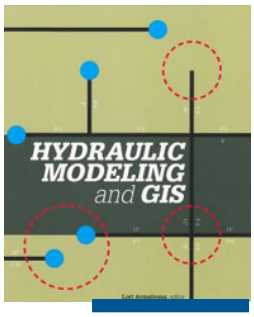
- Field Data Collection
- Model Update
- Calibration

- Baseline TAZ Population & Employment Projections
- Projection Refinement based on Key Planning considerations
- Conversion to Demand Projections

- Future Year Hydraulic Model Assessments
- Scenario Development
- Condition Risk Scores using iCIP or InfoAsset
- Preliminary Project Identification

- Project Prioritization and Schedule
- Cost Estimates
- CIP Optimization
- CIP Management Tools/ Platform Development

Model Update



Black & Veatch professionals were the primary authors of the Esri publication Hydraulic Modeling and GIS.

Recognizing the City has a mature and regularly maintained GIS database documenting the water distribution system, we do not anticipate significant structural efforts to the GIS database or hydraulic model. Black & Veatch will update the hydraulic model with a 1:1 relationship to the GIS database for ease of model maintenance / expansion and to allow the model to continually support O&M systems, the application of asset condition, performance planning and operating decision support.

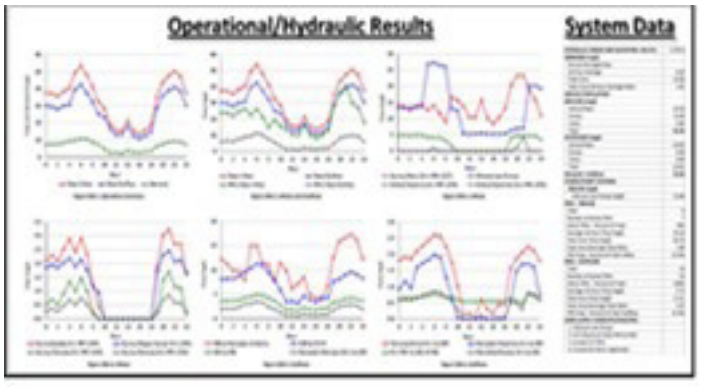
Capacity Assessment

The objective of the capacity assessment will be to evaluate performance of the water transmission and distribution system under current and future year scenarios to account for population growth and to identify capacity-driven improvement needs to meet the performance criteria for each planning year. This will include extended period simulations (EPS), fire flow analysis, evaluation of the linear system flow / configuration, review of pump and tank capacities, and review of previously planned CIP projects.

Energy Efficiency Modeling

As a leader in both Water and Energy, and having performed the City's Energy Efficiency Master Plan, Black & Veatch is ideally suited to support the City in continuing to improve energy efficiency. We will leverage our experience in using hydraulic models for energy efficiency assessments, including:

- Pump efficiency assessments to maximize operation of pumps near best efficiency points.
- Minimizing energy costs ($/kWh) by optimizing storage and pump operating strategies (for example, avoiding high "Billing Demands" and minimizing power use during "On-Peak hours").
- Defining operational and infrastructure improvements to reduce energy costs.



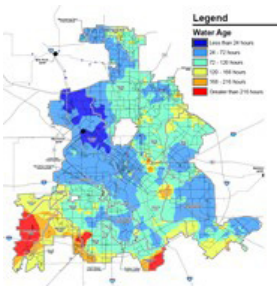
Black & Veatch identified strategies to improve Denver's water distribution system operations and save energy. One key finding was that the City's pressure control stations were operating more than intended, leading to lost energy.

System Vulnerability and Resilience Assessments

Natural disasters, equipment or pipe failures, and a host of other events can severely disrupt customer service and have substantial economic impacts. Black & Veatch has experience evaluating the impacts of potential facility outage scenarios and developing cost effective improvements that significantly enhance reliability and reduce risks. Our experience includes emergency scenario planning for the Tampa Bay Water Regional Supply System.

Black & Veatch worked closely with Pinellas County to develop a detailed plan for maintaining water supply during a construction activity that required a shutdown of the County's primary water supply interconnect with Tampa Bay Water. These efforts paid off, as the County's customers experienced no impacts to their water supply during this event.

Water Quality Modeling



Model simulated water age is a very useful surrogate parameter in assessing distribution system water quality.

Water system planning and design efforts that provide excess hydraulic capacity and redundancy often times result in water quality challenges that must be addressed though complicated and/or undesirable system operations. Water quality modeling during master planning can assess the impacts that capacity-driven improvements can have on water quality. This, coupled with a high level of expertise related to distribution system water quality dynamics, is essential for balancing capacity and water quality in delivering an optimal investment strategy. Understanding this information in the planning stage will allow the City to proactively address these potential impacts.

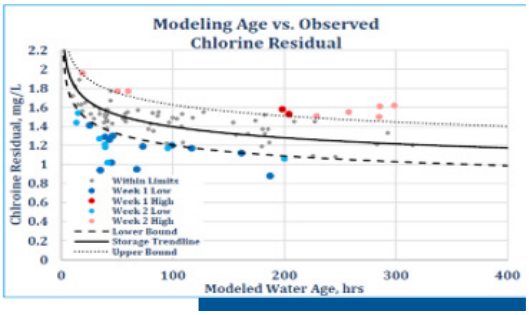
Black & Veatch has used water quality modeling solutions to address customer complaints, and address disinfectant residuals and disinfectant by-products formation concerns for several distribution systems, including Pinellas County, Greater Cincinnati Water Works (full chlorine constituent model), Cities of Venice, and Marco Island, FL. We leverage our modeling and planning expertise coupled with extensive system operations and water quality expertise to provide optimal solutions and strategies.

Developing System Capacity and Performance Driven Improvement Projects

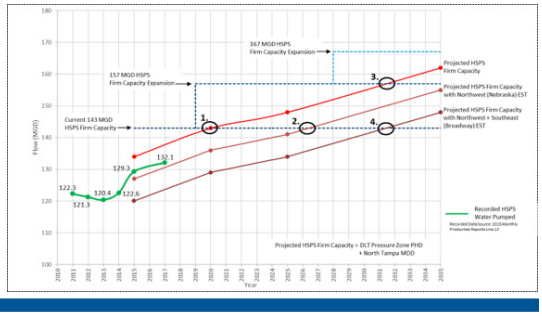
Based on the results of the hydraulic analysis, capital improvements required to adequately supply water demands for planning horizon will be defined and recommended to improve system performance. In accordance with the Black & Veatch Adaptive Planning approach, each improvement will have a clearly defined implementation "trigger" and estimate of when the project will need to be implemented.

Tracking of Project Triggers with Decision Support Tools

One of the most important components for dynamic and adaptive planning is clearly documenting project triggers, being able to track the project triggers, and adapt the schedule to changes that occur over time. The image below shows an example of a decision support tool developed for the City of Tampa for the expansion of its high service pump station and storage tanks based on trending peak flows that are recorded each year. The tool is designed to allow the City of Tampa to monitor the actual peak flows each year, compare it to the previous projections, and determine if this significant CIP project should be moved up or back in the planning horizon. The tool considers the amount of time it takes for the City to design and construct the project so it can be on-line when it is needed. The adaptive planning approach and tools will allow the City to optimize its CIP planning each year to ensure the City is making the right investments at the right time.



Model simulated water age and chlorine residual correlation plots for the City of Venice.



Black & Veatch's recent work for the City of Tampa included the identification of "triggers" that clearly document system conditions that will result in the need to begin pump station and storage upgrades. This allows the City of Tampa to adjust and re-prioritize the CIP project schedules over time as demand projections are updated.

PHASE 5 Capital Improvement Planning

Black & Veatch will perform the following subtasks to align with the City's capital improvement needs, ongoing efforts and projects:

- Cost Evaluation of Proposed Improvements
- Develop a 10-year Capital Improvement Plan

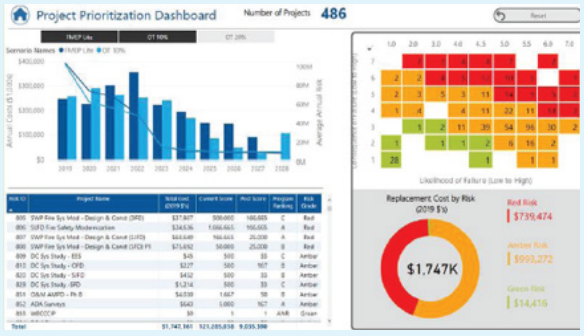
Based on the recommendations developed in the prior tasks, the next step involves establishing a preliminary improvement program which includes all recommended capital improvements with a preliminary priority schedule based on the following:

- Capacity improvements
- Rehabilitation and replacement needs
- Regulatory changes
- System optimization opportunities

> Black & Veatch staff are adapt at listening to the needs of the County, communicating well and providing high quality deliverables. They have worked across departments and disciplines to provide the County holistic system recommendations. As a result, the County had gained increased confidence in implementing projects without the fear of negative unintended consequences from evaluating systems in silos. I recommend Black & Veatch's services to other utilities."
>
> **MARGARET R. (BECKY) COOK, PE**
> SENIOR ENGINEER, PINELLAS COUNTY

Integrated Capital Improvement Plan (iCIP) - Capital Projects and Cash Flow Module

The second module in the iCIP tool developed by Black & Veatch is the Capital Projects and Cash Flow Module. iCIP is a state-of-the-art CIP spreadsheet tool to provide consolidated CIP management with project costing, encumbrance and cash flow schedules, project phasing, and setup for easy updates based on project changes, construction cost changes, escalation, and more. This is the same tool that will be delivered for the Water Master Plan Update and can be easily updated to include the Wastewater Master Plan results.



Allows multiple CIP Optimization Scenarios based on risk.

Illustrates short and long-term cash flow needs

CAPITAL IMPROVEMENT PROJECT PRIORITIZATION

Black & Veatch's Business Case Evaluation process aims to minimize long-term system costs while maintaining required levels of service and mitigating unacceptable system risks. For the Capital Improvement Planning task and development of the CIP, Business Cases will be developed for each of the projects and programs and run through the risk weighted NPV prioritization approach presented in the figure below.

Black & Veatch will develop project business case assumptions for each identified project/program and this will be documented in the City's business case assumptions form. Black & Veatch will review this form with the City and can, as necessary, provide example business case templates that will be modified in a series of interactive meetings to capture all the necessary data in the required format for the City.

Our example templates include the following basic data for each project/program:

- Project definition and work scope
- Triple Bottom Line (TBL), Level of Service (LOS) or other non-financial scoring
- Capital cost breakdown by year
- O&M impact (before & after)
- Revenue impact (if applicable)

Once the Business Cases are developed, Black & Veatch will utilize a Portfolio Optimization and Project Scheduling tool to develop a short-term CIP.

The CIP will be optimized to maximize the NPV benefit or risk reduction per dollar spent. The tool uses the combination of the budget scenario and non-financial planning criteria constraints (Safety, Environmental, Regulatory, Customer Service, etc.) with the NPV results to maximize the NPV benefit given those constraints. In other words, it checks every combination of project installation dates that will:

- Maximize NPV benefit or risk reduction per dollar spent
- Stay within the annual budget, schedule, and non-financial constraints for each scenario

Project timing optimization is then conducted for all projects to arrive at a portfolio optimization result. Special focus is given to investments that have a significant budget impact or are being considered for delay beyond their planned installation date due to utility budget constraints.

The projects can first be scheduled based on the risk tolerance levels of the City. Next, budget constraints can be incorporated into the scheduling process and any changes to install years due to budget constraints are then recalculated. The final step of the prioritization process is to incorporate planning criteria scores, project rankings, and budget constraints into the implementation schedule and going over the results in a planned workshop with the City.

- Based on condition assesement
- AMPs and EAMPs
- Other investment needs (growth, regulatory, safety, etc.)
- Include asset operator recommendations

Input Assumptions

- Planning Criteria
- Capital Costs
- O&M Impact
- Growth Assumptions
- Revenues
- Schedule Constraints
- Failure Probability

Key Results

- Financials Template
- NPV Benefit - Avoided Case
- Financial Efficiency
- Balance Scorecard
- Project Ranking/ Prioritization

Optimization Model

- Financial Efficiency
  - Risk Tolerance
  - Budget Constraints
- Criteria Scoring
- Regulatory & Environmental
- Safety
- Customer Service

PHASE 6 Master Plan Documentation

Documenting the master plan process, assumptions, data sources and results, and summarizing the findings and recommendations is an extremely important part of the master planning process. Black & Veatch recommends preparing technical memorandums throughout the entire process to receive input from the City and to ensure assumptions and decisions made have buy-in before the Master Plan report is prepared and presented to the City. This also allows the final report to reference the technical memorandums as appendices and to be a more clear and concise document that isn't bogged down with the technical content necessary in the technical memorandums.

PROVIDING CLEAR AND USEFUL DELIVERABLES

The Black & Veatch team believes that deliverables need to be both technically precise and easy to understand. We understand how to communicate complex technical information to audiences with varied needs – from rate payers and stakeholders to detailed technical team members. Our approach will be tailored to the City's specific preferences with a recommendation for a layperson (graph-centric) executive summary, core master planning document with appropriately referenced material, and appendices housing detailed technical back-up material.

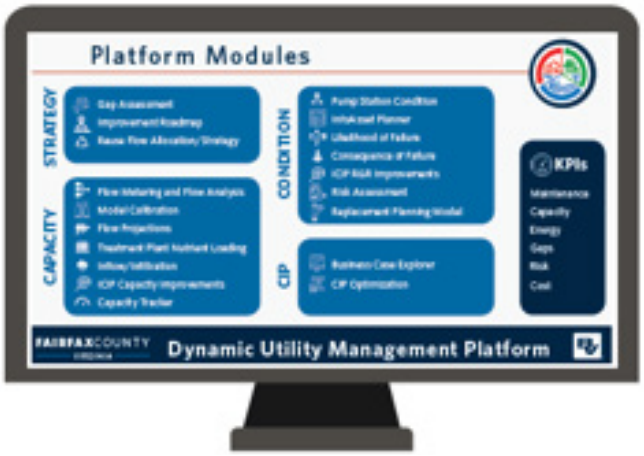
ADAPTIVE PLANNING AND UTILITY MANAGEMENT PLATFORM

The Black & Veatch team believes that a master plan is so much more than the report document at the end of the project. A modern, adaptive and dynamic master plan should live on, be useful every year, and provide tools for the City to rely on independent of consultants.

We have created the Utility Management Platform as a series of decision support tools to assist the City in benefiting from all of the data that is already being collected daily, the tools already being created for master planning analysis and the inexpensive technology already available to all parties. In addition to the final Master Plan Report, Black & Veatch will deliver a Utility Management Platform to the City for continued planning and adaptability into the future. The platform will also be used to support the Program Management efforts moving forward.

> "I had a vision for what a dynamic asset management plan could be, but I wasn't sure that it could become a reality. Black & Veatch listened to my vision and developed a dynamic platform using Power BI which was designed to reference our enterprise data for our Atlantic Treatment Plant. The platform is easy to navigate and includes concise, streamlined dashboards which gave us unprecedented access to our data, including the calculation and tracking of more than 40 KPIs. The dynamic platform provides us with actionable insights at-a-glance and has greatly enhanced out ability to effectively manage our utility."

ANAS MALKAWI
CHIEF OF ASSET MANAGEMENT
HAMPTION ROADS SANITATION DISTRICT



Utility Management Platform Module Examples

The potential Platform Modules available for the City are endless. The Black & Veatch team envisions including modules for each task described in this project approach including a few summarized below.

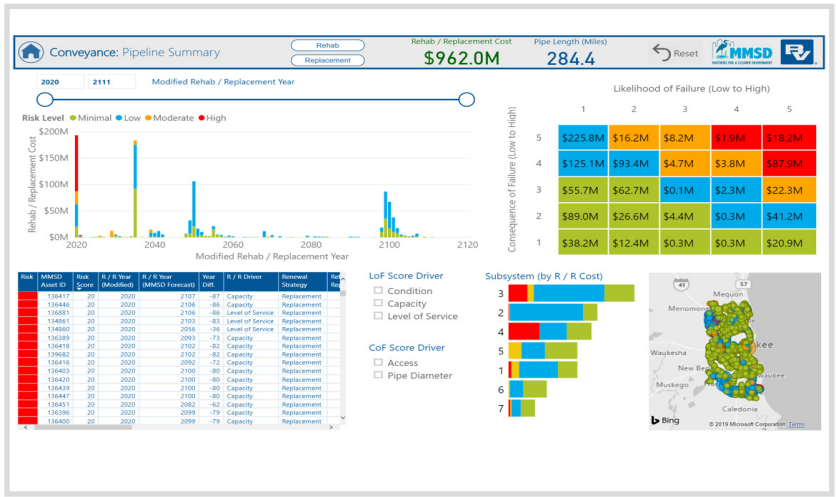
We will rely on and incorporate the following:

- Smart Triggers
- User Experience and Accessibility
- Modular and Expandable Design
- Training of County Staff

Pump Station Condition Assessment

In November 2019, Black & Veatch delivered a Condition Assessment Module to Fairfax County that concisely and effectively conveyed the results of more than 900 assets across 20 pump stations in a single, easy-to-use dashboard screen.

Our team can provide something similar for Hollywood that connect to Cityworks, SCADA and includes analytics on energy efficiency information and remaining useful life beyond simply using age.



Collection System Risk Assessment

Risk Assessment Module developed for the Milwaukee Metropolitan Sewerage District (MMSD) which includes a summary of LoF, CoF and Risk for more than $1.5B of sewer pipeline and pump station assets.

The City will receive something similar to this on the Water System. It will incorporate projects which include areas of high risk water mains and water treatment plant components.

Replacement Planning

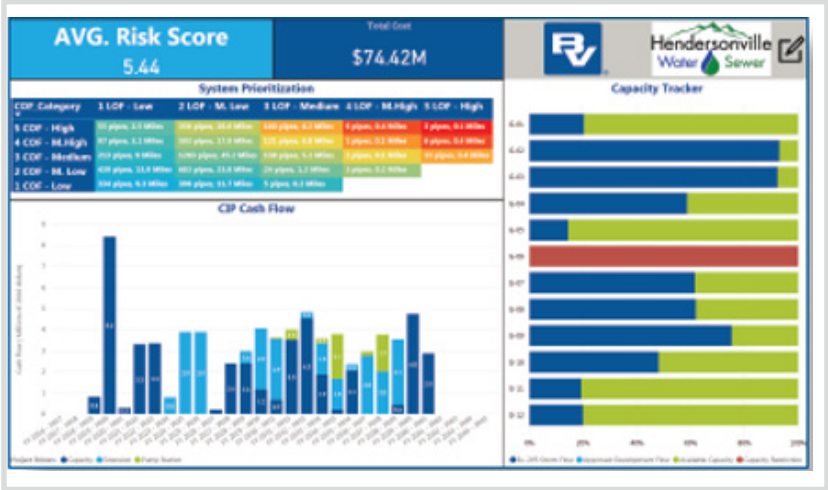
The Replacement Planning Model Module which was developed for HRSD provides a clear, risk-based picture of anticipated rehab/replacement spending over time, which enhanced HRSD's ability to effectively budget spending.

Using the risk calculations combined with unit cost information and the hydraulic modeling results the Black & Veatch team will prepare recommendations on replacement versus renewal projects. The City will be able to drill down into the details on why a recommendation was made and when the action should be taken.

CIP Dashboard

Black & Veatch created a CIP Dashboard for Hendersonville, NC that summarized the CIP data and showed the impact of each recommendation on the projected cash flow.

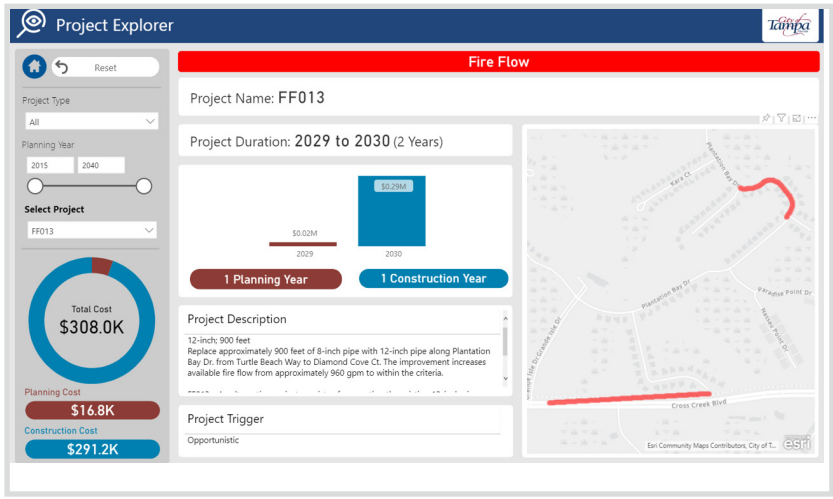
The Black & Veatch Team will prepare the recommended CIP to the City with prioritized projects based on current data, but which can be adapted as the Plan is implemented and system conditions change in coming years.

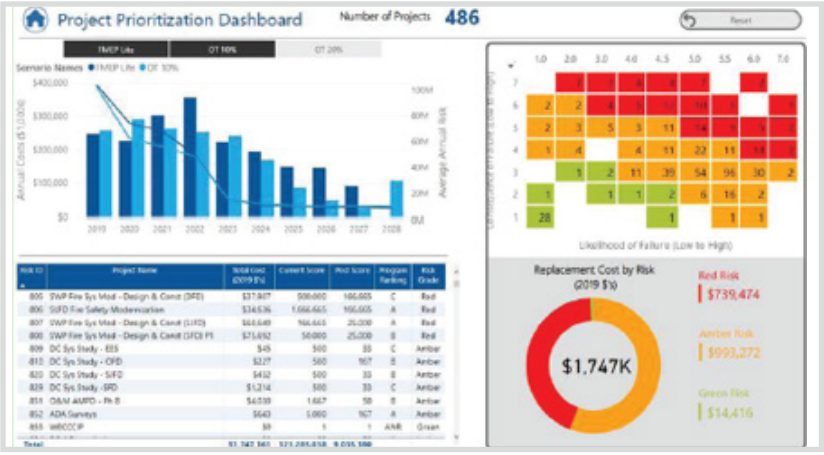


Project Explorer

This is an example Project Explorer dashboard from the City of Tampa. The iCIP module will detail each project in addition to the overall CIP cash flow.

Each proposed project for the City will have a similar dashboard detailing the intent of the project, the project trigger, and other pertinent information needed to execute the project and allow the City to adapt to any new conditions.

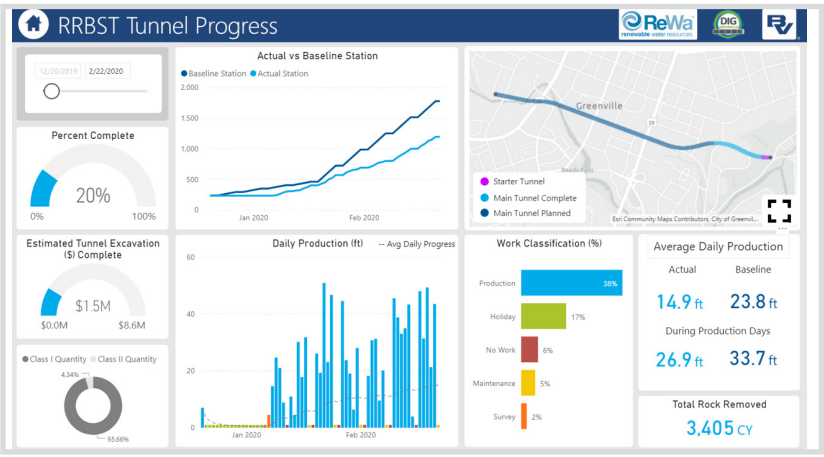




CIP Optimization

This is an example of a CIP Optimization Module which allows for comparison of multiple CIP Optimization Scenarios based on different investment constraints to view impact on risk reduction over time.

With this dashboard the City can examine and optimize the CIP based on overall system risk. This combines information from the hydraulic modeling capacity results, the R&R risk prioritization and vertical asset risk analysis. We will create packages of projects which reduce the risk to the system overall.



Condition Assessment – Schedule Tracking

We recently used a Power BI Dashboard to coordinate multiple engineering firms and contractors on a major tunneling project for ReWa. This tool allows for ReWa and the project team to track progress on the schedule and the distance the tunnel has been drilled.

The Black & Veatch Team will use something similar for the condition assessment portion of the project. We will be able to pull in information for multiple inspectors and locations to help the City track the overall program schedule and ensure the goals are being met.

Pipeline Condition Assessment Management – Cost Tracking

In the same Management Platform for ReWa, a cost tracking module was provided.

The Black & Veatch team will pull in data from all of the contractors and inspection teams to be able to trend their progress and correct problems before they become a bigger issue.

PHASE 7 Asset Management Program (Optional)

The City many consider adding a couple scope items to the Master Plan to complete the few remaining items and efficiently expand its asset management program.

SET TARGET LEVELS OF SERVICE (LOS)

Levels of Service (LOS) set out what a utility intends to deliver to its customers and other stakeholders. They should be aligned with the utility's strategic goals as part of a structured hierarchy. Typically specific performance measures and targets are developed for each LOS.

LOS and performance measures are used to monitor and evaluate performance against targets. Black & Veatch will first review the City's existing LOS standards and performance measure, compare them against industry standards like the AWWA benchmarking and SMRP maintenance metrics, and recommend any additional measures to use.

Black & Veatch will then use the City's available performance data to build dashboards using the Utility Management Platform to report LOS and performance measures.

BUILD ASSET MANAGEMENT PLAN

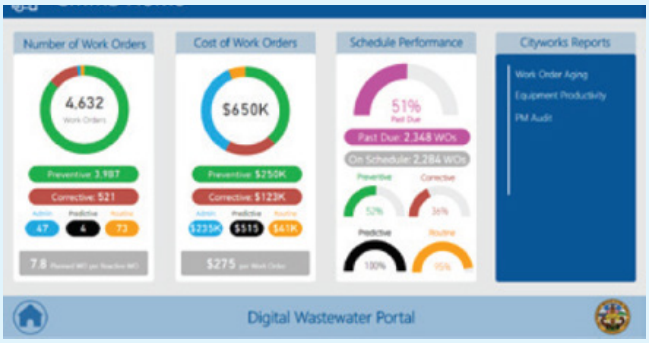
Black & Veatch's Utility Management Platform can be also be used to create a dynamic asset management plan using the components of the different tasks, including the asset inventory, risk assessment and KPIs.

OPTIMIZE O&M INVESTMENT

Black & Veatch is an industry leader in engineering consulting for water and wastewater treatment plants. We provide services such as master planning, process evaluations, permitting and regulatory assistance, preliminary and detailed design, bidding services, construction phase services and inspection, startup and commissioning, operational assistance and training, and a host of related services. Using this experience we will be able to thoroughly analyze the Water System Operations and Maintenance practices and optimize the investment in those systems.

> "Far-reaching strategic projects like the Utility Enterprise Initiative require a wide variety of technical and soft skills as well as the leadership to focus these diverse skills on a common goal. The professionals at Black & Veatch have consistently met these challenging demands and we look forward to continuing our progress with them through the remainder of the Initiative and beyond."

CLAYTON EDWARDS, PE
DIRECTOR, WATER AND SEWER DEPARTMENT
TULSA METROPOLITAN UTILITY AUTHORITY (TMUA)



The Utility Management Platform is a perfect fit to monitor and track Key Performance Indicators (KPI) for the City of Hollywood. KPIs can vary from work order completion as shown above to pressures in the distribution system. Anything that is connected to SCADA, Cityworks, GIS and the hydraulic model can be shown at the same time on the same dashboard.

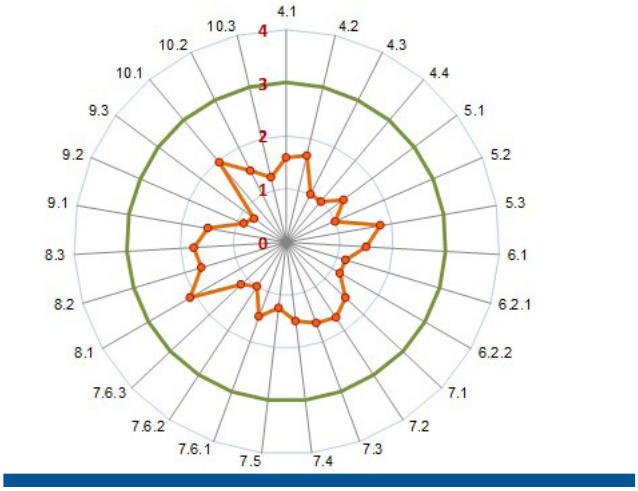
Asset Management Program Development

Black & Veatch's Asset Management team brings best practices from around the world to help our clients improve their asset management approaches. As an Institute of Asset Management (IAM) Endorsed Assessor for International Standards Organization (ISO) 55001, we have assisted numerous clients in the United States and internationally with the implementation of asset management (AM) programs.

The first stage in the AM program development is to perform a gap assessment against the ISO 55001 standard by interviewing staff and reviewing existing processes.

Black & Veatch has a standard approach for the assessment and a tool to score maturity. The gap assessment will identify improvements to be made and will be used to develop an AM Improvement Roadmap.

Black & Veatch has been assisting TMUA to implement an AM Program over the past seven years. TMUA has developed a documented AM Framework and is considering certification to ISO 55001. Some of the benefits reported by TMUA staff include better collaboration and decision making, and improved knowledge sharing and retention. Stated benefits include "everyone is on the same page now;" "asset management is more transparent" and "a lot more consistent documentation."

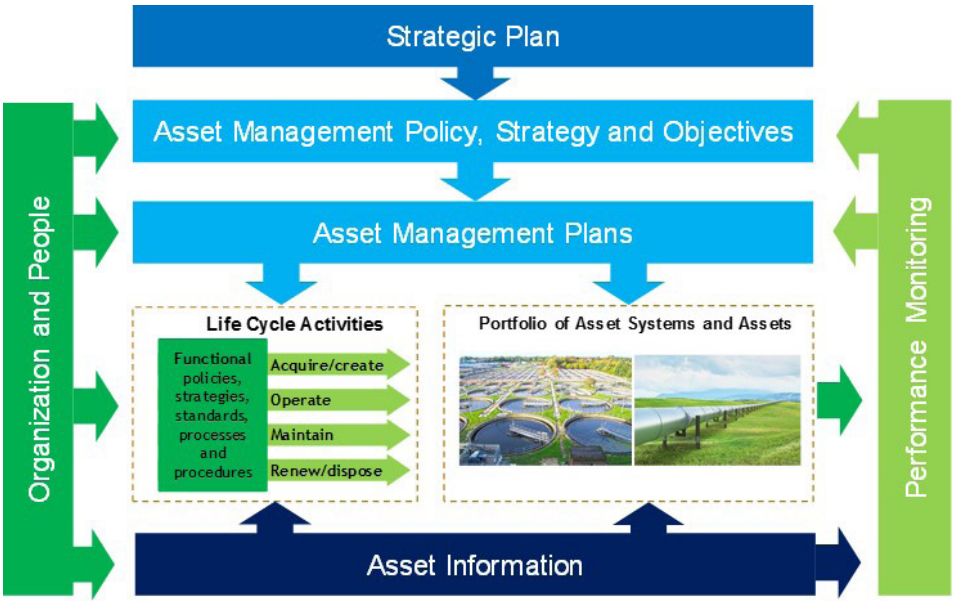


The radar plot shows the results of an ISO 55001 assessment. Maturity is assessed against 27 requirements and scored on a scale of 0 to 4, where a score of 3 is compliance with the requirements.

Asset Management Program Implementation

Black & Veatch's approach to implementing an AM program is to develop the components of an Asset Management Framework. The framework provides a structure to the development of the program, requires clearly defined strategies, and enables the documentation of key processes.

The first component of the AM framework is the AM policy, strategy and objectives, and Black & Veatch can assist the development with facilitated workshops, examples and templates.



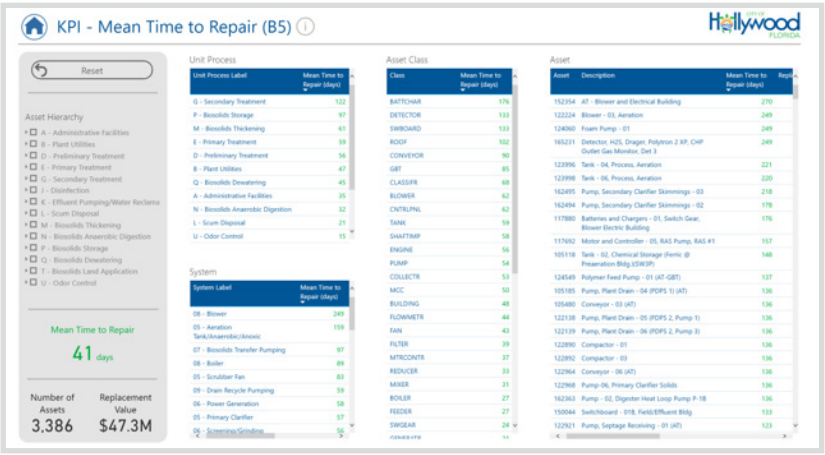
Other tasks could include:

- Program management
- Management of change
- Asset management training
- AM organizational design
- Business process mapping and SOP development
- Maintenance management strategy development
- Enhanced data analytics

In support of the optional Asset Management Program, the Black & Veatch team can prepare a series of key performance indicator dashboards to support the City's goals.

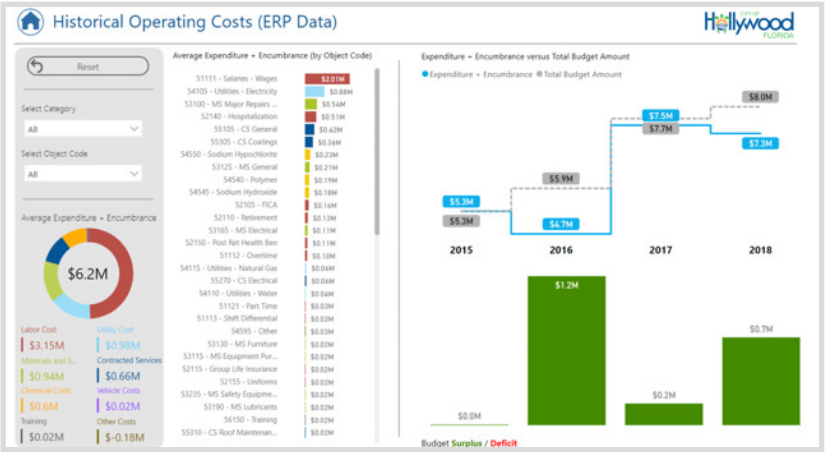
Maintenance Work Orders (Optional)

An important KPI for the City is tracking the number of active work orders, corrective versus preventative work orders and duration of open work orders. A dashboard like this can be prepared to help City staff view and manage their progress without installing Cityworks on their computers.



Meant Time to Repair (Optional)

Through analyzing trends and data in Cityworks regarding work orders and specific equipment, a dashboard will be created to calculate the mean time to repair various asset types and classes. This information can be used to more effectively schedule future work orders. It can also be used to help determine when assets should be replaced.

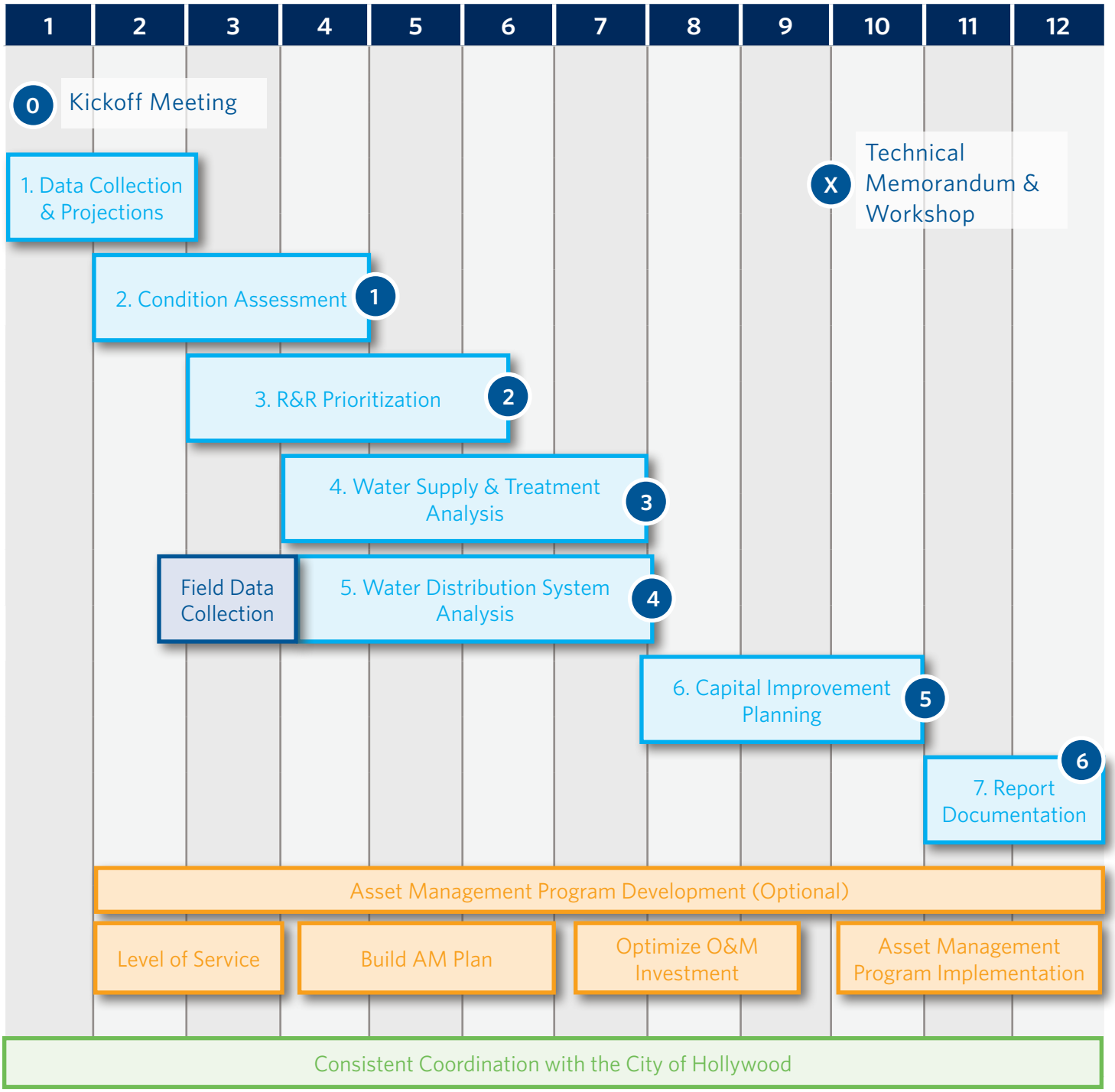


Historic Operating Costs (Optional)

Data from multiple sources can be pulled together to calculate the operating and maintenance costs for different assets and classes. This can be used to help identify large cost sinks and potentially recommend cost savings improvements either through capital projects or operational changes.

SCHEDULE

Black & Veatch fully understands and can successfully deliver the water master planning and engineering services requested by the City in the RFQ. The Project Workflow figure and Schedule illustrated below provides an overview of our Technical Approach and the coordination and timing for successfully executing key elements and tasks of the Water Master Plan.



Summary of Experience

Infrastructure planning is one of the most valuable activities undertaken by our clients. As our nation's water systems continue to age and deteriorate, and new performance standards and regulations are established, a comprehensive planning approach that focuses on optimizing the system's performance, cost and risk is more important than ever.

Black & Veatch is an industry leader in providing water utilities, like the City of Hollywood, comprehensive master plans and dynamic planning tools they can continue to use after delivery of the master planning project.

Black & Veatch has completed hundreds of Water System Master Planning projects for utilities throughout the United States, and has pioneered the development and use of dynamic, adaptive and interactive planning tools to support these efforts. While each water system is unique, many face similar challenges and have the same primary goals of providing a safe, reliable and affordable water supply for their communities. Our team will leverage the experience gained from supporting numerous water utilities throughout Florida and the United States to deliver a Water System Master Plan to the City that is implementable and optimized to meet the City's needs.

FLORIDA UTILITY EXPERIENCE

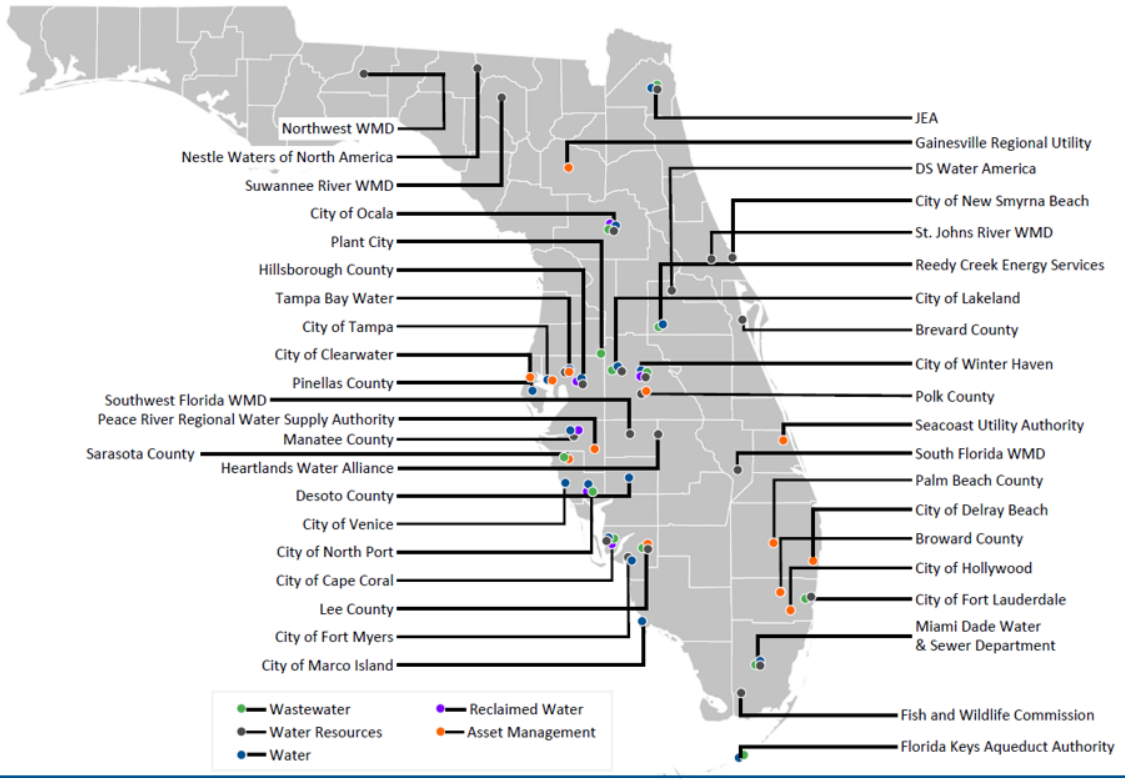


TABLE 1. Select Black & Veatch Team's Risk-Based Prioritization; Hydraulic and Transient Modeling; and Condition Assessment Experience

PROJECT	CONDITION ASSESSMENT EVALUATION	DEMAND PROJECTIONS	WATER SUPPLY PLANNING	WATER TREATMENT EVALUATION	WATER DISTRIBUTION EVALUATION	ASSET MANAGEMENT PROGRAM	CONDITION ASSESSMENT DATA ANALYSES	RISK-BASED PRIORITIZATION & CAPITAL PLANNING	DYNAMIC MASTER PLANNING & CIP DEVELOPMENT	EMERGENCY RESPONSE PLANNING	REGULATORY REVIEW	STAFF TRAINING
City of Tampa, FL; Potable Water System Master Plan		■		■	■	■	■	■	■		■	■
Miami-Dade WASD, FL; Infrastructure Assessment and Replacement Program								■		■		
FKAA, Key West, FL; Stock Island Facility Plan	■	■	■	■	■						■	
Miami-Dade WASD, FL Hydraulic Modeling Support of Planning Activities		■	■									
Miami-Dade WASD, FL Hialeah Water System Modeling and Pressure Study					■							
Pinellas County, FL; Water System Master Plan Update	■	■	■	■	■	■	■	■	■		■	■
Peace River MRWSA, FL; R&R Sufficiency Funding Study	■					■	■	■	■			■
City of Tulsa, OK; Water and Sewer Risk Prioritization	■					■	■	■				
Charlotte Water, NC; Risk Based Pipeline Prioritization		■			■	■	■	■	■			
City of San Jose, CA; Process Piping Condition Assessment	■					■	■	■				
Tampa Bay Water, South Central Hillsborough Regional Wellfield Surge Analysis					■							
Tampa Bay Water, Enhanced Surface Water System Surge Analysis					■							
Tampa Bay Water, FL Regional System Transient Analysis					■							
City of Wilmington, DE; Water and Wastewater Rate Studies					■	■	■	■	■			
City of Venice, FL: Water System Master Plan Update		■	■		■			■	■			
City of Canton, GA; Water and Wastewater Master Plan		■	■	■	■				■		■	■
DeSoto County, FL; Water System Assessment					■							■
City of Fort Myers, FL; Water Treatment Facilities Plan	■	■	■	■			■		■		■	
Greenville Water; SC; Water Facilities Plan	■	■	■	■	■	■	■		■		■	■
Polk County, FL; WRF Data Collection	■					■	■					
Charlotte Water, NC; Water Master Plan	■	■	■	■	■	■	■	■	■		■	■

Black & Veatch has the experience needed to provide the City with a master plan to meet all of the City's needs and provide confidence for the future of the water system.

Stock Island Reverse Osmosis (SIRO) Facility

FLORIDA KEYS AQUEDUCT AUTHORITY | KEY WEST, FLORIDA

RELEVANCE TO CLIENT

- Water Treatment Plant Facility Plan
- Reverse Osmosis Membranes Experience
- Raw Water Supply Analysis

ORIGINAL SCHEDULE

July 2018 - November 2018

ACHIEVED SCHEDULE

July 2018 - November 2018, Achieved

NUMBER AND DESCRIPTION OF CHANGE ORDERS

No change orders were requested

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATION

Not applicable as project did not include construction services

OWNER'S REFERENCE

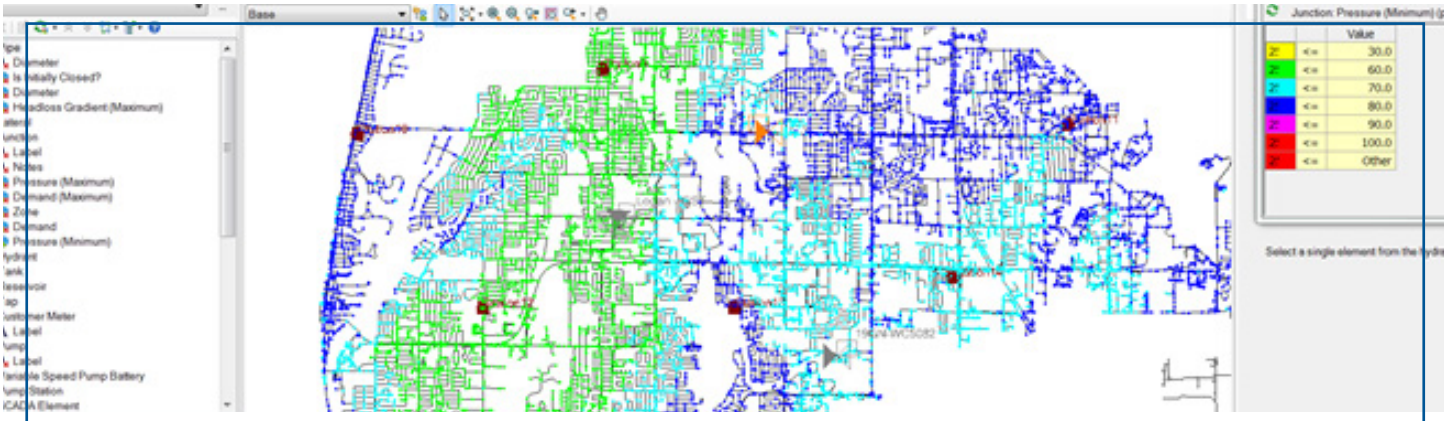
Jolynn Reynolds
1100 Kennedy Drive
Key West, FL 33040
(305) 295-2141

The FKAA supplies an average of 17 mgd of potable water to the Florida Keys. The FKAA currently provides all its water through 130 miles of transmission pipe from its water supply source in Florida City to Key West. Due to the long length of the transmission pipeline and its numerous water crossings, water service is highly susceptible to interruptions due to hurricanes or other emergencies. The FKAA is focusing on establishing a more resilient system by proactively planning for improvements to the seawater treatment systems to manage risk and improve supply reliability. Part of these improvements includes upgrades and expansion of the KHLSDF and consideration of new building codes and standards.

The FKAA requested Black & Veatch to conduct a facility planning assessment for the KHLSDF provide:

1. A review of water demands tributary to the KHLSDF to determine optimal plant size
2. An assessment of facility operational mode (e.g. emergency standby or baseload) and power supply (FKAA owned facility at KHLSDF or shared with Keys Power)
3. Associated lifecycle costs (capital and operating) and non-economic factors for these scenarios to better determine the optimal and cost-effective approach for the KHLSDF

Black & Veatch utilized a holistic approach to accomplish FKAA goals for the facility planning, conceptual design and its associated cost estimate for the KHLSDF project, which resulted in FKAA's optimal plant size selection, sized to maximize supply (with anticipated demand) while minimizing cost and providing construction cost certainty.



Water System Master Plan

PINELLAS COUNTY | CLEARWATER, FLORIDA

RELEVANCE TO CLIENT

- Model Update and Calibration
- Performance Criteria
- Demand Projections
- Treatment Capacity Evaluation
- Water Quality Analysis
- Capital Improvement Planning

ORIGINAL SCHEDULE

October 2020

ACHIEVED SCHEDULE

Ongoing

NUMBER AND DESCRIPTION OF CHANGE ORDERS

No change orders have been requested

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATIONS

Not applicable as project did not include construction services

OWNER'S REFERENCE

Margaret (Becky) Cook
14 South Fort Harrison Blvd, 6th Floor,
Clearwater FL
(727) 453-3343

Pinellas County's water system serves more than 675,000 residential, commercial, industrial, institutional, and wholesale users, providing an average of more than 50 million gallons a day (mgd) of potable water drawn from groundwater, surface water, and desalinated sources. Black & Veatch was selected to update the County's master plan for the system, including its source waters and pumping, distribution, and treatment facilities.

For the update, Black & Veatch implemented an adaptive master planning approach that leveraged the latest technologies in hydraulic and water quality modeling, GIS, and asset management, and used Black & Veatch's custom, interactive CIP planning tools. The dynamic approach allowed reassessment of projects and optimization of plans as changing drivers and conditions influenced project decisions and schedules. Some unique an innovative planning approaches and tools provided to the County included:

- Demand allocation figures to illustrate the demand concentrations and future growth patterns.
- Development of multiple levels of system performance criteria based on industry benchmarks and state/local regulations that are used to assess system adequacy and determine system improvement needs and priorities.
- Water quality assessments and iterative improvement planning to minimize water quality/age/chlorine residual impacts that can be associated with hydraulic capacity driven improvements.
- R&R Risk-Based Prioritization including Facility, Security, Level of Service, and Water Conservation assessments.

Potable Water System Master Plan

CITY OF TAMPA | TAMPA, FLORIDA

RELEVANCE TO CLIENT

- Model Update and Calibration
- Demand Projections
- NRW Seasonality
- Performance Criteria
- Fire Flow Analysis
- Water Quality Analysis
- Asset Management Gap Assessment and Roadmap
- Risk Based Prioritization of Pipeline R&R Needs
- CIP Prioritization

ORIGINAL SCHEDULE

Sept. 2015 - June 2016

ACHIEVED SCHEDULE

Sept. 2015 - July 2018

Schedule Delay due to finding a 36-inch closed valve during calibration and the City reconfiguring the distribution system from one pressure zone to three in the middle of the project.

NUMBER AND DESCRIPTION OF CHANGE ORDERS

One change order was requested for recalibration once the 36-inch valve was opened and the system reconfiguration was completed.

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATIONS

Not applicable as project did not include construction services

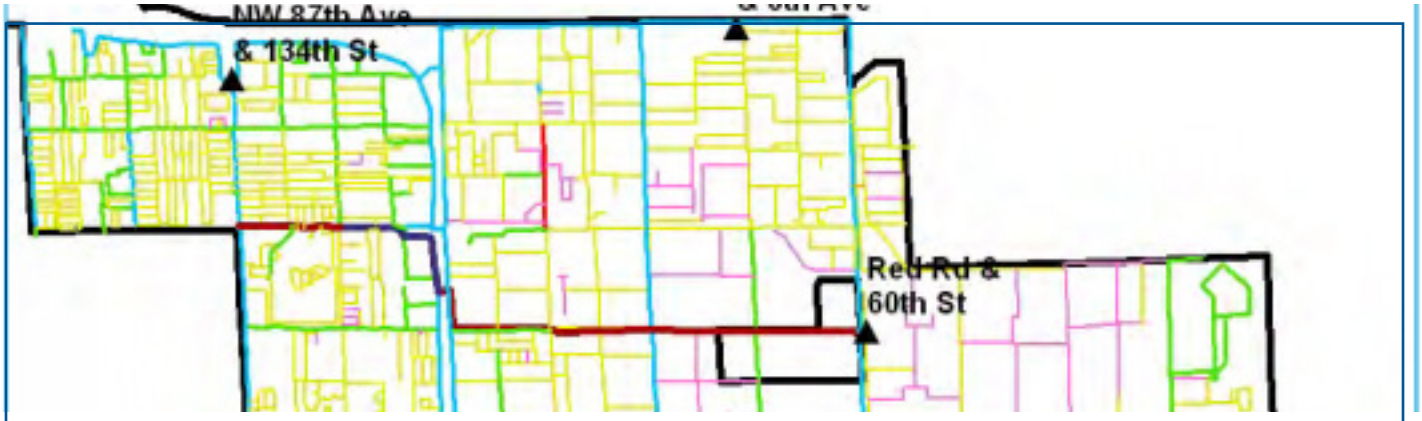
OWNER'S REFERENCE

Brian Pickard
306 E. Jackson St.
Tampa, FL 33602
(813) 274-3282

The City of Tampa provides water service to more than 590,000 people in Tampa, Florida, at an average day demand of 70 mgd. The water distribution system is supplied from a surface water supply and treatment facility (Hillsborough River and the D.L. Tippin WTP) and through interconnections with Tampa Bay Water, which is a regional wholesale water supply authority in the area. The distribution system has one primary pressure zone and includes six storage tanks, five repump stations, and more than 2,400 miles of water main.

The Potable Water System Master Plan project involved many traditional system planning elements, including: water demand projections, hydraulic model update and calibration (using Innovyze's InfoWater software), hydraulic capacity evaluation, capital improvements program (CIP) development, and preparation of a master plan report. However, the project also included some unique an innovative planning approaches and tools to provide the City with a comprehensive and adaptable master plan. This included:

- Development of multiple levels of system performance criteria based on industry benchmarks and state/local regulations.
- Resiliency and reliability assessments including identification of critical infrastructure, asset failure analyses, and defining improvements to increase system resiliency.
- Water quality assessments and iterative improvement planning to minimize water quality/age impacts that can be associated with hydraulic capacity driven improvements.
- Asset Management Program Framework Development, including a gap assessment based on ISO 55000 standards and developing an Asset Management Program Implementation Roadmap Plan.
- Risk Based Prioritization for Pipeline R&R needs using Innovyze's InfoMaster software.



Hialeah Water System Modeling and Pressure Study

MIAMI-DADE WATER AND SEWER DEPARTMENT | MIAMI, FLORIDA

RELEVANCE TO CLIENT
- Hydraulic Modeling
- Planning

ORIGINAL SCHEDULE
1 month

ACHIEVED SCHEDULE
1 month

NUMBER AND DESCRIPTION OF CHANGE ORDERS
None

AVERAGE TURNAROUND TIME FOR REQUESTS FOR INFORMATION
Not applicable as project did not include construction services

OWNER'S REFERENCE
Peter Jelonek, PE
3071 SW 38 Avenue
Miami, FL 33146
(786) 552-8117

The Miami-Dade Water & Sewer Department (MDWASD) supplies water to the City of Hialeah through interconnections at four locations. After a new interconnection was installed with the City of Hialeah, MDWASD decided to model the distribution system network of the City of Hialeah. MDWASD had developed an all-pipes model of the Miami-Dade distribution system and it is desirable at this time to construct and incorporate the distribution system network of the City of Hialeah into this model.

There are existing concerns expressed to the Department by the City of Hialeah. The City is currently experiencing low pressures on the northwest portion of the City, as well as the local hospital. There is not an existing system model of the piping network for the City of Hialeah, therefore the Department considers it necessary to develop a basic model that can be used to make decisions about the supply to this customer.

Planning services performed by Black & Veatch included:

City of Hialeah Distribution System Model Construction

This task included the construction of the hydraulic model for the City of Hialeah.

Model Evaluations

The following evaluations were performed:

- Evaluations using observed flow information at a point in time where supply to Hialeah is being fed through the three meters: the meter at the Hialeah Water Treatment Plant (WTP) 2nd Ave and 7th Street, the meter at 13th Street and 2nd Avenue, and the meter at W 4th Ave and 68th Terrace.
- Evaluation using observed flow information when the meter near West 80th Street and 24th Court was added to the system.

Asset Inventory Survey and Renewal Forecasting

PEACE RIVER MANASOTA REGIONAL WATER SUPPLY AUTHORITY | ARCADIA, FLORIDA

RELEVANCE TO CLIENT

- Asset Inventory and Condition Survey
- Facility Asset Risk Assessment
- Pipeline Asset Risk Assessment
- Asset Replacement Cost Estimating
- Replacement Planning Model
- Asset Management Plan Development
- Power BI Dashboard

ORIGINAL SCHEDULE

Oct. 2019 - March 2020

ACHIEVED SCHEDULE

Oct. 2019 - March 2020, Achieved

NUMBER AND DESCRIPTION OF CHANGE ORDERS

No Change orders were requested

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATION

Not applicable as project did not include construction services

OWNER'S REFERENCE

Mr. Kevin Morris
9415 Town Center Parkway
Lakewood Ranch, FL 34202
(941) 316-1776

Peace River Manasota Regional Water Supply Authority (the Authority) supplies drinking water to more than 900,000 people across Charlotte, DeSoto, Manatee and Sarasota counties in Florida. The Authority's assets include 70 miles of transmission main, a 51 mgd Water Treatment Plant, a 6-billion-gallon reservoir, pumping stations and ASR wells.

As part of its rate study the Authority had to determine the sufficiency of its Renewal and Replacement (R&R) fund, so Black & Veatch was contracted to develop an R&R forecast as part of an asset management plan for the Authority's facilities. The project consisted of the following tasks:

- Asset inventory survey and condition assessment of the facility assets
- Risk assessment of the facility and pipeline assets
- Useful life assessment and forecasting rehabilitation and replacement costs
- Development of a dynamic asset management plan using Power BI

For the inventory survey Black & Veatch developed a Survey123 form to collect asset and condition data, and a multidisciplinary team spent 3-4 days on site collecting data and assessing asset condition and performance. Consequence of failure was also assessed and combined with the condition score to assess facility asset risk. A desktop risk assessment was performed on the pipeline assets.

A replacement planning model was developed in Power BI, using the asset inventory, condition and risk scores to calculate remaining life. Replacement costs were estimated for all the assets and added to the model to forecast the R&R.

> "Black & Veatch has capably met our needs on a tights, demanding schedule. I could not be happier with their level of effort and commitment."
>
> **KEVIN MORRIS**

WWTF Data Collection

POLK COUNTY | WINTER HAVEN, FLORIDA

RELEVANCE TO CLIENT

- Facility Condition Assessment
- Data Collection
- Connecting condition data to CMMS systems

ORIGINAL SCHEDULE

Nov. 2019 - Feb 2020

ACHIEVED SCHEDULE

Nov. 2019 - Feb. 2020, Achieved

NUMBER AND DESCRIPTION OF CHANGE ORDERS

No Change orders were requested

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATION

Not applicable as project did not include construction services

OWNER'S REFERENCE

Chuck Nichols
1011 Jim Keene Blvd.
Winter Haven, FL 33880
(863) 298-4215

The County owns and operates seven wastewater treatment facilities (WWTFs) within six regional utility service areas, including four regional facilities and three smaller "package" plants. As part of a comprehensive asset management program, the County wished to collect asset inventory data from these facilities for use in a computer maintenance management system (CMMS). Additionally the County wished to assess asset condition in conjunction with the collection of asset inventory data.

Black & Veatch provided field data collection services to collect the desired asset inventory and condition data. The following tasks were included:

- Data Collection Plan
  - Update Survey123 Forms
  - Develop Data Collection Plan
- Data Collection: WWTF Asset Surveys
- Data Submission
  - Data Analysis and Quality Control
  - Data Submission

PERFORMANCE RATING:

SCORE	RATING
81 - 100%	EXCELLENT
60 - 80%	SATISFACTORY
31 - 59%	NEEDS IMPROVEMENT
0 - 30%	UNSATISFACTORY

TOTAL SCORE: 91.25

BoCC Project Mgr. Signature: Charles Nichols

Division Director Signature: Tamara Richards

Procurement Specialist Signature: 04/01/2020

Mailing Date: 04/01/2020

Black & Veatch received an "Excellent" score from Polk County on their work on the Project.

Bond Consulting Engineering

MIAMI-DADE WATER AND SEWER DEPARTMENT | MIAMI, FLORIDA

RELEVANCE TO CLIENT

- Water system master planning
- Water treatment facilities assessments
- Prioritization and criticality evaluations

ORIGINAL SCHEDULE

2009 - 2015

ACHIEVED SCHEDULE

2009 - 2015

NUMBER AND DESCRIPTION OF CHANGE ORDERS

None

AVERAGE TURNAROUND TIME FOR REQUEST FOR INFORMATION

Not applicable as project did not include construction services

OWNER'S REFERENCE

Frances Morris
3071 SW 38 Avenue
Miami, FL 33146
(786) 552-8620

Black & Veatch served as the Bond Consultant Engineer for MDWASD since 2009. Bond Consultant Engineering services are provided to ensure that the Department remains in compliance with the Master Bond Ordinance 93-134, which specifies a number of operational and financial requirements that the Department must meet on a recurring basis and for the issuance of additional bonds. Black & Veatch has been responsible for the preparation of two reports annually.

The Annual Bond Consultant Report, which assesses the Department's overall operations and financial performance services to document the physical status of system assets, the adequacy of the Renewal & Replacement (R&R) deposit and the adequacy of the capital improvement program. As required by the Bond Ordinance, the condition of approximately one-third of MDAWSD's major water and wastewater system facilities must be evaluated. The facilities inspected include:

- Three regional wastewater treatment plants (NDWWTP, CDWWTP, and SDWWTP)
- Approximately 80 of the largest sewer system pumping stations in the system
- Three water treatment plants
- Five wellfields (93 Biscayne aquifer wells) and the five South Dade Water Systems
- Six water booster/storage facilities

In order to comply with the inspection of the entire system every three years, approximately one-third of the major assets and a representative sampling of pump stations are scheduled to be inspected as part of this report. The Bond Consultant's Annual Report focuses on the following eight (8) primary areas of the Department:

- Department Organization and Management
- Department Accomplishments and Challenges
- Customers and Sales
- Water System
- Wastewater System
- Capital Improvements Program
- Renewal and Replacement Program
- Financial and Business Condition

Hydraulic Modeling in Support of Planning Activities

MIAMI-DADE WATER AND SEWER DEPARTMENT | MIAMI, FLORIDA

RELEVANCE TO CLIENT
- Hydraulic Modeling
- Water System Planning
- Capacity Evaluations

ORIGINAL SCHEDULE
12 months

ACHIEVED SCHEDULE
12 months

NUMBER AND DESCRIPTION OF CHANGE ORDERS
None

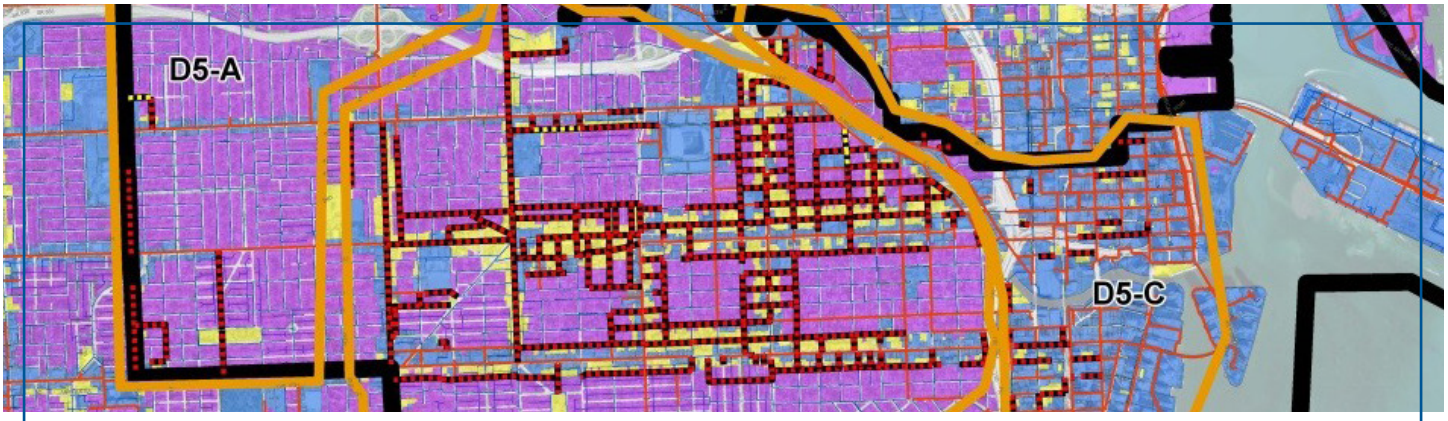
AVERAGE TURNAROUND TIME FOR REQUEST FOR INFORMATION
Not applicable as project did not include construction services

OWNER'S REFERENCE
Daniel Edwards
3071 SW 38 Avenue
Miami, FL 33146
(786) 552-8354

Black & Veatch performed multiple capacity studies initiated by the Miami-Dade Water & Sewer Department's Planning Division (Department).

The services performed by Black & Veatch included:

- Water and Wastewater Capacity Analysis Orientation – Black & Veatch staff met with the Department's staff for a one week period to familiarize them with the current processes that are utilized to perform capacity analyses.
- Water Hydraulic Model Operation and Maintenance – This task provided for fire flow / capacity analysis for new developments requesting connection to the water distribution system.
- Incorporate the plans of the new developments into the hydraulic model.
- Performed hydraulic analysis under steady state Maximum Day Demand + Fire Flow conditions to assess the performance of the system.
- Determined the extent (diameter and configuration) to which water piping, pumps, and or reservoirs must be up-sized to accommodate the new development loadings and meet Department performance standards.
- Incorporated distribution system improvements and re-ran the model to confirm that adequate performance was achieved.



Water Infrastructure Improvements to Non-Residential Zoned Properties in the Miami-Dade Service Area

MIAMI-DADE WATER AND SEWER DEPARTMENT | MIAMI, FLORIDA

RELEVANCE TO CLIENT
- Hydraulic Modeling
- CIP Planning
- Funding and financing review

ORIGINAL SCHEDULE
6 months

ACHIEVED SCHEDULE
6 months

NUMBER AND DESCRIPTION OF CHANGE ORDERS
None

AVERAGE TURNAROUND TIME FOR REQUESTS FOR INFORMATION
Not applicable as project did not include construction services

OWNER'S REFERENCE
Peter Jelonek, PE
3071 SW 38 Avenue
Miami, FL 33146
(786) 552-8117

As a result of a resolution from Board of County Commissioners of Miami-Dade County, the Water and Sewer Authority (WASD) engaged Black & Veatch to provide a plan, including planning level cost estimates and project schedules, to proactively upgrade the deficient local distribution system in non-residential areas to meet current system standards as a way of encouraging economic development and to provide a more reliable distribution system that meets non-residential fire flow needs. The plan used MDWASD's water system model in InfoWater and their integrated GIS to identify deficient infrastructure and to provide a plan to upgrade water service to commercial and industrial areas which included proposed funding in the water and sewer 5-year capital program.

Planning services performed by Black & Veatch included:

Corridor Selection – Deficient Infrastructure Identification. The GIS layers provided by the Department were utilized to update the current model pipe network and to identify the non-residential corridors/parcels that were lacking the appropriately sized water main infrastructure.

Improvements. Single pipe deficiencies that were in close proximity were grouped together to create individual construction projects, then the projects were grouped within one of thirteen commissioning Districts by geographical proximity.

Opinion of Probable Construction Costs. The opinion of probable construction cost covers the improvements identified and includes the construction, engineering, and land acquisition costs as needed.

Scheduling. In general, it has been assumed that all of the projects will be completed within a 10-year time frame.

MDWSD Infrastructure Assessment and Replacement Program

MIAMI-DADE WATER AND SEWER DEPARTMENT | MIAMI, FLORIDA

RELEVANCE TO CLIENT

- Prioritization Planning
- Prioritized all pipelines 16-inch diameter and larger for future inspection
- Condition assessment and determined if rehabilitation or replacement
- The complete list of all pipe segment prioritization was provided

ORIGINAL SCHEDULE

Jan 2013 – Dec 2013

ACHIEVED SCHEDULE

Jan 2013 – Dec 2013, Achieved

NUMBER AND DESCRIPTION OF CHANGE ORDERS

No change orders were requested.

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATION

Not applicable as project did not include construction services

OWNER'S REFERENCE

Daniel Edwards
3071 SW 38 Avenue
Miami, FL 33146
(786) 232-5257

The Miami-Dade Water and Sewer Department ("Department") experienced failures on large water mains and implemented a program for inspection and condition assessment. Inspections focused primarily on prestressed concrete cylinder pipe. Recognizing that other pipelines in the system may be at risk for failure, the Department contracted with Black & Veatch to provide a prioritization of all system pipelines 16-inch diameter and larger. These prioritized pipelines served as Stage 1 of a larger four stage program to improve the facilities within the Department. The program is summarized as follows:

1. Stage 1 – Prioritization Planning (this study)
2. Stage 2 – Inspection
3. Stage 3 – Condition Assessment
4. Stage 4 – Implementation of Solutions

The Department recognized that a prioritization program was necessary to prioritize which facilities should be inspected, evaluated with condition assessment, and potentially rehabilitated or replaced.

Black & Veatch prioritized all pipelines 16-inch diameter and larger for future inspection and condition assessment and determined if rehabilitation or replacement was required. Beyond the immediate purpose of establishing a prioritized list, an added benefit of this study was development of information that can easily be used to devise a systematic approach to conducting condition assessments using asset management principles. The results of this prioritization provided the basis for a program to plan and implement condition assessment inspections as part of an overall asset management plan which will allocate the limited available funding resources to those pipelines that pose the greatest risk.

Energy Efficiency Master Planning Services

CITY OF HOLLYWOOD DEPARTMENT OF PUBLIC UTILITIES | HOLLYWOOD, FLORIDA

RELEVANCE TO CLIENT

- Energy Efficiency Master Plan
- Development of CIP
- Business Case Evaluations
- Water Treatment Process Evaluations

ORIGINAL SCHEDULE

18 months

ACHIEVED SCHEDULE

18 months

NUMBER AND DESCRIPTION OF CHANGE ORDERS

A small amendment for $6,908 was approved by the City to implement minor updates to the Master Plan Report.

AVERAGE TURNAROUND TIME FOR REQUESTS FOR INFORMATION

Not applicable as project did not include construction services

OWNER'S REFERENCE

Francois Domond
1621 N. 14th Ave.
Hollywood, FL 33022
(954) 921-3258

The Energy Efficiency Master Plan resulted in a CIP for the implementation of 19 ECMs for combined annual energy savings of 7 GWh or 15% of the Utility's energy use.

Energy Efficiency Master Plan

Black & Veatch developed a comprehensive Energy Efficiency Master Plan for the City of Hollywood Department of Public Utilities, including the Water and Wastewater Treatment Systems. The master plan resulted in the development of a capital improvement plan (CIP) for the implementation of 19 energy conservation measures (ECMs) for combined annual energy savings of 7 GWh or 15% of the Utility's total energy use. The CIP also results in a net present value of $4.7 million over the life of the improvements. Specific tasks included:

- Development of an existing energy use baseline for the City's water and wastewater facilities and equipment.
- Evaluation of the current and potential alternate electric utility rate structures at each facility.
- Energy efficiency assessments, including efficiency evaluations of equipment, processes, pumping systems and the buildings at each facility.
- Development and analysis of over 50 ECMs. The analyses included capital cost estimates, energy use and cost impacts, other O&M cost impacts, and non-economic factors, such as operational complexity, water quality or regulatory impacts and public acceptance.
- Development and use of an Energy Project Decision Cash Flow Model to define an implementation strategy consistent with the City's overall CIP planning and project funding capabilities.
- The Energy Efficiency Master Plan is the first step for the City's Department of Public Utilities to become a model of energy efficiency and management in the United States.

Cityworks Implementation for Utilities

CITY OF HOLLYWOOD DEPARTMENT OF PUBLIC UTILITIES | HOLLYWOOD, FLORIDA

RELEVANCE TO CLIENT
- Asset Management
- Geographic Information Systems

ORIGINAL SCHEDULE
18 months

ACHIEVED SCHEDULE
18 months

NUMBER AND DESCRIPTION OF CHANGE ORDERS
None

AVERAGE TURNAROUND TIME FOR REQUEST FOR INFORMATION
Not applicable as project did not include construction services

OWNER'S REFERENCE
Francois Domond
Deputy Director
1621 N 14th Avenue
Hollywood, FL 33020
(954) 921-3930

To more effectively and efficiently manage its water and wastewater utility infrastructure as part of an overarching asset management program, the City of Hollywood Department of Public Utilities sought assistance to implement a new Computerized Maintenance Management System (CMMS). CMMS solutions are utilized in a variety of industries - manufacturing, pharmaceuticals, public works, and public utilities to name a few. However, to effectively support water/wastewater operations, the selected solution must support unique industry specific functions such as water line flushing, valve exercising, and CCTV inspections.

The benefits of implementing a modernized CMMS solution include:

Increased Level of Maintenance Information. Developing the historical database that becomes readily available as critical maintenance information is used, turning data into information that can be used to manage maintenance as a business. Improved Work and Service Request Control: streamlining the work order and service request modules, providing the basis for work management, cost tracking, equipment history, and performance reporting.

Improved Planning and Scheduling. Providing the systems and procedures to establish a more effective day-to-day maintenance planning and scheduling function, which is a key contributor to improved craft labor utilization and customer service.

Extend Equipment Life. Automatic scheduling of repetitive preventive maintenance (PM) activities through a well implemented CMMS solution. PM tasks and inspection frequencies can be documented on the PM module and failure trends monitored to highlight major causes of equipment breakdowns and unscheduled repairs.

SCADA Evaluation and System Improvements

CITY OF HOLLYWOOD DEPARTMENT OF PUBLIC UTILITIES | HOLLYWOOD, FLORIDA

RELEVANCE TO CLIENT

- Existing System Evaluation
- SCADA Planning Services
- SCADA Standards Development
- SCADA Programming

ORIGINAL SCHEDULE

2013 - 2014; 2019 - Ongoing

ACHIEVED SCHEDULE

2013 - 2014; 2019 - Ongoing

NUMBER AND DESCRIPTION OF CHANGE ORDERS

N/A

AVERAGE TURNAROUND TIME FOR REQUEST INFORMATION

Not applicable as project did not include construction services

OWNER'S REFERENCE

Francois A. Domond
Deputy Director
1621 N 14th Ave.
Hollywood, FL 33020
(954) 921-3930

SCADA System Evaluation

As part of the Energy Efficiency Master Plan, the Black & Veatch Team performed a high-level review and evaluation of the SCADA systems at both the Water and Wastewater Treatment Plants. The SCADA evaluation included automation and control system improvements related to energy conservation measures, as well as, long term SCADA recommendations for enhanced performance and optimized operations.

The existing SCADA system consists of programmable logic controller (PLC) interconnected using Ethernet network, with supervisory monitoring and control from a human machine interface (HMI) system of servers and workstations. This concept of PLC/HMI-based control system is a sound approach to SCADA and common in the water industry.

SCADA System Improvements

The SCADA system is being modified to improve automation. Black & Veatch provided the facility's operators with a step-by-step guide on the HMI and the ability to monitor the automatic or semi-automatic startup and shutdown sequences for multiple processes at the wastewater plant.

Black & Veatch developed process control strategies and I/O lists, which served as the basis for the PLC and HMI programming. To provide consistency for future programming by the City, the control strategies also included:

- PLC and HMI Standards and Conventions (including tagging and naming conventions)
- Screen Layouts
- Text Font and Color Conventions
- Analog Value Displays
- Standard Graphics
- Alarms and alarm handling
- PLC Program languages, layout and documentation

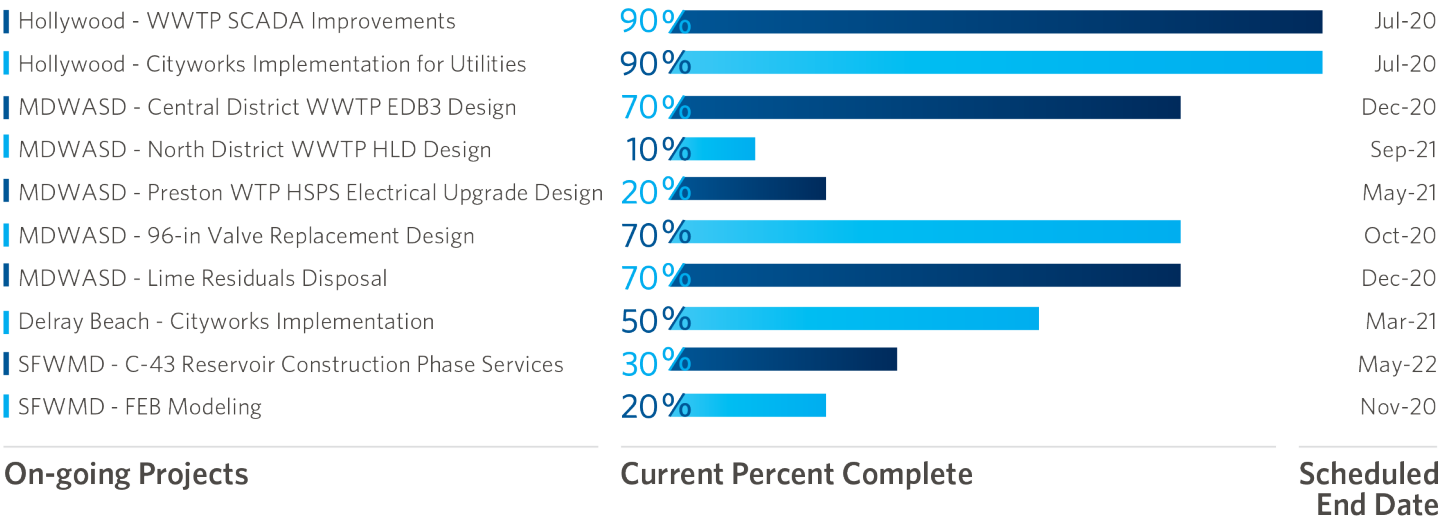
REFERENCES

NO.	LAST 10 PROJECTS COMPLETED BY BROWARD COUNTY OFFICE	CONTACT NAME	PHONE NO.	EMAIL
1	Hollywood - SCADA Improvements Phase 2	Francois Domond	(954) 921-3522	fdomond@hollywoodfl.org
2	Delray Beach - Cityworks Implementation Phase 1	Don Marese	(561) 243-7146	marese@mydelraybeach.com
3	Broward County - Clarifier Rehabilitation	Carlos Garcia	(954) 831-0920	cbgarcia@broward.org
4	Broward County - Master Pump Stations Rehab	Carlos Garcia	(954) 831-0920	cbgarcia@broward.org
5	Broward County - In-House Electrical O&M Services	Carlos Garcia	(954) 831-0920	cbgarcia@broward.org
6	SFWMD - S-127 CCC North Shore Automation Construction Phase Services	Tony Rosato	(561) 682-2604	arosato@sfwmd.gov
7	SFWMD - GG4 Structure Construction Phase Services	Gilbert Jean-Baptiste	(561) 682-6104	gjeanbap@sfwmd.gov
8	MDWASD - Hydraulic Modeling Support	Daniel Edwards	(786) 552-8354	djedw01@miamidade.gov
9	MDWASD - Sewer Service to Commercial Properties	Daniel Edwards	(786) 552-8354	djedw01@miamidade.gov
10	Deerfield Beach - East WTP Site Improvements	Allen Fathi	(954) 298-0407	afathi@deerfield-beach.com

CURRENT AND PROJECTED WORKLOAD AND TIME SCHEDULE TO COMPLETE PROJECT

Our current workload forecast confirms that Black & Veatch has more than adequate staff availability to execute the scope of services that would result from this project. In addition, the City will have access to our over 10,000 professionals to augment availability, if needed.

The following On-going Projects listing includes the projects awarded by the City in the last five years (currently in execution) as well as the other projects being executed by our Coral Springs office. The current percent complete and final completion dates are also included.



The future projects and schedules are listed in the table below.

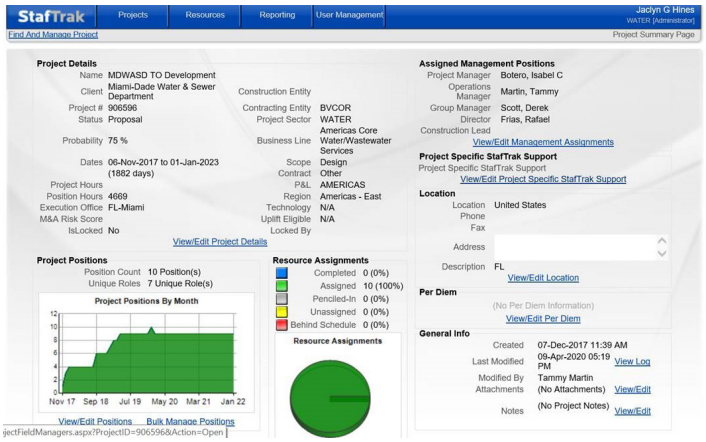
FUTURE PROJECTS	ANTICIPATED START DATE	SCHEDULED DURATION
MDWASD - Water Tanks Inspections	Sep-20	6 months
MDWASD - Hialeah Switchgear Replacement	Oct-20	4 months
MDWASD - Miami Springs Wellfield Rehabilitation	July-20	18 months
North Miami Beach Program	Aug-20	60 months
Hollywood - Cityworks Implementation for Public Works	Jul-20	18 months
Broward County WWS-Biosolids White Paper	Jun-20	6 months

Given our size, there are times when we work on projects concurrently. However, our approach to staffing projects focuses on finding the right balance between the required expertise for a project and the overall workload of our technical resources.

Black & Veatch responds to the challenges of managing concurrent projects by maintaining (and updating monthly) the StafTrak database, which includes current and upcoming projects, the specific professional resources assigned to each, and the monthly time commitment of each professional assigned to each project.

StafTrak allows our team to ensure that:

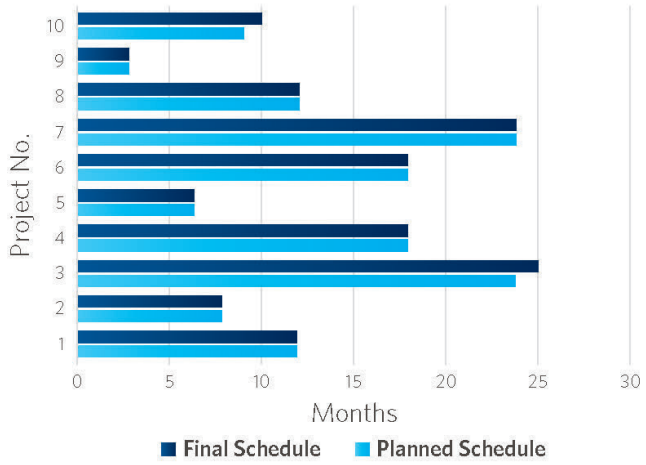
1. Each upcoming project has adequate resources and the right resources for the job
2. Each professional has an appropriate level of assignments



All our projects are managed and executed locally. However, we have the flexibility to engage our Global Integrated Workforce and to manage any occasion of unexpected increased workload.

ABILITY TO COMPLETE PROJECT ON TIME

Black & Veatch recognizes the importance of meeting schedule and budget requirements. We are prepared to devote the necessary resources to meet the most challenging schedules. We control the schedule and budget on projects through experienced and attentive project management. Development of a Work Plan at the beginning of each project and diligent adherence to the Work Plan are paramount to executing projects in an efficient and timely manner. **To the right we have provided bar charts of the last 10 projects completed by our Coral Springs office.**

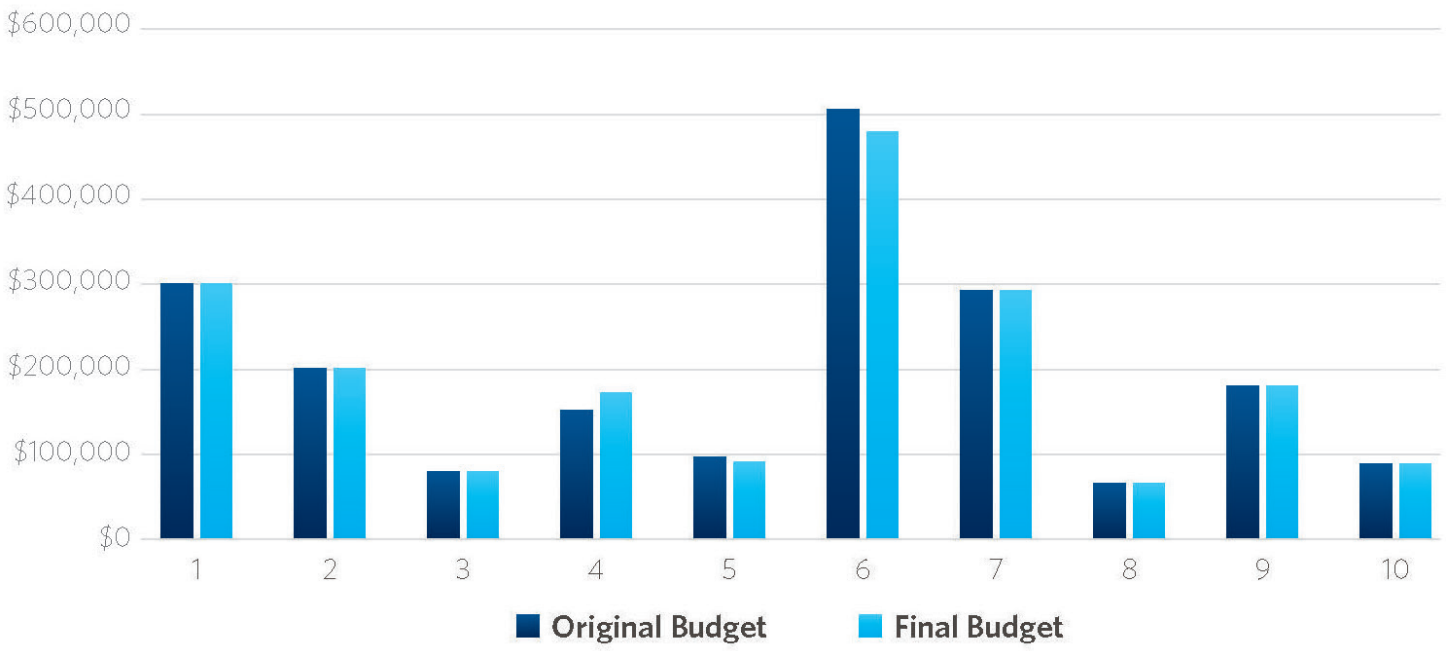


NO.	LAST 10 PROJECTS COMPLETED BY BROWARD COUNTY OFFICE	PLANNED SCHEDULE	FINAL SCHEDULE
1.	Hollywood | SCADA Improvements Phase 2	12	12
2.	Delray Beach | Cityworks Implementation Phase 1	8	8
3.	Broward County | Clarifier Rehabilitation	24	25
4.	Broward County | Master Pump Stations Rehab	18	18
5.	Broward County | In-House Electrical O&M Services	6	6
6.	SFWMD | S-127 CCC North Shore Automation Construction Phase Services	18	18
7.	SFWMD | GG4 Structure Construction Phase Services	24	24
8.	MDWASD | Hydraulic Modeling Support	12	12
9	MDWASD | Sewer Service to Commercial Properties	3	3
10.	Deerfield Beach | East WTP Site Improvements	9	10

ABILITY TO COMPLETE PROJECT ON BUDGET

It is standard practice for Black & Veatch project managers to develop a project budget at the onset of every project. Through our Business Intelligence Center (BIC), data on project charges is available to the Project Manager within one-day of time reporting.

This supports timely adjustments to ensure the work is completed on time and under budget. **The following project listing and chart summarizes our successful financial execution of the last 10 projects completed in the Coral Springs office.**



NO.	LAST 10 PROJECTS COMPLETED BY BROWARD COUNTY OFFICE	ORIGINAL BUDGET	FINAL BUDGET
1.	City of Hollywood | SCADA Improvements Phase 2	$299,970	$299,970
2.	Delray Beach | Cityworks Implementation Phase 1	$202,334	$202,334
3.	Broward County | Clarifier Rehabilitation	$79,711	$78,546
4.	Broward County | Master Pump Stations Rehab	$151,431	$170,246
5.	Broward County | In-House Electrical O&M Services	$95,245	$88,226
6.	SFWMD | S-127 CCC North Shore Automation Construction Phase Services	$503,288	$477,896
7.	SFWMD | GG4 Structure Construction Phase Services	$290,556	$290,556
8.	MDWASD | Hydraulic Modeling Support	$58,766	$58,766
9	MDWASD | Sewer Service to Commercial Properties	$178,662	$178,662
10.	Deerfied Beach | East WTP Site Improvements	$84,052	$84,052

VOLUME OF WORK PREVIOUSLY AWARDED TO THE FIRM IN THE LAST FIVE YEARS

YEAR	WORK ORDER NUMBER	PROJECT NAME	FEE
2015	BV15-01	SCADA Improvements for Sludge Process Control	$234,280.00
2017	BV17-01	Automation & SCADA Improvements for Oxygenation, Chlorination & Effluent Systems	$299,973.00
2018	BV18-01	SRWWTP SCADA Improvements - Phase II	$299,460.00
2018	BV18-02	Phase I Implementation of Cityworks Server Asset Management (AMS) Premium Software within the City of Hollywood, Utilitites Department	$388,852.00
2019	BV19-01	Automation & SCADA Improvements - Phase III	$693,994.00
		Total	$1,916,559.00

Table of Contents

RAFAEL E. FRIAS III, PE

PROJECT DIRECTOR

OFFICE LOCATION
Coral Springs, FL

EDUCATION
MS, Civil Engineering, University of Kansas, December 2002

BS, Biological Engineering, LA State University, December 1997

YEARS EXPERIENCE
23

PROFESSIONAL REGISTRATION
PE – 2004, FL, 61912

PE – 2011, PR, 24726

PE – 2003, KS, 17469

PROFESSIONAL ASSOCIATIONS
American Water Resources Association

Water Environmental Federation

American Water Works Association

WateReuse

Mr. Frias serves as a Client and Project Director with the global water business of Black & Veatch Corporation and is responsible for the management of the Company's operations in Florida and the Caribbean. Rafael specializes in the management of water resources projects, including water supply, water treatment, hydropower and stormwater planning and design. Mr. Frias is also experienced in incorporating sustainability principles into project designs and in the development of sustainable water planning technologies for the management of watersheds and ecosystems, water scarcity and wet-weather conditions. Rafael is a national Board member of the American Water Resources Association (AWRA), and an active member of the Water Environment Federation (WEF) and American Water Works Association (AWWA), for which he as published papers and delivered presentations on comprehensive water resources issues, including sustainable water planning, surface water management, water treatment technologies, aquifer storage and recovery (ASR) and small hydropower.

Some of Mr. Frias' key assignments with the City of Hollywood include:

- Automation and SCADA Improvements for Optimization of the SRWWTP Oxygenation, Chlorination, and Pumping Systems
- Automation and SCADA Improvements for Optimization of the SRWWTP's Sludge Process Control System
- Development of the City of Hollywood Energy Efficiency Master Plan

PROJECT EXPERIENCE

City of Hollywood | Energy Efficiency Master Plan; Hollywood

Senior Project Manager. Black & Veatch developed a comprehensive Energy Efficiency Master Plan for the City of Hollywood's Water and Wastewater systems and facilities. The master plan resulted in an implementation plan for 20 recommended energy cost savings projects and strategies with a net positive value of $4.4 million to the City over the life of the improvements. Specific tasks included: development of an existing energy use baseline for the City's water and wastewater facilities and equipment; evaluation of the current and potential alternate electric utility rate structures at each facility; energy efficiency assessments; operations optimization evaluation for the raw water supply, treatment and potable water distribution systems; feasibility assessment for the development of renewable energy sources, including solar PV; development and analysis of over 50 energy conservation measures;

development and use of an "Energy Project Decision Cash Flow Model;" and completion of a Master Plan Report that provides a roadmap for the City to implement the recommended energy cost savings projects and strategies over the planning horizon.

Our systematic and holistic approach to energy master planning resulted in the identification and evaluation "best fit" energy conservation measures (ECMs) for a combined annual energy savings of approximately 7 GWh, or 15% of the Utilities Department total energy use in 2012.

City of Hollywood | Automation and SCADA Improvements for Optimization of the SRWWTP Oxygenation, Chlorination, and Pumping Systems; Hollywood, FL

Senior Project Manager. Led the development and implementatilon of automation and SCADA improvements at the City's Southern Regional Wastewater Treatment Plant (SRWWTP) to optimize the Oxygenation, Chlorination, and Pumpint Systems. These unit processes are comprised of several large and complex treatment areas, including influent distribution and flow splitting, high purity oxygen aeration, oxygen generation plant, Return Activated Sludge (RAS) pump stations, chlorination facility, and effluent pumping. Most of this equipment is currently controlled manually by Operations professionals, as the existing SCADA system within the unit processes lacks the necessary level of automation to monitor and control the processes from a Human Machine Interface (HMI) in the control room.

MDWASD | Hialeah WTP Feasibility Study; Miami, FL

Project Director. Supported the development of a feasibility study for the decommissioning of the Hialeah WTP and redirecting of flows to the Preston WTP. The evaluation included an analysis of the existing treatment processes and system hydraulics at the Hialeah and Preston WTPs to determine the viability of decommissioning the Hialeah WTP. The results of the study included modifications required to transfer all of the process treatment to the Preston WTP.

Palm Beach County Water Utilities Department | Sustainability and Strategic Planning Services; Palm Beach County, FL

Project Director. Currently, leading Black & Veatch's efforts for the development of a Strategic Sustainability Plan (SSP) for PBCWUD to shape the future state of the utility and support it in continuing to be a leader in the water and wastewater utility industry. As part of the SSP, Black & Veatch is using our Pathfinder strategic planning process, which was developed based on our proven experience working with clients within the water and energy industries. The Pathfinder methodology uses a collaborative approach to meld bottom-up initiatives with top-down strategic intent. The methodology combines sustainability, financial, and operational analytics with technical depth and insights for development of the PBCWUD SSP.

Tampa Bay Water | South Pasco Water Treatment Plant Chemical Feed Modifications; Tampa, FL

Engineering Manager. Managed the completion of a drainage study for the South Pasco Water Treatment Plant to evaluate the hydraulic performance of the existing stormwater treatment facility (dry-retention) and determine if it had sufficient storage capacity to treat the additional runoff resulting from the chemical feed modifications (4,000 ft2 of impervious area). The evaluation suggested that additional storage volume was required to provide the necessary water quality and water quantity benefits and meet SWFWMD ERP requirements.

Heartland Water Alliance (HWA) | Water Supply Planning; DeSoto, Hardee, Highlands, and Polk Counties, FL

Project Engineer. Assisted with the development of surface water alternatives as a supply source for the HWA. Performed a statistical analysis of flow data from USGS stream gages to determine the availability and reliability of the surface water source. The recommended alternatives were evaluated and ranked based on water supply yield and other criteria, such as source location and distribution.

CHRIS BARLOW, PE, CDT

PROJECT MANAGER

OFFICE LOCATION
Coral Springs, FL

EDUCATION
BS, Environmental Engineering, University of Florida, 1998

YEARS EXPERIENCE
22

PROFESSIONAL REGISTRATION
PE – 2003, FL, #59256

PROFESSIONAL ASSOCIATIONS
Florida Water Environment Association (FWEA), active

Florida Engineering Society (FES)/NSPE, active

American Water Works Association (AWWA), active

Southeast Desalting Association, inactive

North American Society for Trenchless Technology, inactive

Mr. Barlow is an experienced engineer that has focused his practice on the analysis and designs of municipal water utility projects, primarily in south Florida. This experience has been developed through the execution of numerous water, wastewater, and water reclamation projects. This experience includes the successful completion of numerous pump station design, rehabilitation, and installation projects; pipeline projects, with extensive experience in horizontal directional drill (HDD) projects (over 60,000-LF); water treatment and supply projects, such as Surficial and Floridian (brackish) and surficial aquifer wellheads, membrane filtration, chemical feed systems, degasification and odor control systems; hydraulic modeling and master planning of water distribution and wastewater collection systems; survey coordination, corridor evaluations, design, permitting, construction observations, construction administration and final regulatory certification of these projects.

PROJECT EXPERIENCE

City of Hollywood | Risk and Resiliency Assessment of the American Water Infrastructure Act, Water System; Hollywood, FL

Project Manager. Delivery of the Risk and Resiliency Assessment required by the American Water Infrastructure Improvement Act. Utilized the methods provided in AWWA J-100 Standard Practices to deliver this comprehensive assessment of the City's water system.

City of Hollywood | High Service Pump Station Upgrades, Water Treatment Plant; Hollywood, FL

Project Manager, Lead Design Engineer, and Construction Administration Engineer. Evaluation, design and permitting of the upgrades to the pump station that was originally built in the early 1970's. The project will provide for the installation six 8,000 gpm variable speed pumps to replace ten existing constant speed pumps that sizes that range in size from 2,500 gpm to 14,000 gpm pumps.

City of West Palm Beach | RAS Pump Station Valve Replacement and Improvements, East Central Regional (ECR) WWTP; West Palm Beach, FL

Project Manager, Design Engineering and Construction Contract Administrator. Rehabilitation of four (4) triplex return activated sludge (RAS) pump stations serving this 55 mgd wastewater treatment plant. The Work consisted of replacing reducing swing check valves with conventional swing

check valves and fitting on the discharge piping, replacing the pump suction valves with new valves equipped with electric actuators, and the installation of 30-inch line-stops on the underground discharge piping, necessary to isolate each pump station.

Martin County Utilities and Solid Waste | Permit Capacity Increase, Tropical Farms Wastewater Treatment Plant; Stuart, FL

Project Manager and Engineer of Record. Modification to the FDEP Wastewater Operating permit that increased the capacity from 5.0 mgd to 5.9 mgd. The purpose of this modification was to increase the permit capacity based on the actual plant performance utilizing the most recent operational data after commissioning and the transfer of flow from two smaller plants that were decommissioned, as part of the Master Plan for this Utility.

City of West Palm Beach | Bulk Sodium Hypochlorite Feed System; West Palm Beach, FL

Project Manager and Construction Administration Engineer. Installation of a new disinfection system that utilizes sodium hypochlorite for the of the gas chlorine disinfection system at the City's water treatment plant. The existing system utilized multiple one-ton cylinders of chlorine gas. The new liquid chlorine system eliminated the risk of public exposure to chlorine gas.

City of West Palm Beach | Water Treatment Plant Automation and SCADA Improvement, Water Utility Division of Public Works; West Palm Beach, FL

Project Manager. Design to provide for the installation of a new fiber-optic communication network and field instrumentation necessary to automate the controls of this historic water treatment facility, dating back to 1894.

City of West Palm Beach | Phipps Park Booster Pump Station Rehabilitation; Palm Beach, FL

Project Manager, Construction Administration Engineer. Project consisted of rehabilitating the facility, and installation of a new flow meter. The construction added an underground by-pass facilitating the rehabilitation.

City of West Palm Beach | Five Remote Water Storage and Re-pump Facilities Conversion from Gas to Liquid Chlorine, Water Utility Division of Public Works; West Palm Beach, FL

Project Manager and Lead Design Engineer. Design to replace the gas chlorine disinfection system with a system that utilizes sodium hypochlorite at the five locations across the City's water distribution system.

City of Miramar | Miramar East Water Treatment Plant Replacement Wells, Water Treatment Plant; Miramar, FL

Project Manager. Hydrogeological services for the progressive design-build team developing the East Water Treatment Plant (WTP) modification from lime softening to Nano-filtration treatment. The well component includes the design of four replacement water supply wells and a design and UIC permitting of a Class I deep injection well system for membrane-treatment reject (concentrate) disposal.

City of Sunrise | Aquifer Storage and Recovery (ASR) Well System Design, Sawgrass Facility; Sunrise, FL

Lead Mechanical Design Engineer. Wellhead design and in-line booster pump station design associated with the conversion of two (2) previously drilled Floridian (brackish) Aquifer wells into Aquifer Storage and Recovery (ASR) wells. The project responsibilities consist of the public water system (PWS) permitting by providing the hydraulic and mechanical process design. The wellhead design provided for 1.5 mgd variable speed submersible recovery pumps for each well and wellhead piping to account for the bi-directional flow of the ASR well. The in-line booster pump station design provides a pressure sustaining valve to prevent low pressure excursions on the treatment plant's feed water pumps, a by-pass parallel to the 3.0 mgd booster pumps, and a purge line extended to the concentrate disposal deep injection well, necessary for cycle testing.

AMANDA SCHWERMAN, PE, ENV SP

TECHNICAL DIRECTOR

OFFICE LOCATION
Tampa, FL

EDUCATION
MS, Civil/Environmental Engineering, Colorado School Mines, 2006

BS, Civil Engineering, Colorado School Mines, 2005

YEARS EXPERIENCE
12

PROFESSIONAL REGISTRATION
PE – 70751, Florida, 2014

PROFESSIONAL ASSOCIATIONS
American Water Works Association (Engineering Modeling Applications Committee, and M32 Update Contributor)

Water Environmental Federation (Collections Systems Committee, Workshop subcommittee Vice Chair)

Florida Water Environment Association

WateReuse Association

Ms. Schwerman's experience is focused on water and wastewater-related planning projects. Her expertise lies in water and wastewater hydraulic modeling, but she has experience with process/mechanical design as well. She is involved with professional societies including chairing the WEF Collections System Committee's workshop group, working on the WEF Envision Taskforce, participating with AWWAs Engineering Modeling Applications Committee (EMAC) and M32 Updates, is a Trustee and the Membership Chair for WateReuse Florida and is a certified Envision Sustainability Professional.

PROJECT EXPERIENCE

Pinellas County | Water and Sewer Optimization Study; Pinellas County, FL

Engineering Manager. The County has embarked upon an Optimization Program for its water, sewer and reclaimed water systems that involves using the "Envision Process", which is an in-depth guidance and rating system used to assess and improve the sustainability metrics of infrastructure projects. The Program initially involved a comprehensive optimization study of the assets associated with or affecting the South Cross Bayou Water Reclamation Facility (SCBWRF). The objectives of the optimization study include, but were not limited to, reducing energy use, reducing O&M costs, process optimization and technology improvements, and triple bottom line sustainability (economic, environmental, and social) of the facility. The COUNTY is responsible for operating and maintaining the water, sewer, and reclaimed water systems within the designated service areas under the jurisdiction of the Pinellas County Florida Board of County Commissioners. Over three billion dollars in assets are included in the water and sewer systems.

City of Tampa | Potable Water Master Plan; Tampa, FL

Engineering Manager & Lead Modeler. Responsible for executing the potable water master plan and deliverables. The project included: updating and calibrating the existing hydraulic model using InfoWater, distribution analysis and improvements for four planning years (2015, 2020, 2025, and 2035), pumping and storage facility capacity assessments, resiliency and reliability assessments, asset management program development, risk based pipeline prioritization using InfoMaster, capital improvement program and Master Plan documentation.

The City of Tampa distribution service area serves a population of approximately 610,000 people across 1 pressure zone at an average day demand of approximately 70 MGD. The distribution system includes one water treatment plant, five repump stations with tanks and several interconnections with Hillsborough County and Tampa Bay Water.

Tampa Bay Water | Long-Term Master Water Plan & Program Feasibility; Pasco and Hillsborough Counties, FL

Project Engineer. focused on the potable reuse feasibility tasks. Tampa Bay Water (TBW) is required to update their Long-Term Master Water Plan (LTMWP) every five years. The most recent LTMWP prior to this project was completed and approved in December 2013 and included a Feasibility Program recommendation. This project included updating both the Feasibility Program and the LTMWP, to evaluate the Board approved projects listed in the 2013 LTMWP and to narrow down the project list to one of more projects that will meet the region's drinking water demand once the demand forecast indicates more supply is needed. In addition to the Board approved projects, several potable reuse projects were included. Black & Veatch was a subconsultant to Hazen & Sawyer.

Tampa Bay Water | System Engineer; Pasco County and Hillsborough County, FL

Project Engineer. For the following tasks. The System Engineer is a multi-year contract to provide miscellaneous design and planning services.

2035 System Analysis

Developed and participated in a variety of efforts to prepare the 2023 System Analysis which was updated from the 2025 System Analysis. Efforts included analyzing emergency break scenarios, member government meetings, bi-weekly status updates and proposed system improvements.

Reservoir Emergency Action Plan

Updated the existing Enhanced Surface Water System (ESWS) model and converted the modeling platform from WaterGEMS to InfoWater. Updates included the installed pipe and orifice plate improvements at the Long Flat Creek (LFC) Blow Offs and the Alafia River Pump Station (ARPS) bypass. The analysis was to determine the drawdown rate and duration to drain the reservoir via the Surface Water Treatment Plant (SWTP), ARPS Bypass and LFC Blow Offs.

Benchmarking Study

Level of Service and Reliability for Wholesale Water Customers – Prepared a questionnaire to document the level of service and reliability standards of seven wholesale providers across the United States, participated in conference calls/interviews of the wholesale providers and preparation of the summary and recommendations report comparing the standards of the participants to that of Tampa Bay Water.

Regional System Transient Analysis

Provided professional services to perform a surge (a.k.a. transient) analysis of the existing regional Transmission Main system using Bentley's HAMMER. The primary objective of the project was to assess transient impacts resulting from a number of trigger events such as an emergency shutdown, pump startup and valve closure. Transient improvement measures such as pump control valve optimization, combination air/vacuum valve (CAV) optimization, surge anticipator/relief valves, rupture disks and elevated tanks were analyzed. The Regional Transmission system consists of three pump stations, 4 additional supply sources, 16 pumps, and 13 customer connections.

ISABEL BOTERO, PE

QA/QC

OFFICE LOCATION
Coral Springs FL

EDUCATION
MS, Environmental Engineering, University of Kansas, 2004

BS, Civil Engineering, University of Missouri, 1999

YEARS EXPERIENCE
17

PROFESSIONAL REGISTRATION
PE - 25626, 2013

PE - 67176, FL, 2007

PE - 2005001044, MO, 2005

PROFESSIONAL ASSOCIATIONS
Water Environmental Federation

Florida Water Environment Association

Ms. Botero is a Project Manager and environmental engineer with 17 years of water systems experience and is a proven performer as a manager and technical leader for the City over the past five years. She has participated in detailed design of water and wastewater projects for alternative delivery methods (design/build/ operate). She is also experienced in developing scope documents for pricing of design/build projects.

As a member of Black & Veatch's Energy Efficiency Master Plan for the City of Hollywood's Water and Wastewater systems and facilities team, Isabel has been closely involved with the City, including the execution of tasks related to the Southern Regional Wastewater Treatment Plant operations optimization with the implementation of SCADA improvements for multiple treatment facilities.

PROJECT EXPERIENCE

City of Hollywood | Energy Efficiency Master Plan; Hollywood, FL

Engineering Manager. Ms. Botero participated in the development of a comprehensive Energy Efficiency Master Plan for the City of Hollywood's Water and Wastewater systems and facilities. The master plan resulted in an implementation plan for 20 recommended energy cost savings projects and strategies with a net positive value of $4.4 million to the City over the life of the improvements.

City of Hollywood | Automation and SCADA Improvements for Optimization of the SRWWTP Oxygenation, Chlorination, and Pumping Systems; Hollywood, FL

Engineering Manager. Led the technical execution and coordinateion with the City's ICE Manager for the implementation of automation and SCADA improvements at the City's SRWWTP. Most of the equipment at the City of Hollywood's SRWWTP is currently controlled manually by Operations professionals, as the existing SCADA system within the unit processes lacks the necessary level of automation to monitor and control the processes from a Human Machine Interface (HMI) in the control room. Black & Veatch was retained by the City to provided services for data gathering, programming and commissioning to replicate the Siemens PLC and HMI for the Oxygen Generation Plant. At the same time, Black & Veatch worked on data gathering and review, development of control strategies, programming, commissioning, and training to Operations staff for PLC 3 (Chlorine Facility) and PLC 6 (Effluent Pump Station).

City of Hollywood | Automation and SCADA Improvements for Optimization of the SRWWTP's Sludge Process Control System; Hollywood, FL

Engineering Manager. Led the technical execution and coordination with the City's ICE Manager for the implementation of automation and SCADA improvements at the City's SRWWTP to optimize Sludge Process Control System. The Sludge Process Control System is a large complex process that is currently controlled manually by City Operations professionals. The existing SCADA system lacks the necessary level of automation to monitor and control the sludge process from the Human Machine Interface (HMI) in the control room; this lack of automation has caused a number of operational issues. Black & Veatch supported the City by increasing the level of automation for the Sludge Process Control System to allow automatic or semi-automatic control of the sludge process from the HMI in the control room.

Broward County Water and Wastewater Services | Improvement Projects – General Engineering Services; Pompano Beach, FL

Engineering Manager. As part of the execution of the General Engineering Services for wastewater, Ms. Botero has participated on the design and construction phase services for multiple improvements projects at the North Regional WWTP including replacement of pump pads for the effluent pumps and improvements to the aeration basins, shorting contactors panels replacement at the outfall pump station and clarifiers rehabilitation.

Miami-Dade Water and Sewer Department | Water Service Improvement to Non-Residential Properties; Miami, FL

Project Manager. Ms. Botero assisted the Miami-Dade Water & Sewer Department (MDWASD) with developing a plan, including planning level cost estimates and project schedules for the improvements of water infrastructure to non-residential zoned properties within MDWASD's service area currently under-sized to bolster commercial re-development. Once the project is implemented, over 15,000 parcels sites will have improved water service.

Puerto Rico Aqueduct and Sewer Authority | PRASA Hydroelectric System Evaluation; Puerto Rico

Engineering Manager. Ms. Botero assisted in the evaluation of existing hydroelectric facilities. The initial phase included the assessment of the existing facilities and issuing recommendations on rehabilitation and modernization. A water availability model and operation reservoir curves were developed for the Loco, Luchetti, Guayo, Yahuecas and Prieto reservoirs. The final component of the project include an economic feasibility evaluation for the implementation of the improvements.

City of Boynton Beach | East Water Treatment Plant Disinfection System Upgrade; Boynton Beach, FL

Construction Project Manager. Execution of the disinfection system upgrade for the 24-mgd East Water Treatment Plant.

Miami Dade County | Alexander Orr Jr. Water Treatment Plant, Chlorine Gas Onsite Generation System; Miami, FL

Project Manager. Design of a new chlorine gas onsite generation system for the 215-mgd water treatment plant with an average consumption close to 9,000 pounds per day (ppd). The system is designed with a firm capacity of 20,000 ppd of chlorine production and will replace the existing practice of storing 90-ton chlorine gas railcars at the plant located in a residential area.

City of Boynton Beach | East Water Treatment Plant Disinfection System Upgrade; Boynton Beach, FL

Project Manager. Responsibilities included development of preliminary design of the new on-site sodium hypochlorite generation system, obtaining the Palm Beach County Health Department Permit, and development of bidding documents. The new disinfection system is housed in the existing chlorine building, including coordination of demolition and new construction while maintaining the existing plant online with a temporary chlorination system. The system will have a capacity to treat 24-mgd.

OLENA LYTVYN, PE

CONDITION ASSESSMENT LEAD

OFFICE LOCATION
Coral Gables, FL

EDUCATION
BS, Civil and Environmental Engineering, Florida State University, 2012

YEARS EXPERIENCE
9

PROFESSIONAL REGISTRATION
PE – 2017, FL, 82696

PE – 2017, IL, 062069139

PROFESSIONAL ASSOCIATIONS
American Water Works Association

American Society of Civil Engineers

Ms. Lytvyn has over five years of experience in civil engineering designs, including composing preliminary engineering reports, route analysis, pipeline design of various sizes, developing cost estimates and inspections. She has also served as the client manager for various clients in the Tampa Bay area.

PROJECT EXPERIENCE

Miami-Dade Water and Sewer Department | 54-inch Condition Assessment Carbon Fiber Repairs; Miami, FL

Engineer. Ms. Lytvyn prepared a condition assessment report for a 54-inch carbon fiber repairs located along Red Road Ave that transfers water from the John E. Preston Treatment Plant to the City of Hialeah and other areas of North Miami-Dade County. She performed limited manned entry assessments of the pipeline's internal condition over a 3-year period. The condition assessment portion included the following tasks: visual inspection of carbon fiber repairs and soundings to asses existing conditions, identify deficiencies. Ms. Lytvyn worked with WASD, CFRP design engineers and manufacturers to develop an appropriate approach for rehabilitating the observed deficiencies of line.

Miami-Dade Water and Sewer Department | SL-2.1; Miami, FL

Engineering Manager. Responsible for managing and coordinating the execution of design of 60-inch PCCP force main. Ms. Lytvyn was responsible for the horizontal and vertical alignment. Additionally, Ms. Lytvyn was responsible for managing subconsultants.

City of West Palm Beach | Condition Assessment of the 42-inch/48-inch PCCP Force Main; West Palm Beach, FL

Engineering Intern. Ms. Lytvyn assisted in reviewing Condition Assessment of 42-inch and 48-inch Diameter PCCP Force Main report prepared by Pure Technologies and providing recommendations on rehabilitation methods. Additionally, Ms. Lytvyn assisted in providing technical support for this project.

Miami-Dade Water and Sewer Department | Prioritization of Water System; Miami, FL

Engineer. Ms. Lytvyn served as a Project Engineer in establishing a comprehensive infrastructure assessment and replacement program for Miami-Dade water transmission and distribution system. Ms. Lytvyn reviewed and analyzed past condition assessment reports of large diameter water mains as well as various environmental and social conditions.

Ms. Lytvyn then developed a prioritization criterion, assigning different values to each factor considered in the consequence/likelihood of failure matrix, taking into account Miami-Dade's need. She was then responsible for providing appropriate recommendations on the replacement/rehabilitation/monitoring of the large diameter transmission mains with corresponding cost estimates. Ms. Lytvyn assisted in the preparation and presentation to the client of prioritization report.

Miami-Dade Water and Sewer Department | 72-inch Force Main Design Build Criteria Package; Miami, FL

Engineer. Ms. Lytvyn assisted in the feasibility study for a Pipeline Rehabilitation/Replacement for Miami-Dade County WASD. The scope of the project required recommendations for a pipeline rehabilitation method(s), preparation of the Design-Build Criteria Package for the selected alternative, assisting the County during selection process of contractor, and providing compliance reviews and support services during the design and construction phases of the replacement/ rehabilitation of the 72-inch force main Interceptor, approximately 3.5 miles long. Additionally, Ms. Lytvyn assisted in the review of proposed construction drawings, design calculation, and shop drawings to ensure compliance with WASD standards and the Design-Criteria Package.

Miami-Dade Water and Sewer Department | Route Analysis for the Replacement of 16,200 LF of 54-inch Water Main along Red Road; Miami, FL

Engineer. Ms. Lytvyn performed the duties of Project Engineer for the evaluation of route alternatives for the replacement of a 54-inch transmission main. Record drawings were obtained and reviewed from all utility companies in the area. Three routes were developed for an alignment of a 54-inch water main. Upon the completion of site reviews and cost estimates, the most optimal route was selected. The recommended route contains several canal and railroad crossings. A report was created documenting all finding and basis of recommendation. Ms. Lytvyn also assisted in the preparation of a presentation given to the Water and Sewer Department on the recommended route.

Miami-Dade Water and Sewer Department | 48-inch PCCP Condition Assessment and Assessment of Carbon Fiber Repairs; Miami, FL

Engineer. Ms. Lytvyn prepared a condition assessment report for a 48-inch PCCP located along SW 56th St. Ms. Lytvyn performed a limited manned entry assessment of the pipeline's internal condition. The condition assessment included 24 pipe sections previously rehabilitated with CFRP liner and 143 non-rehabilitated pipe sections.

Miami-Dade Water and Sewer Department | 54-inch PCCP Condition Assessment; Miami, FL

Engineer. Ms. Lytvyn prepared condition assessment report for a 54-inch PCCP located along Red Road Ave that transfers water from the John E. Preston Treatment Plant to the City of Hialeah and other areas of North Miami-Dade County. Ms. Lytvyn performed a limited manned entry assessment of the pipeline's internal condition. The condition assessment portion included a total of 102 pipe sections and had the following tasks: visual inspection of pipe interior and soundings of mortar lining to asses existing conditions, identify distressed pipe sections, and recommend an approach for rehabilitating distressed sections of line.

Miami-Dade Water and Sewer Department | 96-inch PCCP Condition Assessment; Miami, FL

Engineering Intern. Ms. Lytvyn assisted in the preparation of a condition assessment report for a 96-inch PCCP located along W Okeechobee Rd. The waterline transports raw water from Northwest Well Fields to the John E. Preston water treatment plant. Ms. Lytvyn performed a limited manned entry assessment of the pipeline's internal condition. The condition assessment portion included a total of 172 pipe sections. The assessment included: visual inspection of pipe interior and soundings of mortar lining to asses existing conditions, identify distressed pipe sections, and recommend an approach for rehabilitating distressed sections of line.

ROBERT CHAMBERS, MBA

CAPITAL PLANNING LEAD

OFFICE LOCATION
Coral Springs, FL

EDUCATION
MBA, Finance, Rollins College, 2006

BS, Finance, University of Central Florida

YEARS EXPERIENCE
17

Mr. Chambers is a manager with extensive utility and consulting experience involving a variety public and private utility projects associated with electric, natural gas, and water and wastewater throughout the southeastern United States. His utility knowledge covers a wide range of utility management and operating issues, including cost of service and rate analysis, financial planning, capital financing, acquisitions and valuations, energy management, customer affordability, business case analysis, and strategic planning.

In addition, Mr. Chambers has served and supported municipal utilities in developing, communicating, and educating various stakeholders about the purpose and value of various business plans which have included, to name a few, long term financial plans, capital acquisition and system expansion alternatives, customer rate and affordability scenarios, and strategic plan roadmaps. Mr. Chambers has presented at national utility programs, such as the American Water Works Association – Utility Management conferences and the Southwest Florida Government Financial Officers Association conferences on topics like demand management, program development, and financial planning. In addition, Mr. Chambers he has earned a Master's of Business Administration with a concentration in Finance from the Crummer Graduate School of Business at Rollins College.

PROJECT EXPERIENCE

City of Hollywood | Energy Master Plan; Hollywood, FL

Project Manager. Mr. Chambers served as the Project Manager for the financial and economic feasibility components of an Energy Master Plan for the Water and Sewer Department of the City of Hollywood. The financial team performed detailed business case analysis to determine the feasibility of implementing the Energy Master Plan projects. At the completion of the analysis, the project team developed an implementation plan that was fully funded by the incremental revenues contribution generated from implementing the Master Plan projects.

Athens Clarke County | Financial Consulting Services; GA

Project Manager. Mr. Chambers serves as the project manager in providing a number of financial and consulting services to Athens-Clarke County Public Utilities Department (PUD). Black & Veatch has served as the utility's financial consultant in supporting the utility with the development of utility rates and fees for the water and sewer system in order to maintain the appropriate level of revenues to meet utility system obligations.

In addition, Black & Veatch was contracted to complete a comprehensive assessment of the utility's water business offices in order to improve all the existing services provided to customers by the office.

City of North Miami | Water and Sewer Financial Consulting Services; Miami, FL

Multiple Roles. Black & Veatch supported the City in completing multiple water and sewer rate studies that included the implementation of conservation based rates in order to be compliant with the South Florida Water Management District water use mandates. In addition, Black & Veatch supported the City in applying and successfully retaining $30.0 million in State Revolving Loan funding to upgrade the City's water treatment plant. Black & Veatch has completed various additional financial and management consulting project for the City. Through the execution of these project Mr. Chambers has served in various capacities. Currently, Mr. Chambers serves as the Client Manager.

Palm Beach County Water Utilities Department | Strategic Sustainability Plan; Palm Beach County, FL

Project Manager. Black & Veatch assisted the Palm Beach County, FL Water Utilities Department (WUD) with the development its Strategic Sustainability Plan (SSP). The SSP is the WUD's 3rd generation plan and is intended to be the utility's strategic roadmap. Mr. Chambers served as the project manager through the entirety of this engagement.

The work completed included a three step approach, Situational Analysis; Strategy Development; and Strategic Initiatives and Implementation, to developing the SSP. The project team facilitated workshops to review the goals and objectives in the previous plan, determine how well the utility met previously established goals, identify strategic opportunities, and develop the SSP. In addition, the project team utilized the Effective Utility Management (EUM) framework to provide a measure of how well the utility is performing in key areas of the utility.

Initiatives, strategic, and key performance indicators were developed in order to plan and adaptively monitor the progress of the WUD in meeting the objectives outlined in the SSP in order to provide the best water, best service, and best environmental stewardship.

At the completion of the process, the project team supported the WUD in educating stakeholders about the purpose and value of the SSP.

San Antonio Water System | Financial Consulting Services; San Antonio, TX

Project Manager. Black & Veatch was contracted to perform a comprehensive rates and charges assessment for SAWS. Mr. Chambers is serving as the project manager in completing the water and sewer system rates design and assessments related to special services charges, industrial surcharges, charges for wholesale services, and a complete review of SAWS' customer affordability program.

Puerto Rico Aqueduct and Sewer Authority | Water & Wastewater Rate Study and Economic Feasibility Assessment; Puerto Rico

Project Manager. Mr. Chambers served as the Project Manager on a team that completed an assessment of all PRASA's Hydropower facilities to determine the cost to rehabilitate, fully optimize, and potentially transfer all the facilities owned and operated by PRASA. The business case analysis entailed detailed risk evaluation around the potential operating and capital cost exposure and the incremental increases in generation. At the completion of these assessments, the project team develop a financial plan that was technically and operationally implementable and fully funded by the cost saving gained through the rehabilitation and optimization of these facilities.

MATT MOREY, GISP

ASSET MANAGEMENT LEAD

OFFICE LOCATION
Charlotte, NC

EDUCATION
BS, Marine Science, Coastal Geology, Coastal Carolina University, 2003

YEARS EXPERIENCE
17

PROFESSIONAL REGISTRATION
GIS – 2010, #00066654

Mr. Morey is a Solutions Lead that supports Black & Veatch's Water Division. He has over 15 years of program management, consulting, and system implementation and integration experience on projects for municipal government public works and water, wastewater, and stormwater utilities clients. He specializes in CMMS solution requirements development, systems implementation and refinement, report writing, and systems integration requirements development.

PROJECT EXPERIENCE

City of Hollywood; CMMS Implementation; Hollywood, FL

Asset Management and Information Systems Lead. Leading the implementation of the City's CMMS for Utilities. Implementation focused on the migration from the City's legacy system for linear and facility assets, and included historic data migration for all past work. Tasks included data migration design and development, designing and configuration of the CMMS, integration design and development, report design and creation, end-user training, and implementation planning.

Gwinnett County Utilities; Maximo Enhancements; Gwinnett County, GA

Asset Management and Information Systems Lead. Lead task for Maximo system updates including merging organizational data into a single utility-wide organization. This task included merging all groups warehouse materials into a single master list, standardizing commodity codes for all items to the UNSPSC standard, and providing end-user training for the updated system.

City of Delray Beach; CMMS Implementation; Delray Beach, FL

Asset Management and Information Systems Lead. Leading the implementation of the City's CMMS for Utilities, Parks and Recreation, and Right-of-Way divisions. Implementation focused on the migration from the City's legacy system and included historic data migration for all past work. Tasks included data migration design and development, designing and configuration of the CMMS, report design and creation, end-user training, and implementation planning.

City of West Melbourne, FL; Enterprise GIS and EAMS; West Melbourne, FL

Technical Lead. Performed a business process review; installed and configured ArcGIS Server, including ArcSDE; and implemented Azteca Cityworks for the Planning and Utilities Departments.

St Johns County, FL; Asset Inventory and CMMS Implementation; St Augustine, FL

Technical Lead. Worked with the County's project team to implement a CMMS for the pavement, roads and bridges, traffic, and fleet divisions. A geodatabase was designed and implemented to house the asset data collected by survey staff to be used within the CMMS. The project team performed the installation, data loading and tuning of the Department's enterprise geodatabase, and assisted the Department with the upgrade their enterprise RDBMS.

Forsyth County Utilities; CMMS Selection Support ; Cumming, GA

Asset Management and Information Systems Lead. Provided assistance to the County's staff for selection of a new CMMS system. Responsibilities included the development and review of system requirements, procurement documentation, demonstration script, evaluation criteria, and coordination of final selection.

City of Mesa; Cityworks Implementation for Signal Butte Water Treatment Plant; Mesa, AZ

Asset Management and Information Systems Lead. Leading implementation tasks of Cityworks Asset Management System (AMS) for Signal Butte Water Treatment Plant. Project tasks include asset registry and geodatabase design for facilities/vertical assets, asset data development from BIM and construction documentation, asset data loading, Cityworks software configuration, system testing, end-user training, go-live support, SCADA integration planning, and integration with SharePoint content and document management platform for maintenance plans and O&M manuals.

Charlotte Area Transit System; Implementation Support for Customer Service; Charlotte, NC

Asset Management and Information Systems Lead. Supported City staff with the implementation of the Service Request module for their existing CMMS to transition users off a home grown CRM system. Tasks included caller and call history data migration, user-interface customization including a bus driver lookup plugin, advanced database support, and reporting support.

City of Charlotte Department of Transportation; CMMS Implementation; Charlotte, NC

Asset Management and Information Systems Lead. Leading the CMMS implementation for the Departments Streets Maintenance, Traffic Operations, Public Service, and Planning Divisions. Responsibilities include business process analysis, system installation, system design and configuration, system integration design, report design and creation and training of key staff.

City of Greenville; Asset Management Training & CMMS Gap Analysis; Greenville, SC

Asset Management and Information Systems Lead. Provided the City's engineering staff with an asset management workshop to educate key staff on asset management concepts. Engineering and public works field staff was also provided training on their existing CMMS system to better understand the capabilities of the system. A gap analysis was performed to determine how the City could better utilize their CMMS to provide better cost accounting and other efficiencies.

City of Rock Hill; CMMS Implementation; Rock Hill, SC

Asset Management and Information Systems Lead. Assisting with the upgrade of Cityworks from a desktop environment into a Cityworks Server AMS environment; updating existing configuration; creating custom training materials and "cheat sheets" for quick reference and the training of key staff.

TAMMY MARTIN, PE

PROCESS MECHANICAL

OFFICE LOCATION
Coral Springs, FL

EDUCATION
BS, Civil Engineering, Florida Atlantic University, 2005

YEARS EXPERIENCE
15

PROFESSIONAL REGISTRATION
PE – 2006, FL, 73892

PROFESSIONAL ASSOCIATIONS
Florida Engineering Society

Ms. Martin is an engineering manager and environmental engineer with thirteen years of experience and knowledge of water and wastewater engineering and pump station mechanical process design. Ms. Martin has served as project engineer on a number of environmental engineering projects including stormwater design, permitting, and construction management. She is proficient with WaterGEMS modeling, HEC-RAS modeling, and Arc GIS. She has participated in detailed design and construction of alternative delivery methods (design/build/operate).

PROJECT EXPERIENCE

City of Hollywood | Automation and SCADA Improvements for Optimization of the SRWWTP Oxygenation, Chlorination, and Pumping Systems; Hollywood, FL

Project Engineer. Supported the technical execution for the implementation of automation and SCADA improvements at the City's SRWWTP. Most of the equipment at the City of Hollywood's SRWWTP is currently controlled manually by Operations professionals, as the existing SCADA system within the unit processes lacks the necessary level of automation to monitor and control the processes from a Human Machine Interface (HMI) in the control room. Black & Veatch was retained by the City to provided services for data gathering, programming and commissioning to replicate the Siemens PLC and HMI for the Oxygen Generation Plant. At the same time, Black & Veatch worked on data gathering and review, development of control strategies, programming, commissioning, and training to Operations staff for PLC 3 (Chlorine Facility) and PLC 6 (Effluent Pump Station).

City of Hollywood | Automation and SCADA Improvements for Optimization of the SRWWTP's Sludge Process Control System; Hollywood, FL

Project Engineer. Supported the technical execution for the implementation of automation and SCADA improvements at the City's SRWWTP to optimize Sludge Process Control System. The Sludge Process Control System is a large complex process that is currently controlled manually by City Operations professionals. The existing SCADA system lacks the necessary level of automation to monitor and control the sludge process from the Human Machine Interface (HMI) in the control room; this lack of automation has caused a number of operational issues.

Black & Veatch supported the City by increasing the level of automation for the Sludge Process Control System to allow automatic or semi-automatic control of the sludge process from the HMI in the control room. Improvements included a step-by-step guide on the HMI to monitor the progress of the sequence for the automatic or semi-automatic startup and shutdown of the Sludge Process Control System, and addition of status, alarms and process variables from all sub-systems to be displayed on the HMI.

Miami-Dade County; Alexander Orr Jr. Water Treatment Plant, Chlorine Gas Onsite Generation System; Miami, FL

Project Engineer. Assisted in the design of the on-site chlorine gas (OSG) system including design calculations for the containment area and associated piping for the salt/brine storage tank area; mechanical process design calculations for the chlorine feed pumps for the eductor room; coordination with pump manufacturers and preliminary pump selection; coordination with subconsultants; report preparation; reviewing and revising specifications; and reviewing and editing project plan set. She attended and participated in client and internal project meetings.

Seacoast Utility Authority; Hood Road Water Treatment Plant Membrane Conversion and Raw Water Repump Facility; FL

Project Engineer. Designed a lift station for the Seacoast Utility Authority Water Treatment Plant (WTP) conversion project site, assisted in the preparation and filing of the lift station permit, reviewed and edited technical specifications, and created a preliminary site layout for the Hood Road Raw Water Repump Facility. Ms. Martin also revised the client's existing WaterGEMS models for their potable water distribution system and reclaimed water distribution system to include several new "what-if" scenarios assist the client with planning of future projects and presented the modeling results in a memorandum and several meetings with the clients.

BCWWS; City of Boca Raton; Water Supply Wells; Boca Raton, FL

Project Engineer. Ms. Martin created a WaterGEMS hydraulic model of three new water supply wells and their connection to the city's existing water treatment plant. She then utilized the model output to select pumps for the three water supply wells. She reviewed and revised civil and process mechanical specifications and prepared, reviewed and edited civil and process mechanical plan set.

Palm Beach County Water Utilities; Lake Region Water Treatment Plant; Palm Beach County, FL

Project Engineer. Created geographic information system (GIS) figures showing the geographic distribution of the historical development of Belle Glade, South Bay, and Pahokee using historical aerial photographs in conjunction with data from Palm Beach County. She also created GIS figures displaying the geographic distribution of large and small water meters in Belle Glade, South Bay, and Pahokee. These figures were used for analysis of the pipe network and modeling efforts

Improvement Projects – General Engineering Services; Broward County, FL

Engineering Manager. As part of the execution of the General Engineering Services for wastewater, Ms. Martin has participated on the design and construction phase services for multiple improvements projects at the North Regional WWTP including clarifier rehabilitation and the replacement of transformer number 1. She has also provided construction phase services for the painting at master lift stations 226 and 452 and design services for the wetwell refurbishment at pump stations 452, 458, and 460.

SFWMD; IT Shelter Replacement Construction Project; Palm Beach and Hendry Counties, FL

Engineerig Manager. Ms. Martin is currently assisting in the construction management of four (4) South Florida Water Management District IT shelters in Palm Beach and Hendry Counties. The project includes construction observation staff, quality control testing, and document control of submittals, RFIs, cost proposals, change orders, and pay applications.

STEVEN SCOTT

PROCESS MECHANICAL

OFFICE LOCATION
Orlando, FL

EDUCATION
BS, Mechanical Engineering, Energy, University of Central Florida, 2013

YEARS EXPERIENCE
9

Mr. Scott is a design engineer who specializes in the design and specifications of mechanical process systems. He has designed the mechanical systems for new and existing water and wastewater treatment plants, pumping stations, and hydropower stations.

Steven's experience includes:

- Pumping systems
- Digester gas systems
- Blower systems
- Compressed air systems
- Pipe stress analysis
- Pump system transient analysis

PROJECT EXPERIENCE

Jacksonville Electric Authority | Buckman Street Wastewater Treatment Plant; Jacksonville, FL

Design Engineer. Performed a review on and provided recommendations for the blower system at Buckman Street Wastewater Treatment Plant which includes four 700 horsepower high speed gearless turbo blowers. The blowers, the aeration system, electrical equipment, controls, and the environment were inspected to determine the cause for the faulting blowers. Numerous recommendations were provided as solutions.

Grand Strand Water & Sewer Authority | Myrtle Beach Surface Water Treatment Plant; Myrtle Beach, SC

Design Engineer. Responsible for the design and submittal review of the Liquid Oxygen Supply system, the Ozone distribution system, and the Ozone Generation system.

Mesa Signal Butte | Signal Butte Water Treatment Plant

Design Engineer. Responsible for the design and operation of the sludge mixing system.

Sacramento Regional County Sanitation District | New Wastewater Treatment Plant; Sacramento, CA

Design Engineer. Took part in the design of the $2B wastewater upgrade. Designed the pipe layout and performed the pipe stress analysis for the six new 3,000 hp integrally geared single stage centrifugal blowers for BNR aeration, and one gearless turbo blower for channel aeration. Responsible for the review of the blower and aeration submittals and modifications required to incorporate the equipment.

City of Springfield | Blower Upgrade, Southwest Wastewater Treatment Plant; Springfield, MO

Design Engineer. Designing the blower system which includes four 300 horsepower high speed gearless turbo blowers which are to replace the existing system in an effort to increase process efficiency. The major efforts have included a blower life cycle cost analysis, blower sizing and selections, blower and pipe layout and design, and a pipe stress analysis.

Coastal Water Authority | Capers Ridge Pump Station; Houston, TX

Design Engineer. Took part in the design of a 500 mgd pump station responsible for maintaining the water level of Lake Houston ultimately supplying Houston with water. Main design efforts include a hydraulic analysis of the system, pump sizing and selections, transient analysis on the dual 96" pipelines, locating and sizing air valves, pump bay design and dimensioning per HI, and pump bay intake flushing line design.

Winston-Salem/Forsyth County Utility Commission | Muddy Creek Wastewater Treatment Plant Upgrade; Winston-Salem, NC

Design Engineer. Took part in the design of the digester gas system upgrade. Designed the high pressure digester gas compressor system. The design included compressor sizing, compressor and pipe layout, and system integration and controls.

City of Lakeville | Water Treatment Plant; Lakeville, MN

Design Engineer. Designed the stand-by 150 hp multi-stage centrifugal blower filter backwash blower to work in a duty/stand-by format with the existing blower.

Metropolitan Water District of Southern California | Greg Avenue Pump Station; CA

Design Engineer. Performed the hydraulic analysis and pump design for the replacement of two in-series 1,250hp horizontal bottom suction pumps paralleled with a new 2,250hp bottom suction pump. The second pump in series was to double as a hydraulic turbine during reverse flow.

Medford Water Commission | Ozone Facilities, Robert A. Duff Water Treatment Plant; Medford, OR

Design Engineer. Responsible for the design of a flash mix pump system flash mixing chemicals. The design included hydraulic calculations, pump selections and pump and pipe layouts.

Orange County | South Water Reclamation Facility Phase V Improvements; Orlando, FL

Design Engineer. Designed a blower system including four 800 horsepower single-stage centrifugal blowers. Designed new and modified existing aeration piping for the blowers and the aeration basins. Major efforts included blower sizing, blower and pipe layout and design, pipe stress analysis, and structural support design.

City of Paso Robles | Wastewater Treatment Plant Upgrade; Paso Robles, CA

Design Engineer. Witnessed the gearless high-speed turbo blower performance tests.

New York City Department of Environmental Protection | North River Wastewater Treatment Plant; New York City, NY

Design Engineer. Designed the pipe layout and performed the pipe stress analysis for the new blower system consisting of nine 350 hp gearless turbo blowers for wastewater aeration.

MELISSA VELEZ, LEED AP, PE

PROCESS MECHANICAL

OFFICE LOCATION
Coral Springs, FL

EDUCATION
MS, Environmental Engineer, Stanford University, 2007

BS, Civil Engineer, Environmental Engineer, FL International University, 2005

YEARS EXPERIENCE
13

PROFESSIONAL REGISTRATION
PE – 2011, FL, 72508

Certification – LEED, 2009

PROFESSIONAL ASSOCIATIONS
American Water Works Association - Chair of Drop Savers Poster Contest (Florida) & Water Conservation Co-Chair (Florida Region VI)

Ms. Velez has over 11 years of experience in the water and wastewater field in Florida. My experience includes design, feasibility studies, hydraulic modeling, cost estimating, and construction oversights for water and wastewater treatment plants.

PROJECT EXPERIENCE

City of Hollywood | Automation and SCADA Improvements for Optimization of the SRWWTP's Influent Distribution, Oxygenation Trains, RAS, DEEP Injection Wells; Hollywood, FL

Engineering Manager. Ms. Velez is assisting in the ongoing automation and SCADA improvements for the influent distribution box, oxygenation trains, RAS pump station 2, RAS pump station 4 and deep injection well pump station at the South Regional Wastewater Treatment Plant.

Miami-Dade Water and Sewer Department | Feasibility Study for the Preston and Hialeah Water Treatment Plants Upgrades; Miami, FL

Project Engineer. Phase 1 of the Feasibility Study Report that identified and recommended process modifications and improvements to the conventional softening water treatment plants on the existing site or remotely to address a reclassification of one of the water sources as groundwater under the influence of surface water. Compiled and reviewed pertinent project documents, such as owner historic plant documentation (235 mgd facilities), as-built construction plans, specifications, regulatory permits, and other regulatory communication to assess the existing facilities. Analyzed a variety of alternatives based on process layouts, technologies, and cost.

Miami-Dade Water and Sewer Department | CDWWTP - Tertiary Filtration Pilot Test and Effluent Pump Station Evaluation; Miami, FL

Engineering Manager. Ms. Velez is assisting in the on the development of the pilot test and evaluation of the Central District Wastewater Treatment Plant (CDWWTP) effluent pump station. The objective of the pilot testing tertiary filtration technologies is to confirm the capability of the considered filter treatment technologies to comply with an effluent TSS concentrations of less than 5 mg/L on a continuous basis. Her responsibilities include coordination between the sub-consultants; run and organize progress meeting with team members; organize and coordinate submittals; prepare invoices and progress reports for client.

Miami-Dade Water and Sewer Department | North District Wastewater Treatment Plant Secondary Clarifiers Upgrades; North Miami, FL

Design Engineer/Task Manager. The project consists of the rehabilitation of the twelve secondary clarifiers including, mixed liquor flow splitting structures, return sludge pump stations, and associated yard piping. Implementing the proposed improvements/ rehabilitation will improve the overall reliability of the mixed liquor flow splitting structures, the secondary clarifier system including scum removal, the return sludge wetwells, pumps and discharge piping, and secondary clarifier effluent pipelines. Her responsibilities include construction drawings and specifications for the replacement of the RAS pumps, valves, piping, fitting, appurtenances; scum conveyance upgrades for secondary clarifiers 11 and 12; evaluate solutions to separate reuse filter backwash from sanitary sewer; coordinate with all the sub-consultants; run and organize weekly progress meeting with team members; run an organize workshop with client; organize and coordinate submittals including construction drawings, specifications and cost estimates with all team members.

Fort Myers | East Storage Tanks and Booster Pump Station; Ft. Myers, FL

Engineering Manager. Ms. Velez is assisting on this ongoing project that involves the construction of a new Ground Storage Tank (GST) and Booster Pump Station (BPS) on existing City-owned property. The water main pipeline will be extended to connect to and fill the GST during off-peak periods. An inlet fill valve will be located on the pipeline and will be controlled remotely from the WTP Control Center. The GST will be used as a suction well for the adjacent BPS. The BPS will contain three booster pumps (2 duty, 1 standby) with provisions for a future fourth pump. The pumps will discharge back into the existing 24" water main to maintain a system pressure of at least 50 psi and will be controlled automatically when the system pressure drops below an adjustable pressure set point. The booster pumps will be located inside a building with HVAC, electrical service and instrumentation and controls for the tank and pumps.

City of Daytona Beach | Westside Regional Water Reclamation Facility New Tertiary Filters; Daytona Beach, FL

Project Engineer. Project Engineer for a 45 mgd deep bed filters and feed pump station. Assisted on the Basis of Design Report preparation with the filter design including hydraulic evaluation, site layout, and cost estimate.

Manatee County | Southwest Water Reclamation Facility Clarifiers Improvements; Bradenton, FL

Project Engineer. The construction phase for the rehabilitation of Clarifiers No.1 and 2. Prepared meeting minutes from monthly construction meeting, reviewed shop drawings and submittals for construction contracts.

City of St. Petersburg | Southwest Water Reclamation Facility Thickening Improvements; St. Petersburg, FL

Project Engineer. The replacement of the existing gravity belt thickener and addition of a new thickener in the existing building. Design of all thickened sludge transfer pumps, chemical system, and mechanical piping required to run the upgraded and new gravity belt thickeners. Prepared contract drawings, specifications, and cost estimates for the 60% design deliverable.

City of Sunrise | Springtree and Sawgrass Water Treatment Plant Improvements; Sunrise, FL

Project Engineer. The design of a 1.5 mgd reverse osmosis facility for Springtree Water Treatment Plant and 3-mgd reverse osmosis facility for Sawgrass Water Treatment Plant Project. Designed of the sand strainers; chemical storage and feed systems for sulfuric acid, sodium hydroxide, sodium hypochlorite, and scale inhibitor; replacement of sodium hypochlorite storage tanks; 4-log compliance modifications. Prepared contract drawings, specifications, and cost estimates.

City of Orlando | Conserv II Water Reclamation Facility Biosolids Dewatering System Improvements; Orlando, FL

Project Engineer. Project Engineer for the upgrades to the biological dewatering system which includes a new aerated 400,000 gallons capacity WAS holding tank; replacement of three belt filter presses, and sludge feed pumps.

BRAD VANLANDINGHAM ,PE

STRUCTURAL

OFFICE LOCATION
Orlando, FL

EDUCATION
BS, Civil Engineering, Rose-Hulman Institute of Technology, 1985

YEARS EXPERIENCE
34

PROFESSIONAL REGISTRATION
PE – 1991, FL, 44795

PROFESSIONAL ASSOCIATIONS
American Water Works Association

Water Environment Federation

Mr. Vanlandingham has extensive experience designing a variety of projects including water and wastewater treatment plants, solid waste transfer stations, laboratories, and power stations.

Some of Bradley's key assignments have included:

- Engineering Manager for preliminary and final designs, permitting, and bid phase services for the $62M upgrade to Orange County Utilities South Water Reclamation facility. Following the bid process, construction was scheduled and commenced in the first quarter of 2016.
- Engineering Manager for multiple water supply facilities for utilities in Central Florida. Services provided included treatment process studies, ozone pilot plant, preliminary and final designs, bidding, permitting, construction phase services, as well as startup assistance.
- Engineering Manager for the design and construction of a $27M solid waste transfer in Palm Beach County.

PROJECT EXPERIENCE

Orange County | Southern Regional Water Supply Facility; Orlando, FL

Project Engineer. Responsible for preliminary and final design, bidding, permitting and construction phase services associated with a new 30 mgd water treatment plant. Preliminary design included study of treatment technologies for hydrogen sulfide removal. A present worth analysis of the capital and operation costs for forced draft aeration and ozone was prepared, and was followed by an ozone pilot plant. The new plant includes a 3,000 lb/day ozone system with liquid oxygen, sidestream injection, and 60 in. diameter, 430 ft. long stainless-steel contactor pipeline for hydrogen sulfide treatment, sodium hypochlorite for disinfection, fluoride, 72 mgd high service pump station, two 5-million-gallon circular prestressed ground storage tanks, and over 5000 feet of raw and finished water mains up to 48" diameter. Five new 1,400 ft. deep Lower Floridan aquifer water supply wells were drilled for supply to the plant.

City of St. Petersburg | Oberly and Washington Terrace Pumping Station Improvements; St. Petersburg, FL

Project Structural Engineer. Performed detailed structural design and construction phase services for improvements to the City's 80 mgd Oberly P.S. and 45 mgd Washington Terrace P.S. to accommodate improvements that included addition of pump VFDs, replacement of emergency engine-generators, and replacement of pump switchgear.

Tampa Bay Water | System Engineer; Clearwater, FL

Project Engineer. Contributed to numerous projects as part of a $600 million expansion program for Tampa Bay Water which includes a desalination plant, a surface water treatment plant, pumping stations, and pipelines. Brad was the Project Engineer for the System Enhancements Contract 1 project at the Regional Facilities Site which included the addition of a booster pump station, sodium hypochlorite and ammonia feed systems, engine generator, and variable frequency drive for a high service pump. Brad also assisted in evaluating chemical feed improvements at the Regional Facilities Site and designed a canopy to cover the lime mixing basins in accordance with FDEP regulations concerning CT. He also designed cleaning solution storage tank at the Desal Plant and evaluated structural concerns at the Cypress Creek Pump Station.

Seminole County | Southeast Regional Water Plant; Sanford, FL

Project Engineer. Responsible for the design, permitting, bid, and construction phase services associated with a new 22-mgd water treatment plant. Design included an evaluation of treatment options for hydrogen sulfide removal that considered cascade and forced draft aerators, and oxidation with ozone, hydrogen peroxide, sodium hypochlorite, and chlorine gas. Also performed the structural design of all project facilities including a building housing the high-service pumps, chemical storage and feed, and administrative offices; well houses; and two 2.5-mg prestressed storage reservoirs.

Orange County | Western Regional WTP; Orlando, FL

Design/Project Engineer. Produced structural design drawings and specifications for all project facilities, including high-service pump building, chemical storage and feed building, well houses, and two 2.5-mg prestressed storage reservoirs. The project wind-loading design criteria exceeded the code required minimum and was based on a Category 3 hurricane wind speed. Provided construction-phase support services including technical support, responding to RFIs, and shop drawing review. Coordinated the efforts of all disciplines and subconsultants and served as the primary engineering support contact for the Owner and Contractor.

Manatee County | Stilling Basin Wall Instigation; Bradenton, FL

Structural Engineer. Conducted a study of tall retaining walls downstream of the gated spillway of the Lake Manatee Dam to determine cause of movement and recommend remedial actions. Tasks included specifying surveying work, design of movement indicators, reviewing field data, performing structural calculations, and writing a report summarizing the work.

Tampa Bay Water | Water Pipeline; Clearwater, FL

Structural Engineer. Designed anchorage for a line stop in a 72-inch PCCP water line. Design included steel sheet piling and massive concrete placement to restrain a temporary plug inserted in the pipeline under pressure.

Orlando Utilities Commission | Southwest WTP; Orlando, FL

Structural Engineer. Designed a 7,000-sf, high service pump station and 22,000-sf operations building. Each included a braced steel frame, traveling bridge cranes, and non-load bearing masonry walls. Also designed two 3-mg rectangular concrete reservoirs, and an ozone contact basin.

Charlotte-Mecklenburg Utilities | North Mecklenburg WTP; Charlotte, NC

Structural Engineer. Designed raw water intake structure located 200 feet offshore in Lake Norman. Design included a DOT-type access bridge and a gazebo on top of the intake structure.

AUBREY HAUDRICOURT, PE

ELECTRICAL

McKIM&CREED
ENGINEERS SURVEYORS PLANNERS

EDUCATION
BSEE, Electrical Engineering, Old Dominion University

PROFESSIONAL REGISTRATION
PE - FL, TX, GA, VA

PROFESSIONAL ASSOCIATIONS
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.

PROJECT EXPERIENCE

Howard F. Curren Advanced WWTP Master Plan Phase I City of Tampa, FL

Senior Electrical Engineer. 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

Electrical Engineer. 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

Electrical Engineer. 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. Analysis of pumping and blower systems, operational procedures, and monitoring systems were put in place to document incremental energy usage improvements and to assist in maintaining the program.

Deep Injection Well MS/RO Conc Disp | City of Hollywood, FL

Electrical Engineer. 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

Electrical Engineer. 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.

Jackson County Board of Supervisors: Hurricane Recovery Services | Pascagoula, MS

Electrical Engineer. Provided emergency response electrical support for the City of Pascagoula in the aftermath of hurricane Katrina. Responsibilities included evaluation of electrical equipment damage to city property. Project included inspections, evaluation, analysis, emergency project priority and coordination with FEMA and local authorities. Developed projects to return City facilities to operational status and performance standards. Responsible for construction documents, specifications, cost estimations, and presentation to the city council and FEMA.

DAVID GARCIA

ELECTRICAL

OFFICE LOCATION
Coral Springs, FL

EDUCATION
MS, Electrical Engineering, Florida Atlantic University, 2019

BS, Electronics Engineering, Devry University, 2008

YEARS EXPERIENCE
9

PROFESSIONAL REGISTRATION
EIT - 1100023150

Mr. Garcia is an electrical engineer with 9 years of overall experience in the manufacturing, automation, water and wastewater industries. Since joining Black and Veatch he has joined in the development of security and privacy SCADA policies for water and wastewater utilities, led and supported projects to replace low and medium voltage switchgears, as well as replacing and adding power generation to utilities.

PROJECT EXPERIENCE

MDWASD | Preston Water Treatment Plant Switchgear Replacement; Miami, FL

Lead Electrical Engineer. Mr. Garcia is the lead electrical design engineer for the Preston WTP Switchgear Replacement project. Unique challenges to this project include extreme size and access constraints. The use of gas-insulated switchgear is being consider to accommodate the small space available. The design will also consider upgrading and replacing old soft start pumps for bigger and VFD controlled pumps to eliminate the total number of pumps while maintaining the same water output.

Florida Power and Light | Advanced Reclaimed Water Project; Miami, FL

Lead Electrical Design Engineer. Mr. Garcia is the lead electrical design engineer for the advanced reclaimed plant. The plant will allow for the reuse of reclaimed water for onsite operations.

Gribetz International | Manufacturing Plant System Integration; Sunrise, FL

Lead Electrical Design Engineer. Mr. Garcia was part of a group responsible for integrating equipment from different vendors to stablish functional communication between all equipment with the goal of creating an automated manufacturing process. Tasks included bringing equipment up to NEC or IEC code and local electric code.

Gribetz International | Manufacturing Plant Automatization; Riviera Beach, FL

Lead Electrical Design Engineer. Mr. Garcia participated in the design and implementation of automatization systems in various manufacturing plants. The automatization systems included: the integration of different equipment PLCs, establishing communication to a central computer via TCP/IP, programing and adjustment of system parameters, and operator training.

Gwinnet County Department of Water Resources | SCADA Policies and Procedures; Gwinnet County, GA

Lead Electrical Design Engineer. Mr. Garcia participated in the development of SCADA security policies and procedures for the Gwinnet County Department of Water Resources (GCDWR). The policies and procedures were developed following the NIST800-53 and AWWA standards. All the policies and procedures were designed taking into consideration GCDWR's unique needs and requirements.

City of Venice | Water Treatment Plant Switchgear Replacement; Venice Beach, FL

Lead Electrical Design Engineer. Mr. Garcia is the lead electrical design engineer for the replacement of the switchgear and one engine generator at the water treatment plant in Venice Beach. The project includes evaluating the current switchgear capacity, the plant's current and future demand, and designing a new switchgear to meet the plant's future demand.

City of Venice | Water Booster Pump Station; Venice Beach, FL

Lead Electrical Design Engineer. Mr. Garcia is the lead electrical design engineer for the addition of a new water booster pump station for the City of Venice. In addition to the water booster pump station, the city requested a backup operation building with full SCADA connection and control of their water and wastewater treatment plants and a standby generator for the water booster pump and operations building.

Conserv II Orlando; Orlando, FL

Lead Electrical Design Engineer. Mr. Garcia assisted in this projected by completing the heat load addition calculations necessary for the HVAC group to accurately design the HVAC system in this new building. The information required to complete these tasks included creating a complete electrical equipment list, calculating total energy consumption and heat generation.

LAURIE KUSMAUL

INSTRUMENTATION & CONTROLS/SCADA

OFFICE LOCATION
Coral Springs, FL

EDUCATION
MBA, Management Information Systems, Databases, DeVry University/ Keller Graduate, 2019

BS, Business Information Systems, IT & Networks, DeVry University, 2004

YEARS EXPERIENCE
16

PROFESSIONAL REGISTRATION
Trihedral VTSCADA Advanced Programmer – 2012, Multiple

AVEVA Wonderware System Platform – 2007, Global, CSI3781

PROFESSIONAL ASSOCIATIONS
American Water Works Association

International Society of Automation (ISA)

Ms. Kusmaul is a solutions-oriented Industrial IT Professional with proven success designing, implementing, and integrating cost-effective, high-performance technical solutions in various markets, especially the water & wastewater pumping industry. Strong background in Information Technology, Project Management, and Electrical Controls.

PROJECT EXPERIENCE

City of Hollywood | Automation & SCADA Improvements; Hollywood, FL

PLC & SCADA HMI Programmer. The Southern Regional Wastewater Treatment Plant is located in Hollywood, FL and operated by a crew of highly specialized Public Utilities staff members. The plant uses state-of-the-art technology to treat and dispose of nearly 39.1 million gallons of effluent each day (permitted at 55.5 MGD). The SRWWTP includes an on-site oxygen generation facility for the operation of a pure oxygen-activated sludge process for treatment. It is divided into two sections, East and West, both of which can operate independently. Additionally, the Department maintains a water reclamation facility, which provides an alternative water supply for irrigation for golf courses within the City.

Black & Veatch has researched and documented the entire wastewater treatment plant supervisory control and data acquisition (SCADA) system, and performed automation and control improvements, as well as update SCADA HMI screens to comply with ISA-101 guidelines. PLC CPUs were converted to Schneider Unity programming to support modern function blocks and obsolete CPUs were upgraded to Schneider M340 or M580 CPUs to support new programming standards. SCADA HMI used at this plant is GE Digital iFIX.

Pinellas County Utilities | Phase I - Radio to Cellular Modem Upgrades for Lift Stations; Pinellas County, FL

Project Manager & SCADA Engineer. Phase I of the overall upgrade of the County's SCADA system included removing analog trunked radios form 360+ lift stations and replacing and configuring cellular modems (RedLion RAM series). Startup services and training were provided for preliminary sites. Required some updates to the Wonderware System Platform application and configuration changes in the Motorola RTUs.

Orange County Utilities | SCADA Communications & Logging Optimization; Orange County, FL

SCADA Programmer. Laurie's team provided a customized Motorola program that logs more information regarding site to site communications over radio for the County's 400+ lift stations. In 2011, the County was going to make a system wide RTU change to a different undecided vendor; however, the team helped this customer gain a much deeper understanding of the existing products' capabilities, and enhanced program for more effective communications troubleshooting. The County was then able to pinpoint problem sites related to radio communications instead of experiencing faltering response on a global SCADA software level. "It's just running slow," became "We know it's a problem at xx site at this address, and the problem started at 16:00 hours on Thursday." This program downloaded to each of the RTUs allowed the customer to capitalize on their existing infrastructure. To date, there is no plan to replace the existing RTU hardware to another manufacturer.

Martin County | SCADA Services & Support; Martin County, FL

SCADA Programmer. Provided repairs, parts, and services to the Motorola RTU based SCADA system for lift stations, and upgrade Trihedral VTSCADA proprietary locked application to an open source application, upgradeable and configurable by the customer. Martin County maintains 400+ lift stations. Other system improvements included assisting utility in upgrading some lift stations from analog radios to cellular modems.

City of Orlando | Lift Station Controller and SCADA Programming; Orlando, FL

SCADA Programmer. Provided Motorola ACE 3600 RTU programming assistance at several lift station start-ups. Assisted SCADA team with upgrading telemetry equipment to cellular modems.

Mount Pleasant Waterworks | Center Street and Rifle Range Road Wastewater Treatment Plants & Wastewater Lift Station - SCADA Upgrades; Mount Pleasant, SC

Project Manager & SCADA Programmer. Migrated 2 WWTPs and 160+ lift stations from one SCADA platform (Wonderware) to a new platform in parallel (Trihedral VTSCADA) at customer's request. This involved over 100k IO points. Created a redundant server for automatic server failover. Updated some lift stations from Motorola trunked analog radio to Sierra Wireless GX450 cellular modems by Verizon Networks.

Star Controls partnered with Mount Pleasant Waterworks (MPW) in system optimization, advisory, programming, and training services; assisting MPW in the on-going improvements of its Motorola 160+ RTU SCADA system, which was experiencing wireless communication and performance problems. Before Star Controls' involvement, MPW was considering phasing out Motorola RTUs and replacing them with Allen Bradley PLCs, and migrating from a conventional 800MHz radio system to 450MHz. Star Controls provided its StaRTU software platform to MPW to replace the existing software in all the Motorola RTUs.

City of Deerfield Beach | Wastewater Lift Station SCADA Upgrades; Deerfield Beach, FL

Project & Implementation Engineer. Designed SCADA network, assisted Utility with upgrading pump station hardware (Xylem MultiSmart), radio configuration training and assistance (CalAmp UHF), Trihedral VTSCADA application creation, training, and support.

LAWRENCE BROUILLETTE, PE

INSTRUMENTATION & CONTROLS/SCADA

OFFICE LOCATION
Orlando, FL

EDUCATION
BS, Electrical Engineering, University of Central Florida, 1990

YEARS EXPERIENCE
37

PROFESSIONAL REGISTRATION
PE – 2002, FL, 57973

PE – 2003, VA, 0402037398

PROFESSIONAL ASSOCIATIONS
International Society of Automation

Water Environmental Federation

Mr. Brouillette is a senior I&C engineer responsible for the process design and development of various wastewater, reclamation, and potable water, facilities. He has participated in a wide range of project activities including feasibility studies, alternative technologies review, design, construction services, final commissioning and training.

Some of Mr. Brouillette's key recent assignments have included:

- The design services for a new combined heat and power addition to an existing wastewater plant for Winston-Salem, North Carolina.
- The process design and construction services for a remediation of two water plant for City of Durham, NC.
- The process design and construction services for a new ozonated water plant for Orange County, FL.
- The process design and construction services for a plant expansion of an advanced secondary wastewater treatment plant from 7.5 mgd to 11.25 mgd for Orange County, FL.
- The process design and construction services for a new wastewater plant for Florida Keys Aqueduct Authority, FL.
- Commissioning of a new wastewater plant for the City of Lakeland, FL.
- SCADA Systems Alternatives Report for the City of Fort Myers, FL

PROJECT EXPERIENCE

Orange County Utilities | Southern Regional Water Supply Facility; Orlando, FL

Design Engineer. Supplied design services in the development of contract drawings and specifications for the Southern Regional Water Supply Facility. The project includes P&ID development, the design of PLC-based process controls system for a water plant using ozone for the removal of hydrogen sulfide from the raw water supply.

Orange County Utilities | Southern Regional Water Supply Facility; Orlando, FL

Design Engineer. Supplied design services in the development of preliminary design memo for the Southern Regional Water Supply Facility.

Cape Fear Public Utility Authority | Sweeney Water Treatment Plant GAC Contactors Addition; Cape Fear, NC

Design Engineer. Supplied design services in the development of contract drawings and specifications for the Sweeney WTP Contactors Addition upgrade and expansion project. The project included P&ID development, the design of PLC-based process controls systems for GAC process area, a fiber optic network addition in the plant and construction services in the commissioning of the facility.

City of Durham | Brown and Williams WTP Upgrade and Expansion; Durham, NC

Design Engineer. Supplied design services in the development of contract drawings and specifications for the Brown and Williams WTP Upgrade and Expansion project. The project included P&ID development, the design of PLC-based process controls systems for two water plants, a fiber optic network in the plants and construction services in the commissioning of both facilities.

Utilities Commission of New Smyrna Beach | Water Facilities Improvements; New Smyrna Beach, FL

Design Engineer. Supplied design services in the development of contract drawings and specifications for the Water Facilities Improvements project. The project included P&ID development, the design of PLC-based process controls systems for two pump stations, a 3-mile-long fiber optic network between the plants and construction services in the commissioning of both facilities.

Utilities Commission of New Smyrna Beach | Water Facilities Improvements; New Smyrna Beach, FL

Design Engineer. Supplied design services in the development of preliminary design memo for the Water Facilities Improvements project.

Fairfax County Water Authority | Griffith WTP Control System and Initial SCADA System Design; Fairfax, VA

Design Engineer. Supplied construction services for the FCWA's Frederick P. Griffith Water Plant control system. The plant control system utilizes a redundant fiber optic network and Modicon Quantum PLCs.

Fairfax County Water Authority | Phase 1 and Phase 2 SCADA System Design; Fairfax, VA

Design Engineer. Performed a SCADA system needs/requirements assessment and supplied design services in the development of contract drawings and specifications for the FCWA's Phase 1 and 2 SCADA system. Performed site assessments for remote pumping facilities and determined the site upgrade requirements necessary to utilize a Modicon Momentum PLC based RTU. Performed radio path surveys, radio configuration and field testing of the Schlumberger Utilinet radios in conjunction with the Phase 1 and 2 SCADA Systems design. The SCADA system utilizes a frame relay network for communications to the remote pump stations and a Utilinet packet radio network for communication with control valve and wholesale meter vaults.

Kissimmee Water Resources Department | Lift Station and Imperial Rapid Infiltration Basin; Kissimmee, FL

Instrumentation and Controls Engineer. Performed instrumentation and controls assessment and supplied design services in the development of design modifications to the existing control system of the City's effluent pump station and remote ponds. This modification supported the remote control of these sites. Designed, fabricated, installed and tested the interface panel for the RTUs at the pump station and remote sites. Coordinated the upgrade of the old technology central RTU to an upgraded RTU for the lift station monitoring system. Performed display screen integration, report generation, local area network setup, and installed and integrated the alarm dial out software to allow paging of operators during off-hours.

ROBERT BURCHETT, PE, ENV SP

PUMP STATIONS

OFFICE LOCATION
Tampa, FL

EDUCATION
BS, Civil Engineering, Georgia Institute of Technology, 2000

YEARS EXPERIENCE
20

PROFESSIONAL REGISTRATION
PE – 2006, FL, 64762

Envision™ Sustainability Professional

PROFESSIONAL ASSOCIATIONS
American Water Works Association

Mr. Burchett has 12 years of experience providing engineering consulting services to municipal clients for a variety of water, wastewater, and reclaimed water projects. His experience includes water and wastewater system planning; and detailed design, permitting and construction phase services for water and wastewater system infrastructure. He has extensive experience with water and wastewater system master planning studies, energy efficiency and management, hydraulic modeling, water quality modeling and pump station analysis and design.

PROJECT EXPERIENCE

City of Hollywood | Energy Efficiency Master Plan; Hollywood, FL

Energy Management Team Lead. Responsible for leading technical evaluations of energy efficiency improvement alternatives as part of the development of a comprehensive energy efficiency master plan for the City's Water, Wastewater, and Reclaimed Water Systems and Facilities. The master planning effort includes: electric utility rate analyses; industry benchmarking; development and use of an energy project decision cash flow model; energy assessments of facilities, equipment and infrastructure; renewable energy generation feasibility assessment; and business case evaluations to define and support recommended energy efficiency projects.

Tampa Bay Water | Eldridge-Wilde H2S Removal Facility and Pinellas County Points of Connection Updates; Tarpon Springs, FL

Project Manager. Responsible for the design, permitting, bidding and construction phase services for a variety of improvements to an existing 45 mgd groundwater supply and treatment facility and a new 60-inch diameter pipeline section to meter wholesale water supply flowrates up to 93 mgd. Improvements at the treatment facility include: process control enhancements for a packed tower aeration treatment process; SCADA and instrumentation and controls improvements to support remote monitoring and control capabilities; 36-inch and 42-inch diameter yard piping improvements; four new pumps with variable speed drives; miscellaneous electrical and civil site improvements; and installation of fiber optic communication lines for the wellfield.

Hillsborough County | Lake Park and Fawn Ridge WTP Energy Efficiency Improvements Project; New Port Richey, FL

Project Manager. Responsible for conceptual planning, design and supporting the implementation of energy use and efficiency monitoring enhancements for the Lake Park and Fawn Ridge Water Treatment Plants and Pumping Stations. The improvements included new power meters, communications wiring, and custom programming to display real-time energy use and efficiency data on plant operator screens. The programming work included real-time pump station energy efficiency calculators, and notifications on the operator screens to support avoidance of high energy demand charges and energy use during on-peak billing periods.

City of Lakeland | Northeast Wellfield Energy Efficiency Project; Lakeland, FL

Project Engineer. Responsible for evaluating an existing wellfield supply system to identify pump and operational modifications to improve energy efficiencies. The evaluation resulted in low capital cost improvements that immediately provided a 30% improvement in the energy efficiency of the wellfield. The energy cost savings achieved provided a 1-year payback period on the capital costs for the well pump modifications that were made.

Tampa Bay Water | Morris Bridge Booster Station Expansion; Tampa, FL

Project Manager. Responsible for planning, permitting, design, and construction phase services for improvements to an existing 45 mgd pump station and groundwater treatment facility. Improvements include the addition of a 1000 HP vertical turbine pump, and numerous upgrades to the electrical, instrumentation and controls, and chemical feed systems.

Tampa Bay Water | System Configuration II Program; Pinellas, Pasco and Hillsborough Counties, FL

Project Engineer. Participated in a variety of planning, engineering analyses and program management support activities for the development and implementation of the System Configuration II Program. The System Configuration II Program includes ten projects that will provide Tampa Bay Water with an estimated 25 mgd of additional supply capacity during a median year. Five of these projects will increase the yield from Tampa Bay Water's existing Enhanced Surface Water System, and the other 5 projects involve improvements to increase the hydraulic capacity of Tampa Bay Water's transmission system.

Tampa Bay Water | Long-Term Water Supply Plan; Pinellas, Pasco and Hillsborough Counties, FL

Project Engineer. Responsible for evaluating hydraulic and water quality impacts that potential future water supply options would have on a wholesale water supply and transmission system that provides water to approximately 250,000 customers in the tri-county Tampa area. The long-term water supply planning process included the identification of water supply project alternatives, the formation of a planning advisory panel, and the development of a public involvement effort to gather public input on various water supply concepts. The alternatives were screened and a short-list of project was investigated in more detail, including the development of order of magnitude project costs. The short-list was evaluated, and a number of potential projects were recommended for further detailed evaluation.

City of New Port Richey | Maytum WTP Transfer Pumping Station Improvements; New Port Richey, FL

Project Manager. Responsible for the planning, permitting, design and construction phase services for improvements to increase the hydraulic capacity of an existing 9 mgd transfer pump station system.

KENNETH CABAN, PE, BCEE, LEED AP

WATER MAIN INSPECTIONS

TETRA TECH

OFFICE LOCATION
Hollywood, FL

EDUCATION
MS, Environmental Engineering, Florida International University, 2007

BS, Civil Engineering, Florida International University, 1997

YEARS EXPERIENCE
25

PROFESSIONAL REGISTRATION
PE - 25

Board Certified Environmental Engineer (BCEE)

Leadership in Energy and Environmental Design Accredited Professional (LEED AP)

PROFESSIONAL ASSOCIATIONS
American Water Works Association

Mr. Caban has over 25 years of experience in the analysis, design, permitting, inspection, construction management, and program and project management of water and wastewater conveyance and treatment systems, water, wastewater, and stormwater master planning and design, site development, and capital improvement programs for various municipalities. Mr. Caban has extensive experience with water and wastewater master planning of many of the largest systems in the Country.

PROJECT EXPERIENCE

Water Main Replacement Program, City of Hollywood, FL.

Quality Manager. Oversaw the surveying, geotechnical evaluations, design, permitting, and construction administration services on multiple projects being completed concurrently. The portion of the system being overseen by Mr. Caban is comprised of over 300,000 linear feet (56 miles) of water main replacement, reconnection of over 1,000 service connections, numerous underground and overhead utilities conflicts, permitting through multiple agencies, and construction within schedule and budget. Existing aged cast iron water mains were replaced with both DIP and PVC water mains, ranging from 4-inch to 24-inch diameters. The existing water mains were located within residential streets, paved and unpaved alleys, and easements in the rear of residential lots, which had become overgrown or encroached upon by property owners. Existing water meters located within unpaved alleys or rear easements were relocated to the front of the lots and included new water services within private property. Aged fire hydrants were replaced some water mains were upsized by one nominal size. Extensive asphalt pavement and pavement markings restoration and improvements were also included.

Water Facilities Master Plan Update, Miami-Dade County, FL

Project Manager. The preparation of a comprehensive water master plan for the largest water system in the Southeast United States. The master plan included renewal and rehabilitation of existing facilities including water supply, treatment, storage, transmission, and distribution systems. The master plan also considered a 20-year planning horizon with water demand projections, water system hydraulic modeling, capital program development, financing, implementation planning, and considerations for sea level rise and climate change. This project also included extensive water use permitting and alternative water supply development and planning.

Miami International Airport Water Master Plan Update, Miami-Dade County, FL

Quality Manager for the preparation of a comprehensive water master plan the water system serving one of the largest airports in the county. The master plan included renewal and rehabilitation of existing facilities including transmission and distribution systems. The master plan also considered a 20-year planning horizon with water demand projections, water system hydraulic modeling and calibration, capital program development, implementation planning, and considerations for sea level rise and climate change.

Water Master Plan, Atlanta, GA

Quality Control. Review for the preparation of a comprehensive water master plan for one of the largest water systems in the Southeast United States. The master plan included water supply, treatment, storage, transmission, and distribution systems. The master plan included water demand projections, water system hydraulic modeling, capital program development, financing, and implementation planning.

South Miami Heights Water Treatment Plant – Reservoir and Pump Station, Miami-Dade County, FL

Project Manager. Project manager for Tetra Tech the multi-discipline construction management team (as a subconsultant) acting as the County's Engineering Representatives for the delivery phase of a new 20 MGD water treatment facility utilizing membrane treatment was proposed in the SW service area. Project was initially anticipated to be delivered through three separate construction contracts. The first of these contracts consisted of a 5.0 MG potable water reservoir and high service pumping system that completed construction in 2012 and is currently operational as a storage and re-pump facility. Construction services provided for this contract included construction administration, participation in construction meetings, schedule and change order review, and site inspections.

Owners Engineering Representative, City of North Miami, FL

Project Engineer. Served as an extension of staff for multiple projects related to the potable water system planning and rehabilitation, including water supply, treatment, storage, transmission, and distribution. Services include providing in independent reviews related to the planning and rehabilitation of the City's potable water systems.

Winson Water Treatment Plant Rehabilitation, City of North Miami, FL

Technical Reviewer. Provided independent review of reports, contract documents, and other deliverables and functions for the rehabilitation and expansion of the Winson Water Treatment Plant.

Rehabilitation of Six Biscayne Aquifer Public Water Supply Wells, City of North Miami, FL

Project Manager and Technical Reviewer. Served as an extension of staff to assist in reviewing contract documents, well rehabilitation activities, well rehabilitation videos, and post rehabilitation water quality for the rehabilitation to six Biscayne aquifer water supply wells as part of the its plans to rehabilitate and upgrade its existing water supply, treatment, storage, transmission, and distribution systems. Also provided project management and construction management assistance during rehabilitation to coordinate with the well rehabilitation contractor.

Task Authorization No. 9 – Alexander Orr Jr. Water Treatment Plant Residuals Management Plan (20-Year Water Facilities Master Plan Update), Miami-Dade County Water and Sewer Department, FL

Project Manager. Project manager for residuals management plant which incorporates residuals management plans for the Hialeah and Preston Water Treatment Plants. As part of this project, current operational and maintenance practices and equipment were evaluated, as well as current and future lime sludge production rates. An analysis of the lime sludge lagoons was performed and a lagoon cleaning program was prepared. Alternatives were developed, evaluated, and selected.

JANINE ALEXANDER, PE

WATER MAINS INSPECTIONS

TETRA TECH

OFFICE LOCATION
Hollywood, FL

EDUCATION
BS, Environmental Engineering, University of Central Florida, 1996

YEARS EXPERIENCE
24

PROFESSIONAL REGISTRATION
PE - FL

NPDES Certified Inspector, 2005 & 2012

NASSCO Pipeline Assessment Certification Program (PACP), Lateral Assessment Certification Program (LACP), & Manhole Assessment Certification Program (MACP) Certified,

U-714-06021906, 2014

NASSCO's ITC Program for CIPP, certified ITC Inspector,

CIPP-714-0201409, 2014

OSHA 30 Hour Training for Construction Safety and Health, No. 36-601193051, 2014

Dale Carnegie Effective Communication & Public Speaking 12-Week Course

Dale Carnegie Sales Advantage 8-Week Course

Dale Carnegie Leadership

6-Week Course

Leadership Award Winner, 2012

PROFESSIONAL ASSOCIATIONS
Tau Beta Pi National Engineering Honor Society

Chi Epsilon National Civil Engineering Honor Society

Society of Women Engineers

Ms. Alexander has over 24 years of utility experience including project management for the design of new facilities, relocations of existing facilities, utility coordination, permitting, construction administration, construction management, inspections, and certifications for numerous public and private sector projects.

PROJECT EXPERIENCE

Water Main Replacement Program: Federal Highway (US 1) from Polk Street to Sheridan Street, City of Hollywood, FL

Senior Project Engineer. Design, permitting, bidding, and construction administration services for the east side of Federal Highway (US 1) including approximately 7,400 linear feet of 12-inch water main, 100 linear feet of 16-inch water main, 14 new fire hydrants and reconnections to existing side streets varying from 2- to 8-inches in diameter. Permitting included FDOT utility permitting and a DOH general permit for the water system. Plans also contained pavement removal and replacement, marking/striping plans and MOT details. The existing 8-inch water main along the east side of Federal Highway and was grout filled and placed out of service.

Water Main Replacement Program: Hollywood Boulevard to Sheridan Street, N. Dixie Highway to Federal Highway (US 1), City of Hollywood, FL

Senior Project Manager. The design, permitting and construction administration services for the replacement of approximately 100,000 linear feet of 2-inch through 16-inch diameter PVC and DIP water mains, fire hydrants, and water service lines, including relocation of existing meters for approximately 157 lots in residential and commercial streets and alleyways. The project also includes four (4) FEC railroad crossings at Hollywood Boulevard, Polk Street, Johnson Street and Taft Street. Pavement restoration, maintenance of traffic and lane closure analyses was also included. Permitting includes Broward County right-of-way use for N. 21st Avenue, FEC railroad crossing permitting, FDOT utility for US 1, DOH water system and City of Hollywood Building Department permitting. Construction administration services include review of shop drawings, requests for additional information during construction, review and approval of change orders, field observations, obtaining clearances and substantial and final completion punch list preparation.

Water Main Replacement Program: Hollywood Boulevard to Sheridan Street, Federal Highway (US 1) to the Intracoastal Waterway; Hollywood, FL

Senior Project Engineer. Final design, permitting and construction administration services. The City of Hollywood (City) has an ongoing water main replacement program and has identified the area from Hollywood Boulevard to Sheridan Street between Federal Highway and the Intracoastal Waterway as a project for Tetra Tech to design under the General Engineering Consulting Services contract. The water main improvements consist of approximately 99,700 linear feet of 2-inch, 4-inch, 6-inch, 8-inch, 12-inch, and 16-inch diameter water mains along local City streets, rear easements and paved alleys. These improvements involve upgrading 2-inch, and 6-inch diameter water mains one nominal size and replacing 4-inch, 8-inch, 12-inch, and 16-inch diameter water mains with the same nominal size. The existing utilities will be replaced with new PVC water mains, isolation valves, fire hydrants, water services, and water meters (in some cases). Where water meter and boxes are located in rear easements, these will be relocated to the front within the City right-of-way. Permitting included FDOT Utility permitting, DOH water system permitting and City of Hollywood Building Department permitting. Construction administration services include review of shop drawings, requests for additional information during construction, review and approval of change orders, field observations, obtaining clearances and substantial and final completion punch list preparation. Construction is currently underway.

Hollywood Boulevard Joint Project Agreement (JPA), N. 21st Avenue to City Hall, City of Hollywood, FL

Senior Project Manager. Design, permitting, bidding, and CA services for design, permitting and construction administration (CA) of 285 feet of 20-inch DR-11 HDPE casing pipe with 14-inch DR-11 HDPE carrier pipe installed via horizontal directional drill (HDD) under the Florida East Coast (FEC) railroad ROW and 3,000 feet of existing 8-inch water main piping upsized to 12-inch water main piping, new fire hydrants and existing hydrant reconnections, new water services and meter reconnections and abandoning the existing 8-inch water main in place and grouting it in place. Permitting includes Broward Co. Health/DOH, Broward Co. ROW Use permitting, Broward Co. Traffic Engineering permitting, coordination with FDOT due to stormwater, hardscape and roadway improvements as part of the JPA agreement process. Construction services include meetings, shop drawing reviews, RFIs, review and approval of change orders, field reviews, record drawings, obtaining clearances, and substantial and final completion inspections.

441 NW 7 Avenue Sewer Extension, City of Ft. Lauderdale, FL

Project Manager. Design, permitting, bidding, and CA services for the extension of 300 feet of 8-inch gravity sewer main, one manhole and a sanitary lateral to connect the House of God to the City's wastewater system. Permitting includes Broward Co. Health/DOH.

Pump Stations D-10 and D-11 Flow Analysis and Redesign project, City of Ft. Lauderdale, FL

Project Manager. Wastewater flow analysis due to increased land use densities from single family residential to condo and multifamily uses and evaluation of existing duplex pump stations and upstream influent manholes for rehabilitation or replacement for two existing city pump stations located adjacent to East Las Olas Blvd. on the Isle of Venice (pump station D-10) and Hendricks Isle (pump station D-11). Preparation of preliminary design memorandum including findings and recommendations for rehabilitation and replacement and associated costs, and survey, design, permitting and construction administration services for the rehabilitation and removal and replacement of existing infrastructure in disrepair. The existing pump stations both have 6-inch force mains (FMs) that discharge into an existing gravity sewer system on East Las Olas Blvd. The material for the FMs will also be verified via subsurface utility excavations with recommendations being made for potential FM removal and/or replacement.

RICARDO VIEIRA, PE

WATER MAINS INSPECTIONS

OFFICE LOCATION
Coral Gables, FL

EDUCATION
BS, Civil Engineering, Universidad Central de Venezuela, 1998

YEARS EXPERIENCE
22

PROFESSIONAL REGISTRATION
PE – 2011, FL, 73166

PROFESSIONAL ASSOCIATIONS
American Society of Civil Engineers/ Underground Engineering & Surveying

American Society of Civil Engineers/ ASCE Miami Dade / UESI Chair

American Society of Civil Engineers/ ASCE Palm Beach /FAU Practitioner

Mr. Vieira is a Client Director for Black & Veatch's South Florida operation, with more than 20 years of experience in Civil Engineering. Ricardo has published many National and International papers. He is experienced in leading and completing program management, design management, project management, and task management for water, wastewater, reclaimed, and storm-water transmission and conveyance projects. Experience includes preparing and leading multiple preliminary engineering reports, construction documents, design-build criteria packages, design specifications and plans; permitting, operations and maintenance manuals, project tracking and management. His experience brings together all elements of the design process into a single coordinated effort.

Experience also includes the design of roadway improvements, storm drainage systems, site development projects, and modeling and transient analysis.

PROJECT EXPERIENCE

Miami Dade County Water and Sewer Department | Project SL-2.1 – SP-1 Transmission Force Main Phase 3; Miami, FL

Project Manager. Project SL-2.1 consists of installing approximately 12,600 ft. of 60-inch pipe and fittings for a force main in Miami-Dade County, FL.

Special elements include conventional "cut and cover" work within a narrow road right-of-way along SW 137th Avenue between SW 184th Street and SW 200th Street, a trenchless crossing to cross Black Creek Canal (C-1W), a trenchless installation along 200th Street (SR 994), a Florida Department of Transportation road right-of- way from SW 137th Avenue to SW 134th Avenue, and a trenchless installation along SW 134th Avenue from SW 200th Street to SW 208th Street. These construction techniques are proposed to avoid and minimize impacts to heavily travelled road ways, and waterways

Miami-Dade County Water and Sewer Department | Program Management Consultant Contract to Establish a Comprehensive Infrastructure Assessment and Replacement Program for the Utility; Miami, FL

Deputy Program Manager. Involved the preparation of condition evaluation, forensic analysis, risk determination and renewal options protocol. The program provided the organizational structure required for implementation of the rehabilitation of the County's water system for 30 years while maximizing the impact of available funding.

96-inch Raw Water Main Limited Manned Entry and Field Observations. Involved in the site visit during the rehabilitation of the pipe-line, performed a limited manned entry assessment of the pipeline's internal condition, and performed a quality assurance review of the ongoing CFRP efforts of this raw water line.

54-inch Water Main Limited Manned Entry and Field Observations. Involved in the preparation of condition assessment report for a 54-inch carbon fiber repairs located along Red Road Ave that transfers water from the John E. Preston Treatment Plant to the City of Hialeah and other areas of North Miami-Dade County. Mr. Vieira performed a limited manned entry assessment of the pipeline's internal condition. The condition assessment portion included a total of 12 pipe sections and had the following tasks: visual inspection of carbon fiber repairs and soundings to asses existing conditions, identify deficiencies, recommend an approach for rehabilitating distressed sections of line.

54-inch Water Main Carbon Fiber Repairs (CFRP) Condition Assessment: Mr. Vieira performed a manned entry assessment of the pipeline's existing CFRP internal condition. The condition assessment portion included a total of 12 pipe sections previously repaired with CFRP and had the following tasks: visual inspection of carbon fiber repairs and soundings to asses existing conditions, identify deficiencies, and preparation of condition assessment report with recommendations an approach for rehabilitating distressed sections of the pipeline's existing carbon fiber repairs.

On-Call Rehabilitation to Large Diameter Water Mains: Mr. Vieira was part of the team for a series of contracts to provide inspection, failure analysis, rehabilitation recommendations, and oversight of construction activities for large diameter water mains throughout the City. Projects included the evaluation and design of repairs for water lines ranging from 24-inch to 96-inch, and included steel, ductile and cast iron and concrete water line materials.

MDWASD | Design-Build Criteria for the Government Cut 20-inch Water Main and 54-inch Force Main Replacement; Miami, FL

Project Coordinator. Mr. Vieira was part of the design team developing design-build criteria package for the replacement of the existing 54-inch force main that runs from Miami Beach to the Central District Wastewater Treatment Plant (CDWWTP) and for the replacement of the existing 20-inch water main from Port Island to Fisher Island.

This project involved the horizontal and vertical alignments, identification of land rights and properties affected by the alignment, recommendation method of construction and details of water main replacement, project schedule through construction and opinion of probable construction costs, assist MDWASD through the procurement process, selection of design-build team and negotiations and provide limited construction management support to MDWASD in responding to RFIs, reviewing shop drawings, change orders and claims, and site visits and/or inspections.

Miami-Dade Water and Sewer Department | Design of a 72-inch Raw Water Main; Miami, FL

Project Coordinator. Mr. Vieira designed of a 72-inch Raw Water Main (RWM) to transport raw water from the WASD Northwest Wellfield to the Hialeah/Preston Treatment Plant. The proposed RWM will serve as a redundant pipeline to the existing 96-inch RWM running along NW 74th Street. Mr. Vieira's tasks included developing design criteria and construction constraints, and performing route and pipe material evaluations.

Miami-Dade Water and Sewer Department | Evaluation of 54-inch Red Road Water Main Failure; Miami, FL

Project Coordinator. The MDWASD experienced a catastrophic rupture of a 54-inch diameter PCCP water transmission main which provided potable water to the City of Hialeah and northern Miami-Dade County. Mr. Vieira was part of the team for the failure evaluation and report for the assessment evaluation of the 54-inch water main.

EDWARD RECTENWALD, PG

PRODUCTION WELLS

OFFICE LOCATION
Fort Myers, FL

EDUCATION
MS/MSc, Geology, Florida Atlantic University, Florida, 2006

BSc, Geology, University of Akron, Ohio, 1995

YEARS EXPERIENCE
25

PROFESSIONAL REGISTRATION
PG – FL, GA, LA

PROFESSIONAL ASSOCIATIONS
Groundwater Professional, American Water Works Association

Groundwater Professional, South Florida Hydrologic Society

Groundwater Professional, Everglades Geological Society

Groundwater Professional, Florida Association of Professional Geologists

Groundwater Professional, American Institute of Professional Geologists

Mr. Rectenwald has over 23 years of experience in various hydrologic, geologic, environmental investigations, and expert witness testimony. This experience includes project management, design, permitting, construction and testing of Public Water Supply Wells/Wellfields (Surficial and Floridan Aquifer System) Class I injection wells, Class V Aquifer Storage, and Recovery (ASR) wells, Aquifer Recharge wells, industrial supply wells, irrigation wells, monitor wells, and rehabilitation of deteriorated wells. Mr. Rectenwald has successfully managed the projects and teams for wellfield construction and expansion projects, ASR system construction, and lead teams during Class I and Class V injection well facility construction on numerous projects. Mr. Rectenwald is also involved with regional studies of the Surficial and Floridan Aquifer System by constructing detailed subsurface hydrostratigraphy maps from data obtained from exploratory well drilling, geophysical logging, and aquifer hydraulic testing and analysis results.

PROJECT EXPERIENCE

Miami Dade WASD | Hydrogeological and Engineering Services for Production, ASR Wells Disposal, Storage, and Monitoring Well Networks; Miami, FL

Project Technical Lead. Mr. Rectenwald is the Project Technical Lead for hydrogeologic/geologic services and consultation related to WASD's Wellfields, Injection Wells, and ASR Wells, which includes geochemical studies, groundwater modeling, monitoring, testing, permitting, design, specialized hydrogeologic oversight during construction and other services as needed.

City of Cape Coral | Comprehensive Water Resources Program; Cape Coral, FL

Project Technical Lead. Mr. Rectenwald is the Project Technical Lead for hydrogeologic consulting, supply well siting and permitting, injection well siting and permitting, ASR operational permitting, stormwater management, information management, and bidding and construction services for the City of Cape Coral.

Hillsborough County | Tampa Bay Regional Integrated Water Resource/Aquifer Recharge Partnership Feasibility Study, Tampa, FL

Project Technical Lead. Mr. Rectenwald contributed his expertise on this project to prepare the 2nd phase of a regional reclaimed water feasibility/master plan to continue the evaluation of the water resource benefits to the region by recharging the groundwater system in the District's Water Use Cautionary Areas (WUCAs) in the Tampa Bay Region.

City of Cape Coral | North and South Wellfield Construction/North and South Cape Coral Wellfield Design and Construction, Cape Coral, FL

Project Technical Lead. Mr. Rectenwald managed staff during construction of 22 brackish (saline) water production wells for the City's new North Wellfield to supply the new North Reverse Osmosis Water Treatment Plant (ROWTP). He reviewed lithology descriptions, adhered to specifications, and client contact. Mr. Rectenwald managed the permitting, design, and construction of three ASR exploratory wells for the City of Cape Coral. The project consisted of wellfield testing of existing North Cape Coral production wells, development of a Wellhead Protection Ordinance, wellfield design services, and design and permitting of 31 Upper Floridan aquifer production wells. Nine (9) wells were constructed in the existing Southwest wellfield, and 22 wells were installed in the new North wellfield to provide raw water to the recently constructed North Cape Coral Reverse Osmosis Water Treatment Plant. The Scope of Work included engineering and hydrogeological services for wellfield planning and locating wells, and several minor modifications to the City's PWS Water Use Permit, preparation of applications for well construction permits, preparation of design documents for bidding, and bidding services for construction of the wellfields. Engineering services during construction were provided by MWH hydrogeologist staff for all production wells.

Sarasota County | Venice Gardens Wellfield Evaluation and Rehabilitation, Sarasota County, FL

Project Technical Lead. Mr. Rectenwald is the project technical lead who managed all aspects of the wellfield evaluation and well rehabilitation for 7 Floridan production wells that have a total of 13.75 mgd permitted capacity. Mr. Rectenwald was responsible for developing specifications, selecting a contractor, management of the oversight team, analysis of existing data for identifying which wells required rehabilitation, review of specific capacity testing results post rehabilitation, and identifying an optimal pumping rate for each of the wells.

US AID | West Bank Wellfield Project

Project Technical Lead. Mr. Rectenwald wrote the well drilling and testing specifications for all wells in the West Bank. He acted as the Well Specialist for the design and construction of production wellfields in Bani Naim, Janzur, Arraba, Ashuhuda. He has also travelled to Palestine and managed the oversight during construction and testing for three production wells constructed to a depth of approximately 3,000 feet. Mr. Rectenwald has also been a QA/QC reviewer for the final casing depth selections for all production wells constructed.

City of Cape Coral | North-South Transfer Station, Canal Pump Station No. 2, and Canal Pump Station No. 2 ASR Class V Well Systems; Cape Coral, FL

Project Technical Lead. Mr. Rectenwald was the Project Technical Lead and managed the permitting, design, and construction of all three Class V ASR well systems. He was responsible for field staff providing construction oversight. Mr. Rectenwald also provided QA/QC for describing lithology samples, sample collection and testing, data evaluation, specific capacity testing, and packer testing.

ANAMARIA SARMIENTO, PG

PRODUCTION WELLS

OFFICE LOCATION
Coral Gables, FL

EDUCATION
BSc, Geoscience, Florida International University, Florida, 2013

YEARS EXPERIENCE
7

PROFESSIONAL REGISTRATION
PG - FL

PROFESSIONAL ASSOCIATIONS
- Groundwater Professional, American Water Works Association
- Groundwater Professional, South Florida Hydrologic Society
- Groundwater Professional, Everglades Geological Society
- Groundwater Professional, Florida Association of Professional Geologists
- Groundwater Professional, American Institute of Professional Geologists

Ms. Sarmiento holds a Bachelor of Science in Geoscience and has 7 years of experience which includes drilling/test pit exploration oversight, deep injection well and monitoring well installation, hydraulic testing, and multimedia sampling at public works facilities. She also has experience in construction coordination which involves providing oversight at project sites prior to, during, or after remedial construction-related activities to assess feasibility, monitor progress, and/or ensure conformance. Ms. Sarmiento is also skilled in data collection and analysis, Geographic Information System (GIS), and AQTESOLV.

Ms. Sarmiento's experience includes permitting, design, construction and testing oversight of Class V exploratory wells and Class I injection wells and rehabilitation of deteriorated wells. Ms. Sarmiento assisted with field team management during Class I and Class V injection well construction at Miami-Dade Water and Sewer Department (WASD)'s Central District Wastewater Treatment Plant (CDWWTP) and South District Wastewater Treatment Plant (SDWWTP). Ms. Sarmiento's experience also includes oversight of the drilling and installation of Biscayne Aquifer wells, as well as oversight of plugging and abandonment of Biscayne Aquifer Wells.

Ms. Sarmiento's design, permitting and specialized hydrogeologic oversight experience includes the Miami-Dade WASD's Class I Industrial Injection Well that was drilled to 10,000 feet below land surface (bls) and was completed in the boulder zone to dispose of a combined wastestream of centrate fluid, scrubber fluid, effluent and leachate from CDWWTP.

PROJECT EXPERIENCE

Miami Dade WASD | Hydrogeological and Engineering Services for Production, ASR Wells Disposal, Storage, and Monitoring Well Networks; Miami, FL

Project Support Lead. Project Support Lead for hydrogeologic/geologic services and consultation related to WASD's Wellfields, Injection Wells, and Aquifer Storage and Recovery (ASR) Wells, which includes geochemical studies, groundwater modeling, monitoring, testing, permitting, design, specialized hydrogeologic oversight during construction and other services as needed. Ms. Sarmiento is providing hydrogeologic /geologic services for the injection well expansion projects at the North, Central, and South Wastewater Treatment Plants in support of Florida's Ocean Outfall Legislation.

The project includes the planning, design, permitting, and construction of 15 deep injection wells and associated monitoring wells. Each well is designed with a capacity of 18.6 million gallons per day (MGD).

Miami-Dade WASD | Ocean Outfall Legislation Injection Well Program, Miami, FL |

Project Support Lead. Ms. Sarmiento assisted in the design and permitting of 5-20 MGD Class I Municipal Injection Wells at North District WWTP, 7-20 MGD Class I Municipal Injection Wells at Central District WWTP, 3-20 MGD Class I Municipal Injection Wells at South District WWTP, and 1 Class V Exploratory Injection Well at the planned West District WWTP.

City of Pompano Beach | Pompano Beach WTP Industrial Injection Well System, Pompano Beach, FL

Project Hydrogeologist. Ms. Sarmiento assisted in the Class I UIC Permit Renewal Application for a 7.39-mgd Class I industrial injection well, IW-1, for the City of Pompano Beach. Ms. Sarmiento provided hydrogeologic/geologic services and field oversight for the rehabilitation and plugging and abandonment of IW-1. Upon completion of the oversight activities, Ms. Sarmiento completed the Plugging and Abandonment report for submittal to the client and to the FDEP in compliance with Chapter 62-528 Florida Administrative Code and the client's FDEP UIC Permit. Ms. Sarmiento provided hydrogeologic/geologic services for the design and permitting for a 7.39-mgd Class I Industrial Injection well, IW-1R, for the City of Pompano Beach

City of Cape Coral | Injection Well Systems Hydrogeological Support

Project Hydrogeologist. Ms. Sarmiento provides hydrogeological support by analyzing the City's Injection Well Systems and completing Quarterly Technical Memorandums discussing the trends observed in their operating data and water quality for the City of Cape Coral's three injection well systems: Everest Water Reclamation Facility (WRF), North Reverse Osmosis Water Treatment Plant (NROWTP) and South West WRF and WTP.

City of Lake Worth | City of Lake Worth Beach Water Treatment Plant Injection Well System Annual Reports 2018 & 2019

Project Hydrogeologist. Ms. Sarmiento provided hydrogeological support by analyzing the City's Injection Well System and completing Annual Reports for 2018 and 2019 discussing the trends observed in their operating data and water quality for the City of Lake Worth Beach Water Treatment Plant Injection Well System for submittal to the client and to the FDEP in compliance with Chapter 62-528 Florida Administrative Code and the client's FDEP UIC Permit.

Miami-Dade WASD | Class I Industrial Injection Well Permit Application and Specialized Hydrogeologic Oversight for two Injection Wells and one Dual Zone Monitor Well

Project Hydrogeologist. Ms. Sarmiento was the Project Hydrogeologist for the permitting and specialized hydrogeologic oversight of two 20-mgd Class I industrial injection wells for the disposal of centrate fluid, scrubber fluid, and leachate. This permit was completed on-time during construction through the Boulder Zone for the Florida Department of Environmental Protection (FDEP) Class I Industrial permit application submittal. As designed, this will be the largest diameter injection well in the state with 24-inch diameter FRP tubing.

Miami-Dade WASD | Class V Injection Well CDIIW-1 Specialized Hydrogeologic Oversight

Project Hydrogeologist. Ms. Sarmiento assisted in all aspects of the design, permitting and construction of the first 10,000 feet bls deep exploratory well in the state located at the CDWWTP, Virginia Key, Florida. The well was constructed to dispose of non-hazardous leachate from the Virginia Key Landfill and additional process flows from the plant as a Class I Industrial Injection Well. The exploratory phase of the project to 10,000 feet bls was intended for identification of alternative disposal zones in the Cretaceous Age Formations below the Floridian Aquifer System.

DR. ARTURO BURBANO, PHD, PE, PMP, BCEE

PROCESS SPECIALIST

OFFICE LOCATION
Coral Springs, FL

EDUCATION
Executive MBA, Anderson School of Management, University of California, Los Angeles (UCLA), 2014

Ph.D., Environmental Engineering, University of Cincinnati, 2003

MS, Industrial Engineering, Escuela Politécnica Nacional, (Quito, Ecuador), 1998

BS/MS, Chemical Engineering, Escuela Politécnica Nacional, (Quito, Ecuador), 1992

YEARS EXPERIENCE
28

PROFESSIONAL REGISTRATION
PE - FL, CA, NV

PMP

PROFESSIONAL ASSOCIATIONS
American Academy of Environmental Engineers (AAEE)

American Water Works Association (AWWA)

Water Environment Federation (WEF) - Industrial Water Committee, Groundwater Committee

Project Management Institute (PMI)

Dr. Burbano is a Program Director and Water Treatment Technology Business Line Leader with Black & Veatch in Miami, FL. He is a senior project/manager, senior technologist and business development specialist with 28 years of experience in the water industry, including water, wastewater, water reuse and stormwater for municipal, industrial and federal clients. He has served as an Adjunct Professor of Water/Wastewater Treatment Design at the University of Southern California (USC) and the Florida International University (FIU). Dr. Burbano has extensive experience as project and program manager delivering a variety of infrastructure projects, including design and construction of treatment facilities ranging from 20 gpm to 750-mgd in capacity. His main areas of technical expertise include process selection, bench- and pilot-scale studies, conceptual and detailed engineering design, QA/QC and discipline coordination, bidding, procurement, permitting, and engineering services during construction of water and wastewater treatment plants based on conventional or advanced treatment technologies.

PROJECT EXPERIENCE

Miami Dade Water and Sewer Department (WASD) | CD2.17 Chlorination Facilities Detailed Design; Miami, FL

Project Manager. Project Manager for the detail design of the $22M chlorination facilities for the 143-MGD Central District Wastewater Treatment Plant (CDWWTP). The objective of this Consent Decree (CD) project was to replace the existing chlorine gas system with a new liquid sodium hypochlorite system. The latter was a bulk storage facility with eighteen 20,000-gallon FRP tanks, transfer and dosing pumps and a satellite facility with two 2,500-gallon HDPE day tanks and dosing pumps. The design included all the yard piping, leak detection, injection points, all monitoring and control instrumentation, and incorporated hardening considerations to protect the facility against sea level rising-induced floods.

Upper San Gabriel Municipal Water District | Conceptual Design of Advanced Water Treatment Plant and Distribution Systems for Treatment of Tertiary Wastewater Effluent for Groundwater Recharge; Whittier, CA

Technical Advisor. Dr. Burbano served as technical advisor for this indirect potable reuse (IPR) project. The objective was to evaluate the feasibility of building an advanced water treatment plant (AWTP) to produce 41-MGD of clean effluent using tertiary wastewater effluent from the San Jose Creek Water Reclamation Plant (SJCWRP). The clean effluent was intended to recharge the groundwater in the San Gabriel Basin. The AWTP treatment train included MF/RO followed by AOP using UV/H2O2, and finished water conditioning using decarbonation and lime addition for pH, alkalinity and corrosion control. Dr. Burbano conducted the following tasks: (i) conducting water quality reviews of SJCWRP effluent to identify target constituents of concern for removal, (ii) QA/QC reviews of the conceptual development plan for the AWTP, including detailed process design, site layout and Class 5 cost estimates, (iii) QA/QC reviews of potential implementation timelines and staged construction, and (iv) preparing a Local Resources Program (LRP) funding application and submittal for funding assistance from various agencies.

Brisbane Water | Western Corridor Recycled Water Program/Gibson Island Advanced Water Treatment Plant; Brisbane, Australia

Technical Advisor. Dr. Burbano served as a Technical Advisor of the preliminary and detail design of the 25-MGD Gibson Island AWTP, the largest plant in the Program. The selected treatment train for the AWTP included ACTIFLO® pretreatment, MF/RO and an AOP based on UV/H2O2. The AOP process targeted the removal of NDMA (1-log) and 1,4-dioxane (0.5-log). The finished effluent was intended for industrial reuse and IPR using storage reservoirs. Dr. Burbano supported the design of the pretreatment and AOP systems through a series of bench tests and an extensive review of vendor literature and bench results to determine the best alternatives for treatment technology and vendor selection.

Metropolitan Water District of Southern California | Design, Construction, and Long-Term Testing of Filter Modifications for the Weymouth Water Treatment Plant; La Verne, CA

Project Manager. This project for the 520-MGD Weymouth WTP involved a complete retrofit of filters that operated with almost no changes for over 50 years but had recently showed performance issues such as low filtration rates, reduced run times, and significant media loss. Dr. Burbano managed a comprehensive alternative evaluation to define suitable filter modifications to solve these issues (e.g., alternative media arrangements, replacing original troughs and underdrains with improved commercial products, and testing trough-less filters). Based on this analysis, Dr. Burbano later managed the final design and engineering services during construction of these modified filters, as well as during the long-term testing of these filters at full-scale capacity. This project defined the best performing filter configuration to be later implemented on the entire plant.

Metropolitan Water District of Southern California | Engineering Services for the Construction of Thickeners #5 and #6 at the Jensen Water Treatment Plant; Granada Hills, CA

Project Manager. Dr. Burbano served as project manager of this project to improve solids handling at the 750-MGD Jensen WTP, one of the largest in the US. Dr. Burbano oversaw the completion of all phases of this project, including coordination between Metropolitan staff and the contractor, progress meetings, processing of requests for information and submittals with civil, structural, electrical and instrumentation technical leads, contracts with subcontractors, budget monitoring, and invoicing. After a 18-month construction period, the project met all the schedule, budget and quality targets, the plant increased its solids handling capacity by 50%, and was able to thicken the solids either in batch or continuous mode.

PABLO GALA-SERRA

MEMBRANE SPECIALIST

OFFICE LOCATION
Coral Gables, FL

EDUCATION
MCE, Civil Engineering, Universidad Politécnica de Cataluña, 2007

MS, Civil Engineering, INSA de Lyon, 2006

YEARS EXPERIENCE
14

PROFESSIONAL ASSOCIATIONS
FSAWWA

Mr. Pablo Gala Serra is a Civil Engineer for the Mining Group within the Water Division of Black & Veatch. He has been involved in both traditional design and design-build-operate projects, and in that role has designed both new and retrofitted facilities.

Some of Mr. Gala Serra key recent assignments have included:

- Engineering Manager for water and waste water project at Coral Gables Black & Veatch office.
- Engineering Manager for EWSE (Escondida Water Supply Expansion) project.
- Onshore engineering manager in EWS (Escondida Water Supply) project for Minera Escondida Ltda. Responsibilities include managing Client's interface and a local engineering team of 15 people.
- Engineering lead for the Pre-engineered Metal Building package and design and conception of a new Administration Building and Control Room.
- Civil Engineer responsible for civil packages in the Escondida Water Supply project for Minera Escondida Ltda.
- Participating in international tenders as Civil Expert (choice of project partners, civil works price benchmarking, quantities estimations, technical negotiation and project optimization).
- Civil design engineer for execution of desalination projects. In charge of developing civil guide drawings, specifications, and standards for construction.

PROJECT EXPERIENCE

Engineer Manager; Coral Gables, FL

Engineer Manager. Responsible for executing water and waste water projects. Working in bid and execution phases. Interdisciplinary coordination managing subcontractors and Client's interface.

- SDWWTP Electrical Distribution Building 3
- CDWWTP High Level Disinfection Program

Minera Escondida Ltda. and BHP-Billiton | Escondida Water Supply Expansion; Santiago, Chile

Water Production Engineer Manager. Responsible for interdisciplinary design, Client's interface, managing schedule, budget and supporting procurement. Responsible for implementation and management of design and document management softwares (SmartPlant). Manage a team of 15 engineers and 10 draftmen as well as design subconsultants (topography, geotechnical, automation and permits).

Minera Escondida Ltda. and BHP-Billiton | Escondida Water Supply; Antofagasta, Chile

Onshore Engineer Manager. Responsible for Client's interface and contractor interface regarding the engineering scope of the project. Managing a team of 15 people in the office to meet safety, quality, schedule, cost and Client's requirements.

Package Lead. Responsible for two supply and design packages (Pre-engineered metal building packages and Administration building). Following all the bid, evaluation and award of these two packages. Managing schedule, submittals, cost and change management on these two contract, and being the Client's interface and representative for these two defined scopes.

Civil Responsible Engineer. Responsible for the civil engineering area of the EWS project. Responsible of coordinating procurement packages related with civil engineering, structural engineering and architectural (Pre-engineered buildings, Administration Building, Bar Bending Schedules). Duties include permit coordination, permitting report, and coordination of deliverables with Owner.

Shell Qatar | Pearl GTL; Ras Laffan, Qatar

Civil Design Coordinator. Responsible for the design for Shell Debottleneck project. The project consisted on modifying the existing water treatment plant adding a new treatment basin to ameliorate the flow quality of the treatment plant (4.5 MUSD). Duties included technical management coordination followed by a detailed design development with local partners and the Owner.

Veolia Water Solutions and Technologies | International Bidding Department; Paris, France

Senior Civil Engineer. Responsible of the civil area for international bids. He was also responsible for choosing of project partners, civil works benchmarking, quantities estimations, technical negotiation and project optimization.

Duties included coordination of the civil area for MPG (Major Project Group), where all international Veolia Water projects were developed. The responsibilities included being responsible for civil engineering for small budget projects (less than 5 MUSD), being in charge of developing civil guide drawings, specifications and standards. At the same time he had to be part of research and development team (coordination of internal and external research studies) and all the related outsourcing coordination.

Some of the international bids he was involved in were:

- Sorek Desalination Plant (Israel)
- Mile 6 Desalination Plant, Namwater (Namibia)
- Ajman Power Station Desalination Plant (UAE)
- Ras Az Zwar Power and Desalination Plant (Saudi Arabia)
- Aruba Desalination Plant, Web (Aruba)
- Az-Zour North Desalination Plant (Kuwait)
- El Morro/ MPX Desalination Plant (Chile)
- Tia Maria Desalination Plant (Peru)
- Bello Waste Water Treatment Plant (Colombia)
- Fujairah 1 Power and desalination plant (UAE)
-

SAIPEM- Veolia Water Solutions and Technologies | Field Civil Engineer; Ras Laffan, Qatar

Field Civil Engineer. Responsible of the civil field engineering for the water treatment plant of the Shell Pearl GTL project (600 MUSD). This water treatment plant was constructed for treating and reusing the industrial effluent coming from the Power Plant. This project was constructed in JV with SAIPEM. Duties included optimization of the design for construction, interdisciplinary coordination for issuing the IFC drawings (civil, electrical, piping, instrumentation...), coordination of the design team (2D and 3D), and supervision of the Civil Partner on site.

RON PARKER

OPERATIONS & MAINTENANCE

OFFICE LOCATION
Tampa, FL

EDUCATION
BS, Education, Missouri Western State College, 1979

YEARS EXPERIENCE
38

PROFESSIONAL REGISTRATION
Certified Class IV Water Supply Operator, State of Kansas, 1982

Certified Grade 4 Water Treatment Operator, State of Arizona, 2018

Mr. Parker has more than 34 years of experience in the management of treatment plant operations, facilities operation and maintenance (O&M), treatment plant startup and commissioning, disinfection and neutralization of assorted structures and pipelines, operator training, process control troubleshooting, equipment maintenance, and O&M manual preparation. His experience also includes plant operations management and technical specialties, project procurement and evaluation, and contract management.

Formerly a senior operations manager of a large wholesale water supply system, Ron was responsible for the operation of numerous water treatment plants and related subsystems, as well as quality assessment/quality control (QA/QC) programs, plant analysis, operator training, and plant expansion supervision.

PROJECT EXPERIENCE

Tampa Bay Water | System Engineer; Tampa Bay Area, FL

Operations Specialist. Assisted in the preparation of the pre-startup, startup, and commissioning plans for Tampa Bay Water's Configuration I Master Water Plan projects. This project included three water treatment plants, two raw water pump stations, one high service pump station, an alkalinity adjustment facility, five groundwater wells, and various sized raw and finished water transmission mains up to 84 inches. Responsible for the project coordination and integration of the Master Water Plan projects into Tampa Bay Water's regional wholesale system, and prepared and reviewed the disinfection plans for all transmission mains, along with the three water treatment plants. Assisted in the startup and commissioning of two raw water pump stations and high service pump station, along with a sequenced integration schedule for converting Tampa Bay Water's regional wholesale system to chloramines. This schedule also included the related treatment plants for both Tampa Bay Water and their Member Governments. Assisted in the startup and commissioning of a 9 mgd groundwater treatment plant with packed tower aerators for hydrogen sulfide removal, chlorination, and chloramination.

Assisted in the startup and commissioning of a 66 mgd Surface Water Treatment Plant utilizing ozone for pre-disinfection, an enhanced coagulation process (Actiflo®) for total organic carbon and color reduction, biological filtration, and process residuals management with belt filter presses.

At the 25 mgd Seawater Reverse Osmosis Plant, an evaluation was performed on the pre- and post-chemical feed systems for adequate mixing and contact time within the treatment processes. Performed water quality analysis on three finished water supplies and modeled the blended water quality for pH and alkalinity adjustment.

Tampa Bay Water | Contract Operator Evaluations; Tampa, FL

Operations Specialist. Tampa Bay Water uses a public/private partnership at five water treatment plants. At three of these plants, the contract operator performs the operation and maintenance activities; with only maintenance activities being performed at the other two facilities. The operation and maintenance contracts vary from five years (if renewal option years are used) to 20-year service agreements. Tampa Bay Water has started a program to evaluate the existing contract agreements against other operational alternatives. An evaluation report was prepared for Tampa Bay Water which included assessments of the existing contract, a review of service fee costs, plant assessments, and benchmarking of the costs and staffing size with similar sized plants. Contract operating alternatives were also evaluated and include modifications to existing contracts, new contracts, or self-performance. Each of these areas included an economic and non-economic analysis, a pros and cons summary, a preliminary transition plan if implemented, and a preliminary staffing plan.

Tampa Bay Water | Tampa Bay Desalination Facility Energy Audit; Tampa, FL

Operations Specialist. Tampa Bay Water's energy management program targets specific facilities for an annual energy audit. The Tampa Bay Desalination Facility has the highest power consumption and costs for the agency. Activities with this project included data collection for flows, pressures, electrical usage/cost, billing information and an evaluation of the rate schedule. Additionally, a high-level condition assessment was performed on the major equipment, assisted with the development of an equipment baseline energy tool, coordinated the field testing of equipment, developed three energy management opportunities for the membranes, and assisted with the final report preparation.

City of Venice | Reverse Osmosis Efficiency Study; Venice, FL

Operations Specialist. The City of Venice owns, operates, and maintains a brackish groundwater reverse osmosis water treatment plant. As a part of the water supply permit, a detailed study was completed to improve the water recovery efficiency to the highest degree feasible; with a target of 75% or greater. A desktop evaluation was prepared and four alternatives were evaluated; increase existing reverse osmosis recovery, expand the existing reverse osmosis trains to a two-stage system, expand the existing reverse osmosis trains to a three-stage system, and convert the existing reverse osmosis trains to a closed-circuit system. Full scale and pilot testing was also performed and a testing protocol was developed for each system. Lastly, the concentrate disposal was modeled for alternative options and then compared to the existing/future permit conditions; along with an alternative evaluation utilizing deep well injection for disposal.

Tampa Bay Water | Contract Audits; Tampa, FL

Operations Specialist. Tampa Bay Water uses a public/private partnership to operate and maintain Tampa Bay Water's Regional Surface Water Treatment Plant (120 mgd) and Seawater Desalination Plant (25 mgd). Annually, Tampa Bay Water reviews the contract operator's performance with an operational audit. An audit report was prepared for Tampa Bay Water which included calculations to determine the new fiscal year service fee adjustments based on specific market indices, and an annual settlement for incentives earned or damages assessed. The service fee adjustments include the contract operator's base pay, allocations to the reserve funds, liquidated damage adjustments for production shortfalls and water quality, and the maximum amounts of chemical and power incentives for superior performance.

ARI COPELAND, PO

OPERATIONS & MAINTENANCE

OFFICE LOCATION
Kansas City, MO

EDUCATION
Masters, Environmental Engineering, Water Quality, University of Cincinnati, 2005

Bachelors, Civil Engineering, Environmental Engineering, Worcester Polytechnic Institute, 2003

YEARS EXPERIENCE
18

PROFESSIONAL REGISTRATION
Professional Water Operator, 2014, #POW4-00002-0914

Water Operator - Grade IV, 2014, #W41401E

Wastewater Operators - Level B, 2011, FL, #20048

Water Treatment Operators - Level A, 2010, FL, #18735

PROFESSIONAL ASSOCIATIONS
American Water Works Association

Ari C. Copeland has more than 14 years of experience in water and wastewater plant design, water distribution system operations, permitting, facility assessments and benchmarking, treatment plant startup and commissioning, operator training, process control troubleshooting, conducting pilot studies, standard operating practices (SOPs), and operations and maintenance (O&M) manual preparation.

Formerly a Water Quality Engineer at the American Water Works Association (AWWA), Ari was responsible for answering all water quality and operator questions received by the Association (51,000 membership) in addition to managing large groups of mostly volunteers to write 62 percent of the Association's Manuals of Practice, which are key resources to the drinking water industry. Ari has over 2,000 hours of water and distribution operator training experience through the FL Section of the American Water Works Association (FSAWWA). Ari has helped over 100 operators obtain operator licenses, as well as operate treatment plants and distribution systems. Ari possesses a Professional Operator's designation (Water IV) awarded by the Association of Boards of Certification (ABC).

PROJECT EXPERIENCE

MDC | MDC Ash Handling System; Hartford, CT

Operations Speicalist. Drafted SOPs for the Ash handling air compressor system. Field verified SOPs, Provided Operator training and assisted contractor with onsite start up.

Metro St. Louis Sewer District | Missouri River WWTP Gas Detection SOPs; St. Louis, MO

Operations Speicalist. Drafted Standard Operating Procedures (SOPs) for operators to follow in case a high dangerous gas level is detected in the work area.

City of Kansas City | 87th Street Pump Station; Kansas City, MO

Operations Speicalist. Authored Operations and Maintenance Manual for 87th street pump station.

Irvine Ranch | O&M and Startup Services; Irvine, CA

Operations Specialist. Assisted in the development of process O&M manual covering key processes such as the main pump stations, digesters, and dewatering processes (centrifuges). Created spreadsheets to assist operators with chemical dosing and sludge feed rates to the digesters.

Pinellas County | Dunn Water Reclamation Facility Staffing Assessment and Facility Assessment; FL

Staffing Assessment and facility assessment. Performed a staffing assessment and operations review of the County's Dunn WRF. Conducted a site visit, interviewed key staff to establish staffing levels and concerns as well as reviewed overall condition of plant assets and plant performance . Provided an overall staffing recommendation to The County with recommended number and type of staff to add to Dunn.

New Orleans Sewer and Water Board | S&WB Annual Facilities Operations Assessment; New Orleans, LA

Operations Specialist. Performed an operations review for the water, wastewater, drainage, and pump station facilities within the city limits. Conducted site visits, interviewed the staff, and wrote a final report for the operations review.

Private Investors | Facility Assessment of Wastewater Plants in Mexico; Various, Mexico

Operations Speicalist. Conducted an assessment of condition of equipment and operations of three wastewater treatment plants in Mexico. Drafted report of findings to client.

City of Meriden | Broad Brook Water Treatment Plant; Meriden, CT

Operations Speicalist. Onsite Startup representative for 2.5 MGD surface water treatment plant. Worked with plant operations staff and contractor to start up and commission the plant to meet treatment limits. Drafted plant start up plant and assisted with startup and commissioning documentation.

NEORSD | Southerly Wastewater Treatment Center MACT Renewable Energy Facility SOPS; Cleveland, OH

Operations Specialist. Assisted in the development and field verification of SOPs for incinerator sludge feed process, including dewatering, polymer dosing, and various transfer pump systems. The SOPs were geared towards operators to assist in operating the sludge feed and dewatering systems.

City of Vancouver | Iona WWTP Facility Plan; Vancouver, Canada

Operations Specialist. Assisted in the development of a facility plan evaluating the Iona WWTP's current operations and asset management program. Provided recommendations to keep the facility running until 2030.

City of St. Louis | Missouri River Wastewater Treatment Plant Operations & Maintenance; St. Louis, MO

Operations Specialist. Assisted in the development of incinerator O&M Manual for the Missouri River WWTP. Developed operator training materials for liquid treatment and the solids handing treatments at the plant site.

Miami-Dade | Cross Connection Control Plan; Miami, FL

Operations Specialist. Assisted in the development of Miami Dade's cross connection control plan and helped develop SOPs for the meter and distribution staff.

City of Dallas | Arlington Hydroelectric Facility; Dallas, TX

Operations Specialist. Developed the Facility O&M Manual for a Francis-style turbine power generation system. Served as the Startup Manager and helped coordinate communication between the owner, Tarrant Regional Water District, the vendors conducting startup, and the power utility to ensure adequate staff and water resources were available for startup testing.

ERIN BRIGGEMAN, PE

CHEMICAL FEED SYSTEMS

OFFICE LOCATION
Kansas City, MO

EDUCATION
BS, Chemical Engineering, University of Nebraska, 2001

YEARS EXPERIENCE
19

PROFESSIONAL REGISTRATION
PE - KS, TX, CO, OR, IL

Ms. Briggeman is a chemical engineer with fifteen years of professional consulting experience in the design of chemical storage and feed facilities of water and wastewater treatment plants. Thus far, she has worked on approximately 100 treatment plant designs throughout the U.S. She has been involved in the design of new water and wastewater treatment plants, water and wastewater treatment plant expansions, water pump stations and distribution systems, and municipal wastewater system evaluations for regulatory compliance. Her responsibilities have included the preparation of chemical facility technical memoranda; evaluations of different chemical feed technologies sizing, layout, and selection of equipment; preparation of process and instrumentation diagrams, selection of construction materials; the provision of construction phase services, and regulatory compliance.

PROJECT EXPERIENCE

City of Fort Myers | East Fort Myers Water Reclamation Facility and Overall Campus Sitework; Fort Myers, FL

Lead Chemical Engineer. Performed the design of chemical storage and feed equipment and facilities for a new wastewater treatment plant. Chemicals involved included sodium hypochlorite, DAF polymer, polyaluminum chloride, centrifuge polymer, and sodium permanganate. Work included selection, sizing, and layout of equipment; preparation of chemical technical memoranda; preparation of process and instrumentation diagrams; selection of construction materials for the chemical systems; and provision of construction phase services.

Orange County Utilities | Eastern Regional Water Treatment Plant Phase 2B Expansion; Orange County, FL

Chemical Feed Designer. Prepared the design of chemical storage and feed facilities for a plant expansion. Chemicals involved included carbon dioxide, sodium hydroxide, fluoride, an anti-scalant, and on-site generation, storage, and feed of sodium hypochlorite. Work included selection, sizing, and layout of equipment; preparation of chemical technical memoranda; preparation of process and instrumentation diagrams; selection of construction materials for the chemical systems; and provision of construction phase services.

City of Gilbert | Santan Vista Water Treatment Plant Expansion; Gilbert, AZ

Chemical Feed Lead. Prepared the design of the aluminum sulfate, ballasted flocculation polymer, sodium hypochlorite, sodium hydroxide, fluoride, and carbon dioxide chemical storage and feed systems expansion. Expansion of the existing onsite sodium hypochlorite generation system is also part of the project. Chemical feed work included selection and sizing of chemical facility equipment, preparation of chemical technical memoranda, mechanical layout preparation, preparation of process and instrumentation diagrams, and selection of construction materials. Work included building and fire code review and coordination with other design team members.

City of Atlanta | Intrenchment Creek and South River Water Reclamation Plants; Atlanta, GA

Chemical Feed Lead. Prepared the design of sodium hypochlorite, sodium hydroxide, ferric chloride, and polymer chemical storage and feed systems. Chemical feed work included selection and sizing of chemical facility equipment, preparation of chemical technical memoranda, mechanical layouts, preparation of process and instrumentation diagrams, and selection of construction materials. Work includes building and fire code review and coordination with other design team members. Construction phase services are pending.

City of Burbank Water and Power | Disinfection Study; Burbank, CA

Chemical Feed Lead. Completed an evaluation between bulk sodium hypochlorite and onsite sodium hypochlorite generation. Chemical feed work included selection and sizing of bulk and onsite sodium hypochlorite equipment, preparation of chemical technical memoranda, mechanical layout assistance, preparation of process and instrumentation diagrams, and preparation of cost estimates for each alternative. Criteria for both alternatives was scored and used to facilitate a decision.

City of Bakersfield | Northwest Water Treatment Plant; Bakersfield, CA

Chemical Feed Lead. Prepared the design of polyaluminum chloride chemical storage and feed systems. Chemical feed work included selection and sizing of chemical facility equipment, preparation of chemical technical memoranda, mechanical layout assistance, preparation of process and instrumentation diagrams, and selection of construction materials. Work included building and fire code review and coordination with other design team members.

City of Meriden | Broad Brook Water Filtration Plant; Meriden, CT

Chemical Feed Lead. Prepared the design of sodium hypochlorite, sodium hydroxide, aluminum sulfate, zinc orthophosphate, sodium fluoride, powder activated carbon, and sodium permanganate chemical storage and feed systems. Chemical feed work included selection and sizing of chemical facility equipment, preparation of chemical technical memoranda, mechanical layouts, preparation of process and instrumentation diagrams, and selection of construction materials. Work includes building and fire code review and coordination with other design team members. Construction phase services are in progress.

City of Great Falls | Water Treatment Plant; Great Falls, MT

Chemical Feed Lead. Prepared the design of the liquid ammonium storage and feed system and the chlorine gas feed system modifications. An evaluation of onsite sodium hypochlorite generation and bulk sodium hypochlorite was completed prior to design. In addition, evaluations were done to compare carbon dioxide versus sulfuric acid, sodium hydroxide versus lime versus soda ash, and aqua ammonia versus liquid ammonium sulfate. Chemical feed work includes selection and sizing of chemical facility equipment, preparation of chemical technical memoranda, mechanical layouts, preparation of process and instrumentation diagrams, and selection of construction materials. Work includes building and fire code review and coordination with other design team members. Construction phase services are in progress.

STEVE KING, PE

REGULATORY

OFFICE LOCATION
Tampa, FL

EDUCATION
BS, Chemical Engineering, University of South Florida, 1998

YEARS EXPERIENCE
20

PROFESSIONAL REGISTRATION
PE – FL

PROFESSIONAL ASSOCIATIONS
American Water Works Association

Mr. King received a Bachelor's degree in Chemical Engineering from the University of South Florida in Tampa, Florida, in 1998. Mr. King has gained a variety of experience in Civil Engineering and Project Management since graduating. Projects have included project management, utility investigation, water supply, water and wastewater design, regulatory compliance and permit review.

Mr. King has extensive experience obtaining regulatory approvals for a variety of water and wastewater projects. Prior experience includes working as Permitting Supervisor during a seven year employment with FDEP.

PROJECT EXPERIENCE

Tampa Bay Water | Desalination Facility Pump Station and Piping Repair (Design-Build); Tampa, FL

Engineering Manager. Responsibilities include civil and mechanical design of a replacement desalination pump station and leading the engineering team's efforts. The project involves new suction, discharge and concentrate piping and a new concentrate splitter box. Duties also have also included leading the permitting efforts, including the Environmental Resource Permitting (ERP), Florida Department of Environmental Protection (FDEP) Potable Water Construction Permitting, Hillsborough County Development Services Site Plan Review and Building Department Permitting, and FDEP Dewatering Notice of Intent.

Hillsborough County | Falkenburg Advanced Waste Water Treatment Plant Backwash Blowers; Hillsborough County, FL

Project Engineer. Responsibilities include civil and mechanical design of replacement wastewater filter backwash pumps and filter control valves at an existing Advanced Waste Water Treatment Plant. Duties also include construction phase services (Requests For Information, submittals, site visits, construction oversight). Each of the five filters that are part of the project has five separate pneumatic valves that will require replacement and the two backwash pumps are also being replaced. Duties also included leading the permitting efforts.

Hillsborough County | Valrico Advanced Water Treatment Plant Ultra Violet System; Hillsborough County, FL

Engineering Manager. Responsibilities include civil and mechanical design and construction phase services for a Ultra Violet disinfection expansion at an existing Advanced Water Treatment Plant. Duties also include construction phase services (Requests For Information, submittals, site visits, construction oversight). The project involves new Ultra Violet banks installed in an existing Ultra Violet system, new automated weir gates, stop logs and temporary chlorine disinfection. Duties also have also included leading the permitting efforts for the project, including ensuring that Florida Department of Environmental Protection Wastewater construction exemption was obtained, Hillsborough County Development Services Site Plan Review and others as needed.

Hillsborough County; Hamilton Pump Station Upgrade; Hillsborough County, FL

Engineering Manager. Responsibilities include civil-site and mechanical design of a replacement wastewater pump station at the site of an existing station. Also duties include leading all other disciples in the preparation of the contract specifications and drawings. The project involves all an all new wetwell, pumps and appurtenances. Duties also have included specification preparation, client meetings, minutes preparation and budget tracking and permitting.

Internal (Black & Veatch); Internal Auditor

Internal Auditor. Responsible for Internal Auditing of projects for compliance with internal Quality Management System requirements and contractual requirements. This included reviewing the client contracts for requirements, reviewing our internal databases for objective evidence of compliance, writing reports on the findings of the audit, inputting the findings into a tracking database and reviewing the proposed responses with the project managers.

Tampa Bay Water | Eldridge Wilde H2S Treatment Facility and Pinellas County POC Updates; FL

Project Engineer. Responsibilities include coordination of all of the permitting for the project. Also, responsible for design of a gravity wastewater metering and pH adjustment system in an existing wastewater system line. The design is to include a v-notch weir with an ultrasonic transducer to measure flow (for control and billing), a CO2 feed system to lower the pH of the waste stream and continuous pH monitoring for compliance with Pinellas County's Industrial Pre-Treatment Program.

Hillsborough County Public Works | Project Management; Tampa, FL

Staff Engineer. Responsible for project management and providing technical assistance, to Hillsborough County Public Works, for sediment management, sediment processing and waste processing facility permitting required by the Florida Department of Environmental Protection for four county public works facilities. Including preliminary design and cost estimation, groundwater monitoring oversight/quality assurance review, beneficial use evaluation, waste processing facility permit application preparation, contract review and stormwater environmental resource permit review. Duties also include, final design of sediment containment structures, various agency permitting and management of an Interim Sediment Management Plan. This plan includes processes to allow the County to process new sediment while still removing the existing stockpiles. These processes include building a temporary storage area, berm, lined with plastic for storage of new sediment. Responsibilities also included field visits and investigation of new beneficial use options for the sediment. Additionally duties include subcontractor coordination, report writing and construction coordination.

EMILY TUMMONS, PHD, PE

REGULATORY

OFFICE LOCATION
Kansas City, MO

EDUCATION
Doctor of Philosophy, Environmental Engineering, Michigan State University, 2016

MS, Environmental Engineering, Michigan State University, 2014

BS, Biological Systems Engineering, Environmental Option, Kansas State University, 2011

YEARS EXPERIENCE
8

PROFESSIONAL REGISTRATION
PE – TX

PROFESSIONAL ASSOCIATIONS
American Water Works Association

North American Membrane Society

Dr. Tummons joined Black & Veatch in the Water Treatment Technology group after completing her PhD from Michigan State University. Her dissertation work focused on the mechanisms of membrane-based separations of oil-water emulsions to gain insight into oil droplet behavior at the membrane surface. Since joining Black & Veatch, she has designed and conducted water quality and corrosion studies for potable water treatment systems involving desktop, bench-scale, and pipe-loop evaluations to optimize corrosion control in the distribution system. Additionally, she has been involved in process optimization studies and regulatory reviews for municipal drinking water treatment facilities, which have included water quality modeling and bench-scale testing for the evaluation of alternative coagulants, polymers, oxidants, and adsorption media.

PROJECT EXPERIENCE

Placer County Water Agency; Corrosion Control Study 2018 - Applegate; CA

Lead Process Engineer. Black & Veatch is conducting a water quality assessment to determine the optimal treatment processes to adjust finished water chemistry at the Applegate WTP to limit metals release and improve corrosion control.

City of Olathe; Water Quality and Corrosion Control; KS

Lead Process Engineer. Black & Veatch is conducting a water quality assessment to evaluate finished water targets and corrosion control treatments (CCTs) at WTP2. Water quality modeling was performed to asses potential changes to optimize CCTs and bench-scale coupon testing will be used to screen the potential CCTs to limit lead and copper release.

San Antonio Water System; Vista Ridge Integration Project; San Antonio, TX

Lead Process Engineer. The San Antonio Water System is planning to integrate a new groundwater source that has different water chemistry (low calcium and free ammonia) from the water present in the distribution system. Varying levels of water quality analysis including bench-scale testing and pipe-loop testing with harvested materials from the distribution system were used to test alternative treatments to adjust the water chemistry so as to limit the dissociation of scale in the system and limit the release of metals.

Medford Water Commission; Water Quality and Corrosion Study; OR

Lead Process Engineer. Black & Veatch is conducting an extensive water quality and corrosion study to determine the optimal corrosion control for the Medford Water Commission to limit lead, copper, and iron release from a system that receives groundwater year-round supplemented by treated surface water seasonally. Responsibilities include a review of the existing information, a regulations review, water quality modeling, hydraulic modeling, the design and implementation of both bench-scale corrosion testing and pipe-loop testing, and a full-scale design evaluation with recommendations.

City of Santa Cruz; Pipe Loop Study; CA

Lead Process Engineer. The City of Santa Cruz is entering into an agreement with Soquel Creek Water District to sell excess water supply from the City's WTP. Black & Veatch is conducting a corrosion study to evaluate potential water quality impacts for the change from groundwater to surface water with orthophosphate. Responsibilities include designing a bench-scale testing plan, overseeing the testing to ensure that representative data are produced, presenting results at bi-weekly meetings and at select board meetings, and completing an assessment with recommendations for corrosion control.

Orange County Water District; Groundwater Replenishment System Final Expansion; CA

Process Engineer. The Groundwater Replenishment System Final Expansion Project is evaluating potential design modifications necessary to accommodate the increase in design flow and the changing water qualities of the influent water. Responsibilities included a post treatment system evaluation using water quality modeling to predict the typical, best, and worst case scenarios for water qualities to determine optimal treatment and chemical doses required to meet set product water quality targets. The evaluation included recommendations for plant modifications to accommodate the final expansion goals.

City of Wyoming; Corrosion Assessment and Mitigation Plan; Wyoming, MI

Process Engineer. Responsible for evaluating water quality data from the City of Wyoming Water System to prepare a corrosion assessment and mitigation plan as it relates to lead release in the water distribution system. The data analysis included lead and copper compliance data and multiple water quality parameters from the water treatment plant, a pumping station, and multiple locations throughout the distribution system for wholesale consumers. A regulatory evaluation was also conducted to prepare the City of Wyoming for possible changes to both state and federal drinking water regulations.

Portland Water Bureau; Water Quality and Microbiological Evaluation; Portland, OR

Data Analyst - Black & Veatch. Responsible for finalizing the water quality corrosion study reports to document the existing baseline distribution system water quality and microbiological activity as it relates to lead release in a municipal water distribution system. Perform data analysis for the monitoring plan to assess the location, extent, and impact of water quality, nitrification, and general microbial activity on lead release in the distribution system and household plumbing materials.

NICHOLAS WYATT

GIS INTEGRATION

OFFICE LOCATION
Tampa, FL

EDUCATION
BS, Geological Engineering, Missouri University of Science and Technology, 2018

YEARS EXPERIENCE
1

Mr. Wyatt is a member of the East Region Asset Management/Information Solutions team that supports their Water Division. He has experience in system implementation and integration on projects for municipal government public works and water, wastewater, and stormwater utilities clients. He specializes in systems implementation and refinement, report writing, GIS analysis, and workflow automation via Python.

PROJECT EXPERIENCE

City of Hollywood Florida; Cityworks Implementation; Hollywood, FL

Technical Support. Assisting with the implementation of the City's CMMS for Utilities. Implementation focused on the migration from the City's legacy system for linear and facility assets and included historic data migration for all past work. Tasks assisted on include data migration design and development, designing and configuration of the CMMS, integration design and development, report design and creation, end-user training, and implementation planning.

Pinellas County, Florida; Water Master Plan; Pinellas County, FL

Technical Support. The purpose of this Water System Master Plan Update was to evaluate the existing water system, including the source waters, water treatment facilities, pump stations and the distribution system. The project included: Hydraulic and System Analysis using WaterGEMS, Water Quality Evaluations, Asset Management (risk prioritization using iCIP, condition assessment using Survey123, CMMS analysis in Cityworks, water conservation), adaptive capital improvement planning and documentation.

Creating Survey123 forms incorporating the County's existing GIS Schema, ensuring ongoing compatibility with data collected and CMMS systems in place.

City of Delray Beach Florida; Cityworks Implementation -- Phase 2; Delray Beach, FL

Technical Support. Delray Beach's Cityworks Implementation Phase II includes the implementation of the Public Works department. Tasks included in the project are assistance with data migration for Public Works, Cityworks configuration, reporting, end-user training and go-live support. Responsibilities included Cityworks configuration, reporting in Crystal Reports, performing Cityworks training, and providing go-live support

Peace River Manasota Regional Water Supply Authority, Florida; R&R Sufficiency Study Phase 1 & 2; Arcadia, FL

Technical Support. Black & Veatch provided an asset inventory survey and condition assessment for the Authority's Water Treatment Plant, River Intake Pump Station, Reservoirs and Reservoir Pump Station, Remote Pump Station and Storage Facilities, Bulk Metering Facilities and Aquifer Storage and Recovery (ASR) wells as the first phase in developing a renewal and replacement forecast to assess the sufficiency of the Renewal and Replacement Fund.

- Created Survey123 form for asset inventory survey and condition assessment using the Authority's existing CMMS data.
- Assisted with data collection and condition assessment in the field.
- Responsible for data management and QA of field data in post-processing.
- Worked directly with the Authority to create risk assessment for Transmission Mains.

Polk County, Florida; Water Reclamation Facility Condition Assessment; Polk County, FL

Technical Support. As part of a comprehensive asset management program, Black & Veatch collected asset inventory data and condition information from these facilities for use in a Computerized Maintenance Management System (CMMS).

- Provided key insight and recommendations for Survey123 design to maximize efficiency and accuracy in the field.

City of Fallbrook, California; Cityworks Implementation; Fallbrook, CA

Technical Support. Assisting with the implementation of the city's CMMS for Utilities. Created Cityworks 3D workorder templates to be utilized as a standardized implementation tool.

Fairfax County, Virginia; Condition Assessment; Fairfax County, Virginia; 2019-In-Progress

Technical Support. The purpose of this Condition Assessment is to provide condition scores and energy audits to support the development of a rehabilitation and repair plan for twenty wastewater pumping stations. This included an analysis of the associated facilities such as odor control, electrical buildings, force mains, and manholes.

- Created unique Survey123 forms for each discipline involved in the Condition Assessment, utilizing asset data present on County's as-built drawings of each pump station.
- Perform QC on data collected.
- Created and managing additional Survey123 forms for asset data collection for thirty-four additional pump stations.

Broward County, Florida; Regional Wastewater Master Plan; Broward County, FL

Support. Black & Veatch completed a Regional Wastewater Master Plan focusing on the regional transmission mains and master pump stations. Black & Veatch used Survey123 data collection forms to inventory the asset data and provide condition scores to each asset. The ultimate delivery is an adaptive capital improvement plan tied to project triggers tied to decision support tools to track the triggers.

- Provided guidance and feedback on Survey123 form design to ensure adequate data collection and QC

City of Glendale Arizona; EAMS Implementation; Glendale, AZ

Technical Support. Currently providing implementation services for the selected EAMS software, Lucity. Implementation services include work processes development and Lucity configuration.

- Created Survey123 forms for asset data collection for various Water Treatment Plants.
- Currently providing technical support for the management and distribution of this collected field data.

MARTIN JONES, CENG

R&R SUFFICIENCY PLANNING

OFFICE LOCATION
Alpharetta, GA

EDUCATION
MBA, University Business School, 2005

MSc, Water Resource Systems Engineering, University of Newcastle upon Tyne 1997

BEng, Civil Engineering (2:1 Hons) University of Bristol, 1996

YEARS EXPERIENCE
23

PROFESSIONAL REGISTRATIONS
CEng - UK

PROFESSIONAL ASSOCIATIONS
Member of Institution of Civil Engineers (UK)

Engineering Council (UK)

Mr. Jones is the Asset Management Services Lead in Black & Veatch's Planning & Asset Management Group, and has over 20 years' experience in the international water industry. He is an experienced project manager and specializes in water utility asset management and regulatory audit. He is also an approved assessor for International Organization for Standardization (ISO) 55001 and Publicly Available Specification (PAS) 55 under the Institute of Asset Management (IAM) Endorsed Assessor scheme, and holds the IAM Certificate in Asset Management.

Martin is a member of the American Water Works Association Asset Management Committee. He is also a Chartered civil engineer. Martin has undertaken a variety of asset management projects including asset management assessments, asset valuations, PAS 55 and ISO 55001 implementation and strategy development. Martin was also a lead auditor undertaking technical audits for certification of regulatory information for two UK water companies.

Martin also worked for Wessex Water in the UK where he gained operational experience including water company management, wastewater treatment works operation and sewerage system operation. He also has experience of business development, due diligence, bids, and transition management for water concessions, as well as experience of writing, implementing, and auditing management systems.

PROJECT EXPERIENCE

Palm Beach County Water Utilities Department | Asset Management Strategy; Palm Beach County, FL

Principal Consultant. First phase of project involved assessing data needs for asset management planning, and prioritizing data improvements. Second phase included an ISO 55001 assessment and development of an asset management implementation roadmap.

Miami Dade Water and Sewer Department | CIP Implementation and Gap Analysis; Miami, FL

Principal Consultant. Led review of MDWASD's approach to Capital Improvement Program development, budgeting and implementation, including high-level review of processes and organizational structure.

California DWR | Asset Management Program; CA

Task Lead. Phase A of the program included an ISO 55001 gap assessment, development of an Asset Management Policy, Program Development Strategy that included an organizational review, and an Implementation Plan that included over 20 improvement initiatives and a Management of Change Plan. Phase B has now commenced with implementation of the Management of Change Plan, development of the Asset Management Framework, levels of service, Risk Framework, and Maintenance Management Strategy.

Hampton Roads Sewer District (HRSD) | Asset Management Program, Virginia Beach, VA

Technical Manager. Led an ISO 55001 gap assessment and developed the improvement roadmap. Now implementing the asset management program, developing an Asset Management Framework that includes a SAMP, Asset Management Policy and Asset Management Plans.

Tulsa Metropolitan Utility Authority | Utility Enterprise Initiative, Tulsa, OK

Principal Consultant. Part of team developing and implementing an asset management change program for the Water and Sewer Department and the Engineering Department of the city of Tulsa. Led PAS 55 assessment and roadmap development, and development an asset management framework including strategy and objectives. Have performed annual update assessments using ISO 55001, and most recently performed a pre-certification assessment.

CPS Energy | ISO 55001 Assessment and Asset Management Policy

Principal Consultant. Part of team that performed an ISO 55001 assessment of the gas business. Also facilitated the development of an Asset Management Policy for CPS Energy that included the gas and electric transmission business lines.

Douglasville-Douglas County Water and Sewer Authority | Water Master Plan; Douglasville-Douglas County, GA

Principal Consultant. Developed prioritization methodology for capital projects identified from the master planning activities, and assisted with development of the 5-year and 20-year capital improvement program.

Gwinnett County Department of Water Resources | Pump Station Risk Assessment and Prioritization; Gwinnett County, GA

Principal Consultant. Developed risk assessment approach for wastewater pump stations.

City of Tampa | Water Master Plan; Tampa, FL

Principal Consultant. Led an ISO 55001 gap assessment for the Water Department and developed the improvement roadmap.

City of Grand Rapids | Comprehensive Master Plan; Grand Rapids, MI

Principal Consultant. Led ISO 55001 assessment of the Water System and Environmental Service departments. Also facilitated the development of an initial asset management strategy and template for developing asset management plans.

Forsyth County Department of Water and Sewer | Asset Management Assessment; Forsyth County, GA

Principal Consultant. Led an ISO 55001 gap assessment and developed a plan for the implementation of an asset management program.

Milwaukee Metropolitan Sewer District | 2050 Facilities Master Plan, Milwaukee, WI

Principal Consultant. Advising on the development of asset management plans based on the International Infrastructure Management Manual. This task included the development of a risk assessment methodology, including a risk register template and business case form. Project will involve optimization of the capital improvement program (CIP) once projects are developed.

BRANDY THIGPEN, PE

HYDRAULIC MODELING

OFFICE LOCATION
Phoenix, AZ

EDUCATION
BS, Environmental Engineering, North Arizona University, 1998

YEARS EXPERIENCE
22

PROFESSIONAL REGISTRATIONS
PE - AZ

PROFESSIONAL ASSOCIATIONS
American Water Works Association

Ms. Thigpen is an Engineer specializing the areas of water distribution modeling, hydraulic analysis, transient analysis, water quality and system optimization. She is involved in the development and modification of water distribution and hydraulic models using software packages such as WaterGems, H20 Map, InfoWater and ArcGIS and transient modeling using software packages such as HAMMER and InfoSURGE. Her experience includes water supply, treatment and distribution, wastewater collection, treatment, and reuse, and water / wastewater infrastructure master planning.

PROJECT EXPERIENCE

Miami-Dade Water and Sewer Department | Planning Division Support Services – Hydraulic Modeling; Miami, FL

Lead Hydraulic Modeler. Responsible for potable water system capacity assessment for proposed developments on an on-call basis. The model (InfoWater) is an all pipe model. Participated in orientation training with the department staff for a week at the department offices to learn the people and processes utilized by the utility to complete the analyses. The capacity analyses were completed in a short time frame (less than 3 days) to address developer's needs. Capacity analyses included fire flow requirements and available capacity.

Cape Fear Public Utility Authority | Water System Extension Planning and Design; Wilmington, NC

Lead Hydraulic Modeler. Performed hydraulic modeling to evaluate the system performance and potential improvements associated with extending the CFPUA water distribution system to serve the Flemington water system and potential additional areas in the future. System planning and design tasks included: update of the CFPUA hydraulic model to include the Flemington water system; hydraulic modeling of peak hour and fire flow demand conditions; identification of pipeline and PRV improvements needed to extend the CFPUA water distribution system; and development of hydraulic design criteria for a new PRV facility. At the time of the project, CFPUA's water system served a population of approximately 200,000 people in the City of Wilmington and surrounding communities in New Hanover County across 4 pressure zones at an average day demand of approximately 16 mgd.

San Antonio Water System | SCADA Integration; San Antonio, TX

Lead Hydraulic Modeler. Led hydraulic modeling efforts in support of helping to develop SCADA controls for major facilities in half of the SAWS system. This project was in support of the Central Water Integration Program.

Clifton Water District | System Hydraulic Model and GIS Evaluation; Clifton, CO

QA/QC. Lead efforts to develop a hydraulic model of the distribution system. In addition, Black & Veatch evaluated GIS data updating and hosting options. Assisting in setting up a Black & Veatch hosted GIS site.

Wildland Urban Interface - Phase 2; Colorado Springs, CO

Project Engineer / Lead Hydraulic Modeler. Colorado Springs is located along the foothills of the Rocky Mountains. Portions of the system are in areas that are at significant risk for wildfires. Colorado Springs Utilities and the Colorado Springs Fire Department are working together to evaluate the ability of the existing distribution system to provide fire flow for a wildfire, identify possible system improvements, and identify needed isolation valves to restore the system after a fire. The Utilities' hydraulic model was used to model available water under existing distribution system configuration and to develop alternatives to provide additional water. The goal is to understand the available resources and have a plan in the event of a wildfire near at-risk neighborhoods.

Colorado Springs | Colorado Springs Finished Water Master Plan; Colorado Springs, CO

Project Engineer / Lead Hydraulic Modeler. The 2016 FWMP Update included the following tasks:

- Updating demographic and water use projections.
- Conducting a model verification of the existing All Pipes Operations Model.
- Development of the Northfield Improvements to allow for fluoride blending at the Mesa WTP.
- Development of the Downtown Area Redevelopment Master Plan to address a recent increased interest in redevelopment in the downtown area.
- Valve criticality assessment of all isolation and control valves within the distribution system.
- Water quality and source trace modeling of the distribution system to identify and recommend improvements to address areas of low chlorine residual in the distribution system.
- A system wide redundancy evaluation to consider limited production capacity at any of the Springs Utilities (Utilities) WTPs.

Startex-Jackson-Wellford-Duncan (SJWD) Roger's Bridge Road Pump Station Design; Duncan, SC | 2017

Hydraulic Modeler. The project consisted of design, permitting, and contractor/equipment procurement assistance services to construct a new 4 mgd finished water pump station along Rogers Bridge Road in Duncan, SC. The pump station will be approximately 1,200 ft2 in size, will include three new 2 mgd, variable speed driven, horizontal split case pumps, and will also include a standby generator. This project also includes approximately 5,200 linear feet of 16-inch finished water suction main that will feed the new pump station from the system. Was responsible for preparing system curves for the pump selection using the hydraulic model created and calibrated during the Master Plan project.

City of Glendale | Hydraulic Modeling and System Analysis Services; Glendale, AZ | 2014-Present

Project Engineer / Lead Hydraulic Modeler. Responsible for providing hydraulic modeling and analysis of the City's water infrastructure in support of the ongoing planning and design requirements of the City's Utility and Engineering Departments. Projects include the Zone 2/3 Pressure Zone Analysis, Hillcrest Ranch Booster Station Feasibility Analysis, Hillcrest Ranch Booster Station Transient Analysis and Hillcrest Ranch Booster Station Standard Operating Procedure.

CASEY MARIKA, PE

HYDRAULIC MODELING | POPULATION & DEMAND PROJECTIONS

OFFICE LOCATION
Tampa, FL

EDUCATION
BS, Civil Engineering, Florida Gulf Coast University 2017

BS, Environmental Engineering, Florida Gulf Coast University 2017

YEARS EXPERIENCE
2

PROFESSIONAL REGISTRATIONS
EI - FL

Mr. Marika's experience is focused on water and wastewater-related planning projects. His focus lies in water and wastewater system planning, but he has experience with process/mechanical and civil design as well. He is a member of the Florida Water Environment Association and is a certified Engineering Intern

PROJECT EXPERIENCE

City of Tampa | Potable Water Master Plan; Tampa, FL

Staff Engineer. Responsible for assisting in the execution of the potable water master plan and deliverables. The project included: updating and calibrating the existing hydraulic model using InfoWater, distribution analysis and improvements for four planning years (2015, 2020, 2025, and 2035), pumping and storage facility capacity assessments, resiliency and reliability assessments, asset management program development, risk based pipeline prioritization using InfoMaster, capital improvement program and Master Plan documentation. The City of Tampa distribution service area serves a population of approximately 610,000 people across 1 pressure zone at an average day demand of approximately 70 mgd. The distribution system includes one water treatment plant, five repump stations with tanks and several interconnections with Hillsborough County and Tampa Bay Water.

City of Venice | Venice Water Master Plan Update; Venice, FL

Staff Engineer. The City of Venice's Utilities Department treats groundwater and distributes the treated water to service a population of approximately 22,000 people in the City of Venice/South Sarasota County area. The goal and objective of the Water Supply Master Plan (Project) is to assist City staff in providing a reliable and robust water system with adequate capacity to accommodate future growth within the City's water service area. The City of Venice uses an average of approximately 2.0 mgd of drinking water from one WTP. Their distribution system includes more than 76 miles of piping, 1 booster station and 2 elevated storage tanks and is and all-pipes model, using InfoWater. Tasks included: field data collection, population and demand projections, water supply and treatment capacity, model update and calibration, hydraulic analysis, water age and chlorine residual correlation, water quality evaluation, CIP planning and master plan documentation.

Tampa Bay Water | Long-Term Master Water Plan & Program Feasibility; Pinellas, Pasco and Hillsborough Counties, FL

Staff Engineer. Focused on the potable reuse feasibility tasks. Tampa Bay Water (TBW) is required to update their Long-Term Master Water Plan (LTMWP) every five years. The most recent LTMWP prior to this project was completed and approved in December 2013 and included a Feasibility Program recommendation. This project included updating both the Feasibility Program and the LTMWP, to evaluate the Board approved projects listed in the 2013 LTMWP and to narrow down the project list to one of more projects that will meet the region's drinking water demand once the demand forecast indicates more supply is needed. In addition to the Board approved projects, several potable reuse projects were included. Black & Veatch was a subconsultant to Hazen & Sawyer. The following lists the projects evaluated:

- Gulf Coast Desalination
- Seawater Desalination Expansion (with & without potable reuse)
- Thonotosassa Wellfield
- Aquifer Recharge Project
- Surface Water System Expansion
- South Hillsborough County Indirect Potable Reuse Wellfield
- Tampa Bypass Canal Augmentation with Potable Reuse

Pinellas County | Optimization Program; St Petersburg, FL

Staff Engineer. Responsible for completing project goals and executing client deliverables related to defining and implementing optimization improvements for the William E. Dunn WRF (WEDWRF) and the South Cross Bayou WRF (SCBWRF). Tasks at the WEDWRF included the development of a calibrated wastewater process model for assessing future plant modifications; a plant staffing evaluation, a treatment process optimization study; prioritization of the County's CIP projects, and an energy efficiency evaluation. Tasks at the SCBWRF included the development of a calibrated wastewater process model for assessing future plant modifications, investigation into high copper levels in the WRF effluent, a dewatering system technology alternatives evaluation, a treatment process optimization study, and an energy efficiency evaluation. Several reports and technical memorandums were developed to document findings and workshops were held to convey recommendations and define next steps.

Plant City | Wastewater Master Plan; Plant City, FL

Staff Engineer/Hydraulic Modeler. Plant City's Utilities Department collection system services a population of approximately 38,000 people. The goal and objective of the Wastewater Master Plan (Project) is to assist City staff in providing a reliable and robust system with adequate capacity to accommodate future growth within the City's sewer service area. Their collection system includes more than 140 miles of gravity pipes, 20 miles of forcemain, and 44 lift stations using InfoWorks ICM. Tasks included: field data collection, population and demand projections, sewer treatment capacity, model update and calibration, hydraulic analysis, asset management strategy development, risk-based facilities assessment, CIP planning and master plan documentation.

Lee County | Wastewater Master Plan; Lee County, FL

Staff Engineer. Lee County's Utilities Department collection system services a population of approximately 250,000 people. The goal and objective of the Wastewater Master Plan (Project) is to assist County staff in providing a reliable and robust system with adequate capacity to accommodate future growth within the City's sewer service area. Their collection system includes 10 service areas more than 650 miles of gravity pipes, 350 miles of forcemain, and 690 lift stations. The model was developed in InfoWater because the Master Plan hydraulic analysis was only conducted for the forcemain portion of the collection system. Tasks included: field data collection, population and demand projections, sewer treatment capacity, model update and calibration, hydraulic analysis, CIP planning and master plan documentation.

AMANDA ZARAZURA, PE

R&R RISK PRIORITIZATION

OFFICE LOCATION
Denver, CO

EDUCATION
IAM Certificate in Asset Management, 2019

MS, Environmental Engineering, Texas Tech University, 2001

BS, Environmental Engineering, Texas Tech University, 2001

YEARS EXPERIENCE
19

PROFESSIONAL REGISTRATIONS
PE - TX

PROFESSIONAL ASSOCIATIONS
Water Environment Federation

Amanda Zarazúa is a Regional Asset Management Lead with 17 years of experience specializing in asset management and wastewater collection studies. Her experience includes asset management program development, ISO 55001 gap assessments and improvement plans, risk-based condition assessment and capital improvement planning, implementation and optimization of computerized maintenance management systems (CMMS) and GIS, CMMS software needs assessments, and wastewater collection system master planning.

PROJECT EXPERIENCE

City of Tampa Water Department | Potable Water System Master Plan; Tampa, FL

Senior Asset Management Consultant. Comprehensive Water System Master Plan update including asset management program framework development and risk-based prioritization for pipeline improvements. Led workshops within the Water Department and other supporting City groups to conduct a gap assessment review based on ISO 55001 standards. Developed an asset management program implementation roadmap. Developed a dynamic risk-based prioritization model using InfoMaster software and led workshops to support development of likelihood of failure and consequence of failure criteria. The results of the model were used to support the capital improvement projects planning. Developed a customized InfoMaster guideline for the City's use to continue to maintain their model. Provided a budget gap assessment based on baseline replacement needs for the water distribution system compared to current funding and estimated future funding needs. Developed a survival curve spreadsheet tool to estimate life expectancy by pipe material.

City of Atlanta | Small Diameter Water Mains Risk Prioritization; Atlanta, GA

Lead Asset Management Consultant. Developed a risk-based prioritization approach to support the small diameter repair and rehabilitation program. Performed a data gap assessment to populate missing attribute data including material, installation year, and diameter. Developed a risk model using InfoMaster software. Determined appropriate likelihood of failure and consequence of failure criteria to support the R&R management strategies. Developed a rehabilitation decision tree including associated replacement costs to define priority groups for rehabilitation.

Baseline replacement costs were estimated to provide a level of investment per year. A valve criticality evaluation using a similar risk-based approach was performed to develop a valve exercising program.

City of Greenville| InfoMaster Sewer Model Development and Training; Greenville, SC

Lead Asset Management Consultant. Provided support to the City of Greenville to develop an InfoMaster sewer model to identify and prioritize rehabilitation efforts based on CCTV inspection data. Developing a risk-based methodology using likelihood and consequence of failure factors to prioritize continued CCTV inspection efforts and identify high risk pipes for long-term rehabilitation planning using the InfoMaster model. Hands-on training and a customized training guideline were provided.

City of Aurora/Aurora Water | Gun Club Pump Station Condition Assessment; Aurora, CO

Lead Asset Management Consultant. Condition and operational assessment of the City's Gun Club Pump Station. Developed a combined condition and age-based approach to estimate remaining useful life for each asset within the pump station. Defined criteria and scoring methodology to represent the condition and reliability of the assets for use in determining the remaining life estimate. Updated the City's asset list and collected additional attribute information during field visits to provide a complete asset list for the City's use in updating their InforEAM asset management system.

Coachella Valley Water District | Asset Inventory and Condition Assessment; Palm Springs, CA

Asset Management Consultant. Asset inventory data collection and condition assessment program for over $1.2 billion in infrastructure assets encompassing water treatment, water distribution, wastewater treatment, wastewater collection, irrigation and canals, drainage, stormwater, District facilities, fleet, and small equipment. Project involves application development and deployment for both horizontal/distributed assets using ArcGIS Collector application and a Black & Veatch developed mobile application for facilities and non-spatial asset inventory and assessment on mobile devices. Key tasks supported include data analysis and preparation, asset hierarchy development for vertical and horizontal assets, field planning, field team organization and deployment, data collection, condition assessment, and application development/integration in support of the CMMS/Nexgen implementation for their enterprise asset management program.

Tulsa Metropolitan Utilities Authority| Utility Enterprise Initiative; Tulsa, OK

Senior Asset Management Consultant. Utility Enterprise Initiative to develop an asset management program according to ISO 55000 standards. Program activities include asset management plans and implementation of a computerized maintenance management system (CMMS) software to support water and wastewater treatment, wastewater collection, water distribution, and water supply. Developed risk methodologies in alignment with overall asset management framework including likelihood of failure and consequence of failure criteria for facilities/plant equipment to support calculation of risk at a system level and for the water distribution system. Developed equipment condition assessment forms, inspection templates, and contractor asset input forms. Developed the InfoMaster risk-based prioritization model based on defined likelihood and consequence of failure for water distribution. Baseline replacement costs were estimated to provide a level of investment per risk level. Currently developing a similar risk approach to support improvement planning efforts for the sanitary sewer system. Developing asset management plans for facilities and the water distribution system. Led workshops to develop workflow processes and identify system requirements for the CMMS software. Developed the RFP for selection of the CMMS software vendors. Developed the full implementation schedule including a training plan. Prepared initial treatment facility asset hierarchy template, asset types, and recommended data fields for use in developing system asset registers.

KEVIN CEVALLOS, PE

FIELD DATA COLLECTION

OFFICE LOCATION
Coral Springs, FL

EDUCATION
MS, Environmental Engineering, University of Florida-Gainesville, 2019

BS, Civil Engineering, University of Florida-Gainesville, 2014

YEARS EXPERIENCE
6

PROFESSIONAL REGISTRATIONS
PE - FL

Mr. Cevallos is a Design Engineer with experience and knowledge of water and wastewater systems. Mr. Cevallos has served as Design Engineer on a number of Civil engineering projects including water and wastewater treatment plant facilities design.

PROJECT EXPERIENCE

Brown County Water and Wastewater Services | Wetwell Refurbishment at Pump Stations 452, 458, and 460; FL

Resident Engineer. As part of the implementation of the General Engineering Services for wastewater, Mr. Cevallos has participated on the design and construction phase services as a resident engineer during the construction of the Wetwell Refurbishment at Pump Stations 452, 458, and 460. The work included daily construction inspections and reporting, safety coordination including confined space training, management of submittals/RFIs, client construction meetings and possible change order requests.

South Florida Water Management District | Golden Gate 4; West Palm Beach, FL

Design Engineer. Mr. Cevallos is currently assisting the design of a new water control structure with two automated roller gates, an overflow weir structure and a new control building to replace an existing weir structure with smaller manual gates.

Broward County Water and Wastewater Services | Improvement Projects; Broward County, FL

Design Engineer. As part of the implementation of the General Engineering Services for wastewater, Mr. Cevallos has participated on the design and construction phase services for multiple improvements projects at the North Regional WWTP including replacement of pump pads for the effluent pumps and improvements to the aeration basins, shorting contactors panels replacement at the outfall pump station and clarifiers rehabilitation. In addition, Mr. Cevallos assisted in the design of clarifier rehabilitation and the replacement of transformer number 1. He also provided construction phase services for the painting at master lift stations 226 and 452 and design services for the wetwell refurbishment at pump stations 452, 458, and 460.

Broward County Water and Wastewater Services | A3 clarifier Rehabilitation; Florida

Resident Engineer. As part of the implementation of the General Engineering Services for wastewater, Mr. Cevallos has participated on the design and construction phase services as a resident engineer during the construction of the A3 clarifier at Broward County Water and Wastewater Service's North Regional Wastewater Treatment Plant. The work included daily construction inspections and reporting, management of submittals/ RFIs, safety coordination including confined space training, and client construction meetings.

Miami-Dade Water and Sewer Department | Water Service Improvement to Non-Residential Properties; Miami, FL

Design Engineer. Mr. Cevallos assisted the Miami-Dade Water & Sewer Department (MDWASD) with developing a plan, including planning level cost estimates and project schedules for the improvements of water infrastructure to non-residential zoned properties within MDWASD's service area currently under-sized to bolster commercial re-development. Once the project is implemented, over 15,000 parcels sites will have improved water service.

South Florida Water Management District | IT Shelter Replacement Construction Project; West Palm Beach and Hendry Counties, FL

Design Engineer/Construction Submittal Support. Mr. Cevallos assisted in the construction management of four (4) IT shelters in Palm Beach and Hendry County for the South Florida Water Management District. The project includes management of submittals/RFIs.

Mount Pleasant Waterworks | Rifle Range Road WWTP Rehabilitation and Expansion; SC

Design Engineer. The project consisted of improvements to Rifle Range Road Wastewater Treatment Plant (RRRWWTP) expand the treatment capacity from 6.6 mgd MM to 9.2 mgd MM. The upgrade included the following facility improvements: Construction of a new headworks facility, New influent force main piping to new headworks facility New blower building and multistage blowers with the capacity to meet the maximum month airflow requirement with one blower out of service and renovate the existing dewatering facility to alleviate existing issues with ancillary mechanical and electrical services and to house a new 2.5-meter belt filter press. Mr. Cevallos served as a design engineer in helping develop the hydraulic profile for the entire upgrade and the basis of design report for the dewatering process.

DC Water | Blue Plains Advanced Water Treatment Facility Combined Heat and Power Project; Washington, DC

Construction Submittal Support. Provided construction phase services for new combined heat and power project that produces up to 100,000 pph of steam for use in the Cambi process as well as up to 15 MW of electricity for use in the Blue Plains AWTF. Facilities included gas blowers, siloxane removal equipment, gas compressors, combustion turbines, heat recovery steam generators, and other ancillary facilities. The project is being delivered through a Design-Build-Operate contract arrangement.

Tennessee Valley Authority | Upstream Berm Design; Johnson City, TN

Design Engineer. Mr. Cevallos helped produce a final engineering package for the purpose of the construction of an upstream berm to provide risk reduction directly related to sinkhole development in the upstream embankment slope and applicable areas upstream of the embankment toe of the Boone Dam, located near Johnson City Tennessee. The objectives of the upstream filter berm design were to provide risk reduction for applicable potential failure modes identified for long-term operation post implementation of seepage remediation. Specifically, the upstream filter berm shall promote stability of the upstream slope of the dam and provide risk reduction against the development and progression of sinkhole development in the upstream embankment slope and applicable areas upstream of the toe. In addition, to provide a berm of sufficient width to safely support personnel, equipment, materials and activities associated with construction of a grout based or cut-off wall-based seepage remediation along the crest of the embankment. Mr. Cevallos coordinated, wrote, and edited the design specifications and participated in site visits as well as client meetings.

MATT POWIS, PE

CAPITAL PROJECT PRIORITIZATION

OFFICE LOCATION
Kansas City, MO

EDUCATION
MS, Finance, University of Missouri Kansas City, 2006

BS, Business Administration, University of Missouri Kansas City, 2004

YEARS EXPERIENCE
16

PROFESSIONAL ASSOCIATIONS
American Water Works Association

Mathew Powis serves as a manager in the Planning and Asset Management group that supports Black & Veatch's Water Division. He has project and modeling experience in helping utilities balance their revenue requirements while maintaining a strong financial position and addressing their aging infrastructure using asset and project capital prioritization and budget optimization; affordability studies; financial forecasting; cost of service rate studies; bond feasibility studies; and valuation analyses.

PROJECT EXPERIENCE

HRSD | Organizational Risk Framework; Virginia Beach, VA

Lead Consultant. The project involved the development of an ISO 55001 gap assessment and improvement roadmap. Mr. Powis assisted in implementing the program by helping develop an Organizational Risk Framework that included risk policy, roles and responsibilities, risk management processes, consequence criteria, and likelihood criteria for senior management decision making.

Milwaukee Metropolitan Sewerage District | Facilities Plan; Milwaukee, WI

Lead Consultant. Lead Consultant for the capital prioritization and optimization task for the development of a comprehensive facilities plan to meet their needs through 2050. He is assisting in the implementation of Black & Veatch's innovated and proven Risk Based Project Prioritization and Optimization solution for their wastewater projects. He is responsible for developing the model, performing the optimization simulations, and developing strategies for the Utility's CIP to manage multiple budget scenarios.

Tulsa Metropolitan Utility Authority (TMUA) | Utility Enterprise Initiative; Tulsa, OK

Lead Consultant. Lead Consultant for the Capital Prioritization and Optimization task of TMUA's Asset Management implementation initiative, Utility Enterprise Initiative. He is assisting in the implementation of Black & Veatch's innovated and proven 'Project Prioritization and Optimization' solution for several water and wastewater projects.

He is responsible for leading workshops with engineering and maintenance staff, developing business case approaches for each water/wastewater project, performing Monte Carlo and optimization simulations, and developing strategies for the utility's capital improvement plan (CIP) during a period of tight budget constraints to minimize rate increases. TMUA is currently expanding the Capital Prioritization and Optimization process to their Stormwater CIP.

Department of Water Resources (DWR) | Capital Prioritization and Optimization; Sacramento, CA

Lead Consultant. This project is for Capital Prioritization and Optimization Pilot Study that includes over 500 projects from the existing CIP. Risk reduction was developed and evaluated for each project that include capital costs and required labor. An optimization model was used to schedule projects to maximize the risk reduction benefit while maintaining existing budget and resource constraints. Several budget constraint levels will be assessed to evaluate any cost savings or risk mitigation benefits.

Indianapolis Power & Light (IPL) | Long Term Electric Transmission and Distribution Capital Plan; Indianapolis, IN

Lead Consultant. Assisted in the review and development of a long-term capital plan for IPL's electric transmission and distribution (T&D) infrastructure. Black & Veatch provided an engineer's review of a system risk model to analyze and score asset risk across the T&D system for IPL. This model highlights the risk reduction benefits achieved through IPL's long-term asset replacement program, which is focused on addressing high risk assets that are nearing the end of their useful life.

Greater Cincinnati Water Works (GCWW) | Water Rate Study and Model; Cincinnati, OH

Project Manager. Manager for the preparation of a comprehensive water rate study, which included financial planning, cost-of-service analysis and rate design. Prior study was for the development of a user-friendly financial planning and rate design model to enable ongoing use by GCWW staff.

City of St. Joseph | Revenue Requirements and Cost of Service Rate Studies; St. Joseph, MO

Project Manager. Manager for the annual preparation of revenue requirements and a cost of service rate study for the municipal wastewater utility of the city of St. Joseph, MO. Assists in providing comprehensive financial planning services for the sewer enterprise fund. Tasks include development of five-year revenue requirements, allocation of costs to functional components, and design of rates.

Johnson County Wastewater | Capital Prioritization and Optimization; Johnson County, KS

Project Manager. Manager for Capital Prioritization and Optimization Pilot Study that included 21 projects from the existing CIP. Business cases were developed and evaluated for each project that include distributions for capital costs, operations & maintenance expenses, revenue, and avoided costs (likelihood and consequence of failure). Utilizing Monte Carlo simulation, net present value (NPV) of costs distributions were calculated for each project. An optimization model was used to schedule projects to maximize NPV benefit and non-financial criteria on a portfolio basis while maintaining existing budget constraints. Several budget constraint levels were assessed to evaluate any cost savings or risk mitigation benefits.

City of Grand Rapids | Comprehensive Master Plan Update Financial Analysis; Grand Rapids, MI

Lead Consultant. Lead Consultant for an update to the city's water and sewer master plans. The city provides water and sewer utility service to multiple neighboring communities and has an established methodology for determining rates and charges. Using this methodology, Black & Veatch developed a forward-looking model that determines the impact to community revenue requirements of proposed water and sewer capital improvements that result from the master planning process. The model also estimated the impact to the city's water and sewer enterprise fund debt service coverage.

CHAD BARKER

COST ESTIMATING

OFFICE LOCATION
Orlando, FL

EDUCATION
Civil Engineering Coursework, University of South Florida

YEARS EXPERIENCE
29

PROFESSIONAL REGISTRATIONS
Florida Licensed Underground Utility and Excavation Contractor
#CUC057098
OSHA 40-Hour Training
OSHA Competent Person
Confined Space Entry
CPR and First Aid

Mr. Barker has 25 years of experience in the civil, water, wastewater, and transportation construction industry, with experience on multiple sizes and types of roadwork, sitework, pipeline, WWTP, WTP, industrial process and other major transportation infrastructure and utility infrastructure projects. In addition to developing detailed project cost estimates, he has also developed detailed cost tracking systems, effectively managed projects, and personnel, as well as operated a medium sized, self-performance contracting firm during my time in the industry.

PROJECT EXPERIENCE

City of Morro Bay | Water Reclamation Facility Design-Build; Morro Bay, CA

Principal Estimator. Replacement of an aging wastewater treatment facility near the city's waterfront with a state-of-the-art water reclamation facility on a greenfield site located 1.5 miles inland. The facility was designed to produce IPR-quality water for aquifer recharge.

California Water Service | Palos Verdes Pipeline Project Progressive Design-Build; Palos Verdes, CA

Principal Estimator. Progressive design-build project to rehabilitate water infrastructure on the Palos Verdes peninsula. Project consists of approximately 7 miles of large diameter (24-inch and 30-inch) buried potable water pipeline and a booster station. The alignment is threaded through dense neighborhoods, equestrian trails, schools and community facilities, and environmentally sensitive areas.

Parker Water and Sanitation District | Water Resources Centralization Progressive Design-Build, Phase 1B; Parker, CO

Principal Estimator. Progressive design-build of nine miles of groundwater conveyance systems, a 100,000-gallon reservoir, four miles of distribution pipeline, pump stations, and disinfection modifications to existing well houses.

Clean Harbors, Inc. | El Dorado Incinerator Expansion; El Dorado, AR

Senior Estimator. Competitive design-build of the first new hazardous waste incinerator in the US in 25 years. Project consisted of rotary kiln, secondary combustion, ash conveyance, APC systems along with accompanying structural steel supports and platforms. Mr. Barker was responsible for Civil, Structural, and Mechanical systems for hazardous waste incinerator. He also provided coordination with internal and external design teams and major equipment vendors.

NAVFAC | NAS JRB NOLA Water Distribution System; Belle Chasse, LA

Lead Estimator. Competitive design-build of new water distribution system for existing operational Naval Air Station. Project consisted of over 40K linear feet of new fire and water pipelines along with new fire pump station and refurbishing of existing storage towers and tanks. Mr. Barker was lead estimator through the pursuit development and execution of the project after award. He worked closely with the design team during proposal and final designs to provide highest project value, and negotiated and procured all project vendors and subcontractors.

California American Water | Desalination Facility; Monterey, CA

Senior Estimator. Competitive design-build of a new 9.6 MGD advanced desalinization water treatment facility. Mr. Barker was responsible for civil, structural, and mechanical systems for desalination facility. He coordinated with internal and external design teams and major equipment vendors, and procured quotes for Divisions 2 – 16.

Okaloosa County | Arbennie Pritchett Water Treatment Facility Expansion; Eglin AFB, FL

Lead Estimator. Competitive design-build of 5.0 MGD expansion to existing wastewater treatment facility. Mr. Barker was lead estimator through the pursuit development and execution of the project after award. He coordinated with internal and external design teams and major equipment vendors, and procured and negotiated quotes for Divisions 2 – 16.

USACE | JBLM WWTP Construction; Fort Lewis, WA

Lead Estimator. Competitive design-build of new 12.0 MGD wastewater treatment facility. Mr. Barker was responsible for civil, structural, and mechanical systems for desalination facility. He coordinated with internal and external design teams and major equipment vendors, and procured quotes for Divisions 2 – 16.

USACE | Ft. Irwin Advanced Water Treatment Facility; Fort Irwin, CA

Role in the project. Competitive design-build of new 6.0 MGD wastewater treatment facility. Mr. Barker was responsible for civil, structural, and mechanical systems for desalination facility. He coordinated with internal and external design teams and major equipment vendors, and procured quotes for Divisions 2 – 16.

FRANCESCA MCCANN

STATE REVOLVING FUND COMPLIANCE

OFFICE LOCATION
Washington, DC

EDUCATION
MBA, International Finance, UCLA Anderson School

BA, International Political-Economy, Colorado College

YEARS EXPERIENCE
20

Ms. McCann brings nearly 20 years of commercial and financial leadership in the water and energy sectors. Her expertise includes alternative delivery (DB, DBO, BOOT, P3, CMAR), stakeholder relations, and financial project structuring. Francesca currently serves as Business Development Director for infraManagement Group (iMG), a Black & Veatch company. Her work with iMG includes project development, asset management, and evaluation and optimization of commercial structures, financing options, and business case alternatives. Project work includes water, wastewater, stormwater and resource recovery.

Prior to joining Black & Veatch, Francesca served as CEO of Abengoa Water USA, where she led the company to successfully contract a $3.4 billion water supply project in San Antonio, Texas (SAWS Vista Ridge), the largest water public-private partnerships in the U.S. In addition, she led the commercial and financial development of industrial and municipal water supply, wastewater treatment and alternative energy projects.

Francesca has an extensive network of industry contacts that includes investors, regulatory experts, policymakers, and publicly-traded and privately-held management teams. She has been featured in print and on television including the New York Times, Business Week, Barron's, Bloomberg and MSNBC. She frequently speaks at prominent water conferences in the U.S. and abroad.

PROJECT EXPERIENCE

infraManagement Group

Business Development Director.

- Develop new business for infraManagement Group (iMG), a wholly-owned subsidiary of Black & Veatch. IMG is the P3 arm and asset management company of Black & Veatch.
- Establish innovative project finance structures for alternatively-financed water supply, water and wastewater infrastructure and reuse projects.
- Collaborate with water and wastewater utilities, local, state and national governments and utility associations (NACWA, NAWC, WDBC, etc.) to examine the application of various innovative financing mechanisms for complex infrastructure projects including municipal bond financing, project finance and public private partnerships.

Abengoa Vista Ridge Project Leadership.

- Contracted the Abengoa Vista Ridge Project in San Antonio, TX. The $3.4 billion Project is the first of its kind, large-scale water supply PPP in the U.S. The Project has an EPC value of ~$850 million and will supply 50,000 acft/year of water to the City of San Antonio over a 30-year period.
- Led public negotiations for Abengoa of the Vista Ridge contract with the San Antonio Water System (SAWS) Staff and Board.
- Managed development and negotiations of complex contracts for engineering and water rights between multiple parties over a period of nine months.
- Directed the financial and legal due diligence teams for valuation and risk analysis of the off-take contract.
- Managed public relations, community engagement and dialogue with the business community, securing critical local and political support for the Project, securing an 11-0 City Council vote in favor of the Project.

Global Water Strategies; International Finance Corporation (IFC)/World Bank Group, Washington, DC

Water Sector Expert.

- Managed sustainable water and energy programs with a focus on technology efficiency and analysis of banks' mechanisms for lending.
- Developed Water & Communities Framework, a benchmark study for companies on managing social and community-related water risk.

GIOVANNA RIVERA

FINANCIAL & FUNDING PLAN

OFFICE LOCATION
Coral Springs, FL

EDUCATION
Graduate Certificate, Financial Analysis; MA, Applied Economics, Johns Hopkins University; BS, International Economics/Political Science

YEARS EXPERIENCE
11

PROJECT EXPERIENCE

Miami-Dade Water and Sewer Department | Water and Sewer Financial Planning Services, FL

Led the financial efforts including a comprehensive water and sewer cost of service and rate study for both retail and wholesale customers, adequacy of rates and charges evaluation and bonds feasibility report.

Sewerage & Water Board of New Orleans | Comprehensive Financial Planning, Cost of Service Study and Rate Design, LA

Analyzed revenue requirements including operating expenses and capital financing, project future revenues, performed a cost allocation and design of rate schedules.

Woodruff Roebuck Water District | Water Rate Study, SC

Analyzed cost of service and rates for the water utility to enhance and sustain the financial viability of the utility. Conducted a financial plan, cost of service allocations and design of rate schedules.

City of Kansas City | Water Services Department | Revenue Requirements, Cost of Service and Rate Study for Water and Wastewater Services, MO

Analyzed future revenues of the water and wastewater utility under existing levels of charge, as well as the utility's total operating expense and capital financing requirements. Examined the adequacy of projected revenue to meet the water program's total requirements to allocate the costs of service, and develop a schedule of water and wastewater rates.

Columbia Water Department | Water and Sewer Rate Study, SC

Conducted a financial plan which included the analysis of future revenues as well as the utility's operating expense and capital financing requirements , cost of service allocations and design of rate schedules.

MARK SEASTEAD

CITYWORKS SPECIALIST

OFFICE LOCATION
Charlotte, NC

EDUCATION
MS, Resource Planning, Missouri State University, 1996

BS, Geology, The State University of New York at Fredonia, 1994

YEARS EXPERIENCE
26

PROFESSIONAL ASSOCIATIONS
American Water Works Association

Mr. Seastead is the East Region Practice Leader for Asset Management that supports Black & Veatch's Water Division. He has over 21 years of program management, consulting, and system implementation and integration experience on projects for private entities, municipal government and water, wastewater, and transportation focused clients. He specializes in work and asset management program development, CMMS solution selection, business process mapping, systems implementation and refinement, systems integration, and end user training and support. Having led both large enterprise and small departmental efforts to both private and public sector clients, Mr. Seastead provides a unique experience in leading asset management and IT program development that focuses on practical usage measurable performance.

PROJECT EXPERIENCE

Salt Lake City | EAMS Implementation - Phase 2; Salt Lake City, UT

Project Manager. Leading the full implementation of an enterprise asset management system for the Salt Lake City Water Reclamation Facility (SLCWRF). This included developing an asset hierarchy, inventorying assets, defining business processes associated with maintenance management, EAMS system configuration, end user training and support. This project also includes integration with the GE Proficy iFix and iHistorian SCADA system.

Jackson Energy Authority | EAMS Implementation; Jackson, TN

Asset Management Lead. This project is assisting the JEA Water and Sewer Departments with the implementation of a new Cityworks EAMS. Services include defining key business processes, asset hierarchy development, system configuration, integration with JEA CRM, testing, and system support. When completed the system will support field operations and maintenance of water and wastewater systems managed by JEA and provide them with real-time work and asset management performance, more effective work planning, and compliance for federally mandated wastewater asset management.

Forsyth County | EAMS/CMMS Selection; GA

Asset Management Advisor. This project is assisting the Water and Sewer Department with the creation of a CMMS selection RFP. Services include defining system requirements, assistance with development of RFP language, demonstration script development, RFP evaluation ranking criteria, and assisting client with submittal evaluations and system selection.

City of Greenville | EAMS Training; Greenville, SC

Project Manager. This project provides ongoing EAMS training on the Cityworks platform for Public Works users. Mr. Seastead is also leading asset management workshops to gather requirements for system expansion, document business processes to be incorporated into the EAMS and provide an implementation plan for system expansion.

Unified Port District of San Diego | Phase 2 Enterprise Asset Management Program; San Diego, CA

IT Technical Lead. This project is building upon the Phase 1 initiative that Mr. Seastead while employed by another company. Mr. Seastead is leading requirements gathering, business process mapping and conceptual architecture design for a new Enterprise Asset Management System (EAMS). This includes defining requirements, preparing an RFP for system selection and assisting the client with selecting, procuring and implementing the EAMS. The results of this effort will be a new EAMS that integrates with the existing SAP ERP system and deployed to over 150 new users with mobile technology.

City of Charlotte – DOT | EAMS Implementation; Charlotte, NC

Project Manager. This project is migrating CDOT from Hansen to Cityworks Enterprise Asset Management (EAM). Mr. Seastead is leading existing business process mapping, asset hierarchy development, requirements gathering for integration with the City's CRM program along with configuration, testing, and training. The results of this effort will be a fully implemented EAMS compliant with the rest of the City, improved business processes, and deployed EAMS to over 100 new users.

City of Rock Hill | CMMS Support - Facilities Management; Rock Hill, SC

Project Manager. This project is assisting the City with implementing a facilities management focused computerized maintenance management system (CMMS). Services include defining key business processes and leading the system configuration, testing, training and support for the client.

Union County | EAMS Selection & Asset Management Framework; Monroe, NC

Technical Lead EAMS. As a technical advisor Mr. Seastead assisted with the development of CMMS system functional and technical requirements, assisting with the development of RFP language, creation of vendor scripting and evaluation processes.

Water Reclamation District of Southern California | Asset Management Program; Lakwood, CA

Technical Lead IT. As a Technical Advisor Mr. Seastead assisted with the ISO 55001 based Asset Management GAP assessment. Mr. Seastead also led the CMMS selection task that included developing functional requirements, assisting with the development of RFQ language, creation of vendor scripting and evaluation processes, and assistance with developing consensus from WRD staff on final selection. Mr. Seastead also developed the framework for an Information Management Master Plan (IMMP) framework that is currently being implemented.

Salt Lake City | EAMS Implementation; Salt Lake City, UT

Project Manager. Led the pilot implementation of an enterprise asset management system for the Salt Lake City Water Reclamation Facility (SLCWRF). This included developing an asset hierarchy, inventorying assets, defining business processes associated with maintenance management, EAMS system configuration, end user training and support.

City of Fargo | EAMS Implementation; Fargo, ND

Project Manager. Senior Technology Consultant of the CMMS implementation for the City's Public Works department, with responsibilities that include business process analysis and development, asset data collection planning, configuration design, GIS planning workshops, CMMS configuration, training, report development, and system integration design.

JEFF STILLMAN, PE, BCEE

GAP ASSESSMENT

OFFICE LOCATION
Boston, MA

EDUCATION
MS, Civil Engineering and Environmental, North Carolina State University, 1997

BS, Civil Engineering and Environmental, University of Illinois, 1995

YEARS EXPERIENCE
23

PROFESSIONAL REGISTRATIONS
PE - MA

PROFESSIONAL ASSOCIATIONS
American Water Works Association

Water Environmental Federation

Collection Systems Committee

Mr. Stillman is a Practice Leader in Asset Management and Infrastructure Planning. He has executed a wide variety of asset management and infrastructure planning projects and programs, including risk-based facility prioritization; computerized maintenance management systems; sewer system evaluation surveys; and capacity, management, operations, and maintenance (CMOM) programs.

Throughout his career, Jeff has focused on building tools, developing processes, and conducting training and workshops to facilitate ultimate use by clients. Such tools have included hydraulic and water quality models, prioritization databases, relationships with SCADA and maintenance management systems, flow/capacity allocation, and more. He has extensive experience in utilizing asset information databases and geographic information systems (GIS) to aid development and analysis of various model software packages and prioritization databases to support master planning and development of capital improvements plans.

PROJECT EXPERIENCE

Water Services Department | Comprehensive Water System Master Plan; Kansas City, MO

Lead Asset Management Consultant. Black & Veatch was retained to provide the first comprehensive update to WSD's master plan in 15 years. The project included evaluations of supply, demand, hydraulic and treatment performance as well as physical asset condition. WSD is planning substantial investment to reduce the number of pipe breaks in its distribution system and requires a capital planning method to ensure these funds are allocated efficiently. Jeff led the implementation of a risk-based capital planning method using complimentary break and economic models. The break forecasting model was based on the I-WARP method published by the Water Research Foundation and allows the modeler to consider both static (pipe diameter, soil type, etc.) and dynamic attributes (climate, cathodic protection, etc.). The output is a predicted break frequency for each individual pipe segment. These break frequencies were then fed into an economic model that considered annual budget limits, direct and indirect break costs, and cost savings for road work coordination and adjacent pipe segment replacement. Together, these models were used to develop defensible, cost-efficient annual pipe rehabilitation projects over a 5-year planning period.

Miami-Dade Water & Sewer Department | Infrastructure Assessment and Replacement Program for Water Mains 16-inch and Larger; Miami, FL

Lead Asset Management Consultant. Managed the development of a MS Excel prioritization model for the MDWSD pipeline networks. This model – which considered factors such as age, material, diameter, location, critical customers and leak history – enabled a quantitative prioritization of all linear assets which led to the development of a targeted and effective rehab and replacement program for the water distribution system.

Tulsa Metropolitan Utilities Authority | TMUA Comprehensive Assessment; Tulsa, OK

Lead Asset Management Consultant. Managed the development of a Strategic Asset Management System (SAMS) software tool based in MS Access. This tool, capable of seamless synchronization with the Antero Computerized Maintenance Management System (CMMS) system, provides an intuitive, user-friendly interface to enhance the tracking of the consequence and probability of failure for wastewater facility assets while enhancing the ability of TMUA to make important decisions regarding their Capital Improvement Plan. As a parallel activity within the Comprehensive Assessment project, Jeff was responsible for asset management activities, including a gap assessment and development of a recommended plan for further asset management program implementation.

City of Grand Rapids, MI | Master Plan Update; Grand Rapids, MI

Asset Management Segment Leader. Responsible for coordination of asset management activities in the master planning process. Led the asset management program assessment, which was conducted according to ISO 55001 principles and was used to develop an organizational asset management strategy and subsequently in developing an asset management plan for the water distribution system.

Milwaukee Metropolitan Sewerage District | 2050 Facility Plan; Milwaukee, WI

Asset Management Task Leader. Responsible for coordinating development of asset management for each utility asset system in the 2050 Facility Plan. This has included working with the District to define levels of service, key performance indicators, and specific performance measures, which are subsequently used as a basis for triple bottom line assessment and prioritization in a business case evaluation process. The asset management plans are being developed according to principles in the International Infrastructure Management Manual.

Boston Water and Sewer Commission | High Pressure Fire System Study; Boston, MA

Project Engineer. Conducted a study of Boston's High Pressure Fire System. This study involved a comprehensive investigation of an aging fire system that was installed between 1910 and 1920, to help determine whether the system must remain in service, whether portions can be decommissioned, and how remaining sections should be rehabilitated. The study involved assessing alternatives for modifying the system. Constructability was a major concern in alternatives evaluation because the system lies in the highly congested downtown section of Boston.

United Water New York | Pipe Criticality Analysis; Rockland County, NY

Project Engineer. Jeff was responsible for developing a risk-based prioritization system that served as the basis for United Water New York's Long Term Main Replacement Program. This project involved utilizing available GIS data, asset information data, model results and customer information data to calculate likelihood of failure, criticality, and overall risk. The high-scoring facilities were then grouped into logical projects and programmed into the capital improvements program with a firm basis for rate justification.

WILL WILLIAMS

ASSET MANAGEMENT FRAMEWORK

OFFICE LOCATION
Atlanta, GA

EDUCATION
BA, Geography, Royal Holloway and Bedford New College, 1989

YEARS EXPERIENCE
30

PROFESSIONAL ASSOCIATIONS
Royal Geographical Society

International Water Association Asset Management Specialist Group

Foundation for Water Research, Wastewater Forum

Georgia Association of Water Professionals

Mr. Williams has extensive experience in asset management planning, including asset failure analysis, risk assessment, performance benchmarking, maintenance optimization, business planning, serviceability assessment, whole life costing, operational efficiency, business change management and infrastructure rehabilitation.

Prior to joining Black and Veatch, Mr. Williams served the Vice President and Global Director of Asset Management for water and power for Halcrow. He was previously Director of Asset Management and Planning at the UK Water Research Centre. Mr. Williams has more than 27 years asset management experience and is a committee member of the International Water Association Asset Management Specialist Group.

PROJECT EXPERIENCE

Miami Dade Water and Sewer Department (MDWASD) | CIP Implementation and Gap Analysis; Miami, FL

Project Director. The project undertook a review of MDWASD's approach to Capital Improvement Program development, including budgeting and project implementation, focused on high-level review of processes and organizational structure. Specific process and organizational changes were recommended to improve investment targeting and efficiency of project delivery.

Palm Beach County Water Utilities Department | Asset Management Strategy; FL

Project Director. Led the development of an ISO55001 based asset management strategy. Project involved undertaking a gap analysis, developing specific improvement recommendations and developing a prioritized improvement roadmap.

Hillsborough County | Bond Engineer; FL

Project Director. Project Director for this five-year project, which entailed assessing the operational efficiency and capital maintenance policies of Hillsborough County for Bond Rating purposes. $800,000.

Gwinnett County Department of Water Resources (GCDWR) | Asset Management Strategy Development

Project Director. Project Director for this study to develop an asset management strategy for the Department of Water Resources. The project covered all aspects of the County's water, wastewater and storm water assets and was aimed at establishing Gwinnett County's current level of asset management "maturity" and comparing this to U.S. and international best practice to identify and prioritize areas for improvement. The study produced a five- year strategy and improvement roadmap to help GCDWR adopt best-in-class management approaches across its operations.

Northern Indiana Public Service Company (NIPSCO) | Long Term Electric Transmission and Distribution Capital Plan; IN

Project Director. Project Director for development of a long-term $1 billion plus capital plan for NIPSCO's electric transmission and distribution (T&D) infrastructure. Black & Veatch developed a system risk model to analyze and score asset risk across the T&D system for NIPSCO. This model highlights the risk reduction benefits achieved through NIPSCO's long-term asset replacement program, which is focused on addressing high risk assets that are nearing the end of their useful life.

Hillsborough County | Assessment; FL

Project Director. Project Director for the development of a system-level useful remaining life model, as well as a compilation of an asset inventory database with condition and data confidence grading. The project included strategic planning, field survey, asset inventory, water distribution system assets, useful remaining life, criticality, advanced condition and system improvement. Additionally, a cost benefit analysis was performed to identify priorities and scale of investment required.

Hampton Roads Sanitation District (HRSD) | Asset Management Program; VA

Project Director. Managing a three-year ISO 55001 gap assessment and Asset Management Program Implementation. The program includes, developing an Asset Management Framework that includes a Policy, Strategic Asset Management Plan (SAMP) capital prioritization, maintenance optimization, data management and the development of Asset Management Plans.

Salt River Project (SRP) | Substation Transformer Asset Investment Management Project; AZ

Project Director. Project Director for this study to review the way SRP manages its 230 and 500 kilovolt transformer fleet. The review considered the complete asset lifecycle, from how SRP engineers, specifies, procures, installs, commissions, maintains, tests and manages these critical assets. This work included a review of SRP's processes, procedures, organizational structure, data and systems to compare them to best practice and identification of any gaps that need to be filled in the short-term and whether there are any longer-term improvement opportunities. Mr. Williams' roles have included managing all Black & Veatch resources committed to the project, developing recommendations regarding SRP's transformer asset management program, and he also provided assistance with the development of an asset management-related risk management framework.

Winston-Salem/Forsyth County Utilities Commission | PAS 55 Assessment; NC

IAM Endorsed Assessor Assessor. Led a team undertaking a PAS 55-based assessment of Winston Salem's approach to management of their wastewater collection system. The project scope included undertaking staff interviews, documentation review, and a gap analysis using the PAS 55 AM standard.

BEN COWNIE

UTILITY PLATFORM DASHBOARDS

OFFICE LOCATION
New York, NY

EDUCATION
BS, Engineering (Electrical Concentration), Trinity College, 2006

YEARS EXPERIENCE
12

PROFESSIONAL REGISTRATIONS
PE - NY

PROFESSIONAL ASSOCIATIONS
American Water Works Association

Mr. Cownie is an Engineer working in water distribution modeling, hydraulic analysis, transient analysis, planning and asset management. He is involved in the development and modification of water distribution and hydraulic models using software packages such as WaterGems, H20 Map, InfoWater and ArcGIS and transient modeling using software packages such as HAMMER and InfoSURGE. He also develops asset management prioritization models to enhance rehab and replacement programs as well as capital planning.

Some of Mr. Cownie's key recent assignments have included:

- Developed a surge mitigation strategy for a reclaimed water system in Henderson, NV which allowed for optimized control of pump stations and control valves, leading to a more efficient renewable resource in the area.
- Developed a Strategic Asset Management System (SAMS) software tool which streamlined the management of wastewater facility asset information for TMUA, while seamlessly integrating with their Antero CMMS.
- Involved in the water side of a comprehensive water and wastewater master plan for Union County, NC. The integrated plan consolidates all facets of utility's operation into a single efficient vision for Union County's water resources development and utilization.

PROJECT EXPERIENCE

City of Tampa | Potable Water Master Plan; Tampa, FL

Technical Advisor. Responsible for quality control of the potable water master plan and deliverables. The project included: updating and calibrating the existing hydraulic model using InfoWater software, distribution analysis and improvements for four planning years (2015, 2020, 2025, and 2035), pumping and storage facility capacity assessments, resiliency and reliability assessments, asset management program development, risk-based pipeline prioritization, capital improvement program and master plan documentation. At the time of the project, the City of Tampa distribution system served a population of approximately 610,000 people at an average day demand of approximately 70 mgd. The system includes 1 water treatment plant, 5 repump stations with tanks and several interconnections with the Hillsborough County and Tampa Bay Water systems.

TMUA | TMUA Comprehensive Assessment; Tulsa, OK

Asset Management Consultant. Involved in the development of a Strategic Asset Management System (SAMS) software tool based in MS Access. This took, capable of seamless synchronization with the Antero CMMS system, provides an intuitive, user-friendly interface to enhance the tracking of the consequence and probability of failure for wastewater facility assets while enhancing the ability of TMUA to make important decisions regarding their Capital Improvement Plan.

Miami-Dade Water & Sewer Department | Infrastructure Assessment and Replacement Program for Water Mains 16-inch and Larger; Miami, FL

Asset Management Consultant. Involved in the development of a MS Excel prioritization model for the MDWSD pipeline networks. This model – which considered factors such as age, material, diameter, location, critical customers and leak history – enabled a quantitative prioritization of all linear assets which led to the development of a targeted and effective rehab and replacement program for the water distribution system.

Union County Public Works | Water System Planning Update; Union County, NC

Hydraulic Modeling Analyst. Update of the 2011 Master Plan which included update of the all-pipes hydraulic model in Bentley WaterGEMS, development of diurnal demand patterns and calibration of the all-pipes model for the combined 853 Pressure Zone. This project also included a preliminary capacity analysis and construction phasing for the New Yadkin River WTP, which considered the iterbasin transfer (IBT) limits between the Yadkin and Catawba basins. A preliminary siting study for the new Yadkin River WTP was also completed, as well as proposed pressure zone boundary modifications and pipeline infrastructure (raw water and finished water transmission) required to enable maximum water supply reliability and resiliency for the Union County water system customers. In addition to supply, distribution system improvements (storage, pipeline, pump and valve projects) were recommended based on the results of the hydraulic modeling.

All improvement projects developed as part of this planning updated were provided within an integrated CIP which also included all Wastewater improvement projects.

Charlotte Water | Water Distribution System Master Plan; Charlotte, NC

Project Engineer/Task Leader. Responsible for preparing a 25-year Master Plan for Charlotte Water's water distribution system. Project included water system data utilization planning, development of system performance criteria and project prioritization guidelines, water demand projections, existing facilities evaluation, a comprehensive field testing program (including 40 C-Factor Tests), hydraulic model update, development of 7-day customer-specific diurnal demand patterns, a 7-day EPS calibration using InfoWater software, water quality modeling and analysis, integrated model development and management protocol, distribution system analysis, water system capacity and reliability analysis, detailed evaluation of the Central Business District (CBD), and CIP and master plan report. Customer demands at the time of the project; the CW water system served a population of approximately 864,000 people in 3 major pressure zones at an average day system demand of approximately 102 mgd. The system included 3 treatment plants, 5 zone transfer pumping stations, 3 pumped storage tanks, and 7 elevated storage tanks.

Union County | Water Quality Study; Union County, NC

Hydraulic Analyst. Involved in the conversion of the existing skeletonized WaterGEMS hydraulic model to an all-pipes reduced model utilizing the County's GIS inventory. Following the model update, a detailed demand allocation (based on 2012 consumption billing records) was completed. Water Age simulations were then conducted in order to identify operational strategies to improve water quality throughout the northeastern portion of the distribution system.

Litigation Statement

Black & Veatch Holding Company, together with its affiliates ("Black & Veatch"), constitutes a large, international engineering and construction firm. Inevitably, like similarly-sized firms, at any given point in time we are involved with claims and litigation. Black & Veatch maintains a program of insurance to protect against claims arising out of its work. In the opinion of Black & Veatch management, no pending claim or litigation will have a material impact on Black & Veatch's ability to execute this project.

KPMG LLP
Suite 1100
1000 Walnut Street
Kansas City, MO 64106-2162

Independent Auditors' Report on Supplementary Information

The Board of Directors
BVH, Inc.:

We have audited the consolidated financial statements of BVH, Inc. and its subsidiaries as of and for the years ended January 3, 2020 and December 28, 2018, and have issued our report thereon dated February 24, 2020 which contained an unmodified opinion on those consolidated financial statements. Our audit was performed for the purpose of forming an opinion on the consolidated financial statements as a whole. The Financial Review 2019 document is presented for the purposes of additional analysis and is not a required part of the consolidated financial statements. Such information is the responsibility of management and, other than the Revenue Backlog amounts, was derived from and relates directly to the underlying accounting and other records used to prepare the consolidated financial statements. Other than the Revenue Backlog amounts, the information has been subjected to the auditing procedures applied in the audit of the consolidated financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the consolidated financial statements or to the consolidated financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the information, other than the Revenue Backlog amounts, is fairly stated in all material respects in relation to the consolidated financial statements as a whole.

KPMG LLP

Kansas City, Missouri
February 24, 2020

Financial Review 2019

Condensed consolidated financial information for BVH, Inc. (in millions):

FOR THE FISCAL YEARS	2019	2018
Revenue	$3,654	$3,480
Cost of Revenue	2,949	2,848
Overhead Expenses	579	533
Operating Income	**$126**	**$99**
Other Expenses & Taxes	20	19
Net Earnings	**$106**	**$80**

AT FISCAL YEAR END		
Cash & Cash Equivalents	$482	$383
Contract Receivables	389	461
Contract Assets	342	450
Other Current Assets	53	67
Total Current Assets	**$1,266**	**$1,361**
Building, Equipment & Other Non-Current Assets	274	274
Total Assets	**$1,540**	**$1,635**
Notes Payable & Current Portion of Long-Term Debt	7	6
Contract Liabilities	605	481
Accounts Payable & Other Current Liabilities	686	766
Total Current Liabilities	**$1,298**	**$1,253**
Other Non-Current Liabilities	78	235
Equity	164	147
Total Liabilities & Equity	**$1,540**	**$1,635**

REVENUE BACKLOG	$3,920	$3,727

BLACK & VEATCH