

RFP # 22-22 | APRIL 6, 2022



CITY OF ANN ARBOR
PUBLIC SERVICES AREA/WASTEWATER TREATMENT SERVICES UNIT

WWTP ULTRAVIOLET (UV) DISINFECTION REPLACEMENT PROJECT



April 6, 2022

City of Ann Arbor
c/o Customer Service
301 East Huron Street
Ann Arbor, MI 48107

RE: RFP #22-22: WWTP Ultraviolet (UV) Disinfection Replacement Project

Dear Review and Selection Committee:

Upgrading the Ultraviolet (UV) Disinfection system at the City of Ann Arbor Wastewater Treatment Plant (WWTP) is a critical component to maintaining regulatory compliance with the City's NPDES permit requirements. The City's existing UV system needs to be modified by the end of Fiscal Year 2024, operation of the WWTP needs to be maintained while meeting permit requirements and the project budget needs to be considered when recommending and implementing the replacement equipment.

With the criticality of this project, Black & Veatch's deep bench of talented and available staff and recent similar experience, will be instrumental to the success of your project. Black & Veatch has assembled a uniquely qualified team to provide the City with a strong balance of national and Michigan-based expertise. Black & Veatch, together with our teaming partners, Moore+Bruggink and JDH Engineering, are excited to work with the City to offer the following distinct advantages:

- **An Integrated and Efficient Delivery Approach.** Our team will review historical data and existing site conditions while also seeking to efficiently collect new data. We will work in parallel with the City to confirm design criteria to supplement the UV technology evaluation and provide the **best UV system for the City. Our project approach presents a clear and efficient plan for this project and shows how we will comfortably meet your project schedule.**
- **Unmatched UV Technology Expertise.** This project requires a team with exceptional UV experience. Black & Veatch has completed over **75 UV disinfection projects in the last 10 years** with several of these being retrofits and replacement of existing UV disinfection equipment. Our disinfection expertise and knowledge of industry standards can be found in both *White's Handbook on Chlorination and Disinfectants*, as well as *WEF's Manual of Practice No. 8* both co-authored by Gary Hunter, our team's UV Specialist who will guide the City's technology evaluation. **With this UV experience, you can be confident the right UV technology will be selected for your project.**
- **Experienced Project Delivery Team.** Beyond UV expertise, a successful design requires a team of local, knowledgeable designers who can assess how to efficiently modify your existing mechanical, electrical, structural and I&C equipment to accommodate a new UV system while maintaining plant operations. Gary will be supported by many of the same team of engineers that recently designed the Wyoming, MI Clean Water Plant UV Disinfection project. Collectively, our team has worked on more than 85 UV projects. **This experience of UV retrofits both in Michigan and across the U.S. means we will provide you with the comprehensive design knowledge required for an efficient project.**

The Black & Veatch team is committed to working with the City to develop a long-term replacement of your existing UV Disinfection system. We look forward to partnering with you on this important project and would be pleased to answer any questions you have regarding our proposal. Please contact Project Manager Heather Cheslek at CheslekHA@bv.com or 616-710-6446 regarding next steps.

Sincerely,

BLACK & VEATCH CORPORATION

A handwritten signature in blue ink that reads "David S. Koch". The signature is fluid and cursive, with the first letters of each name being capitalized and prominent.

David S. Koch, PE
Associate Vice President

A

PROFESSIONAL QUALIFICATIONS





Professional Qualifications

AN EXPERIENCED TEAM WITH LEADING INDUSTRY KNOWLEDGE

Black & Veatch has brought together a focused team comprised of expertise in UV disinfection, as well as local wastewater treatment infrastructure from Moore+Bruggink and JDH Engineering. Each of these companies brings unique strengths and expertise to the table that will benefit Ann Arbor.

BLACK & VEATCH

Black & Veatch's global water business provides innovative, technology-based solutions to utilities, governments and industries worldwide. Since our founding in 1915, Black & Veatch has grown steadily to its current position as a leader in water, environment, energy and telecommunications. Today, Black & Veatch is a global corporation with nearly 10,000 professionals in more than 100 countries worldwide.

With respect to wastewater, Black & Veatch brings extensive disinfection and construction sequencing experience having evaluated and designed UV disinfection facilities at more than 1,500 wastewater and water treatment plants around the world. Our expertise and authority in the area of disinfection can be found in the *White's Handbook on Chlorination and Disinfectants* as well as *WEF's Manual of Practice No. 8, Chapter 19* on Disinfection authored by Black & Veatch UV professional Gary Hunter.



Black & Veatch Office | Ann Arbor, MI



BLACK & VEATCH

COMPANY CORPORATE OFFICE

Black & Veatch Corporation
11401 Lamar Avenue
Overland Park, KS 66211

MICHIGAN HEADQUARTERS OFFICE

Black & Veatch LTD of Michigan
3550 Green Court
Ann Arbor, MI 48105

FOUNDED IN
1915



EMPLOYEE OWNED



2021 ENR DESIGN FIRM SOURCEBOOK RANKINGS

#7 Top 25 in WWTP

#4 Top 25 in Sanitary & Storm Sewers

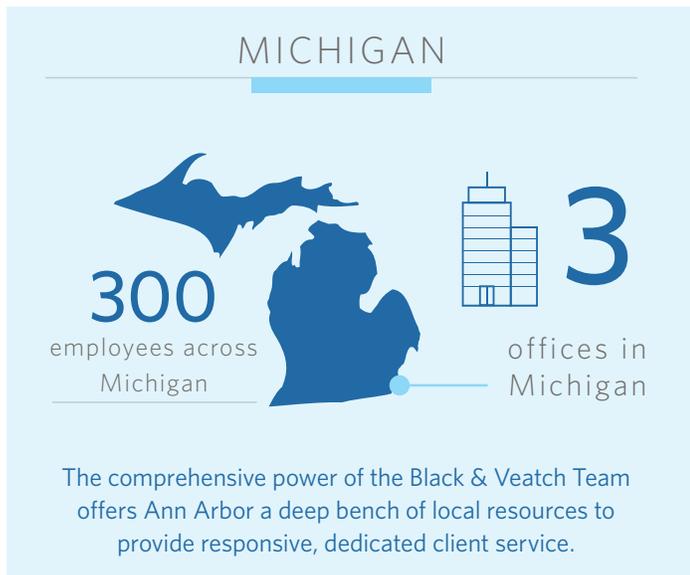
#7 Top 20 in Water

#13 Top 500 Design Firms

Black & Veatch is licensed in the State of Michigan

SERVING MICHIGAN FOR 100+ YEARS

For over a century, Black & Veatch has faithfully served clients throughout Michigan from our offices in Ann Arbor, Grand Rapids and Troy. Black & Veatch has nearly 300 professionals in Michigan, operating in all engineering disciplines and possessing specialty expertise in many areas that includes water, wastewater, energy, telecommunications and financial sectors. Our professionals are familiar with local conditions having worked on many projects throughout Michigan including projects for the City of Ann Arbor, City of Grand Rapids, Great Lakes Water Authority (GLWA) and the City of Wyoming, to name a few.



MOORE+BRUGGINK

Moore+Bruggink's (M+B) office is located in Grand Rapids, MI and has approximately 50 staff members. Founded in 1956 by two civil engineers and veterans of WWII, Millard Moore and Ray Bruggink launched a civil engineering firm that would provide professional assistance and improve the quality of life for people in Michigan. M+B's wastewater and water treatment design and construction teams have contributed to award-winning operations for many clients.

The 3 "Rights" - M+B's Business Philosophy

RIGHT CLIENT: M+B considers clients as a critical piece of the team. Working together toward the same goals is crucial to any successful project. Additionally, working within efficient service ranges of our local clients means M+B can be there when a client needs them.

RIGHT TEAM: M+B carefully reviews the scope of each project to ensure the proper personnel, experience, expertise and resources are available to deliver efficient and effective solutions.

RIGHT SOLUTION: Clear and open communication throughout the project life, along with a long-term vision shared by the project team, client and the end users, provides solutions that last.

Customer Focus is one of M+B's core values. They provide the best possible service at all times to its clients and they stand behind their products - always doing the right thing for our customers and community.

JDH ENGINEERING

Founded in 1981 in Grandville, MI, JDH Engineering has grown to become one of the largest and premier structural consulting groups in Michigan, utilizing their collective knowledge and experience to develop solutions for the built environment. As an employee-owned group with broadly distributed ownership, each engineer on JDH's team approaches their work as more than "just a job" and understands the importance of bringing integrity, attention and commitment to their clients and their projects. This teamwork approach to their business relies heavily on teamwork within their office as well as with external project teams.

JDH Engineering is a multi-faceted group, with experience in a wide variety of structures and materials. From the design of complex building facilities to the evaluation and inspection of existing structures, JDH's collective experience across a spectrum of structural needs is what sets the firm apart. JDH's portfolio includes numerous restoration and renovation projects that have preserved and enhanced older structures.

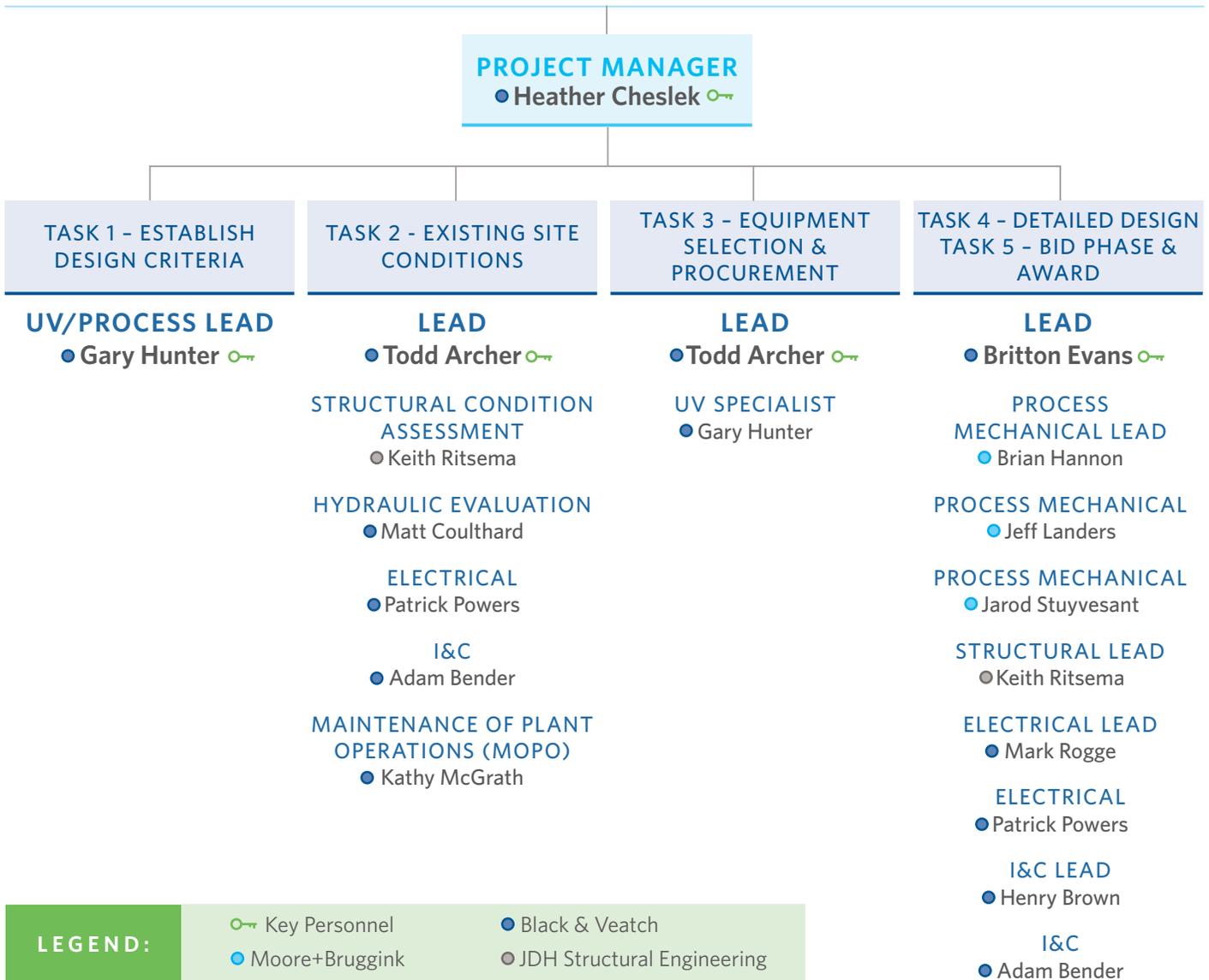
PROJECT LEADERSHIP

The Black & Veatch team will be led by Project Manager **Heather Cheslek**, who provides over 20 years of wastewater infrastructure experience and led the team that studied, designed and constructed the UV disinfection system at the Wyoming Clean Water Plant (CWP). Supporting Heather will be Engineering Manager **Britton Evans** and Technical Advisor **Todd Archer**. Britton has worked closely with Heather managing the technical aspects of the Wyoming CWP UV addition project along with several other key WWTP improvements projects in the Midwest. As the Engineering Manager, Britton will ensure that disciplines are engaged accordingly to maintain the overall project schedule and quality. Todd

has been a part of more than 20 wastewater disinfection projects, bringing the City and project team extensive experience navigating technology evaluations and procurement, design and construction sequencing.

Gary Hunter will lead the UV disinfection technical analysis and communication with UV suppliers, using his 37 years of experience with disinfection processes to ensure that the City’s disinfection and permitting requirements are met. Gary will work closely with Todd Archer and Britton Evans to ensure the appropriate design parameters are used to size, assess and design the required equipment modifications into the existing infrastructure while maintaining plant operations.

CITY OF ANN ARBOR WWTP UV DISINFECTION REPLACEMENT PROJECT





HEATHER CHESLEK, PE
PROJECT MANAGER

WHY HEATHER?

Proven Management and WWTP Excellence: Heather is a go-to project manager for many of Black & Veatch’s most challenging WWTP projects in Michigan. She leverages her detailed coordination skills to drive project teams through study, design, equipment procurement, construction and commissioning to meet the goals of each project.

PROJECT EXPERIENCE

- **CWP UV Disinfection Improvements; Wyoming, MI:** Project Manager for alternatives analysis, detailed design, bid and construction phase services for new Trojan UV system. Pre-procured UV equipment to coordinate the long lead time with the City’s schedule.
- **WWTP Electrical Improvements; South Bend, IN:** Project Manager for evaluation, recommendations and cost estimates for equipment replacement to meet the City’s long-term reliability goals.



GARY HUNTER, PE
TASK 1 LEAD

WHY GARY?

Industry-Leading UV Expertise: With 150+ projects, Gary is Black & Veatch’s subject matter expert for the deployment of UV disinfection at WWTPs. In recent years, he has completed five projects replacing Trojan 4000 systems and has been a contributing author to four WEF books on the design and operation of wastewater UV systems, proving his high level of expertise in successful UV designs.

PROJECT EXPERIENCE

- **CWP UV Disinfection Improvements; Wyoming, MI:** Process Lead Engineer of two UV channels for 42-MGD peak flow. Pre-negotiated Trojan UV equipment scope of supply prior to bidding due to long lead time.
- **Lower Bird WWTP Expansion and UV Disinfection; Catoosa, OK:** Process Lead Engineer for two banks of Trojan UV equipment. Led performance testing to ensure successful operations.
- **WWTP UV Disinfection Project; Sioux City, IA:** Process Lead Engineer to replace existing chlorine/dechlorination system with UV disinfection. Studied UV technology, developed design options for pre-qualified UV system suppliers and pre-selected UV system through competitive design process.



TODD ARCHER, PE
TASKS 2 AND 3 LEAD

WHY TODD?

National UV Experience: Todd has worked on 20+ disinfection projects in roles ranging from project manager, technical lead to project advisor. His experience in the evaluation, selection and design of UV disinfection systems will ensure the best possible solution is derived for the City's needs. Additionally, Todd knows the value of ensuring the operations staff feels comfortable with the evaluation and selection of UV equipment, based on his role as co-author of a WEF UV fact sheet tailored to WWTP operators.

PROJECT EXPERIENCE

- **WWTP UV Upgrade and Expansion; Piqua, OH:** Engineering Manager for new 21.5-mgd UV system. Led UV equipment and piping layouts for Wedeco Duron system, development of 20-year costs for UV suppliers and competitive equipment pre-selection.
- **WWTP UV Disinfection System; DePere, WI:** Design Engineer for Trojan 4000 UV system to replace hybrid UV/chlorine system. Retrofitted existing chlorine contact channels for UV disinfection.



BRITTON EVANS, PE
TASKS 4 AND 5 LEAD

WHY BRITTON?

Local Leadership: Based in Michigan, Britton brings 13 years of experience in the wastewater industry to the City. His strengths in organization and coordination, combined with his work on Wyoming's CWP UV Project, will allow him to apply lessons learned to Ann Arbor's UV design and construction for a more successful and user-friendly system.

PROJECT EXPERIENCE

- **CWP UV Disinfection Improvements; Wyoming, MI:** Engineering Manager for alternatives analysis, detailed design, bid and construction phase services for new Trojan UV system. Coordinated all disciplines, meeting organization, client interaction and deliverables to maintain the project schedule.
- **Primary Settling Tanks to High Strength Waste Receiving and Distribution; Chicago, IL:** Lead Engineer for civil/site detailed design; coordinated with all disciplines; developed valving, pumping and internal piping layouts; and coordinated with relevant vendors and manufacturers to obtain equipment quotes.

KEY TEAM MEMBER	VALUE TO THIS PROJECT
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KATHY MCGRATH
MOPO
 BLACK & VEATCH

With over 35 years of wastewater operations background, Kathy is a certified operator with hands-on experience with multiple projects. Kathy’s strengths include working with design, construction and plant staff to efficiently manage the transition to operating new processes while maintaining permit compliance. Her experience will be an asset to the Ann Arbor project.



BRIAN HANNON, PE
Process Mechanical Lead
 MOORE+BRUGGINK

Brian has 20 years of project experience with wastewater system planning and design, including eight UV projects in the last 10 years. He is ideal to lead the mechanical process effort with his recent work designing UV systems, extensive resume of wastewater process system upgrades, as well as Class B wastewater license, which gives him practical hands-on experience at WWTPs.



JEFF LANDERS, PE
Process Mechanical/ Hydraulics
 MOORE+BRUGGINK

Jeff brings to the City his recent experience designing a vertical UV system installation rated for 20-mgd flows with low UV transmittance for Midland, MI. Jeff also has a strong background in geotechnical and structural issues that factor into cost estimates.



JAROD STUYVESANT, PE
Process Mechanical/ Hydraulics
 MOORE+BRUGGINK

Jarod was integral as the lead project engineer on the recent modifications to the Grandville, MI CWP UV system in 2018. For Ann Arbor, Jarod will assist with equipment layouts, study phase estimating, vendor interaction and miscellaneous calculations.



MATT COULTHARD, PE
Process Mechanical/ Hydraulics
 BLACK & VEATCH

Matt’s local presence will provide a quick response time to help coordinate efforts with the City of Ann Arbor. His primary duties include preliminary design, detailed design and construction phase activities for wastewater treatment facility projects. He has experience in hydraulic computations, UV performance testing, facilities layout and design, condition assessment of facilities, preparation of technical reports and feasibility studies.

KEY TEAM MEMBER

VALUE TO THIS PROJECT



KEITH RITSEMA,
PE

Structural
JDH Structural
Engineering

Keith is a Principal Structural Engineer who has worked on investigations and designs of new and existing structures for over 20 years. He has performed structural design for several wastewater facility improvements projects including the Grandville, MI Clean Water Plant and Hillsdale, Michigan Wastewater Treatment Plant. His expertise will assist the team in the investigation and design of necessary improvements to the existing UV disinfection area to ensure a long term solution is implemented.



MARK ROGGE, PE

Electrical
BLACK & VEATCH

Mark has over 25 years of experience and knowledge of power distribution equipment design, manufacturing and operation, developing a network of expert resources both internal and external to Black & Veatch. He recently completed the electrical design and design oversight for two projects involving UV systems and is currently working to complete two additional projects with Trojan UV systems in 2022.



PATRICK POWERS,
PE

Electrical
BLACK & VEATCH

Patrick recently performed a dual role on a two-phased study and execution project to rehabilitate the river water intake system for a client in Wyandotte, MI. He is a Michigan-licensed PE, currently living near Ann Arbor, and his commitment to the region and local presence allows him to provide immediate, attentive project support.



HENRY BROWN

I&C - Lead
BLACK & VEATCH

Henry is a licensed professional engineer in the state of Michigan and has recent experience providing I&C design expertise for the City of Wyoming's CWP UV project, as well as the Theresa Street Water Resource Recovery Facility UV Improvements for Lincoln, NE. He also has over 10 years of experience with SCADA integration and instrumentation for wastewater and water treatment.



ADAM BENDER

I&C
BLACK & VEATCH

Adam serves as the I&C discipline lead on both small- and large-scale projects to deliver complete designs deliverables such as DCS/PLC network architecture drawings, I/O lists, setpoint lists, system descriptions, control narratives, logic diagrams, cause and effect diagrams, wiring diagrams, instrument lists and data sheets. Adam is based in the Ann Arbor office and has approximately 15 years of professional experience, with four years in the industrial automation environment programming PLCs/HMIs and robots for complete automation solutions.

HEATHER CHESLEK, PE

PROJECT MANAGER

Heather has 23 years of experience working on a wide variety of investigations and improvements to wastewater collection and treatment facilities. She has led multi-discipline and multi-firm teams solving critical infrastructure needs. Most recently, she assisted the City of Wyoming, Michigan with the addition of UV Disinfection and Effluent Pumping at their Clean Water Plant.



PROJECT EXPERIENCE

City of Wyoming | Clean Water Plant UV Disinfection Upgrades; Wyoming, MI

Project Manager. Performed an alternatives analysis to determine the appropriate combination of UV disinfection and effluent pumping to achieve the City's goals. Once the alternative was selected, the project team performed detailed design, bid and construction phase services for the new UV disinfection system and effluent pumping by constructing a new building utilizing an existing aeration basin. The Trojan UV equipment was pre-procured prior to bidding the construction project to begin manufacturing of the equipment due to the long lead time.

City of Wyoming | Clean Water Plant Process Assistance Study; Wyoming, MI

Project Manager. Reviewed and analyzed nine years of process performance data that was then used in the SUMO dynamic process model to identify potential operational modifications that could be made to improve plant performance. Evaluated return activated sludge, primary effluent sludge return, solids retention time and the addition of minor physical improvements to the aeration basins. Documented the process evaluation in a technical memorandum and performed operations training to review the in-depth analysis.

Ottawa County | Regional Biosolids Study; Ottawa County, MI

Project Manager. Provided biosolids technical expertise to a local engineering company to work with the nine stakeholder treatment facilities that operate in Ottawa County to identify feasible alternatives to mitigate their biosolids disposal challenges. Participated in several workshops using the Nominal Group Technique to obtain unbiased and clear input from each stakeholder to select one alternative for conceptual development.

Citizens Energy Group | Belmont AWTP Incinerator Improvements; Indianapolis, IN

Project Manager. Coordinated multi-discipline and multi-firm team to design, bid and construct air emissions improvements to four multiple hearth incinerators. The \$32M project included upgrades to emission control equipment to meet new MACT regulations, detailed assessment and review of ongoing operations

OFFICE LOCATION

Grand Rapids, MI

EDUCATION

- MS, Environmental Engineering, Environmental and Water Resources, Massachusetts Institute of Technology, 2003
- BS, Civil and Environmental Engineering, Michigan State University, 1999

YEARS EXPERIENCE

23

PROFESSIONAL REGISTRATION

- PE - Michigan
- PE - Indiana

PROFESSIONAL ASSOCIATIONS

- Water Environment Federation - WEF Delegate and Students and Young Professionals Committee
- Indiana Water Environment Association - President
- Society of Women Engineers - Central Indiana Section - Fund Development Committee
- American Water Works Association - Young Professionals Committee

and maintenance practices, planning and design of a new SCADA-based control room and associated I&C equipment; both state and city permitting and a cost-benefit analysis to continue use of multiple hearth incinerators compared to replacement with fluid bed incinerators. Executed the project using a Construction Management-At-Risk model.

City of South Bend | WWTP Electrical Improvements; South Bend, IN

Project Manager. Conducted a thorough evaluation of the Electrical System at the WWTP and provided recommendations and cost estimates for equipment requiring replacement and addition to ensure treatment capacity during dry and wet weather conditions are met. Conducted workshops to obtain input from Engineering, Operations and Maintenance personnel to assist with prioritizing needed improvements to the plant electrical equipment. Evaluation included sizing of backup generators where necessary, recommendations for replacement of aging electrical gear and new power feed scheme and cost estimates for each recommendation to assist with capital planning.

City of Manistique | WWTP Capacity Analysis; Manistique, MI

Project Manager. Provided wastewater technical expertise to a local engineering company to identify the WWTP's current loading conditions and determine if the City can accept additional hauled septage and leachate waste. Reviewed design information for the WWTP with a focus on BOD, CBOD, TSS, TKN, TP and PFAS/PFOS parameters. Developed an Excel model tool to analyze the capacity of the WWTP using historic plant performance data and USEPA literature values for septage and leachate to help the City make real-time decisions on whether or not they can accept additional septage and landfill leachate while maintaining their NPDES permit limits.

City of Escanaba | WWTP Improvements; Escanaba, MI

Project Manager. Provided wastewater process and structural technical expertise to a local engineering

company to develop the basis of design, design and bid documents, construction submittal and RFI review, operation and maintenance manual review and startup assistance for the addition of new primary and secondary clarification and associated control buildings.

Fort Wayne City Utilities | WPCP Primary/Secondary Treatment and Digester Upgrades: Waste Activated Sludge (WAS) Thickening; Fort Wayne, IN

Project Manager. Led multi-discipline team during design and construction phase for upgrades to the WAS Thickening Building. Includes demolition of the existing centrifuges as well as piping, electrical, instrumentation and HVAC system, as well as two rotary drum thickeners, polymer feed system, WAS feed pumps, thickened WAS pumps, HVAC and plumbing, security, painting, lighting and electrical and instrumentation for the new equipment. Coordinated the design with other designers on other project elements at the WPCP and with the Guaranteed Savings Contract service provider.

Fort Wayne City Utilities | 3RPORT Routing Study and Design; Fort Wayne, IN

Deputy Project Manager. Provided planning and design services for the 3 Rivers Protection & Overflow Reduction Tunnel Routing Study and preliminary engineering effort. Worked with Black & Veatch team and several subconsultants to perform geotechnical exploration, groundwater monitoring, hydrogeological modeling, hydraulic modeling of the collection system, field survey and land and easement acquisition.

Town of Speedway | WWTP Improvements; Speedway, IN

Project Manager. Coordinated electrical and instrumentation design, bid phase and construction phase services for improvements to the UNOX and SNDR processes at the WWTP. Coordinated Plant-wide SCADA Master Plan effort to develop a facility-wide control block diagram, site plan showing locations of instrumentation equipment and an opinion of probable cost for recommended improvements throughout the treatment plant.

GARY HUNTER, PE, BCEE, ENV SP

TASK 1 LEAD

Gary is responsible for filtration and disinfection technologies at Black & Veatch with 37 years of experience. Gary serves as the UV process consultant to EPRI conducting studies and training for water and wastewater UV disinfection facilities across the United States.

PROJECT EXPERIENCE

City of Little Rock | Wet Weather Treatment Plant Improvements; Little Rock, AR

Senior Process Engineer. Developed plans and specifications for expansion of effluent disinfection to 94, mgd with latest UV technology from Trojan (UVSigna).

City of Wyoming | Clean Water Plant UV Disinfection Upgrades; Wyoming, MI

Senior Process Engineer. Developed pre-selection criteria for selection of UV equipment for a new 42-mgd disinfection facility. Design, construction phase services and startup are being provided for a Trojan UVSigna System.

North Texas Municipal Water District | UV System Testing; Dallas, TX

Senior Process Engineer. Developed procedures for evaluation of low-pressure UV system for a 5-mgd facility for the inactivation of Cryptosporidium for a wastewater facility.

City of Centennial | Mulchy Gulch Wastewater Plant Improvements UV Disinfection; Centennial, CO

Senior Process Engineer. Evaluated two different UV alternatives (Trojan Signa, WEDECO Duron) for installation at a 16.5-mgd peak design flow. Prepared conceptual and economic analysis examining two UV alternatives. Prepared specification for preselection of equipment. Oversaw preselection process of UV equipment. Prepared final specification for final selected vendor.

East Bethel Water Reclamation Plant Metropolitan Council | UV Optimization Project; St. Paul, MN

Senior Process Engineer. Evaluated performance of two Aquaponics medium pressure following an 2.5 mgd MBR design flow treatment system. UV System designed to provide effluent capable of meeting NWRI requirements (less than 2.2cfu/100 mL total Coliforms). Advised on sampling to examine performance and optimization of UV system.



OFFICE LOCATION

Greenville, SC

EDUCATION

- PhD Studies - Clemson University
- MS, Civil Engineering, Brigham Young University, 1985
- BS, Civil Engineering, Brigham Young University, 1984
- AA, Engineering, Ricks College, 1978

YEARS EXPERIENCE

37

PROFESSIONAL REGISTRATION

- PE - Kansas

PROFESSIONAL ASSOCIATIONS

- Water Environmental Federation Disinfection Committee
- Water Environmental Federation - Member
- IUVA Wastewater Subcommittee
- American Society of Civil Engineers

City of Charlotte | Mallard Creek Reclamation Plant
Miscellaneous Improvements; Charlotte, NC

Senior Process Engineer. Under Task Order 9, developed concepts for a new 32-mgd effluent filter and a new UV system complex to replace existing systems at Mallard Creek WWTP. The preliminary design phase comprised wastewater sampling and characterization, evaluation of the existing facilities and operating data, analysis of alternative filtration and UV technologies and development of preliminary design concepts and criteria. Preliminary computational fluid dynamics modeling was performed to evaluate the hydraulics of proposed concepts.

City of Yakima | Water Reclamation Plant Improvements,
Yakima, WA

Senior Process Engineer. Developed UV concepts for 31.5-mgd wastewater facility. Prepared designed specification for ENAQUA UV system. Conducted performance testing after installation of equipment.

City of Peoria | Water Reclamation Plant Construction;
Peoria, AZ

Senior Process Engineer. Conducted conceptual design of UV system downstream of MBR performance with a average design capacity of 5 mgd. UV system required to meet Class A+ disinfection requirements. Prepared specifications for selected enclosed low pressure/high output UV system. Evaluated performance testing after installation for compliance with specification.

Pinellas County | Dunn Water Reclamation Facility Facilities
Improvements | Pinellas County, FL

Senior Process Engineer. Evaluated two different UV alternatives (Trojan Signa, WEDECO Duron) for installation at a 16.5-mgd peak design flow. Prepared conceptual and economic analysis examining two UV systems. Conducted Workshop on findings and prepared final report on recommended system.

City of Atlanta | UV Improvements, Facilities
Improvements | Atlanta, GA

Senior Process Engineer. Prepared conceptual designs and evaluated four different UV alternatives (Trojan Signa, WEDECO Duron, Suez HiCAP and Calgon C3500) for installation at the South River, RL Sutton and Utoy Creek Water Reclamation facilities. Conducted educational seminars from all UV vendors. Developed CAPEX and OPEX costs for each alternative.

Johnson County | Wastewater New Century Airport
Complex UV Disinfection; Johnson County, KS

Senior Process Engineer. Evaluated three different UV alternatives (Trojan 3000+, Aquionics, WEDECO TAK55) for installation at a 4-mgd design flow. Prepared conceptual and economic analysis examining two UV alternatives. Oversaw a four-week UV demonstration using low pressure/high output UV system. Assisted design team in the preparation of specification for UV system.

City of Paso Robles | UV Disinfection Systems; Paso Robles,
CA

Process Consultant. Assisted in the design on 5.5-mgd UV system that was capable of meeting California Drinking Water Watch water reuse requirements. Worked with state regulatory officials to establish design criteria for each system. Prepared specifications for three different UV systems. Coordinated shop drawing review for selected system. Coordinated and supervised spot check bioassay testing of installed system.

City of St. Joseph | Facilities Improvements; St. Joseph, MO

Senior Process Engineer. Supervised pilot demonstration study of two 0.5 mgd UV demonstration facilities for treatment of trickling filter/activated sludge effluent. Options included bulk hypochlorite/bisulfite, on-site generation of hypochlorite and bulk bisulfite and UV disinfection. Prepared specification for procurement of UV equipment for 108 mgd facility that included both wet and dry weather. Assisted in design of UV facility with ability to disinfect both wet and dry weather.

TODD ARCHER, PE

TASKS 2 AND 3 LEAD

Todd served as project manager, technical lead and project engineer on more than 20 disinfection projects. He provides extensive experience in the evaluation, selection and design of UV disinfection facilities — coordinating design staff for successful project execution.

PROJECT EXPERIENCE

NEW Water | Wastewater Treatment Facility UV Disinfection System; De Pere, WI

***Project Engineer.** New Water had a Disinfection Facility Plan performed to evaluate the existing hybrid disinfection approach which utilized UV (Trojan 400 system) for dry-weather flows and chlorine for wet-weather flows at the De Pere WWTF. The recommendation was to design an all-new UV system and retrofit that into the same footprint as the existing disinfection process. Todd led the disinfection evaluation portion of the project and continued his lead role into design. The WWTP also contained filters upstream of disinfection and a portion of the disinfection facility needed to be maintained to be used as backwash water for the filters. This requirement and the overall sequencing of the project required extensive coordination to ensure the facility was able to continue operation while meeting permit.

City of Deer Park | Deer Park Wastewater Treatment Facility Replacement UV Disinfection System; Deer Park, TX

***Lead Process Engineer.** The Deer Park WWTP UV system was aging and a disinfection alternatives analysis was performed. This evaluation consisted of evaluating replacing the UV system in-kind, replacing the existing UV system with the latest UV system within the existing UV facility, and replacing the system with an all-new UV disinfection facility with the latest UV technology. After extensive evaluation, which included construction sequencing and MOPO, it was determined an all-new UV facility was the most cost-effective solution for Deer Park.

Todd led the disinfection alternatives evaluation and then also led process design of the all-new 24-mgd UV disinfection system for the City of Deer Park. This project included pre-selection of the UV equipment through a competitive RFP process, and then preliminary and detailed design.

City of Sioux City | UV Disinfection Improvements; Sioux City, IA

Engineering Manager. The City of Sioux City's existing sodium hypochlorite/sodium bisulfite disinfection process had aged and as a result, the City was



OFFICE LOCATION

Chesterfield, MO

EDUCATION

- BS, Civil and Environmental Engineering, Southern Illinois University Carbondale, 2008

YEARS EXPERIENCE

13

PROFESSIONAL REGISTRATION

- PE - Missouri

PROFESSIONAL ASSOCIATIONS

- Missouri Water Environment Association
- Water Environment Federation - Disinfection and Public Health Committee, Membership Chair

seeking to convert to UV disinfection. The City retained Black and Veatch to analyze UV alternatives, support equipment selection through a competitive bidding process and perform detailed design.

Todd was the engineering manager, oversaw the UV equipment alternative evaluation and was the primary author for the UV equipment procurement bid documents. The competitive bid process required extensive coordination with the City's procurement department, UV system suppliers and the City's management team to ensure all parties were aligned. Todd conducted the competitive bid analysis based on a 20-year lifecycle cost analysis and recommended the system that represented the lowest cost alternative to the City. The team is now finalizing the bid evaluation and will be moving into detailed design.

City of Naperville | Springbrook Water Reclamation Center Disinfection Evaluation, Naperville, IL

***Project Technical Leader.** The City of Naperville had an aging sodium hypochlorite/sodium bisulfite disinfection process that serviced the north and south facilities at their Springbrook Water Reclamation Center and then commissioned a disinfection alternative evaluation.

Todd served as the technical lead and oversaw the alternative evaluation, which included a cursory evaluation of both mature and innovative disinfection technologies, review of historic plant data, development of a sampling plan to generate additional UV transmission and undisinfected bacteria data and a life-cycle and non-cost evaluation of updating the sodium hypochlorite/sodium bisulfite systems, utilizing separate UV systems at both the north and south facilities and a combined UV system. The evaluation was documented in a Technical Memorandum and findings were presented to the City during a workshop. The evaluation found that a combined UV system met the City's cost and non-cost needs. The City has extended the contract to include the pre-selection and design of the new UV system, where Todd provided technical guidance to the design team and will review documents produced.

**Denotes projects while at previous employer.*

Johnson County Wastewater | Nelson Complex Disinfection Facility Plan; Kansas City, KS

***Project Technical Leader.** The facility's existing hybrid disinfection system consisting of a medium-pressure Trojan 4000 system for dry-weather flows and chlorine disinfection for wet-weather was aging. This project was initiated to perform a condition assessment and design improvements to the system.

Todd evaluated the hybrid disinfection system at Johnson County Wastewater's Nelson Complex and was the primary author of the Disinfection Facility Plan. The work involved reviewing historical performance of the disinfection system, interviewing operations staff and identifying possible reasons for the unreliable performance of the existing UV system. This work consisted of two bench scale studies with different coagulants and disinfectants to determine optimal treatment for secondary effluent and to meet permit requirements. Todd assisted with the study design, lab operations, data analysis and reporting. This information was ultimately used to develop a 20-year net present value for the viable disinfection alternatives, one of which included retro-fitting a UV system into the existing UV Facility.

Linden Roselle Sewerage Authority (LRSA) | UV Replacement; Linden, NJ

***Project Manager.** LRSA's existing UV disinfection system was installed in the late 1990s and some of the equipment and appurtenances have reached the end of their useful life. The project scope was to assess the existing disinfection system and facility for civil, site, process/mechanical equipment, structural, HVAC, plumbing, electrical and controls. Upon completion of the assessment, it was recommended to replace the existing UV disinfection system.

Todd served as the project manager for UV equipment procurement and design. This consisted of developing a procurement strategy that adhered to New Jersey's and LRSA's procurement requirements. Upon procurement, the UV equipment would be designed around the selected system with the general construction contract including, a defined scope and fee for the UV equipment.

BRITTON EVANS, PE, ENV SP

TASKS 4 AND 5 LEAD

Britton serves as an engineering manager, coordinating multi-discipline teams to complete all aspects of a project. He is an organized and experienced leader that has performed planning studies, detailed design and construction phase services for various water and wastewater infrastructure projects including, treatment process improvements, linear infrastructure, deep tunnel pump stations, civil/site design, mechanical process and condition assessments

PROJECT EXPERIENCE

City of Wyoming | Clean Water Plant UV Disinfection Upgrades; Wyoming, MI

Engineering Manager. The Wyoming Clean Water Plant UV Disinfection Upgrades included two TrojanSigna UV channels able to disinfect up to 46 MGD. To increase dissolved oxygen levels and raise the water level to above the 100-year flood plain, three new 72-inch diameter screw pumps were installed so water can be discharged over top of a gravity cascade aeration staircase. The UV system and screw pumps were installed in an existing unused aeration basin. Associated I&C and electrical components were installed in an existing mechanical room. Britton was responsible for civil/site design, coordination of all disciplines, meeting organization, client interaction and deliverables.

Metropolitan Water Reclamation District of Greater Chicago | Calumet Water Reclamation Plant Conversion of Primary Settling Tanks to High Strength Waste Receiving and Distribution; Chicago, IL

Lead Engineer. Britton was responsible for development of civil/site and mechanical process contract documents, as well as conducting site visits and attending meetings with the client. Aspects of the design included structure layouts, roadway demolition and layout, erosion and sediment control plans, permitting, internal piping and valving layouts, as well as coordinating with vendors.

Great Lakes Water Authority (GLWA) | Baby Creek CSO Facility Effluent Piping Improvements, Construction Alternatives Evaluation, and Structural Analysis; Detroit, MI

Engineering Manager. Responsible for the development of detailed design drawings and specifications for the cleaning and debris removal of the effluent conduits for the Baby Creek CSO Facility. Coordinated the development of a construction alternatives analysis, as well as a structural analysis of the Baby Creek effluent conduits.



OFFICE LOCATION

Grand Rapids, MI

EDUCATION

- BS, Engineering, Civil and Environmental, Calvin University, 2009

YEARS EXPERIENCE

13

PROFESSIONAL REGISTRATION

- PE - Michigan
- ENV SP

PROFESSIONAL ASSOCIATIONS

- Michigan Water Environment Association

GLWA | CSO Facility Sump Pump Improvements; Detroit, MI

Engineering Manager. Responsible for the development of design drawings for GLWA's maintenance group to modify the sump pump and/or drainage systems within the sodium hypochlorite storage areas at seven CSO facilities. Provided layouts for sump pumps, air compressor systems (if needed), discharge piping, concrete pads or wall mounts. Prepared P&IDs, one-line diagrams and instrumentation installations and wiring details.

Fox River Water Reclamation District | WRF Phosphorus Removal - Struvite Facilities; Elgin, IL

Civil Engineer. WRF improvements to reduce the phosphorus recycled within the liquid stream by precipitating it in the form of struvite within the digested biosolids. Responsible for leading the civil/site design in development of drawings and specifications for all yard piping, structure coordination, demolition and erosion and sediment control and miscellaneous details.

City of Grand Rapids | Eastside Sewer Improvements Program Separation; Grand Rapids, MI

Civil Engineer. Responsible for development of contract documents for the sewer separation projects in the east side commercial/residential areas of the City of Grand Rapids. Of the projects he has designed, storm sewers varied in size from 12- to 78-inch diameter, with each project including sanitary sewer and water main replacement as well as road, landscaping and street lighting utility improvements. The work also involves identifying utility conflicts and coordinating the effort with private utilities, reviewing the preliminary design developed with neighborhood associations, conducting pre-bid meetings, performing bid evaluations and assisting in construction phase services including, preparation of as-built drawings. He has designed 10 individual contracts ranging from \$1.3M-\$5.2M construction value.

City of Wyoming | WTP Discharge Piping Improvements; Wyoming, MI

Civil Engineer. After performing repairs to a 54-inch diameter transmission main in the summer of

2020, the City of Wyoming requested Black & Veatch work with a local engineering firm to design a more permanent solution to provide them with redundancy and flexibility for their transmission system operation. The team performed hydraulic analysis of the 26-mile transmission main system; reviewed photos to provide condition assessment guidance; developed procurement documents for several long-lead, large-diameter ball valves; and developed design documents for replacement of nearly 1,000 feet of 54-inch transmission main including, thrust restraint and cathodic protection design. Britton was responsible for coordinating all deliverables to the prime consultant, coordinating with the pre-procured valve manufacturer for proposal and submittal review and coordination with the design team.

Lansing Board of Water & Light | Staff Supplementation; Lansing, MI

Lead Water Plant Engineer. Responsible for contract plant engineering and assisting the client with the process of developing documents and presenting their new Capital Project Transformation Process used for capital project execution. Documents included project overview, obtaining contributor information, resource plan, budget forecast, schedule, construction estimate and drafting feasibility studies. Projects included drilling of new wells, dry chemical handling, instrumentation control upgrades, site/building upgrades and pumping system upgrades.

Lansing Board of Water & Light | Water Condition Plants Condition Assessment and Replacement Study; Lansing, MI

Engineering Manager. Responsible for coordinating the development of various technical memorandums, including information of all assets at both Dye and Wise Water Conditioning Plants. Evaluated physical and operational conditions, expected life and recommended improvements. Phases of work also included a gap analysis, risk register development and a review of the existing level of investment for continued operation of the plants.

KATHY MCGRATH

MAINTENANCE OF PLANT OPTIONS (MOPO)

Kathy has more than 35 years of experience in the wastewater and water field with a primary focus on plant operations. She also has extensive experience with permitting, treatment plant startup and commissioning, MOPO, operator training, process control troubleshooting, conducting pilot studies, standard operating practices and operations and maintenance manual preparation.

PROJECT EXPERIENCE

City of Wyoming | Clean Water Plant UV Disinfection Upgrades; Wyoming, MI

Operations Specialist. Authored the Operations Manual for improvements to the disinfection system including, sections on UV disinfection, screw pumps and cascade aeration. Developed and delivered training to the plant staff and assisted during commissioning.

Fulton County | Big Creek Water Reclamation Facility; Roswell, GA

Project Manager. Oversaw operations of a 24-mgd water reclamation facility that utilized UV disinfection of the effluent prior to discharge to the Chattahoochee River

City of Wareham | Wastewater Pollution Control Facility Expansion; Wareham, MA

***Operations Specialist.** Assisted with development of the Operations Manual for the City of Wareham wastewater pollution control facility. Facility improvements included the addition of UV disinfection.

City of Atlanta | RM Clayton Water Reclamation Center; Atlanta, GA

Wastewater Superintendent. Oversaw operations of a 120-mgd water reclamation facility that was part of a combined sewer system, resulting in wide variations in plant flow. Facility processes included a large UV disinfection system that functioned automatically to accommodate and effectively disinfect effluent flow prior to discharge to the Chattahoochee River.

Mount Pleasant Waterworks | Rifle Range Road WWTP; Mount Pleasant, SC

Operations Specialist. Assisted with creating a new Operations and Maintenance Manual for a WWTP expansion. Developed and delivered training classes to the plant staff on new plant processes.



OFFICE LOCATION

Atlanta, GA

EDUCATION

- AA, Applied Arts, 40 Credit Hours, St. Petersburg College, 2016

YEARS EXPERIENCE

37

PROFESSIONAL REGISTRATION

- Wastewater Operator License, #WW1-014231, Georgia, 2000
- Wastewater Operator License, #WWA0006345, Florida, 1989

PROFESSIONAL ASSOCIATIONS

- Georgia Association of Water Professionals
- Water Environment Federation

BRIAN HANNON, PE

PROCESS MECHANICAL/HYDRAULICS

Brian has been responsible for and involved with the study, design, permitting and construction engineering phases of several WWTPs and sewage pumping stations across West Michigan and Indiana since joining Moore+Bruggink in 2008. These projects include both municipal and industrial and range from plants as small as 10,000 gallons per day to 60 mgd. He is active in the Michigan Water Environment Association and several other local professional organizations.

Brian was awarded the Michigan Water Environment Association's "Outstanding Environmental Consultant" Award in 2017 among other service and merit awards. His clients have won numerous awards for their projects, including a National ACEC award for one of the top 24 Engineering Projects, as well as Utility of the Future designations from WEF/NACWA, among others.

Brian is also in the position of having certification as a licensed Class B wastewater operator in the State of Michigan. This gives him a unique perspective when reviewing and developing plans and interacting with other wastewater professionals.

PROJECT EXPERIENCE

City of Zeeland | Clean Water Plant Improvements; Zeeland, MI

Project Engineer. Entailing multiple process improvements to go from 1.65 to 3.5 MGD of flow, improved lamp technology, replacing old connections and other parts and tying into a new SCADA System. UV elements included evaluation of dosing rates, hydraulics and the potential to add more lamps, as well as adding a new building structure around the UV system for improved lifecycle and ease of maintenance during winter months. This project also included post UV aeration to maintain dissolved oxygen levels to the permit requirements that increased. Designed an effluent pump station with the ability to gravity flow up to a certain flow rate and then turn on the pumps to pump up to 7 MGD firm capacity through the force main to the river.

City of Grandville | Clean Water Treatment Plant Expansion; City of Grandville, MI

Project Engineer. Design and construction of a \$20M expansion to the City of Grandville Clean Water Plant, including new headworks screening and grit removal, new primary clarifiers, aeration basins, new final clarifiers, UV system improvement and an egg-shaped anaerobic digester with a cogeneration facility to capture and beneficially reuse the methane produced. This project was the ACEC-MI Engineering Excellence Award winner of the Eminent Conceptor grand prize award and was one of the ACEC top 24 engineering projects.



Moore+Bruggink
Consulting Engineers

Engineering Clean Water 

OFFICE LOCATION

Grand Rapids, MI

EDUCATION

- BS, Mechanical Engineering, University of Kansas
- BS, Business Administration, University of Kansas

YEARS EXPERIENCE

20

PROFESSIONAL REGISTRATION

- PE - Michigan
- PE - Indiana
- State of Michigan Class B Wastewater Operator Certification 18894

PROFESSIONAL ASSOCIATIONS

- Michigan Society of Professional Engineers Western Michigan Chapter, President (2013 - 2017)
- Michigan Water Environment Association, Treasurer (2019 present)
- Michigan Water Environment Association, Chair Positions (2013- 2017)
- American Society of Mechanical Engineers
- National Society of Professional Engineers
- Water Environment Federation

JEFF LANDERS, PE

PROCESS MECHANICAL/HYDRAULICS

Jeff's experience includes civil and environmental engineering, business management, project management, regulatory compliance, civil infrastructure, environmental engineering, asset management and construction monitoring and management.

His related duties include problem definition and scope of development, proposal and contract development, planning and feasibility studies, permitting, design, contracting, construction and remediation, project closeout and closure reporting.

PROJECT EXPERIENCE

City of Albion | WWTP - USDA-RD Funding Procurement and Project Design; Albion, MI

Project Manager. Led the project plan, application for \$16.8M in funding and approval coordination with the City of Albion, as well as financial analysis, environmental assessments and alternative analysis included. Facilitated rate increases through council approval required to support the project. Project is currently in design phase and includes headworks, chemical feed systems, aeration control and anaerobic digestion process improvements along with updates to SCADA, site lighting, architectural facades and electrical systems.

Southern Clinton County Municipal Utilities Authority | Facility Master Plan; Detroit, MI

Project Manager. Facility-wide master plan to predict growth in flow and loading from four surrounding communities contributing to the Authority's WWTP. Reviewed onsite assets, conducted condition assessment, determined future permits limits from EGLE, reviewed process conditions, determined potential upgrades necessary to meet future flow/loading scenarios, reviewed existing capital improvement plan items and completed master plan report to advise the Authority on projects and upgrades necessary to satisfy growth in flows and loadings, meet permit requirements and maintain assets. Report includes a CIP and estimated timing of projects.

Livingston County Drain Commission | Septage Receiving Station; Livingston County, MI

Project Engineer. Design and construction of a \$6.5M Septage Receiving Station expansion with the pilot testing of septage presses to determine if industrial pretreatment program surcharges could be reduced. The new facility will have a third receiving bay, septage screens, equalization tanks and a sludge press to dewater the septage.



Moore+Bruggink
Consulting Engineers

Engineering Clean Water 

OFFICE LOCATION

Grand Rapids, MI

EDUCATION

- BS, Civil Engineering, Western Michigan University

YEARS EXPERIENCE

13

PROFESSIONAL REGISTRATION

- PE - Michigan
- EGLE Stormwater Operator

PROFESSIONAL ASSOCIATIONS

- Michigan Water Environment Association
- Michigan Rural Water Association

JAROD STUYVESANT, PE

PROCESS MECHANICAL/HYDRAULICS

Jarod has been working as a process engineer designing wastewater treatment systems, performing various hydraulic and process calculations, writing detailed design reports, conducting alternative analysis and life cycle costs analysis, modeling systems in 3D CAD for WWTPs in the area and conducting construction management for his design projects. He has experience as the onsite engineer/inspector for large-scale construction projects and is also involved with some site development and roadway projects for various project managers at M+B.

Jarod is active with the Michigan Water Environment Association (MWEA) and is a member of the New Professionals Committee. He has a passion for wastewater treatment and implementing sustainable designs to optimize resource recovery, as well as creating better communities throughout the area.

PROJECT EXPERIENCE

City of Grandville | UV System Improvements; Grandville, MI

Project Engineer. Designed a building addition, UV module replacements, UV control cabinet replacements, concrete plank installation and site grading. Project included design, CAD modeling, shop drawing review, coordination with electrical and mechanical subconsultant, construction management both on and off site and interface with City of Grandville staff.

City of Zeeland Clean Water Plant Solids Handling Design; Zeeland, MI

Project Engineer. Design and implementation of a solids handling improvement project at the City of Zeeland Clean Water Plant, with full-scale design for a new solids-handling building, gravity belt thickener, thickened solids discharge pump, filtrate recycle lift station, a new reclaimed process water supply pump and miscellaneous site piping and site improvements. Assisting with onsite construction management tasks throughout the remainder of construction.

City of Grandville | Clean Water Plant Solids Handling Design; Grandville, MI

Project Engineer. Ongoing improvements to Grandville's solids handling facilities including, design of site improvements and new buildings to house proposed volute screw press thickening and centrifuge dewatering equipment, dewatered sludge hauling, odor control, WAS equalization and pumping and digested sludge storage. Current design includes engineering design and calculations, 3D CAD modeling, cost estimating, alternatives analysis, construction planning and coordination with subconsultants.



Moore+Bruggink

Consulting Engineers

Engineering Clean Water 

OFFICE LOCATION

Grand Rapids, MI

EDUCATION

- BS, Civil/Environmental Engineering, Calvin College

YEARS EXPERIENCE

8

PROFESSIONAL REGISTRATION

- PE - Michigan

PROFESSIONAL ASSOCIATIONS

- Michigan Water Environment Association
- National Society of Professional Engineers

KEITH RITSEMA, PE

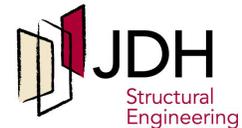
STRUCTURAL

Keith joined JDH Engineering in the Spring of 2001, performing project engineering duties on a variety of industrial, commercial and educational projects. He soon displayed the ability to manage all aspects of structural engineering on complex projects, from conceptual phases through construction.

Keith is a first line liaison with the client through the design and construction process. He is responsible for development of the structural system and its interface with other design disciplines, coordinating of the preparation of structural contract documents and contract administration. In addition, Keith has developed extensive expertise in investigate and evaluation of existing structures. This experience includes evaluation of homes for hurricane and flood damage, load rating of existing structures and investigation of building failures during or post-construction.

PROJECT EXPERIENCE

- Kent County Road Commission, Clinton County Road Commission
- Washtenaw County Road Commission
- Michigan State Police & Kent County Forensics Facility in Walker
- Several projects at the Grandville Clean Water Plant, Kinros, Croswell and Hillsdale WWTPs and Sturgis wastewater pump station



OFFICE LOCATION

Grandville, MI

EDUCATION

- MBA, Cornerstone University
- MCE, Structural Engineering, North Carolina State University
- BSCE, Civil Engineering, Calvin College, 1999

YEARS EXPERIENCE

22

PROFESSIONAL REGISTRATION

- PE - Michigan
- PE - Maryland
- PE - Missouri
- PE - North Carolina
- PE - Ohio

PROFESSIONAL ASSOCIATIONS

- American Institute of Steel Construction AISC
- Masonry Institute of Michigan MIM
- National Council of Examiners for Engineering & Surveying NCEES
- Structural Engineers Association of Michigan SEAMi

MARK ROGGE, PE

ELECTRICAL LEAD

Mark is an electrical engineer in the Systems Engineering department within Black & Veatch's Water Division, specializing in Energy Intensive power system design. He has designed, studied and managed wastewater and water treatment, industrial, power plant auxiliary electric and mission critical facility power systems throughout his engineering career. Mark performed power system design and study activities for new and retrofit projects.

PROJECT EXPERIENCE

City of Wyoming | Clean Water Plant UV Disinfection Upgrades; Wyoming, MI

Lead Electrical Engineer. Completed electrical engineering design and construction phase support to incorporate UV disinfection into the Wyoming Clean Water Plant's process. Incorporated vendor electrical requirements, replacement of transformers, electrical supply for all ancillary equipment and lighting for the new building.

City of Kansas City | WTP Electrical Reliability Improvements; Kansas City, MO

Electrical Engineer. Provided lead electrical engineering construction support. Collaborated with KCMO Project Management, KCMO Facility Management, Contractor and full engineering team to provide timely and professional electrical engineering support and formal response to RFIs, submittals and change request.

City of Kansas City | Blue River WWTP Secondary 13.2kV Electrical Improvements; Kansas City, MO

Electrical Engineer. Completed electrical quality control design review of the 90% design electrical drawings. Worked with engineering disciplines to incorporate design enhancements that will both save money and improve safety, maintainability and reliability of the proposed electrical equipment..

Hastings Utility | Whelan Energy Center Unit 1 Distributed Control System Upgrade; Hastings, Texas

Electrical Engineer. Collaborated with the DCS checkout team to overcome unexpected control design issues with pumps, valves, motors, SUSs, MCCs, fans, transformers, protective equipment and other equipment associated coal power plant.



OFFICE LOCATION

Kansas City, MO

EDUCATION

- BS, Electrical Engineering, University of MO, 1995

YEARS EXPERIENCE

26

PROFESSIONAL REGISTRATION

- PE - Missouri

PATRICK POWERS, PE

ELECTRICAL

Patrick is an I&C/Electrical Engineer at Black & Veatch, working on a variety of projects within the Power Generation group, including coal, gas, hydro, nuclear and several industrial projects. Innovative and versatile, he has supported other Black & Veatch businesses, such as Telecom, Water, but also business development in Healthcare.

Prior to joining Black & Veatch, Patrick trained in the U.S. Navy Naval Nuclear Power Program. His background includes service as a nuclear electronics technician and S8G reactor operator aboard the submarine USS Michigan (SSGN 727).

PROJECT EXPERIENCE

University of Michigan | Central Power Plant Expansion; Ann Arbor; MI

Electrical/I&C Engineer. Design engineering role in relocation of brine system and emergency diesel generator. Contract support of fuel gas compressor.

Undisclosed Client | Substation DSCADA Upgrade; MI

Electrical/I&C Engineer. Modified existing and generated new client drawings to support the installation and procurement of SCADA equipment for multiple substation sites.

DTE-Energy Services | Carroll Shelby Plant Integration; Dearborn, MI

I&C Engineer. Ladder-logic and controls re-design of five diesel generator plant at Ford Central Energy Plant to support critical switchgear lineup.

BASF | Project Detroit; Wyandotte, MI

Electrical/I&C Engineer. Aux power and control design for river water intake system upgrade for EPA 316b compliance and process optimization.

Undisclosed Client | Waste Processing Project; CA

Electrical/I&C Engineer. Provided support for specification and sizing calculations for procurement of uninterruptible power supply and diesel generators for experimental waste processing project.



OFFICE LOCATION

Ann Arbor, MI

EDUCATION

- BS, Electrical Engineering, Michigan State University, 2012
- BA, Telecommunications, Michigan State University, 2003

YEARS EXPERIENCE

17

PROFESSIONAL REGISTRATION

- PE - Michigan
- PE - Oregon

HENRY BROWN, PE

I&C - LEAD

Henry is an I&C Engineer for Black & Veatch. He leads I&C design for water and wastewater projects from basis of design through construction.



PROJECT EXPERIENCE

City of Wyoming | Clean Water Plant UV Disinfection Upgrades; Wyoming, MI

Lead I&C Engineer. Lead I&C engineer for a UV system addition to an existing WWTP. Responsible for P&ID and specification development, interdisciplinary coordination and international workload delegation and coordination.

City of Davenport | East River Station WTP; Davenport, IA

I&C Engineer. Provided support engineering for a UV and disinfection upgrade to a water treatment plant.

City of Mankato, MN | Wastewater Disinfection and Digester Improvements; Mankato, MN

Lead I&C Engineer. Developed I&C basis of design for a disinfection and digester improvement for a WWTP. Perform detailed design including, P&ID development, specification development and instrument selection. Coordinated with international team to efficiently manage workload and responsibilities.

City of New Port Richey | Electrical System Improvements; New Port Richey, FL

Lead I&C Engineer. I&C design for network reconfiguration at water reclamation facility.

Inman Capobello Water District | Water Treatment Plant Pilot; Inman, SC

Lead I&C Engineer. I&C Engineer and international workforce coordinator for a new ceramic membrane microfiltration water treatment plant.

Placer County Water Agency | Ophir Water Treatment Plant; Auburn, CA

I&C Engineer. Provided support for P&ID development and communication with Mumbai for bulk of drafting. Communicated between mechanical, I&C and chemical teams to incorporate all considerations into drawings. Incorporated QC comments into drawings to stay ahead of schedule.

OFFICE LOCATION

Kansas City, MO

EDUCATION

- MS, Electrical Engineering, Power and Telecom, University of Kansas, 2011
- BS, Electrical Engineering, General, University of Kansas, 2009
- AA, Liberal Arts, Mathematics, Johnson County Community College, 2006

YEARS EXPERIENCE

13

PROFESSIONAL REGISTRATION

- PE - Michigan
- PE - Kansas

ADAM BENDER, PE

I&C

Adam is an I&C Engineer within Black & Veatch's global power business located in the Ann Arbor office. He has experience providing I&C input to a wide variety of power generation projects. Typical roles include I&C-specific input to multidiscipline drawings and design documentation such as P&IDs, isometric piping drawings, network architecture drawings, system descriptions, control narratives, logic diagrams, cause and effect diagrams, wiring diagrams, valve and instrument data sheets and more. Having served as the responsible engineer for the procurement of I&C-related equipment, Adam also has experience in instrument equipment contract management. Other experience includes the development of system control logic diagrams, analog loop descriptions and graphical interface screens. He has approximately 13 years of professional experience, with four years in the industrial automation environment working with PLCs and robotics. He also has experience in managing teams and team efforts, has held professional supervisory positions and has assumed leadership roles.

PROJECT EXPERIENCE

Lansing Board of Water & Light | Delta Energy Park; Lansing, MI

I&C Project Discipline Engineer. Led the I&C team pertaining to project deliverables and design. Coordinated between Ann Arbor project team and Pune, India project team. Acted as primary I&C interface with the owner and owner's engineer.

Duke Energy | Gibson Ammonia System Safety Improvement Project; Owensville, IN

I&C Project Discipline Engineer. Led the controls and electrical team in the modification of the liquid anhydrous ammonia system. Two 1.5 MW vaporizers and auxiliary equipment were added along with new ammonia flow control units. A new DCS drop was designed for all of the AFCU equipment and the existing tank farm controls were also migrated from an older PLC system to the new DCS to be part of the newly implemented PSM program at the site.

DTE Energy | MATS Program; River Rouge, MI

I&C Startup and Commissioning Engineer. Project involved adding AQCS equipment (ACI/DSI) to the backend of multiple coal units spanning three plants for a total of eight AQCS "Islands." Responsibilities included on-site commissioning and startup support, including checking and verifying all control loops with field technician support, DCS support, equipment operation training and support, as-built drawing markups and overall project support.



OFFICE LOCATION

Ann Arbor, MI

EDUCATION

- BS, Electrical Engineering, Michigan State University, 2006

YEARS EXPERIENCE

20

PROFESSIONAL REGISTRATION

- PE - Michigan
- PE - Indiana

B

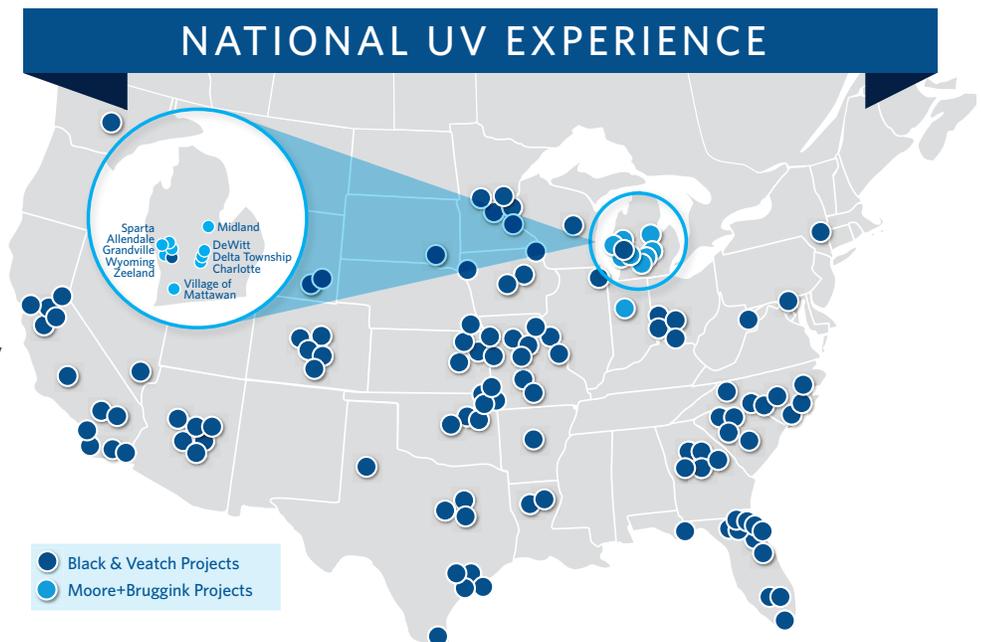
PAST INVOLVEMENT WITH SIMILAR PROJECTS



B Past Involvement with Similar Projects

The Black & Veatch team offers the City industry-wide UV experience, with the proof of having delivered on complex WWTP improvements throughout Michigan. Relevant to the needs of the City and our approach to your project, the figure below shows the breadth of our UV disinfection experience across the nation.

Black & Veatch is a global leader in application of UV to wastewater and water studies and design with 200+ UV installations that disinfect nearly five billion gallons of water each day worldwide. This work spans studies, equipment evaluation and negotiation, retrofit of existing facilities, pumping, re-aeration and automated dosing to optimize the cost of operation—directly related to the components of Ann Arbor’s project.

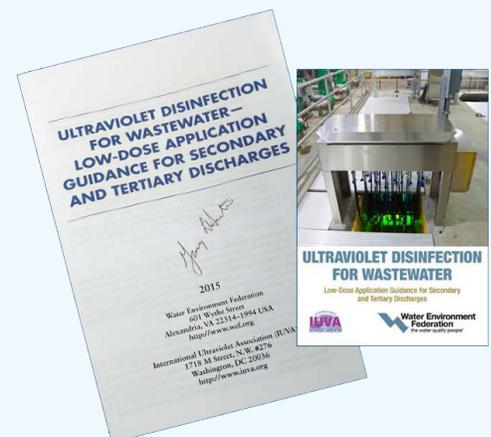


Setting UV Industry Standards

Our disinfection experts are at the forefront of UV industry standards. Task 1 Lead Gary Hunter authored major publications such as:

- **WEF Wastewater Disinfection Training Manual** including, Chapter UV disinfection
- **Design of Water Resource Recovery Facilities (WEF MOP 8)**
- Updating the latest edition of **White's Handbook of Chlorination and Disinfection**, which is used by utilities and consultants worldwide for the design of UV disinfection systems

This expertise gives our clients the peace of mind that we are developing proven and reliable solutions with the intimate understanding of the key issues in operating and maintaining UV systems.



Summary of Black & Veatch's UV Disinfection Project Experience

The following table and project descriptions highlight our team's UV experience in the last 10 years with features relevant to your goals, proving we have the expertise to successfully deliver on the City project.

Detailed descriptions of these featured, relevant projects can be found on pages 12-19.

PROJECT LOCATION	YEAR COMPLETED	SCOPE (S, PD, FD)	UV CAPACITY (MGD)	MFG	UV NEGOTIATION	FACILITIES RETROFIT	CONSTRUCTION SEQUENCING/MOPO
Wyoming WWTP* Wyoming, MI	Ongoing	FD	55	Trojan	■		■
Sioux City WWTP* Sioux City, IA	Ongoing	FD	29	Pending	■	■	■
Nelson Complex* Johnson County, KS	Ongoing	PD	150	Multiple	■	■	■
Mallard Creek WWTP* Charlotte Water, NC	Ongoing	FD	24	Xylem	■	■	■
Lower Bird Creek WWTP* Tulsa Metropolitan Utility Authority, OK	2017	FD	8	Trojan	■	■	■
Paso Robles WWTP* City of Paso Robles, CA	2016	FD	5	Trojan		■	■
Mill Creek WWTP* Johnson County, KS	2020	S	120	Trojan		■	■
Wakarusa WWTP* City of Lawrence, KS	2018	FD	2.5	Trojan	■	■	
Cave Creek WRF* Phoenix, AZ	2017	FD	16	Pending	■		
Arrowhead Ranch WRF* City of Glendale, AZ	2014	FD	9	Trojan		■	■
Cedar Falls WRF* Cedar Falls, IA	2012	FD	21	Suez	■	■	■
Haikey Creek WWTP* Regional Metropolitan Utility Authority, OK	2016	FD	40	Xylem	■		■
Midland WWTP** Midland, MI	Ongoing	FD	20	Suez	■	■	■
Grandville CWP** Grandville, MI	2012/2018	FD	20	Xylem	■	■	■
Charlotte WWTP** Charlotte, MI	2015	FD	4.2	Trojan		■	■
Zeeland CWP** Zeeland, MI	2018	FD	3.5	Trojan	■	■	■
Crooked Creek WRF Gwinnett County, GA	2015	FD	16	Trojan	■		
Cherry Point WRF Beaufort Jasper, SC	Ongoing	PD	28	Xylem	■	■	■
Clemson WWTP Clemson, SC	Ongoing	FD	4.2	Multiple	■		■
Lucas WWTP Shreveport, LA	Ongoing	S	100	Multiple		■	
Marcy Gulch WWTP CWSD, Highlands Ranch, CO	Ongoing	FD	16.5	Trojan	■		■
RM Clayton City of Atlanta, GA	2015	PD	150	Multiple	■	■	
Northwest WRF Orange County Utilities, FL	2015	FD	11.25	Trojan	■	■	■
Blue River WWTP Johnson, KS	2015	FD	10.5	Trojan	■	■	
Cedar Creek WWTP City of Olathe, KS	2013	FD	25	Trojan		■	■
South Mesquite Regional WWTP North Texas Municipal Water District, TX	2019	FD	82.5	Trojan	■	■	■
Southeast WRF City of Lubbock, TX	2012	FD	32	Suez	■		■
Dunn WRF Pinellas, FL	2017	S	12	Multiple	■		■
Little Rock WWTP LRWRA, Little Rock, AR	Ongoing	FD	58	Trojan	■	■	■
South River Atlanta, GA	2015	PD	60	Trojan		■	
Utoy Creek City of Atlanta, GA	2015	PD	80	Multiple	■	■	■
Taylor Creek MSDGC, Cincinnati, OH	2018	FD	15	Trojan		■	
Spencer Creek WWTP St. Peters, MO	2012	FD	20	Trojan	■		■
St. Joseph WPF St. Joseph, MO	2012	FD	54	Xylem	■		■
Hagerstown MD WWTP Hagerstown, MD	2014	FD	13	Suez	■		■

*=FEATURED PROJECT; **=MOORE+BRUGGINK PROJECT; S=STUDY; PD=PRELIMINARY DESIGN; FD=FINAL DESIGN



UV Disinfection, Reaeration & Effluent Pumping Upgrades

CITY OF WYOMING | WYOMING, MI

RELEVANCE: UV technology study, design of two UV channels, UV conversion at existing plant, preselection of UV equipment and maintenance of plant operations (MOPO).

The City of Wyoming retained Black & Veatch to implement effluent treatment systems at the Clean Water Plant as recommended in their 2011 Facilities Plan (also prepared by Black & Veatch). This project included UV disinfection, re-aeration, pumping and flow measurement facilities, featuring:

- Design of two UV channels designed for 42 MGD (peak flow) and three 72-inch-diameter screw pumps integrated with cascade aeration.
- Repurposed existing unused aeration basin for the UV channels and screw pumps.
- Pre-negotiated Trojan UV equipment scope of supply prior to bidding of the construction project due to long lead time.
- Incorporated re-aeration of effluent flow after the UV process.
- Assisted with start-up and commissioning operations as well as provided updated O&M manuals for City use

KEY PERSONNEL

- Heather Cheslek, Project Manager
- Gary Hunter, Process Lead
- Britton Evans, Engineering Manager
- Kathy McGrath, Startup Assistance and Operations Training Lead

CLIENT REFERENCE

Myron Erickson, Director of Public Works
City of Wyoming
2350 Ivanrest Ave SW
Wyoming, MI 49418
616-261-3562



Sioux City WWTP UV Disinfection Project

CITY OF SIOUX CITY | SIOUX CITY, IA

RELEVANCE: Regulatory compliance, cost analysis pre-selection of UV supplier and MOPO.

The City of Sioux City retained Black & Veatch to design a new UV disinfection system to replace the existing chlorine and dechlorination system at the City's WWTP. The City's desire to move away from chlorine disinfection and replace it with UV disinfection was driven by more stringent permit regulations and their higher cost to operate the chlorine system. Key project features of our work were as follows:

- Study of latest generation UV technology from Xylem/Wedeco (Duron).
- Conducted water quality analysis, including collimated beam testing, used to size the UV equipment.
- Developed conceptual design options for both the pre-qualified UV system supplier systems, WEDECO Duron and Trojan Signa UV systems, to repurpose the existing chlorine contact basin.
- Pre-selected a UV system through a competitive bidding process, which was based on a 20-year life-cycle cost to ensure they received the system with the lowest overall cost of operation.

KEY PERSONNEL

- Gary Hunter, Process Lead
- Todd Archer, Engineering Manager

CLIENT REFERENCE

Tom Pringel, Utilities Director
Sioux City Wastewater/Environmental Services
405 6th Street
Sioux City, IA 51102
712-279-6957



Nelson Wastewater Treatment Complex UV Improvements

JOHNSON COUNTY WASTEWATER | MISSION, KS

RELEVANCE: Evaluations to select UV system, UV facility replacement at existing plant, MOPO.

For the last two decades, Black & Veatch has been collaborating with Johnson County Wastewater to upgrade the 52-mgd Nelson Wastewater Complex. A past project was completed to install a new UV facility in which responsibilities included a pilot program to establish design dose and operating conditions, as well as innovative designs that allowed for independent cooling of electrical system and UV lamps. Black & Veatch's responsibilities on a current project to replace the existing Trojan 4000 system includes:

- Evaluation of three different UV systems through gathering design, operation and maintenance details; hosting manufacturer interviews with the client; and carrying out a triple bottom line analysis of three UV systems.
- Coordination with existing plant facilities and consideration of the UV facility interim operation during construction of the upstream treatment train.

KEY PERSONNEL

- Gary Hunter, Process Lead

CLIENT REFERENCE

Patrick Denning, Assistant Chief Engineer-Existing Infrastructure
Johnson County Wastewater
11811 Sunset Drive
Suite 2500
Olathe, KS 66061
913-530-7582



Mallard Creek WWTP Reliability and UV Improvements

CHARLOTTE WATER | CHARLOTTE, NC

RELEVANCE: Preselection of UV equipment, water quality testing, hydraulic and CFD modeling, UV dose optimization, flow-paced UV dosing, UV conversion at existing plant and MOPO.

Black & Veatch has worked with Charlotte Water for more than 20 years. The recent Reliability & UV Disinfection Improvements project to replace the existing tertiary filtration and UV disinfection processes includes:

- Study of latest generation UV technology from Xylem/Wedeco (Duron).
- Wastewater sampling and characterization.
- Evaluated existing facilities, operating data and alternative filtration and UV technologies.
- Developed preliminary design concepts and criteria.
- Preliminary computational fluid dynamics (CFD) modeling to evaluate the hydraulics of proposed concepts.
- Developed preselection criteria for selection of UV equipment for upgrade to 32-mgd disinfection facility.
- Detailed design, including coordination with the preselected equipment manufacturers, optimized configurations and minimized modifications to existing structures, piping and associated appurtenances.

KEY PERSONNEL

- Gary Hunter, Process Lead

CLIENT REFERENCE

Henry Eudy, ORC
City of Charlotte
600 E 4th Street
Charlotte, NC 28202
980-214-5977



Lower Bird Creek WWTP Expansion & UV Disinfection

TULSA METROPOLITAN UTILITY AUTHORITY | CATOOSA, OK

RELEVANCE: UV equipment cost negotiation, flow-paced UV dosing, conversion of gaseous chlorine to UV disinfection, preselection of UV equipment, MOPO and performance testing.

Black & Veatch provided study, design, bidding and construction engineering services, including startup and commissioning, SCADA programming and configuration for the Lower Bird Creek WWTP Expansion project. The expansion doubled the facility's capacity to an annual average flow of 4 mgd. We were responsible for:

- Converted two existing chlorine contact basins into UV disinfection channels.
- Designed two banks of Trojan UV3000Plus UV equipment with three modules per bank (per basin).
- Met geometric mean of 200 fecal coliform/100 mL and a limit of 1,000 fecal coliform/100 mL at 8-mgd peak flow.
- Fast-tracked design and completed in less than 18 months.

KEY PERSONNEL

- Gary Hunter, Process Lead & Performance Testing
- Matt Coulthard, Performance Testing

CLIENT REFERENCE

Matt Vaughn, Water Pollution Control Manager
Tulsa Metropolitan Utility Authority
175 East 2nd Street
Tulsa, OK 74103
918-596-9845



Paso Robles WWTP UV Design

CITY OF PASO ROBLES | PASO ROBLES, CA

RELEVANCE: Prepared specifications and design of UV system, UV conversion at existing plant, regulatory coordination, MOPO and performance testing.

Black & Veatch prepared the Facility Plan for the City's WWTP to expand its capacity to 5.55 mgd, promote water quality and extend water supply resilience in Paso Robles. The UV system is the first UV installation in the state of California. We were then selected for design and construction services of the Facility Plan's improvements, including:

- Prepared specifications for three different UV systems.
- Designed 5.5-mgd in-channel Trojan UV system that meets California Drinking Water Watch reuse requirements.
- Worked with state regulatory officials to establish design criteria for each system.
- Coordinated shop drawing review for selected system.
- Coordinated and supervised spot check bioassay testing of installed system.
- Planned shutdown and a tie-in to existing facilities with critical shutdowns limited to four-hour operations and scheduled during night time to ensure minimum interruption to the wastewater collection and treatment.

KEY PERSONNEL

- Gary Hunter, Process Lead

CLIENT REFERENCE

Matt Thompson, PE
City of Paso Robles
1000 Spring Street
Paso Robles, CA 93446
805-227-7200



Mill Creek WWTP UV Disinfection Study

JOHNSON COUNTY WASTEWATER | JOHNSON COUNTY, KS

RELEVANCE: UV study at existing plant, site optimization, and operation and maintenance cost analysis, technology evaluation and selection.

Johnson County Wastewater contracted Black & Veatch to provide expertise through various technical memorandums in order to meet regulatory requirements. One of the reports outlined evaluation of various disinfection treatment technologies included UV, sodium hypochlorite and multi-barrier disinfection. The study included:

- Site optimization alternatives.
- Cost/benefit and triple bottom line analysis of alternatives including, operation and maintenance costs.
- Recommendation to proceed with UV disinfection for their 126-mgd facility due to cost and safety.

KEY PERSONNEL

- Gary Hunter, Process Lead

CLIENT REFERENCE

Patrick Denning
Johnson County
4800 Nall
Mission, KS 66202
913-715-5000



Waukarusa WWTP UV Improvements Design

CITY OF LAWRENCE | LAWRENCE, KS

RELEVANCE: UV design at existing plant, evaluation of alternatives, pre-selection of UV system supplier and fast-track design.

Black & Veatch guided the City from conception to commissioning of the greenfield 2.5-mgd WWTP, force mains and remote pump station to meet stringent treatment limits. The new Waukarusa River WWTP & Conveyance Corridor project was originally designed to meet NPDES limits of 10 mg/L TN with 1.0 mg/L TP or 8.0 mg/L TN with 1.5 mg/L TP. After one year of operation, the City selected to operate at a 10 mg/L TN with 1.0 mg/L TP permit. Our work included:

- Developed Technical Memorandum for UV disinfection strategy to meet treatment limits.
- Designed low-pressure/high output UV disinfection system.
- Fast-tracked design with a seven-month schedule to meet funding and regulatory challenges.
- Prepared early release contract to pre-load the site prior to the primary project.
- Assisted with start up and commissioning services

KEY PERSONNEL

- Gary Hunter, Process Lead

CLIENT REFERENCE

Melinda Harger, Interim
Director
City of Lawrence
PO Box 708
Lawrence, KS 66044
785-832-7880



Cave Creek Water Reclamation Plant Rehabilitation

CITY OF PHOENIX | PHOENIX, AZ

RELEVANCE: Cost analysis, MOPO, regulatory compliance and Trojan 4000 replacement

The Cave Creek Water Reclamation Plant was removed from service in 2009 due to a lack of growth in the area. When in operation, the plant relied on a Trojan 4000 UV disinfection system that exhibited numerous issues meeting the plant’s effluent permit without supplemental chlorine. In 2017, the City selected Black & Veatch to address long-term operation needs with a condition assessment and recommendations, which are estimated at \$326M. Our work included:

- Performed a condition assessment of the plant.
- Reviewed existing design characteristics that may require updates or changes based on past operational issues.
- Evaluated alternate technologies that provide better water quality or reduce maintenance costs.
- Designed major process upgrades, including replacing existing UV disinfection system a new in vessel UV disinfection system.

KEY PERSONNEL

- Gary Hunter, Process Lead

CLIENT REFERENCE

Jeff Cowee, Project Manager
City of Phoenix
200 W. Washington Street
Phoenix, AZ 85003
602-228-5407



Arrowhead Ranch Water Reclamation Facility UV Disinfection Upgrade

CITY OF GLENDALE | GLENDALE, AZ

RELEVANCE: Cost analysis, startup and commissioning services, MOPO, and Trojan 4000 replacement.

The City of Glendale selected Black & Veatch to evaluate and replace the existing Trojan 4000 UV Disinfection system at Arrowhead Ranch Water Reclamation Facility. Black & Veatch performed a study of the plant and provided additional services for the \$5.2M improvements project, which resulted in an annual power savings of nearly \$1M and earned the City a utility rebate of more than \$1M. Our work included:

- Reviewed water quality, power consumption and operations and maintenance data to establish a baseline for comparison with alternative technologies.
- Detailed design, construction administration and start-up and commissioning services for replacement of the existing UV system with a new, low-pressure/high-output UV system.

KEY PERSONNEL

- Gary Hunter, Process Lead

CLIENT REFERENCE

Curt King, Plant Supervisor
City of Glendale
5850 West Glendale
Avenue
Glendale, AZ 85301
623-930-3957



Cedar Falls Disinfection and Solids Handling Improvements

CITY OF CEDAR FALLS | CEDAR FALLS, IA

RELEVANCE: UV disinfection design, hydraulic assessments, onsite construction management assistance, MOPO and permitting coordination.

Black & Veatch was contracted to design major improvements at the 21-mgd peak flow Cedar Falls Water Reclamation Facility. This project included:

- Reconfigured UV disinfection facilities based on effluent and hydraulic assessment to maintain a gravity discharge outfall.
- Added a new building to house the UV process and electrical equipment.
- Designed secondary clarifier improvements to maintain effluent quality.
- Construction phasing to on-site conditions and a requirement to maintain flow throughout the facility.

KEY PERSONNEL

- Gary Hunter, Process Lead

CLIENT REFERENCE

Mike Nyman
City of Cedar Falls
220 Clay Street
Cedar Falls, IA 50613
319-268-5561



Haikey Creek WWTP Disinfection Improvements

REGIONAL METROPOLITAN UTILITY AUTHORITY | BROKEN ARROW, OK

RELEVANCE: UV equipment cost negotiation, preparation of plans and specifications for TrojanUVSigna system, flow-paced UV dosing, retrofit of existing facilities and conversion of gaseous chlorine to UV disinfection.

Black & Veatch reviewed the disinfection practices at the 16-mgd Haikey Creek WWTP to reduce the risks associated with continued use of gaseous chlorine for effluent disinfection. Our work included:

- Performed comprehensive disinfection study.
- Initiated a UV equipment preselection process with the WEDECO TAK55 system selected as the basis of design.
- Designed three UV disinfection channels built inside an existing chlorine contact basins for 5- to 40-mgd flows to meet permit requirements.
- Constructed new electrical building over the UV channels, housing the UV ballasts and power supply units.
- Installed covers to prevent algae growth and clogging/fouling of UV modules.

KEY PERSONNEL

- Gary Hunter, Process Lead

CLIENT REFERENCE

Roger Hughes
Regional Metropolitan
Utility Authority
11602 East 151st Street
South
Broken Arrow, OK 74003
918-259-7000



Midland WWTP UV System

CITY OF MIDLAND | MIDLAND, MI

RELEVANCE: UV design, new generator and electrical feed, 3D modeling and MOPO.

Moore+Bruggink was selected to design a vertical UV at the 20-mgd Midland WWTP. A new building will be placed around the new system, with additional space for storage of trucks and equipment and maintenance of the lamps. Additional project elements included:

- Designed Ozonia UV vertical system with lamps that turn on and off to match transmissivity readings of the water for energy savings and static water level control weirs to maintain water over the lamps.
- Added new generator and electrical feed for reliable power.
- Reconfigured final effluent water draw-off piping to maintain feed to the plant.
- Used 3D modeling to ensure clearances and illustrate project elements to the plant staff.
- MOPO with the tanks remaining in service during construction to ensure no impacts to the plant effluent.

KEY PERSONNEL

- Brian Hannon, Project Manager
- Jeff Landers, Project Engineer
- Jarod Stuyvesant, Project Engineer

CLIENT REFERENCE

Stephen Smith, Operations and Maintenance Supervisor
City of Midland
333 West Ellsworth Street
Midland, MI
989-837-3504



2012 CWP Expansion and 2018 UV System Upgrades

CITY OF GRANDVILLE | GRANDVILLE, MI

RELEVANCE: UV retrofit design, new PLC programming, and MOPO.

Moore+Bruggink installed one of Michigan’s first UV systems at the Grandville CWP in 2001. When the plant was expanded to 20-mgd in 2012, an additional channel was added to meet the new peak flows. Key project elements include:

- Retrofitted Wedeco UV horizontal system into chlorine contact tank, with lamps that turn on and off to match transmissivity, an additional channel of UV lamps with minimal bypassing and ballast cabinets placed on a mezzanine level in the existing building.
- Added PLC programming to help control the lamp output of the new “EcoRay” lamps to save energy while maintaining kill rates.
- MOPO without bypassing the building or exceeding any permit limits.

KEY PERSONNEL

- Brian Hannon, Project Manager
- Jeff Landers, Project Engineer

CLIENT REFERENCE

Todd Wibright, Superintendent
City of Grandville
15 Baldwin
Jenison, MI 49428
616-457-0720



2015 WWTP UV System

CITY OF CHARLOTTE | CHARLOTTE, MI

RELEVANCE: Conversion to Trojan UV system, energy efficient design for operations and maintenance cost savings and MOPO.

Moore+Bruggink led the conversion of an existing chlorine contact system and tankage to a Trojan UV system. The project helps the Charlotte WWTP meet its 4.2-mgd flow and included:

- Converted existing chlorine contact system and tankage to a Trojan horizontal UV disinfection with lamps that turn down their output based on flow to save energy since the average daily flow is only 0.90 mgd.
- Performed study that showed an annual operations and maintenance savings of \$5,500, compared to the chlorine disinfection method that was in place.
- MOPO to keep chlorinated flow in an adjacent tank for backwash of the tertiary filters while demolishing chlorine channel inner walls, constructing the new system and placing a fiberglass building over the system.

KEY PERSONNEL

- Brian Hannon, Project Manager

CLIENT REFERENCE

Matt Griffith,
Superintendent
City of Charlotte
111 East Lawrence Avenue
Charlotte, MI 48813
517-231-2324



2018 CWP Improvements (UV System Portion)

CITY OF ZEELAND | ZEELAND, MI

RELEVANCE: UV dosing rates evaluation, hydraulic modeling, post-UV aeration, Trojan UV system design and new SCADA system.

The City of Zeeland selected Moore+Bruggink for the major improvements project to expand the CWP capacity from 1.65 to 3.5 mgd. The project includes one of the first Trojan UV systems installed in Michigan in 1999. Moore+Bruggink was responsible for:

- Designed Trojan UV system with current lamp technology, replaced old connections and other parts and tied UV into a new SCADA system.
- Evaluated UV dosing rates, hydraulics and potential to add more lamps.
- Added a new building structure around the UV system for improved life cycle and ease of maintenance during winter months.
- Incorporated post-UV aeration to maintain DO levels and meet permit requirements that have increased over time.
- An effluent pump station with the ability to gravity flow up to a certain flow rate and then turn on the pumps to pump up to 7 mgd firm capacity through the force main to the river.

KEY PERSONNEL

- Brian Hannon, Project Manager
- Jarod Stuyvesant, Project Engineer

CLIENT REFERENCE

Doug Engelsman,
Superintendent
City of Zeeland
350 Rich Avenue
Zeeland, MI 49464
616-772-0873

C

PROPOSED WORK PLAN





Proposed Work Plan

The City’s overarching project goal is to successfully replace the City’s existing UV disinfection system by the end of the fiscal year 2024. The replacement of these facilities is critical for meeting permitted disinfection requirements as well as staying within the time period of available spare parts of their existing outdated and unsupported UV system.

The Black & Veatch team will guide the City to efficiently select a UV technology, negotiate with the selected vendor, plan for MOPO throughout construction and expedite the design phase for increased construction flexibility.

PROJECT UNDERSTANDING

The City of Ann Arbor (the City) owns and operates the Wastewater Treatment Plant (WWTP) that provides wastewater services to the local community. The WWTP staff has been operating a Trojan UV4000 system since its installation in 2000. During 2021, Trojan Technologies informed owners of the UV4000 system that they will no longer support this product with spare parts starting in July 2022. Because of this, the City must replace its UV disinfection equipment by July 2024 to avoid exhausting spare components inventory and risking compliance issues. This date in 2024 is a key project date setting the overall study, design and construction schedule.

Black & Veatch has helped a number of clients through the process of replacing UV4000 and will bring this knowledge to assist the City in this important project.

The overall goal is to replace the existing Trojan UV4000 with a new UV Disinfection Facility and minimize potential construction and operational delays through a collaborative study and design process.

Another key project element is defining and understanding the design criteria and existing site infrastructure. Based on a site visit, existing site infrastructure will be used to the best extent possible for the replacement of the existing UV disinfection equipment. The plant hydraulics will need to be assessed to define the impact to upstream and downstream flow conditions. UV electrical equipment will require evaluation of existing electrical supply, connection to the plant control system and space availability. Our design team has developed an approach that has been used for similar UV disinfection projects which, simultaneously assesses key project elements to avoid project design delays while capturing schedule efficiency.

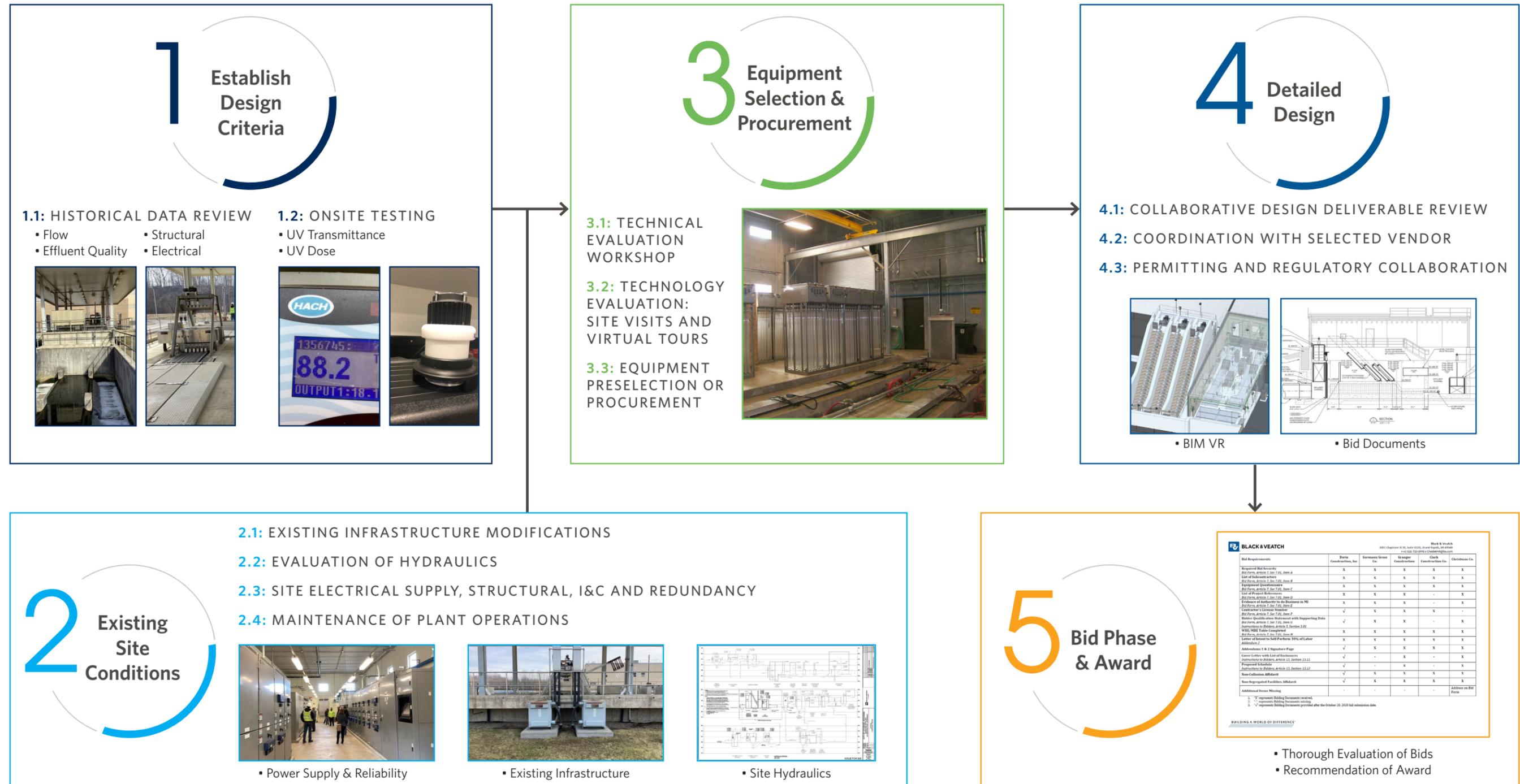
OVERVIEW OF PROJECT APPROACH

To achieve these major goals and objectives, our work plan will address five important components (shown below) that will provide the project foundation and project delivery plan throughout the planning, design and construction of this project. Tasks 1 through 3 of the Project Delivery Plan can be completed concurrently as part of the preliminary design phase.



WWTP UV DISINFECTION REPLACEMENT PROJECT

PROJECT DELIVERY PLAN - KEY ELEMENTS



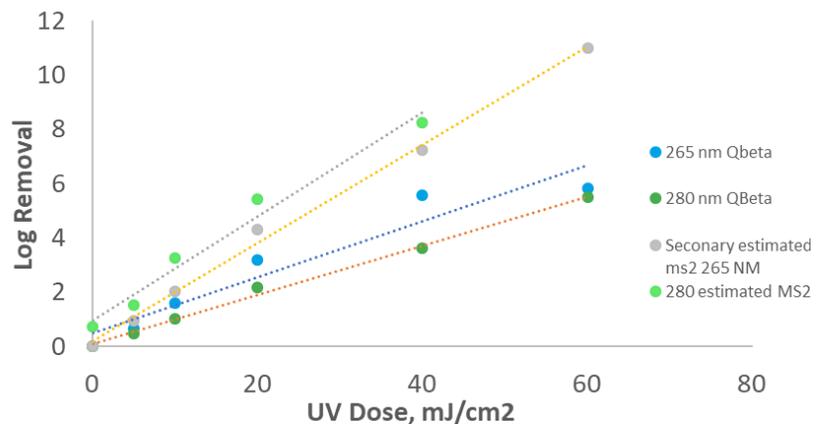
1 Establish Design Criteria

A key objective to our approach to this project is to ensure that we have a firm understanding of the City's goals and objectives as well as the WWTP historical performance of the existing UV Trojan UV4000 system.

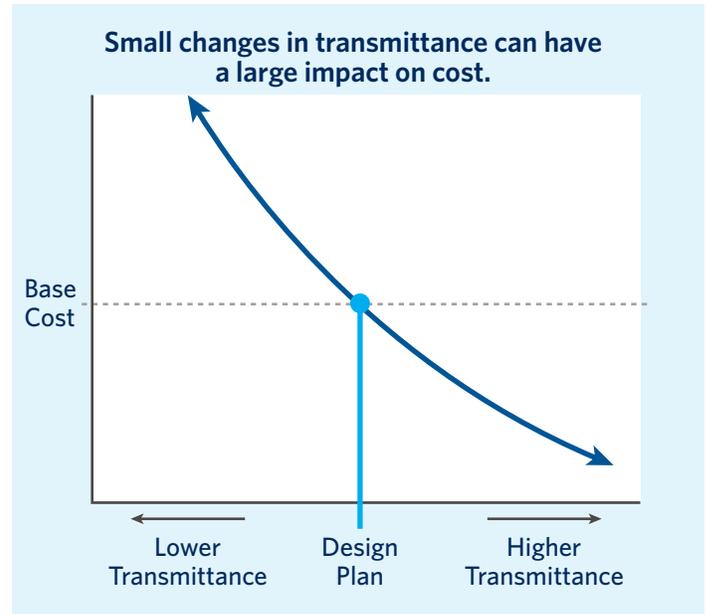
Our understanding of the City's goals is to replace the UV4000 in 18 months using the least amount of CAPEX with a system that provides increased OPEX savings while staying in compliance during construction. One of the key tasks identified as part of the preliminary design efforts includes establishing design criteria for the project. Establishing design criteria early within the preliminary design phase will ensure the design team and the City are in agreement from the beginning of the project.

1.1 Historical Data Review

As part of the preliminary design, five years of plant operational and water quality data from the existing system will be requested to establish baseline performance. This baseline analysis helps establish existing costs that can be used to leverage energy efficiency grants similar to what Black & Veatch did at the Arrowhead Ranch facility in Glendale, AZ. This data request will include water quality information such as TSS, turbidity, transmittance, COD, as well as operational data such as power consumption and dose.



Right sizing the design of UV equipment relies on assessment of effluent water quality. Onsite portable testing (lab setup on left) can be performed to supplement available data. Collimated Beam testing can provide an efficient (time and cost) means to establish correlations to log removal and UV dosage (figure on right).



Gary Hunter will lead the data collection and review, working with the project team to develop historical performance and effluent water quality criteria. Historical UV transmittance (UVT) data will then be used to develop correlations to historical plant performance, TSS, transmittance and historical dose. The Black & Veatch team will specifically review the following components for process stability and design impacts to the disinfection system:

- Detailed evaluation of WWTP performance and filtration effluent quality allows tuning of UV operating parameters to optimize and minimize UV system equipment cost needs and energy

consumption. This data can be combined with historical UVT and recommended onsite testing to observe data trends and make recommendations for the design requirements of the new UV system.

- Dynamic influent peak flow events can impact overall UV performance. We will review historical peak flows to increase flexibility of operations throughout the system. This effort will match water quality transmittance with higher flow rates to determine if there is under utilized capacity. If available, our team will develop an operating strategy that can be used with one channel in service to minimize MOPO activities during construction.

1.2 Onsite Testing

Right-sizing the UV disinfection equipment relies heavily on water quality data to establish delivered dose intensity. The team understands and has been provided limited historical UVT data available from the Ann Arbor WWTP and recommends a shortened three-day special sampling period to assist with development of initial design criteria for the subsequent technology evaluation. A testing protocol will be developed for a Collimated Beam test (figures on previous page) to be completed over the course of the three-day time period. Gary Hunter will lead the protocol development and onsite testing. This testing can be initialized at the outset of the project to quickly gain critical insight for UV technology selection. Gary recently completed a similar effort for the City of Sioux City, IA. He will bring this demonstrated approach to the testing allowing for the effort to be completed efficiently. If needed, additional testing following the pre-selection of the UV equipment will allow a more robust data set to further characterize the effluent water quality and identify opportunities to optimize the operation of the new UV system during detailed design.

2 Existing Site Conditions

Our design team understands the UV process, electrical and controls equipment, as well as structural integrity of incorporating new equipment into existing infrastructure. Assessment of the existing site conditions can occur

simultaneous to Task 1, increasing project efficiency and advancing design.

2.1 Existing Infrastructure Modifications

The City has already identified that an assessment of the existing UV structure should be completed due to its age. This structure was a repurposed chlorine contact basin when the existing UV system was installed in 2000. Therefore, verification of the structure life moving into the future is a critical part of this project. The Black & Veatch team, led by [Todd Archer](#), recommends that a visual condition assessment be performed by [Keith Ritsema](#), [Patrick Powers](#) and [Adam Bender](#) to assess the condition of the existing UV disinfection structural components, electrical and controls equipment and site conditions.

The primary goal of this effort is to reduce the risk of delays and change orders during construction by preemptively identifying potential areas of needed improvement. Our team will review each individual aspect with City staff to identify the best path forward for the project and plant operations.

2.2 Evaluation of Hydraulics

The transition from the existing Trojan UV4000 system to a new UV disinfection system will result in hydraulic changes to the overall facility. The Black & Veatch team will leverage previous record drawings and hydraulic profiles to develop a hydraulic model of the facilities from the filtration process through the outfall including, the UV bypass line. Based on the established design criteria, a peak flow capacity will be used as the basis for the evaluation. This analysis will also include evaluation of the UV bypass line. The hydraulic model will assess the peak flow and various other conditions to ensure plant operations are successfully.

While not currently included in our proposed work plan, a value-added service that can be performed is computational fluid dynamic (CFD) modeling. This effort is recommended as modeling the proposed configuration will result in optimal and consistent UV performance as some structural modifications are anticipated to accommodate the selected UV equipment. An unequal flow split between channels or highly variable velocity can result in poor disinfection performance and increased

operational complexity. An example CFD analysis of UV channel configurations is shown in the figure below.

Example of CFD Modeling Results from Mallard Creek WWTP Reliability and UV Improvements in Charlotte, NC. This can be performed as a supplemental service.



2.3 Site Electrical Supply, Structural, I&C and Redundancy

A critical aspect of the change from one UV disinfection system to another includes a confirmation of the existing power supply capacity, reliability and redundancy. Our team will incorporate the power reliability measures that are used with the existing system. Led by Todd Archer, we will work early in the preliminary design to confirm the existing power supply and anticipated changes.

Our team will visually examine the existing above grade facilities, as well as the below water surface structures. Coordination with staff will occur to allow each channel to be taken offline, drained and inspected. If needed after the visual inspection, in-depth testing and inspection can be performed to assess the future life of the structure as a supplemental service.

The plant utilizes Factory Talk for the plant SCADA system. Our team also understands that the WWTP is in the process of upgrading and modernizing its control system. Depending on the timing of the upgrades, our team of experienced electrical and I&C engineers understand the need for the new UV PLC to communicate with both new and existing systems.

2.4 Maintenance of Plant Operations (MOPO)

Our team recognizes the criticality of keeping the WWTP online while the UV disinfection system is constructed.

As we have learned from past WWTP projects, one of the keys to a successful construction project will be to identify and mitigate the MOPO issues early in the project. In the process of the initial development of MOPO activities, a number of items need to be considered and evaluated with Plant staff. Our team has considered a number of options that we would discuss with City Staff at the initial project kickoff, including:

1. Determining the peak flow one channel can treat and then alternating the installation/replacement of the old UV system with the new system.
2. Using the existing UV bypass line for temporary chlorination and dechlorination. EGLE will need to be contacted and agree to a variance during construction.
3. Construction of a new UV system using the UV bypass line as the influent to the new system. While this provides the least amount of disruption to the existing facility, it is also the most expensive approach.

As we have learned from past WWTP projects, one of the keys to a successful construction project will be to identify and mitigate MOPO issues early in the project.

MOPO activities will need to be balanced with cost to ensure the most cost-efficient approaches are being implemented. As part of the design our team, [Kathy McGrath](#) will utilize her operations experience and work with the City's maintenance and operations (O&M) staff to walk through the proposed construction sequencing schedule, evaluating the existing facilities and contractor requirements at each stage. Existing infrastructure will be assessed to ensure long-term operability.

3 Equipment Selection and Procurement

A key aspect for both the design team and the City is the UV equipment selection process and eventual

procurement. Several UV technology manufacturers exist, each with specific applications that are better suited to specific configurations. Our approach will include a workshop with the City to review the potential alternatives that fit in the existing UV disinfection area. A similar approach was used at the Arrowhead Ranch WRF in Glendale, AZ and the Nelson Complex in Johnson County, KS for their conversion from the Trojan 4000 system to a new UV Disinfection system.

3.1 Technology Evaluation Workshop

The Black & Veatch team will lead a technology workshop to discuss the established design criteria resulting from Task 1 and the preliminary findings of the existing site conditions from Task 2. Both of these tasks will feed into the UV technology assessment and ultimate selection. Typically, UV equipment is pre-selected or negotiated early as part of the design process to allow for a more streamlined design, buy-down of equipment lead time and reduction in changes during construction.

The Black & Veatch team recommends the City either pre-select or pre-purchase the UV equipment to reduce risks in a volatile and ever-changing market.

The technology workshop will identify comparative advantages and disadvantages of each technology, with respect to performance, O&M, ease of installation (site constraints), schedule and cost.

3.2 Technology Evaluation: Site Visits and Virtual Tours

The key to selection of a new UV system is to see what technologies other utilities have installed and how well they are operating. Our team recommends a day of site tours to nearby facilities such as Wyoming CWP and Grandville CWP; if needed, we can supplement these virtual tours with other facilities. These tours are not only to examine the UV equipment but, also electrical, I&C and other critical aspects of the system. Discussions with other operators can also be used to adjust MOPO activities to ensure a smooth transition during construction.

3.3 Equipment Preselection or Procurement

Currently, contractors are seeing a shortage of raw materials, which could impact the scheduling for this project. Recent Black & Veatch UV projects have experienced equipment lead times up to six months from approved shop drawings. Assuming the shortages continue over the next couple of years, we will evaluate strategies to accommodate long delivery times to ensure the project is completed before the end of the 2024 fiscal year. If markets recover to pre-pandemic conditions, the lead times could be closer to three months, which will help build in additional float into the schedule.

For the City of Wyoming, pre-selection of the TrojanSignal UV equipment and development of a RFP was a successful approach to ensure a fair price and meet design and schedule requirements for the project.

One potential strategy for expediting the schedule and firming up the equipment price is to sole source or pre-purchase the UV equipment. Current pricing received from three UV disinfection equipment manufacturers ranges between \$1.1M and \$1.3M with increases anticipated later this year. Typically, UV manufacturer(s) are pre-selected as part of the design services so design documents (drawings and specifications) can be customized to the specific layout of that manufacturer. This approach maintains the responsibility of the UV equipment underneath the contractor. Another potential strategy to reduce the risk of equipment delays during construction is to expedite the shop drawings for the UV equipment within the first two months of construction to minimize the impact to overall construction. The construction documents can be developed such that specific deadlines are required to ensure purchase orders are issued in a timely manner.

The Black & Veatch team has used this approach to reduce schedule to allow for the installation of a UV system of Sioux City, IA in 18 months. Key to the compact schedule is being able to identify the equipment early so

that fabrication can occur and supply chain issues can be minimized. With the system pre-selected by the City, shop drawings can be completed and the system be released to fabrication.

4 Detailed Design

Critical project-specific aspects of the detailed design and implementation of this project include coordination with the pre-selected equipment manufacturer and collaborative design deliverable reviews. **Britton Evans** will work closely with the design team with a focus on coordination with City staff and design disciplines to ensure the final project meets the City’s needs. Britton completed this effort for the City of Wyoming CWP UV Disinfection project so he is very familiar with the potential pitfalls and can help the collective team avoid them for this project.

4.1 Collaborative Design Deliverable Review

Once the manufacturer(s) for the UV system is selected, the design team will move swiftly into detailed design. Our team will incorporate the preliminary design criteria to develop a 50% set of design documents. Project deliverables include a 90% and 100% set of design documents and the 100% design documents representing the final bid documents for the project.

Good design requires collaboration, coordination and buy-in from all parties to ensure the final design meets the City’s needs.

UV Disinfection Design Specialist with 37 Years of Experience

Gary Hunter, Black & Veatch’s UV specialist, has extensive experience working with all of the major manufacturers of UV equipment and optimizing control philosophies to meet site-specific operational requirements and performance goals.



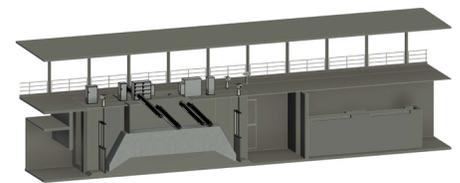
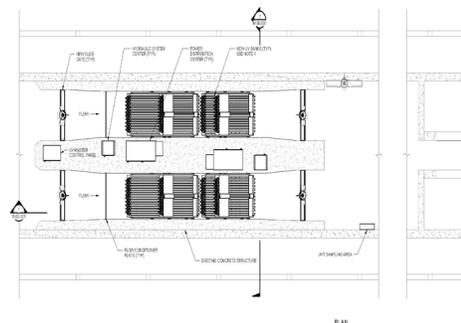
As part of the collaborative design deliverables, the Black & Veatch team will coordinate virtual milestone workshops to review design documents and address comments from the City. This provides full exposure to all the drawings and models along with navigation between 2D and 3D data at the same time. Black & Veatch has implemented this as standard practice due to the increased quality of final deliverables and reduced change orders during construction. The model space allows for open communication between all parties. Many key members of this team successfully used this approach for the new UV system being installed for the City of Wyoming.

4.2 Coordination with Selected Vendor

Significant coordination between the design team and pre-selected equipment manufacturer(s) will be required during detailed design. Positive coordination between all

BIM MODEL FOR SUCCESSFUL DESIGN REVIEW

Black & Veatch will ensure that the detailed design efforts for the UV disinfection system are fully integrated into the existing facilities. A preliminary BIM model of the Ann Arbor UV disinfection structure has been developed. This will be expanded upon and included part of the 50% and 90% design reviews allowing City staff to explore the proposed design layout.



parties will ensure that systems are efficiently designed, supplied and installed. The design team will also work closely with the UV manufacturer to develop a flexible control philosophy, allowing the City to select a control strategy based on either current dose target (i.e., 30 mJ/cm²) or the site-specific fecal coliform dose-response from ongoing Collimated Beam testing. This flexible control philosophy will allow for the UV system to operate fewer lamps at reduced power, thus minimizing maintenance requirements and optimizing energy savings while also maintaining the option to operate at a higher dose target, if desired.

4.3 Permitting and Regulatory Collaboration

Obtaining regulatory approval for a project can oftentimes present challenges. It can be highly beneficial to include EGLE in design review meetings so they can be part of the conversation. This allows EGLE to understand the project goals, drivers and decisions made along the way, leading to efficient approvals and keeping the project on schedule. Our team utilized this approach for the City of Wyoming CWP UV Disinfection project and it resulted in a very smooth and quick Construction Permit approval process.

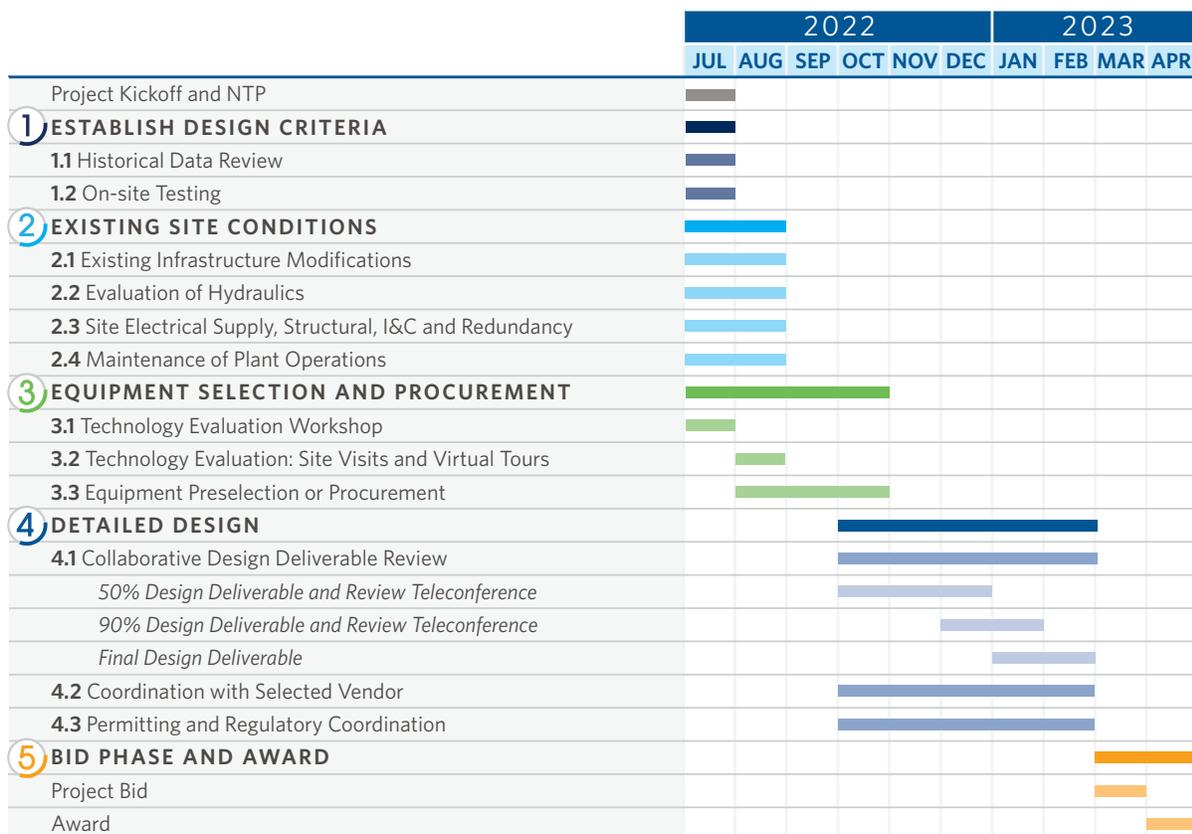
5 Bid Phase and Award

The Black & Veatch team will prepare the applications and supporting documentation for the necessary EGLE Construction permit and City permits.

The Black & Veatch team will assist the City with advertising the project Invitation to Bid to ensure all City and/or funding advertising requirements are met. Our team will lead a pre-bid meeting, answer any questions that arise from interested parties and prepare any addenda that may be required. A complete review of each bid package will be performed and summarized in a bid evaluation and recommendation of award memorandum for the City’s review and use.

PROPOSED PROJECT SCHEDULE

Our team understands that the schedule for this project is driven by the City’s need to replace the existing UV disinfection equipment prior to the end of fiscal year 2024. Considering the current long-lead times for equipment, we outlined a streamlined approach to the study and design phase that facilitates a smooth transition into the construction phase of the project.



D

FEE PROPOSAL

Please see separate sealed envelope labeled Section D



E

AUTHORIZED NEGOTIATOR





Authorized Negotiator

AUTHORIZED NEGOTIATOR

David S. Koch, PE
Associate Vice President
KochDS@bv.com
616-308-7165



F

ATTACHMENTS



**ATTACHMENT B
LEGAL STATUS OF OFFEROR**

(The Respondent shall fill out the provision and strike out the remaining ones.)

The Respondent is:

- A corporation organized and doing business under the laws of the state of Michigan, for whom David S. Koch bearing the office title of Associate Vice President whose signature is affixed to this proposal, is authorized to execute contracts on behalf of respondent.*

~~*If not incorporated in Michigan, please attach the corporation's Certificate of Authority~~

- ~~• A limited liability company doing business under the laws of the State of _____, whom _____ bearing the title of _____ whose signature is affixed to this proposal, is authorized to execute contract on behalf of the LLC.~~
- ~~• A partnership organized under the laws of the State of _____ and _____ filed with the County of _____, whose members are (attach list including street and mailing address for each.)~~
- ~~• An individual, whose signature with address, is affixed to this RFP.~~

Respondent has examined the basic requirements of this RFP and its scope of services, including all Addendum (if applicable) and hereby agrees to offer the services as specified in the RFP.

David S Koch Date: April 6, 2022
Signature

(Print) Name David S. Koch Title Associate Vice President

Firm: Black & Veatch Ltd of Michigan

Address: 3550 Green Court, Ann Arbor, MI 48105

Contact Phone (616) 308-7165 Fax (312) 346-4781

Email KochDS@bv.com

**ATTACHMENT D
CITY OF ANN ARBOR
LIVING WAGE ORDINANCE DECLARATION OF COMPLIANCE**

The Ann Arbor Living Wage Ordinance (Section 1:811-1:821 of Chapter 23 of Title I of the Code) requires that an employer who is (a) a contractor providing services to or for the City for a value greater than \$10,000 for any twelve-month contract term, or (b) a recipient of federal, state, or local grant funding administered by the City for a value greater than \$10,000, or (c) a recipient of financial assistance awarded by the City for a value greater than \$10,000, shall pay its employees a prescribed minimum level of compensation (i.e., Living Wage) for the time those employees perform work on the contract or in connection with the grant or financial assistance. The Living Wage must be paid to these employees for the length of the contract/program.

Companies employing fewer than 5 persons and non-profits employing fewer than 10 persons are exempt from compliance with the Living Wage Ordinance. If this exemption applies to your company/non-profit agency please check here No. of employees

The Contractor or Grantee agrees:

- (a) To pay each of its employees whose wage level is not required to comply with federal, state or local prevailing wage law, for work covered or funded by a contract with or grant from the City, no less than the Living Wage. The current Living Wage is defined as \$14.05/hour for those employers that provide employee health care (as defined in the Ordinance at Section 1:815 Sec. 1 (a)), or no less than \$15.66/hour for those employers that do not provide health care. The Contractor or Grantor understands that the Living Wage is adjusted and established annually on April 30 in accordance with the Ordinance and covered employers shall be required to pay the adjusted amount thereafter to be in compliance with Section 1:815(3).

Check the applicable box below which applies to your workforce

Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage without health benefits

Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage with health benefits

- (b) To post a notice approved by the City regarding the applicability of the Living Wage Ordinance in every work place or other location in which employees or other persons contracting for employment are working.
- (c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.
- (d) To permit access to work sites to City representatives for the purposes of monitoring compliance and investigating complaints or non-compliance.
- (e) To take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee covered by the Living Wage Ordinance or any person contracted for employment and covered by the Living Wage Ordinance in order to pay the living wage required by the Living Wage Ordinance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services or agrees to accept financial assistance in accordance with the terms of the Living Wage Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Living Wage Ordinance, obligates the Employer/Grantee to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract or grant of financial assistance.

Black & Veatch Ltd of Michigan
Company Name
 April 6, 2022
Signature of Authorized Representative Date

David S. Koch, Associate Vice President
Print Name and Title

3550 Green Court
Street Address
Ann Arbor, MI 48105
City, State, Zip

(616) 308-7165 / KochDS@bv.com
Phone/Email address



ATTACHMENT E

VENDOR CONFLICT OF INTEREST DISCLOSURE FORM
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All vendors interested in conducting business with the City of Ann Arbor must complete and return the Vendor Conflict of Interest Disclosure Form in order to be eligible to be awarded a contract. Please note that all vendors are subject to comply with the City of Ann Arbor's conflict of interest policies as stated within the certification section below.

If a vendor has a relationship with a City of Ann Arbor official or employee, an immediate family member of a City of Ann Arbor official or employee, the vendor shall disclose the information required below.

1. No City official or employee or City employee's immediate family member has an ownership interest in vendor's company or is deriving personal financial gain from this contract.
2. No retired or separated City official or employee who has been retired or separated from the City for less than one (1) year has an ownership interest in vendor's Company.
3. No City employee is contemporaneously employed or prospectively to be employed with the vendor.
4. Vendor hereby declares it has not and will not provide gifts or hospitality of any dollar value or any other gratuities to any City employee or elected official to obtain or maintain a contract.
5. Please note any exceptions below:

Conflict of Interest Disclosure*	
Name of City of Ann Arbor employees, elected officials or immediate family members with whom there may be a potential conflict of interest.	<input type="checkbox"/> Relationship to employee <hr/> <input type="checkbox"/> Interest in vendor's company <input type="checkbox"/> Other (please describe in box below)
None	

*Disclosing a potential conflict of interest does not disqualify vendors. In the event vendors do not disclose potential conflicts of interest and they are detected by the City, vendor will be exempt from doing business with the City.

I certify that this Conflict of Interest Disclosure has been examined by me and that its contents are true and correct to my knowledge and belief and I have the authority to so certify on behalf of the Vendor by my signature below:		
Black & Veatch Ltd of Michigan	(616) 308-7165	
Vendor Name	Vendor Phone Number	
	April 6, 2022	David S. Koch
Signature of Vendor Authorized Representative	Date	Printed Name of Vendor Authorized Representative



BLACK & VEATCH