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Date: September 1, 2016

Mr. Gregory A. Tramontozzi
Executive Director
Passaic Valley Sewerage Commission
600 Wilson Avenue
Newark, New Jersey 07105

Dear Mr. Tramontozzi:

The undersigned hereby submits the enclosed proposal for the position of **DESIGN SERVICES AND DESIGN SERVICES DURING CONSTRUCTION OF STORMWATER PUMPING STATIONS.**

The undersigned hereby undertakes and promises to provide services for **DESIGN SERVICES AND DESIGN SERVICES DURING CONSTRUCTION OF STORMWATER PUMPING STATIONS** and to do all work requested as appropriate and required herein as well as the contract documents concerning the same, including all written amendments and changes thereto, if any, which are incorporated herein by reference and made a part of this proposal.

Jerry Notte
SIGNATURE

Jerry Notte, PE
Type or Print Full Name

(973) 316-3543
Telephone Number

CH2M HILL Engineers, Inc.
BUSINESS NAME

Vice President
Title

09/012/16
Date

(973) 334-5847
Fax-Telephone Number

Section 1

Executive Summary

The CH2M team, has the global and local pumping station design and construction experience coupled with a strong understanding of your project objectives. We will deliver your vision of protected facilities with reliable and operable stormwater pumping stations by leveraging worldwide experience in stormwater, wastewater and wet weather pumping station design, assigning an award winning team, and by following proven design and construction approaches.

Project Overview and Critical Objectives

After Superstorm Sandy devastated PVSC's facilities and severely disrupted plant operations, PVSC began post-storm recovery and aggressively pursued FEMA funding to develop a comprehensive capital program to implement storm-related resiliency and reliability at the plant. The three stormwater pumping stations are a key component of the CIP, and its timely completion is critical to protecting PVSC from vulnerability to a major storm event. The Basis of Design Report prepared by the Program Management Consultant provides the results of initial investigations and design criteria of the pumping stations. The CH2M team is committed to assisting PVSC in achieving its overall vision by advancing the project through design and construction. Our team will achieve the following critical project objectives:

- Deliver in a programmatic environment
- Provide a design that achieves all PVSC project objectives including meeting Hydraulic Institute requirements
- Emphasize operability during and after construction
- Comply with FEMA funding requirements
- Optimize the schedule, to minimize risk exposure to another flood event
- Identify cost savings where possible

The CH2M and Alden Team fully meet PVSC's Experience Criteria:

Familiarity with the Work, Requirements, and Procedures of PVSC. Our team has an almost 20 year working history with PVSC. We are familiar with the plant, its staff, and the plant's operations, as well as the design objectives of the pumping stations.

Prior Experience with Public Entities and/or Governmental Agencies. CH2M has a strong work history serving public sector agencies, including in New Jersey, for decades and in supporting client projects funded by FEMA.

Team Experience in Design of Stormwater and Sewage Pumping Stations (Minimum 10 Years). CH2M's extensive expertise in stormwater and sewage pumping stations the work yields here a portfolio of stormwater and sewage pumping stations designed and built around the world (see Exhibits 3-1).

Staff Experience In Modeling and Design of Stormwater and Sewage Pumping Stations. Our modeling and design team, as shown in Section 2, offer a full range of integrated expertise as required for this project, including hydraulic and physical modelers, proven project and design managers, experienced design discipline leads and construction management expertise.

History of Successful Projects, Similar in Size and Scope, including References: A select group of projects that demonstrate the depth and breadth of the team's experience is presented at the end of this chapter.

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Technical Competence: An Award Winning Design and Construction Team to Achieve Your Vision

Our team provides pumping station design experts, hydraulic modeling specialists, and staff reflecting the background, professional qualifications, education and training necessary to fully understand and meet the project requirements. **Project Manager Shivani Patel,** who has led key members of our proposed team in other successful wet weather pumping station designs, is based in Parsippany, NJ only thirty minutes away from PVSC. She will lead key personnel from CH2M's extensive conveyance team, including structural, mechanical, electrical, and modeling resources from both CH2M and Alden Labs. Our team is committed to implementing this important project and includes the following features, reflected in our organizational chart (Exhibit 2-2) and discussed in Section 2:

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"CH2M has brought together for PVSC many of the same team members that designed the award winning H1 wet weather pump station for NHSA, including Shivani Patel (PM), Bill McMillin (Modeling Lead), Martin Moore (Design Manager, not in picture) and Dave Missig, (Resident Project Representative). This team is experienced in working together to deliver pump station designs in New Jersey."

- **Technical Advisors Provide Global Best Practices:** Our team includes experts in hydraulic modeling and pump stations design, including **Kevin Nielsen and Jim Gagnon**.
- **Design and Technical Expertise in All Project Facets:** Our design team includes staff fully versed in similar designs, including **Design Manager Martin Moore**, and lead modeling from **Bill McMillin and Alden Labs** for both design and operability evaluations; the team also includes very experienced constructibility/ construction sequencing specialist **Paul Whitener,** to customize the design to your facility.
- **FEMA Resources Providing Continuity: Project Manager Shivani Patel** will lead our FEMA efforts, providing continuity throughout the project.

Firm Qualifications: Best Practices Gained through Local and Global Stormwater, Wastewater and Wet Weather Pumping Station Projects

The CH2M team's capabilities in stormwater, wastewater and wet weather pumping station design and construction go hand in hand with our global leadership in wastewater treatment. This extensive level of experience offers PVSC reduction in risk throughout the project's life. We are providing seven projects as a sample of our team's capabilities to successfully complete this work. We describe our firm qualifications in detail in Section 3, which includes many pumping stations of similar capacity and conditions to PVSC's.

We bring the following key qualifications:

- Decades of demonstrated expertise in designing and constructing stormwater, wastewater and wet weather around the United States and the world, including pumping stations that interact with barrier floodwalls
- Extensive experience in physical hydraulic modeling as well as other modeling tools to achieve to all design standards and deliver operable pumping stations
- Local management team that has very successfully led key staff in extremely similar projects
- National and local expertise in construction management, to facilitate a smooth construction period and coordinated
- Proven FEMA and Federal disaster funded project experience to assure FEMA compliance
- A 70-year record of successfully delivering projects for public entities and governmental agencies, since CH2M's inception in 1946

Project Approach/Schedule: Achieving a Flood Resiliency Vision

Our comprehensive ***4-Phase Design Delivery Process*** addresses the project's objectives for the modeling and design of the stormwater pumping stations, as illustrated in Exhibit 1-1, and is more fully explained in Section 4. Our strategy incorporates a process of proven checklists and methodologies for design success; applies best practices for design elements including **Modeling** which in turn allows us to optimize both **Design** and **Operability**, incorporates **Constructability, Cost Estimating** and **Permitting** throughout the phases. Section 4 also details our project management, quality management, and construction management approach to meet/exceed schedule, meet budget, and overall, reduce impact on PVSC staff as we complete the stormwater pumping stations to best serve PVSC for decades to come.

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Section 2

Technical Competence

The CH2M team provides stormwater pumping station design experts, modeling specialists, and staff experienced at working together to deliver stormwater pump station design and design during construction. Our team is ready to collaborate with PVSC and promises immediate responsiveness to implement this important project.

In the wake of the events of Superstorm Sandy, PVSC will install a perimeter flood wall and associated stormwater pumping stations at its wastewater treatment plant to protect its vital assets, as well as the environment. Our team members, led by local Project Manager Shivani Patel, PE, have extensive relevant experience on elements that impact long-term project success: detailed design criteria for pumping stations, operator safety procedures, design and construction of structures in local conditions, and a deep understanding of the critical plant facilities that must be kept operational. PVSC can be confident our team will meet the critical requirements of this project:

- Stormwater planning, modeling, and design expertise throughout the U.S. and the world—offering lessons learned and innovative solutions from projects of similar size, scope, and complexity, and assuring an in-depth knowledge of stormwater permitting and regulatory requirements, and geographic conditions
- Local, New Jersey-based team with proven project success working together, including successfully delivering pump stations in the Northeast and the ability to integrate the pump station design with the floodwall design, thereby benefitting PVSC with streamlined delivery
- Firsthand knowledge of PVSC's infrastructure, systems and PVSC's staff gained from previous experience— reducing the learning curve and improving project delivery, efficiency, and cost savings
- Deep bench-strength with respected professionals and experts both in the Northeast and worldwide to deliver three concurrent pump station designs to maintain an optimal schedule for PVSC
- A long history of success on physical modeling with key teaming partner, Alden Labs, assuring PVSC an integrated team

Geographical Location Enhances Responsiveness and Facilitates our Commitment to PVSC

CH2M's local office is within 20 miles of the project site and approximately 30 minutes from PVSC's office. With this close proximity, PVSC will benefit from a truly local team who will efficiently collaborate with your staff and deliver the design (Exhibit 2-1). In addition to our local team, we can draw from the more than 730 staff located throughout our Northeast offices, as well as from the more than 22,000 CH2M employees worldwide who stand at the ready to successfully deliver this project for PVSC.

Our Project Manager, Shivani Patel, PE, is fully committed to PVSC for the duration of the project, and lives within 30 minutes driving distance from PVSC. Locations of our other key staff are noted on their biographies.

Exhibit 2-1: PVSC will benefit from CH2M's truly local team, who will efficiently collaborate with your staff to deliver the design

Team Organization

Project Manager Shivani Patel, PE brings to PVSC the technical expertise, leadership skills, and project experience to achieve project success. She recently led the same design team on our organization chart for four Wet Weather Pump Stations, ranging in size from 52-250 mgd —this team stands ready to work together again for PVSC!

Our team is organized to provide a clear line of responsibility and accountability from Project Manager Shivani Patel, PE to PVSC's project manager, Al Perry. Shivani was chosen to lead this project because she is a strong project manager with the technical expertise, leadership skills, and project experience to achieve

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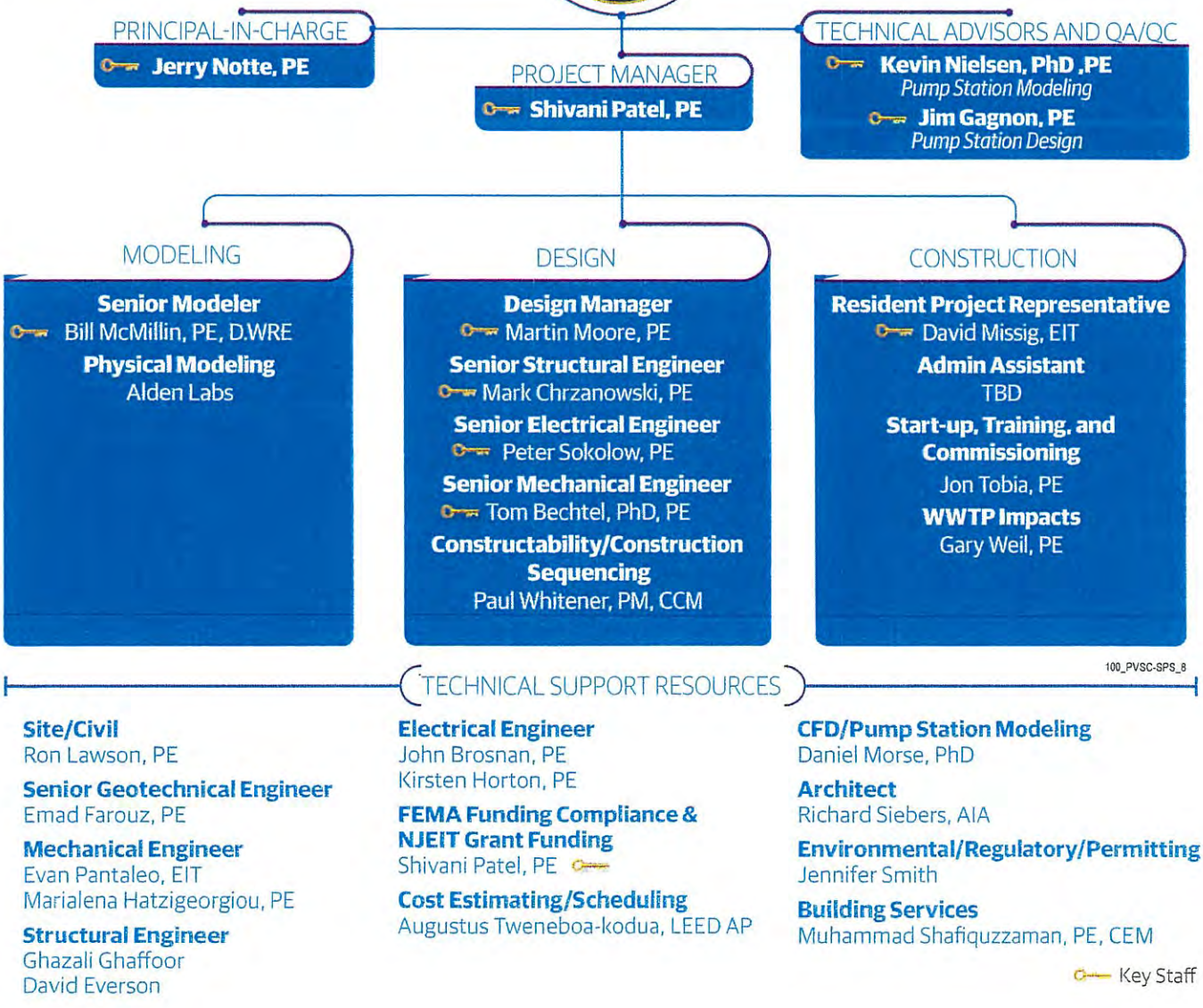
project success for PVSC. In fact, Shivani recently served as project manager— leading the same design team proposed for this project —for four Wet Weather Pumps Stations, with two of these pump stations constructed in the City of Hoboken for the North Hudson Sewerage Authority (NHSA). With Shivani's extensive knowledge of the projects' service area and her interpersonal skills to engage and coordinate with not only the CH2M team, but also the stakeholders, public agencies, and members of the community, the City of Hoboken has enjoyed success in alleviating flooding in areas that historically flooded during storm events that coincide with high tide. Under Shivani's leadership, these recent, relevant projects were all delivered on budget and on schedule. Similar to her recent role for NHSA, Shivani will provide oversight and technical leadership over the entire project lifecycle, and be the primary point of contact to PVSC.

Our team's organization under Shivani's leadership is shown in Exhibit 2-2. The personnel we carefully have selected for this project have the experience and knowledge and have been organized to address the Scope of Work items in your RFP. Our senior engineers will be responsible for the direct day-to-day oversight of work performed by our engineers; the work will be performed depending on the most efficient design delivery.

An introduction to our other key team members follows our organization chart later in this section.

Exhibit 2-2: Organization Chart



CH2M and Alden have partnered on similar projects to bring to our clients world-class design expertise and modeling capabilities.

In partnership, our firms delivered:

- Water Technologies Screen Testing
- Tarrant Regional Water District CFD and Physical Modeling of Integrated Pipeline Project Booster Stations

With Alden as a subconsultant to CH2M, our firms collaborated on:

- King County Brightwater Influent Pump Station Physical Model
- King County Brightwater Treatment Plant Weir Physical Model (2 separate contracts)
- Sacramento EchoWater Primary Effluent Pump Station Physical Model
- Lane City, TX Relift Pump Station Physical Model
- King County Georgetown Influent Pump Station Physical Model
- Dayton, WA Little Goose SFB Sectional Model

Physical Modeling

Based on our strong working relationship (Exhibit 2-3) and their recognized expertise in physical modeling, we have added Alden Research Laboratory (Alden) to our team.

Established in 1894, Alden is the oldest continuously operating hydraulic laboratory in the United States and one of the oldest in the world. Alden offers specialized services in modeling (flow, physical scale, and numerical); component testing, feasibility studies, flow meter calibration, and field data collection. With a keen understanding of scaling laws and empirical guidelines, Alden has been building geometric scale physical models for more than 120 years.

A recognized leader in the field of fluid dynamics consulting, research, and development, Alden has conducted numerous hydraulic model studies of water treatment facilities, including diversion chamber and regulating structure, screening and grit facilities, pump stations and others. The firm has conducted considerable research in the area of vortex formation and suppressors, and scale effects on vortices in Froude models. Alden's employees regularly present papers on scale effects on vortex flows and other topics related to intakes at various national and international meetings, and haven been published in ASCE journals and proceedings. The firm conduction generic testing to determine flow characteristics in containment pump sumps, and these test results led to revised NRC regulatory guidelines. Alden's former president is a past Chairman of the ASCE Task Committee on Intake Vortices and the Task Committee for Standards in Hydraulics. In addition, Alden staff members have written chapters for various handbooks and manuals on pump intakes and swirling flow and currently are serving on the HI Intake Design Standards Committee for pump sumps.

Background and Qualifications of Key Staff

On the following pages, we describe the qualifications of our key staff, including professional accomplishments, and geographic location.

Shivani Patel, PE

Role: Project Manager

Education: BS, Environmental Engineering

Training/License: Professional Engineer: NJ, CA

Years of Experience: 17

Location: Parsippany, NJ

Scope of Work Tasks: 1-10

Shivani was hand-selected to serve as project manager for this PVSC pump station project based on her strong project management skills and similar experience. With more than 17 years of directly relevant experience, Shivani has managed or held key roles on similar projects in New Jersey and the Northeast. For example, she served as the Project Manager for North Hudson Sewerage Authority's four Wet Weather Pump Station projects, with capacities from 52-100 mgd. Similar to this PVSC project, the North Hudson pump stations will alleviate flooding in Hoboken during wet weather events. As project manager, Shivani managed CH2M's design services from the planning stages through construction contract documents. She closely coordinated with NJ Transit, Hudson County Engineer's Office, City of Hoboken, Port Authority of New York and New Jersey due to the location of one of the pump stations near bus and train terminals and tracks. She also obtained permits from local/state agencies (Waterfront Development, Treatment Works Approval, Soil Erosion and Sediment Control, and U.S. Army Corps of Engineers signoff), obtained funding through the NJDEP state revolving loan fund, coordinated with stakeholders, and procured easements with property owners.

In another example, Shivani served as the project manager for design services from planning to final construction documents and for engineering services during construction for upgrades and expansions to the Hartford MDC's wet weather treatment facilities, with average capacities from 120 mgd to 200 mgd. Under this contract, she managed the design of eight new Dual Use Primary Clarifiers; a 200 mgd Combined Effluent Pump Station, with the possibility of future use up to 250 mgd; Odor Control System Preliminary Design; and cost estimating for the entire wet weather program. Shivani will draw from best practices and lessons learned on these and her other relevant projects to achieve success on this PVSC project.

Rounding out Shivani's qualifications are her experience in design and management of water and wastewater improvement projects, including traditional and innovative designs of water and wastewater facilities. This includes project management, permitting, development and review of construction plans, preparation of specifications and construction management. She has a broad range of design experience in the civil and environmental engineering field. She has over 10 years of experience with working with NJDEP and NJEIT for State Revolving Loan Fund projects.

Jerry Notte, PE

Role: Principal in Charge

Education: BS, Civil Engineering; BS, Biology/Chemistry

Training/License: Professional Engineer; NJ, NY

Years of Experience: 35

Location: Parsippany, NJ

Scope of Work Tasks: 10

As principal-in-charge, Jerry will provide accountability to PVSC and will make sure Shivani and our project team have the resources they need to successfully deliver design services and design services during construction for this stormwater pumping stations project. Knowledgeable of your facilities, operations, procedures, and staff, Jerry served as principal-in-charge for PVSC's Sodium Hypochorite Storage Facilities Upgrade Project and Newark Bay Outfall Dechlorination Facilites Project. As a lifetime resident of New Jersey, Jerry understands the importance of this project, having helped his clients and friends cope with the damages of Superstorm Sandy. For example, he worked with CH2M's operations group to help the North Hudson Sewerage Authority prepare for, respond to, and recover from Superstorm Sandy damages to the wastewater facilities after being inundated from 14-foot storm surge. For PVWC, he was Program Manager for its $150 million Emergency Power and Water Storage Program. A former general manager for the North Jersey District Water Supply Commission, he directed over $350 million in capital improvements and addressed risk management, NJ stakeholder liaison, and downstream flooding and resiliency issues, including flood control design and operations.

Bill McMillin, PE, D.WRE

Role: Senior Modeler

Education: MEE, Environmental Engineering, BCE, Civil Engineering

Training/License: Professional Engineer; NJ Diplomate, Water Resources Engineer

Years of Experience: 30

Location: Parsippany, NJ

Scope of Work Tasks: 3

Based in Parsippany, Bill is a senior modeler who has led or held a key position on PVSC projects for more than 20 years, bringing a unique familiarity of your facilities, operations, procedures, and staff. He has a broad base of public and private sector experience in delivering evaluations, planning, design, and implementation of water resources, collection system, wastewater treatment, and environmental management projects. Bill is experienced in the regulatory, planning, design and implementation aspects of wet weather flow management. He participated in authoring federal guidance documents for CSO controls and professional publications on wet weather management and related use attainability analyses. He has voluntarily assisted the State of New Jersey in developing its CSO policies and permits for long-term control planning, and has extensive experience in working with local and state agencies for conducting projects that address regulatory and permit compliance issues. In the past five years, he has led climate resilience evaluations and planning efforts for more than 30 water and wastewater utilities, including PVSC, New York City, Boston, Los Angeles, Portsmouth (NH), and Newport (RI). He served on the EPA's Environment Technology Valuation (ETV) technology panel for Wet Weather Modeling. In addition to his involvement

in professional society activities and public education, he has served on the Manhattan College Dean of Engineering's Consulters Committee in New York City.

Martin Moore, PE

Role: Design Manager

Training/License: Professional Engineer: VA

Location: Chantilly, VA

Education: BS, Engineering Technology

Years of Experience: 29

Scope of Work Tasks: 1, 4 - 6

Martin has nearly three decades of experience in pump station and large-scale water/wastewater facility design and construction administration projects in the United States and Canada. He has managed the design of anaerobic digester systems, pumping stations, and other related treatment plant facilities from concept to initial operations, often coordinating the work of large, multi-discipline design teams. He is knowledgeable in complex construction sequences and construction around operational facilities and has procurement experience with a variety of models, ranging from equipment sole source, per-select, pre-purchase, and bidding and negotiation of construction contracts. Recently, Martin served as Design Manager for North Hudson Sewerage Authority's Wet Weather Pump Stations project in Hoboken, whose scope of work is similar to this one. In that role he managed the design for the following pump stations: H5 (80 mgd) Wet Weather Pump Station; H3/H4/HSI (80 mgd) Wet Weather Pump Station; H6/H7 (52 mgd) Wet Weather Pump Station; and H1 (100 mgd) Wet Weather Pump Station and screening facility.

David Missig, EIT

Role: Resident Project Representative

Training/License: Engineer-in-Training

Location: Parsippany, NJ

Education: MS, Construction Management, BS, Environmental Engineering Technology

Years of Experience: 21

Scope of Work Tasks: 6

Dave is a New Jersey resident with more than 21 years of directly relevant project experience, including providing Resident Project Representative (RPR) and construction phase services, ranging from construction management, inspection, and resident engineering for large, complex water and wastewater projects. Dave's construction experience with projects of similar scope and magnitude will be of value to PVSC as the RPR. He served as a resident engineer for North Hudson Sewerage Authority, including facilities installed to address storm/wet-weather events and provided construction management support for the largest Ultraviolet disinfection plant in the world—the $1.4 billion Cat/Del Ultraviolet Water Disinfection Facility for the NYC Department of Environmental Protection. His career has spanned wastewater treatment plant construction, design and inspection, combined sewer overflow systems design and construction, sanitary sewer design-rehabilitation and construction, with responsibilities typically involving construction management; construction inspection; design implementation of drawings and specifications; design review; shop drawing reviews; coordination between contractors, subcontractors, other engineers, operators, and the owner. He also performs redesigns in the field; responds to technical requests for information; prepares request for quotations, work change directives, and field orders; prepares and reviews change orders; assists with claims negotiations and in preparing as-built drawings. He processes contractor's monthly payment applications; conducts monthly progress meetings; prepares weekly project status reports; and maintains contractor's schedule and budgets.

Mark Chrzanowski, PE

Role: Senior Structural Engineer

Training/License: Professional Engineer: NY, PA, CT, OH, NC, GA, AL, MI

Location: Gainesville, FL

Education: BSCE, Structural Engineering and Construction Management, University of Cincinnati

Years of Experience: 35

Scope of Work Tasks: 1, 2, 4, 5

As a Senior Structural Engineer and Technologist, Mark provides PVSC the benefit of 35 years of experience that include the design and construction of facilities associated with water and wastewater treatment throughout the United States. His experience encompasses a diverse spectrum of capabilities including practicing lead structural engineer, structural quality control reviewer, technology

management, front-line management, program management, and project management, as well as experience gained from being a co-founder and former principal of a structural consulting firm. Mark is fluent in the design of the overall structural system using a variety of materials including concrete, masonry, steel, aluminum and wood. He also possesses extensive knowledge in concrete materials, structural condition assessment and rehabilitation, and repair of concrete construction. Through his involvement at the national level of the American Concrete Institute, Mark investigates technological advances in the concrete industry that bring additional value to CH2M's global enterprises and more importantly to clients.

Pete Sokolow, PE

Role: Senior Electrical Engineer

Education: BS, Electrical Engineering

Training/License: Professional Engineer: NJ, NY, PA, DE

Years of Experience: 48

Location: New York, NY

Scope of Work Tasks: 1, 2, 4, 5

Pete brings to PVSC a 48-year career specializing in engineering, permitting, and construction for power distribution and generation for public utilities, including pump stations, water, and wastewater facilities. He led the electrical engineering portion of Climate Resiliency report for wastewater facilities in the five boroughs of New York, conducting a thorough infrastructure investigation and recommending necessary storm resiliency improvements. He brings a thorough understanding of PVSC facilities, having served as electrical engineer for the WAS Pump Station Alternatives Study, Raw Water Pumping Station Upgrade, and Little Falls Water Treatment Plant Power Distribution System projects. His wide range of experience includes medium voltage substations, low voltage switchgear distribution apparatus and motor control centers, and supervision of electrical apparatus shutdown and alteration to equipment with minimal interruption to plant operations. Mr. Sokolow is familiar with electrical distribution switchgear (34.5KV, 26.4KV, 4.16KV, 480VAC and 120/208VAC) including 480 VAC Motor Control Centers (MCC) and 4.16KV MCC with variable frequency drives

Tom Bechtel, PhD, PE

Role: Senior Mechanical Engineer

Education: PhD, Chemical Engineering; MS, Mechanical Engineering, BS, Chemical Engineering

Training/License: Professional Engineer: OH, IL, IN, MI

Years of Experience: 20

Location: Columbus, OH

Scope of Work Tasks: 1, 2, 4, 5

Tom is a senior engineer with more than 20 years of experience in chemical and mechanical engineering. Throughout his career, he has focused on providing mechanical and chemical engineering for water and wastewater clients throughout the United States. For example, over the past few years he has been serving as the Design Engineer for various project for the District of Columbia Water and Sewer Authority's Blue Plains AWTP. In this role, he was responsible for hydraulic modeling and the design of all pumping stations, as well as services during construction. He has been the author or co-author for numerous papers and articles, many focused on the design and treatment of water and wastewater facilities. He is adept in contract drawing and specification preparation; chemical and mechanical system modeling and calculations; process equipment layout and design; and construction phase engineering services.

Kevin Nielsen, PhD, PE

Role: Technical Advisor – Pump Station Modeling

Education: PhD, Civil and Environmental Engineering; MS, Civil and Environmental Engineering; BS, Civil and Environmental Engineering

Training/License: Professional Engineer: ID and MT

Years of Experience: 32

Location: Corvallis, OR

Scope of Work Tasks: 1-10

Kevin specializes in fluid mechanics, hydraulic design, hydrology studies, and environmental water resources project planning. He is experienced in the design and study of water control and conveyance

systems and has been responsible for several hydrologic studies. He has worked on feasibility studies and final design of projects for storm drainage, flood control, hydroelectric power development, dams, hydraulic structures, irrigation, fish hatcheries, fish passage, stream stabilization, municipal water supply, wastewater treatment, and transportation. He has participated in Value Engineering (VE) studies to review designs associated with river protection and control structures, energy dissipation, pipeline and pump station systems, and several other associated hydraulic components. He has also been involved in the preparation of environmental assessments and environmental impact statements. Dr. Nielsen is currently CH2M's global hydraulics leader for hydraulic transient analysis, application of computational fluid dynamics (CFD), and advanced hydraulic modeling, evaluation and design.

Jim Gagnon, PE

Role: Technical Advisor – Pump Station Design

Education: MS, Environmental Engineering, BS, Civil Engineering, University of Massachusetts

Education: Training/License: Professional Engineer: MA, OH, KY, MI

Years of Experience: 21

Location: Cincinnati, OH

Scope of Work Tasks: 1-10

Jim is a senior engineer specializing in environmental and process engineering and has 21 years of experience in treatment plant and pumping station operational evaluations and process systems optimization as well as design, construction administration, and research for various civil, water, wastewater and odor control projects. His primary responsibilities currently include process and hydraulic evaluations; process and equipment selection and review; process and civil systems design; detailed design and specifications preparation; and construction phase administration. Prior to joining CH2M, Jim worked as a Project Manager responsible for the design and construction phase engineering services for water and wastewater facility projects throughout the Northeast.

Rounding out our Modeling, Design, and Construction teams are carefully selected professionals who offer PVSC technical competence and experience in their respective fields (Exhibit 2-4).

Exhibit 2-4: Additional Staff

Name & Title	Years of Experience	Why Selected?
Daniel Morse, PhD CFD/Pump Station Modeling	13	• PhD in mechanical engineering with expertise in CFD analysis and the application of fundamental fluid mechanic principles to solve difficult engineering problems • Responsible for advanced hydraulic analysis of projects related to large municipal pump station design and modifications to wastewater facilities
Evan Pantaleo, EIT Project Engineer	5	• Based in Parsippany, recent project experience includes emergency recovery work associated with Super Storm Sandy, and design of headworks facilities including pump stations • Familiar with PVSC, having recently served as Design Lead for the Sodium Hypochlorite Storage Facility Improvements project
Paul Whitener, PE, CCM Constructability/ Construction Sequencing	30	• Certified Construction Manager (CCM) and CM Practice Lead for CH2M, brings established CM best practices and a proven quality program to PVSC • Responsible for construction management and design/build construction project operations for large water/wastewater projects with similar scopes of work
John Tobia, PE Start-up, Training, and Commissioning	31	• Based in Parsippany, NJ, career focused on municipal water and wastewater design and construction management projects • Design experience includes design management, senior technical reviews and Engineer-of-Record responsibilities for pumping stations, wastewater treatment plants, and water distribution systems
Gary Weil, PE WWTP Impacts	38	• A NJ PE with 38 years of experience managing pump station and wastewater projects, with construction values up to $250M, and capacities up to 370 mgd • Understands and designs for stormwater management on every wastewater facility; for DC Water's ENR Facilities at Blue Plains Advanced Wastewater Treatment Plant, commissioned and oversaw subconsultant design and installation of a 1,000 foot-long floodwall to provide flood protection from a 500-year storm event

Section 3

Experience

The CH2M team's pumping station expertise coupled with our hydraulic and physical modeling experience and know-how in delivering under a programmatic environment will result in a project that achieves PVSC's needs and objectives.

It is vital that PVSC's stormwater pump stations provide long-term resiliency to your facilities. We share this goal—we have delivered similar projects in response to Hurricane Katrina and regionally following Hurricane Sandy. PVSC can be confident in this team:

- We will manage project risks through verification of the project's predesign
- Assure application of Hydraulic Institute standards
- Optimize design features based on extensive pump station design experience

We will keep PVSC engaged and collaborate through every phase and milestone decision, providing seamless project delivery and reduced impact on your staff.

The proposed stormwater pumping stations will establish a more resilient WWTP system for the region, improving reliability and operability by providing a stormwater management system that works in conjunction with the planned floodwall. As the project moves from preliminary design into design and then construction, PVSC must be confident that the team selected is able to:

- Validate the work completed to date,
- Model and design three stormwater pumping stations that meet Hydraulic Institute standards, and that will provide protection from the 100-year, 24-hour rainfall event,
- Include in the design the operability and access required by your facility that is one the nation's largest WWTPs,
- Provide construction management support that reduces impact on PVSC's operations and staff.

The team must also ensure the project will interface with other ongoing projects delivered as part of PVSC Flood Mitigation Program, and complies with FEMA funding requirements. Advancing this project requires expertise in physical and hydraulic modeling as well as stormwater pump station design, a deep understanding of how the pump stations and floodwall designs will interact with each other, an understanding of federal funding requirements, and an unwavering commitment to meeting the schedule, and expediting it to the extent possible.

The CH2M and Alden Team fully meet PVSC's Experience Criteria:

Familiarity with the Work, Requirements, and Procedures of PVSC. Our team has an almost 20 year working history with PVSC. We are thoroughly familiar with the plant, its staff, and the plant's operations, as well as the design objectives of the pumping stations.

Prior Experience with Public Entities and/or Governmental Agencies. CH2M has a strong work history serving public sector agencies, including in New Jersey, for decades and in supporting client projects funded by FEMA.

Team Experience in Design of Stormwater and Sewage Pumping Stations (Minimum 10 Years). CH2M's extensive expertise in stormwater and sewage pumping stations providing a portfolio of stormwater, wastewater and wet weather pumping stations designed and built around the world (see Exhibits 3-1).

Staff Experience In Modeling and Design of Stormwater and Sewage Pumping Stations. Our modeling and design team, as shown in Section 2, offers a full range of integrated expertise as required for this project, including hydraulic and physical modelers, proven project and design managers, experienced design discipline leads and construction management expertise.

History of Successful Projects, Similar in Size and Scope, including References: A select group of projects that demonstrate the depth and breadth of the team's experience is presented at the end of this chapter.

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In order to model, design and construct three stormwater pumping stations that will work in conjunction with the proposed floodwall and provide PVSC with the

required protection from the 100-year, 24-hour rainfall event, CH2M has developed a team that brings all of the elements necessary to achieve PVSC's objectives:

- Extensive stormwater, wet weather and wastewater pump station design experience
- Excellent physical and hydraulic modeling capabilities to ensure that the design achieves all Hydraulic Institute requirements and PVSC's stated objectives
- Experience delivering to PVSC and within the New Jersey regulatory environment
- The ability to deliver projects that meet all FEMA funding requirements and can be delivered in a programmatic environment

Demonstrated Experience in Design Services & Design Services During Construction

Consistently ranked by *Engineering News*-Record as a leader in wastewater system planning, design, and construction, CH2M's experience includes some of the largest and most complex pump stations ever built, including the award winning H1 wet weather pump station for North Hudson Sewerage Authority (NHSA). We bring large pump station experience with similar project aspects to PVSC, including innovative pump control concepts, physical hydraulic modeling, 3D design, and collaboration within a program. Our reputation for delivery excellence is based upon our dedication to meet schedule and budget requirements, as well as our unwavering commitment to quality. We integrate innovation and sustainable practices into our designs to produce long-term assets.

CH2M is a leader in the field of conveyance, pumping and transmission infrastructure technology. We have more than 200 professionals dedicated to the planning and design services for facilities that include pump stations, combined and separate wastewater collection systems, lift stations, storage, transports, combined sewer overflow (CSO)/sanitary sewer overflow (SSO), wet weather, outfalls, stormwater collection and related facilities. Our staff holds key industry positions with many national engineering societies, including the American Society of Civil Engineers' Pipeline division, American Water Works Association, Water Environment Federation, North American Society for Trenchless Technology, and the Environmental and Water Resource Institute.

CH2M has designed more than 2,000 conveyance and pumping systems, giving us the experience to find better design solutions to any conveyance problem. Our firm maintains a team with expertise in conveyance systems dedicated exclusively to delivering a core set of capabilities to address the specific needs of conveyance projects. CH2M has extensive experience specializing in master planning, hydraulic modelling, sanitary sewer evaluation studies, regulatory compliance, flow monitoring, design, and operations and maintenance. CH2M and our team members have extensive knowledge of federal, provincial, municipal and other utility owner bylaws/approvals/permitting requirements.

Hydraulic and Physical Modeling Experience Resulting in Achieving Hydraulic Institute Requirements

The CH2M and Alden team provides extensive hydraulic physical modeling experience resulting in conformance with Hydraulic Institute requirements and assurance that the stormwater pump station designs will achieve PVSC's flood protection objectives

Through our decades of hydraulic physical modeling experience, CH2M and Alden have learned and proven that modeling during design results in a reliable design that achieves Hydraulic Institute requirements and is optimized for efficiency during operations. As shown in Section 2, CH2M and Alden have worked together on several physical modeling projects, including Hartford MDC combined effluent pump station.

In addition to our experience in developing physical models with Alden Labs, CH2M has a decades long history of developing hydraulic models to confirm

Exhibit 3-X CH2M has extensive stormwater and wastewater pumping station design and construction experience that we will bring to PVSC's project. This table provides a sampling of some of our recent project experience that inclues a range of pumping station capacities with project elements that are especially applicable to PVSC's project.

Project Name, Client & Location	PVSC Stormwater Pumping Station Design and Services Required Project Elements									
	Pump Station Capacity (mgd)	Physical Hydraulic Modeling	CFD/Other Hydraulic Modeling	Stormwater/Wasterwater/ Wet Weather Pumping Station Design	Permitting	Cost Estimating	Design Services During Construction	Resident Project Representative/Resident Inspection	Coordination with Program Manager or Other Coordinated Projects
Engineering, Design and Construction for Wet Weather Pump Stations	50, 40, 40, 26 (156 total)	✓	✓	✓		✓	✓	✓	✓
North Hudson Sewerage Authority (4 pumping stations)	250	✓	✓	✓		✓	✓		
Hudson County, NJ	100, 80, 80, 52 (312 total)		✓	✓	✓	✓	✓	✓	
Hartford Water Pollution Control Facility Wet Weather Expansion Project	10			✓		✓			
Hartford Metropolitan District Commission, Hartford, CT	250	✓	✓	✓	✓	✓	✓		✓
Rocky Hill Water Pollution Control Facility Upgrade	66 total pumping stations			✓	✓			✓	
Hartford MDC, CT	27- primary effluent PS		✓	✓			✓	✓	✓
21 – stormwater PS (90% design only)			✓	✓	✓	✓			
Flood Protection for Central Treatment Plant	400	✓	✓	✓			✓	✓	
City of Tacoma, WA	10			✓	✓				✓
Lower Mill Creek Partial Remedy Phase 1 Tunnel Deep Pumping Station, Cincinnati, Ohio	84, expandable to 168		✓	✓	✓	✓			
Appraisal, Design and Supervision of Altmouth and Crossens Pumping Stations, Environmental Agency, United Kingdom	214		✓	✓		✓	✓	✓	
Blue Plains Advanced Treatment Facility Influent Pumping Station, District of Columbia Water and Sewer Authority, Washington D.C.	900	✓	✓	✓	✓	✓			✓
Stormwater Infrastructure Improvements Program Central Bayshore and Lake Pancoast, City of Miami Beach, FL	7.2 each			✓	✓	✓			✓
Thames Tideway Deep Shaft Pumping Station for Lee Tunnel, United Kingdom	400	✓	✓	✓		✓	✓		✓
Derek Guthrie Pumping Station, Louisville MSD, Louisville, KY	250		✓	✓	✓	✓	✓	✓	✓
Flat Branch Pump Station, UOSA,	105			✓					
Sulphur Springs Pump Station, City of Tampa, FL	28		✓	✓	✓	✓	✓		
Donut Pond Pump Station, City of Tampa, FL	65		✓	✓	✓		✓		
Bonita Springs West WRF, Bonita Springs, FL	17.5		✓	✓	✓		✓		
North Oconee Pump Station, Athens, GA	30		✓	✓	✓		✓		
Fort Benning Pump Station, Columbus, GA	20		✓	✓	✓		✓		

Project Name, Client & Location	PVSC Stormwater Pumping Station Design and Services Required Project Elements								
	Pump Station Capacity (mgd)	Physical Hydraulic Modeling	CFD/Other Hydraulic Modeling	Stormwater/Wastewater/Wet Weather Pumping Station Design	Permitting	Cost Estimating	Design Services During Construction	Resident Project Representative/Resident Inspection	Coordination with Program Manager or Other Coordinated Projects
Lakeview Pump Station, SD1 of Northern Kentucky, KY	22.7		✓	✓			✓		
Narrows Rd Diversion Pump Station, SD1 of Northern Kentucky, KY	17		✓	✓	✓		✓		
ASA Advanced WTF, Alexandria, VA	72		✓	✓	✓		✓		
Southerly WWTP, Columbus, OH	210		✓	✓	✓		✓		
Blue Plains WWTP, DCWASA, Washington, DC	890		✓	✓	✓		✓		
Broad Run WRF, Loudoun Water, VA	180		✓	✓	✓		✓		
Cox Creek WRF, Anne Arundel Co., MD	15		✓	✓					
Noman Cole, Jr. PCP, Fairfax County, VA	67		✓	✓	✓		✓		
Piscataway WWTP BNR, Accokeek, MD	30		✓	✓	✓		✓		
Atherton WWTP, Independence, MO	52		✓	✓	✓		✓		
Beloit WWTF, Beloit, WI	18		✓	✓	✓		✓		
Columbia Boulevard WWTP, Portland, OR	100		✓	✓	✓		✓		
Green Bay WWTP, Green Bay, WI	49		✓	✓	✓				
Hyperion WWTP, Los Angeles, CA	400		✓	✓	✓		✓		
Jones Island WWTP, Milwaukee, WI	120		✓	✓	✓		✓		
Morris Forman WWTP, Louisville, KY	105		✓	✓	✓		✓		
North WWTP, Memphis, TN	150		✓	✓	✓		✓		
Wayne F. Hill WRP, Gwinnett County, GA	40		✓	✓	✓		✓		
West Point WWTP, Seattle, WA	120		✓	✓	✓		✓		
Changi WRP, Republic of Singapore	1057		✓	✓	✓		✓		
Foss Flood Defense Barrier Pumping Station Recovery Scheme, Environment Agency, York, United Kingdom	0.3	✓	✓	✓					
Influent Pump Station Replacement Project, Roseville, CA	54		✓	✓		✓	✓	✓	
WRP 4 and 7 Headworks Screened Influent Pump Stations, Coachella Valley Water District	40		✓	✓	✓	✓	✓		
Upper Rowlett Creek/Upper Cottonwood Creek Lift Stations Improvements, North Texas Municipal Water District, Wylie, TX	25 and 56		✓	✓		✓	✓		

design elements and identify opportunities for design improvements that will enhance reliability, operability and efficiency. **Exhibit 3-1** highlights a sampling of pump station design projects for which CH2M provided modeling services.

Construction Management Experience in Support of Design Activities

The CH2M team provides full-service capabilities from design through start-up and commissioning; our design services during construction and resident project representative experience will support successful delivery

Design services during construction are a routine extension of our design for infrastructure projects, as reflected in **Exhibit 3-1**. Additionally, our team

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"CH2M has brought together for PVSC many of the same team members that designed the award winning H1 wet weather pump station for NHSA, including Shivani Patel (PM), Bill McMillin (Modeling Lead), Martin Moore (Design Manager, not in picture) and Dave Missig, (Resident Project Representative). This team is experienced in working together to deliver pump station designs in New Jersey."

provides construction management through a resident project representative and support staff. As the No. 1 ranked Construction Management/ Program Management firm in 2016 as determined by Engineering News-Record, CH2M has successfully managed construction of more than $24B in water and wastewater projects. Since 2005, the Construction Management Association of America (CMAA) has awarded CH2M 17 Project Achievement Awards, earned through industry-leading construction management practices that will also be applied for PVSC. While our construction phase services are provided around the world, such as at one of the world's largest wastewater facilities, the $2 Billion Changi WRF in Singapore, we highlight below some of our recent projects completed in the Tri-State area:

- North Hudson Sewerage Authority Complete CSO Engineering Services – Providing construction management, inspection, and resident engineering services (in addition to design/engineering services) for this $44 million capital improvement program that included 2 wet weather pumping stations
- Nassau County Bay Park WWTP Upgrades Construction Management Services ($13.2M capital cost)
- NYCDEP Catskill/Delaware Ultraviolet Disinfection Facility - Construction manager for $1.4 billion program for the world's largest UV plant
- NYCDEP Citywide Wastewater Infrastructure Construction Management Services ($315M in capital costs)
- City of Stamford Water Pollution Control Plant Upgrade and Expansion – Provided construction management, inspection and resident engineering (in addition to design/engineering services) for this award winning $105 million upgrade and expansion program.

Projects like PVSC's Stormwater Pumping Stations involve complex engineering and construction assignments in densely urban and heavily trafficked areas, requiring innovative approaches to mitigate traffic impacts reduce construction duration, and reduce interference with ongoing construction contracts. PVSC can have confidence that regardless of the construction issue or controls challenge, we have the tools, skills, and people to ensure construction is completed in a collaborative manner.

History with PVSC Provides Ability to Meet Schedule with Minimized Learning Curve

In addition to our stormwater pumping station design experience, CH2M is the No. 1 ranked engineering and design, construction management/program management wastewater firm in the world. As program managers, we understand the role of the design engineer in a complex, multi-contract project. We have worked with PVSC's Program Manager on numerous other wastewater programs, and we look forward to working collaboratively with them to achieve PVSC's goals for this project.

Working knowledge of PVSC's facilities, preferences, and organization is an essential ingredient to project success, and one that our team offers. Our experience at your facility, and the trust built over many years, will support collaboration with your staff and efficiency of project delivery through a deep understanding of your facility operations, site conditions, and design standards. We have successfully completed or are implementing a number of projects for PVSC, as illustrated by the Newark Bay Outfall Dechlorination Facility and the Sodium Hypochlorite Storage Facilities Upgrade that CH2M has performed for PVSC.

Relevant Project Highlights

- Investigation and evaluation of existing facilities and operations provided CH2M with in-depth knowledge of PVSC's processes
- Reviewed operational records, record drawings, and field conditions to determine the most practical facility design for implementation of chemical dechlorination

Key Staff: Shivani Patel, Jerry Notte, Evan Panteleo, John Tobia, Augustus Tweneboa-kodua, and Tom Bechtel

Newark Bay Outfall Dechlorination Facility, Passaic Valley Sewerage Commission, Newark, NJ

To prepare for impending NJPDES permit requirements, PVSC needed to evaluate options for dechlorination of wet weather diversions to the Newark Bay outfall (002). At the same time, evaluation of upgrades to the existing facilities for storage and conveyance of sodium hypochlorite used in effluent disinfection were needed due to high maintenance requirements. These facilities are increasingly important as PVSC implements various improvements for increasing the wet weather capacity of their wastewater treatment facility to 720 MGD. The scope of work included the investigation of the existing facilities, evaluation of facility options, and recommendations for improvements based on CH2M's experience with numerous similar facilities. These recommendations were made recognizing the importance of maintaining reliable operations, continuous permit compliance throughout the project implementation, and providing the lowest lifecycle cost to the PVSC rate-payers.

Regarding the Newark Bay outfall, CH2M reviewed operational records, record drawings, and field conditions to determine the most practical facility design for implementation of chemical dechlorination. The CH2M preliminary design team had successfully completed similar improvements at large facilities for more than 30 clients in the past. This experience provided them the insight to incorporate the necessary features and design standards to provide ease of operation and years of reliable use.

The findings of the investigations were summarized in a single Preliminary Design Report. The report included copies of all data referenced in the development of the recommendations, applicable standards and references, preliminary specifications and facility layouts, and cost estimates.

CH2M's working relationship with PVSC will allow for ease of coordination on future projects.

Relevant Project Highlights

- Evaluated storage and feed capacities under various operating scenarios
- Designed 150,000 gallons of sodium hypochlorite storage
- Specified Fiberglass Reinforced Plastic Institute (FRPI) standards

Key Staff: Shivani Patel, Jerry Notte, Evan Panteleo, Richard Siebers, John Tobia, Augustus Tweneboa-kodua, and Tom Bechtel

Sodium Hypochlorite Storage Facilities Upgrade Passaic Valley Sewerage Commission, Newark, NJ

PVSC owns and operates a 330 mgd pure oxygen-activated sludge secondary wastewater treatment plant serving approximately 1.4 million people, 225 significant industrial uses, and 5,000 commercial users. PVSC serves 48 towns and cities located in portions of Bergen, Essex, Hudson, Union, and Passaic counties, including Newark, Jersey City, Patterson, and Passaic.

PVSC's disinfection facilities include storage and conveyance systems for sodium hypochlorite solution used as a disinfectant for secondary treatment effluent prior to discharge. PVSC's sodium hypochlorite storage facilities consist of five 30,000-gallon fiberglass-reinforced plastic (FRP) tanks that store 15 percent active sodium hypochlorite solution. The tanks were fabricated in 1997 by Augustus Fiberglass and have been in service ever since. One of the five storage tanks, Tank No. 4, is out of service due to reliability concerns and ongoing repair costs.

PVSC initiated design services as a proactive measure intended to provide continued reliable disinfection of their secondary treatment effluent. Other aspects of the disinfection facilities were evaluated and incorporated as key elements to this project:

- Evaluation of the condition and capacity of the existing sodium hypochlorite feed pumps and associated control, instrumentation, and distribution systems
- Theoretical desktop evaluation of sodium hypochlorite dosages and required storage capacities to disinfect wet weather flows, including blended primary effluent and secondary effluent flows during wet weather events
- Evaluation of the existing secondary containment and instrumentation and controls at the sodium hypochlorite truck unloading area

PVSC's existing sodium hypochlorite storage tanks require excessive maintenance, with interior lining being required every one to two years. Recognizing the importance of these facilities to PVSC's operation, the project team included the direct involvement of Principal Technologist, Jerry Duppong. Jerry is CH2M's leading corrosion control specialist. He led the development of recommendations for materials of construction for this project. Jerry also led the evaluation of available maintenance records, construction information, and manufacturer's specifications to determine recommended alternatives for repair or replacement.

This long-term working relationship with PVSC, in combination with staff deeply versed in stormwater pumping station design and wastewater expertise, uniquely positions our team to achieve project success. From these projects, we bring the following attributes that directly benefit the current project:

CH2M's Experience with PVSC since 1997

- Newark Bay Outfall Dechlorination Facility
- Sodium Hypochlorite Storage Facilities Upgrade
- Final Clarifier Polymer Storage and Feed Facilities
- Rehabilitation of Existing Oxygen Tanks
- Thickening Centrifuge Facilities
- Rehabilitation of Existing Final Clarifiers
- Floating Dock and Off-Loading Facilities
- Sodium Hypochlorite Facility Improvements
- Sodium Hypochlorite Spray System
- Final Clarifier Ducking Skimmer Pilot Test
- Renovation of O&M Warehouse and Head-End Incinerator Buildings
- Demonstration of Final Clarifier Rotary Ducking Skimmer
- Evaluation of Secondary Treatment Facilities
- Modifications and Rerouting of Primary Skimmings System
- Primary Clarifier Scum Conveyance System

- **CH2M knows your preferences for delivery.** Our experience in the delivery of PVSC design projects includes the successful completion of the Sodium Hypochlorite Storage Facilities (100% complete) and the Newark Bay Outfall Dechlorination Preliminary Design Project (95% complete).
- **CH2M has successfully delivered both modeling and design projects to PVSC.** The Sodium Hypochlorite Storage Facilities (100% complete) included design deliverables and the Newark Bay Outfall Dechlorination Preliminary Design Project (95% complete) included d both modeling and design providing CH2M insight to PVSC's modeling and design expectations.
- **CH2M has successfully delivered projects across PVSC's facility.** The list of projects (on this page) that CH2M has performed show that we have delivered across PVSC's entire facility providing us with a strong understanding of your facility and operational needs when designing the stormwater pump stations.

Experience with Public Entities and/or Governmental Agencies

The CH2M team fully understands the nuances of working for a public agency such as PVSC, having served the public sector for 70 years, including local clients such as the Passaic Valley Water Commission and the North Hudson Sewerage Authority

Since 1946, CH2M has grown to a large, global firm delivering public infrastructure projects across a spectrum of industries with deep commitment to our water and wastewater clients. We have delivered thousands of public works projects for public entities and/or governmental agencies. Some of our local clients, in addition to PVSC are shown on **Exhibit 3-2.**

Exhibit 3-2: CH2M has extensive experience delivering to public entities and governmental agencies in New Jersey

1. Passaic Valley Sewerage Commission
2. Passaic Valley Water Supply Commission
3. Bay Shore Regional Sewerage Authority
4. North Hudson Sewerage Authority
5. Cape May County Municipal Utilities Authority
6. Brick Township Municipal Utilities Authority
7. Southeast Morris County Municipal Utilities Authority
8. City of Newark
9. North Jersey District Water Supply Commission
10. Ocean County Utilities Authority
11. Township of North Brunswick
12. NYC Department of Environmental Protection
13. NYC Department of Design and Construction
14. Hackettstown Municipal Utilities Authority
15. Northwest Bergen County Utilities Authority

Proven FEMA and Federal Disaster Funded Project Experience Assures FEMA Compliance

CH2M is FEMA's go-to firm for providing national disaster response and recovery services

CH2M has cultivated and maintained a partnership relationship with FEMA and has extensive experience providing national disaster response and recovery services including providing extensive grant program compliance expertise. We have managed over $1 billion in FEMA mission critical program work since 2005. This experience will assist in monitoring FEMA compliance and minimizing audit risks. Our FEMA experience is shown in **Exhibit 3-3.**

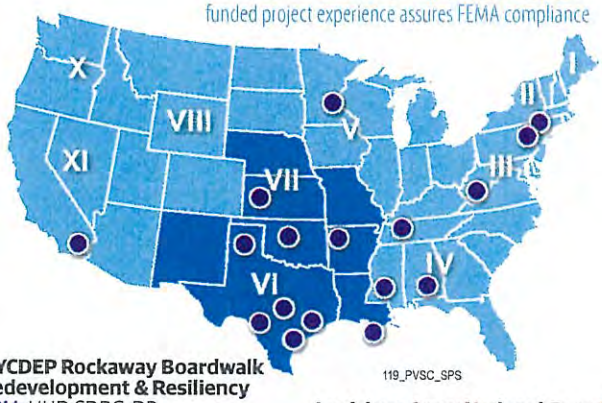
History of Successful Projects

Our team's portfolio of stormwater and sewage pump station modeling, design and construction experience includes project elements and considerations similar to those required for successful completion of the PVSC Stormwater Pumping Stations Design Project

The following section highlights successful CH2M projects, completed within the last 10 years, where we leveraged our full-service capabilities (planning, design, construction, and operations) to address key project elements similar to PVSC's Stormwater Pumping Stations project:

- Successful local and regional pumping station design and construction oversight projects delivered by our proposed team
- Constructed designs that incorporated physical modeling with our partner Alden Labs
- Stormwater pump station designs that work in conjunction with floodwalls and internal stormwater collection systems at WWTPs
- Wet weather pumping station capacity designs that cover the same range of capacities as PVSC's three planned pump stations
- Stormwater pump station evaluations and designs prepared in response to major storm events
- Stormwater pumping stations designed to address the 100-year storm event similar to PVSC's storm parameter requirements

Exhibit 3-3: CH2M's FEMA and Federal disaster funded project experience assures FEMA compliance



NYCDEP Rockaway Boardwalk Redevelopment & Resiliency
$8M; HUD CDBG-DR

NY MTA Bridges & Tunnels/Design
$700; FEMA PA and HMGP

Louisiana Department of Education
$1.4B; FEMA PA, CDBG DR, Restart, Historic Tax Credits

Orleans Parish School Board
$525M; FEMA PA and HMGP

City of New Orleans
$1B; FEMA PA and HMGP

Louisiana State University
$1.06B; FEMA PA and mixed Federal funding

Harpeth Valley Utilities District (Nashville, TN)
$100M; FEMA PA

Louisiana Army National Guard
$525M; MilCon Disaster appropriation

City of Joplin (MO)
$100M anticipated; FEMA PA, CDBG DRA

USACE, New Orleans District
$625.9M; FEMA, State of LA

NYCHA
$180M; FEMA PA

NJ TRANSIT
$8.5M; FTA DR

St. Bernard Parish (LA)
$474M; FEMA PA, FEMA HMGP

NYCDDC
$270M; FEMA PA, CDBG - DR

WDOT
$20.7M; FHWA ER

CDOT
$520M; FHWA ER

Engineering, Design and Construction for Wet Weather Pump Stations; North Hudson Sewerage Authority, Hudson County, NJ

Relevant Project Highlights

- Provided design for four pumps stations to alleviate chronic overflows in a densely populated urban area, with similar conditions to PVSC's site and SDC for 2 of the pump stations
- All four pump station designs included below grade pump stations similar to those proposed by PVSC
- Provided onsite resident project representative during duration of construction of the two pump stations that have been constructed
- Performed hydraulic modeling to determine required size of each pump station
- Provided permitting assistance which required close coordination with several agencies/stakeholders

Proposed Staff that Worked on This Project

Shivani Patel, Martin Moore, Bill McMillin, David Missig, Evan Panteleo, Ghazail Ghaffoor, Paul Whitener, Richard Siebers, Muhammad Shafiquzzaman, John Tobia, Marialena Hatzigeorgiou, Augustus Tweneboa-kodua, Peter Sokolow and Ron Lawson

Client Reference

Wet-Weather Pump Station Designs

Four wet weather pump stations have been proposed to be constructed in Hoboken, NJ by the North Hudson Sewerage Authority to address chronic overflows street flooding in portions of the City. In this densely populated City of 50,000, the majority of the 1.3 sq mile land area is below the 100-year flood plain and portions of the City are below the normal high tide level of the receiving body of water, the Hudson River. Street flooding in the low lying areas of the City are prone to flooding when rain events occur at high tide. Hoboken is divided into 7 combined sewer shed drainage areas with more than 31 miles of pipe. There are currently six combined storm overflows (CSO) that

Pump Station	No. of Pumps (each)	Firm Pump Capacity (mgd)	Pump Station Elev.	Elec Room Elev	Total Capital Cost
H1	2	100	Below Grade	Above Grade	$17,605,500*
H3/H4/HSI	2	80	Below Grade	Below Grade	$9,400,000**
H5	2	80	Below Grade	Below Grade	$8,506,700*
H6/H7	2	52	Below Grade	Below Grade	$8,100,000**

*Actual Construction Cost
**Engineer's Estimate (2007)

convey excess combined storm water to the Hudson River. The Authority's ultimate plan to eliminate wet street flooding associated with weather envisions the construction of a wet weather pump station on four CSO outfalls: at the east end of Observer Highway (CSO H1), at the east end of 4th Street (CSOs H3/H4/HSI), at the east end of 11th Street (CSO H5) and the east end of 15th Street (CSOs H6/H7). In order to minimize the impact on land use all of the pump stations are located below grade and all but one station's electrical equipment is also located below grade with an above grade emergency generator.

CH2M provided design services for all of the pump stations from the planning stages through construction contract documents including, obtaining permits from local/state agencies (Waterfront Development, Treatment Works Approval, Soil Erosion and Sediment Control, and U.S. Army Corps of Engineers signoff), obtaining funding through the NJDEP state revolving loan fund, coordination with stakeholders, and procurement of easements with property owners. CH2M performed hydraulic modeling to determine the required size of each pump station.

H1 Screening and Wet Weather Pump Station Services During Construction

Screening and Wet Weather Pump Station project was completed in the fall of 2012. CH2M has been providing services during construction for this complex project since January 2010. The H1 CSO Screening and Wet Weather Pump Station was designed to relieve the flooding associated with storm events occurring at high tide in the south western portion of Hoboken. The wet-weather pump station operates during storm events that coincide with high tide in order to allow overflow discharge during these conditions and was used to pump down the flooding in Hoboken from Superstorm Sandy.

The project required close coordination with NJ Transit, Hudson County Engineer's Office, City of Hoboken, Port Authority of New York and New Jersey as the construction of the pump station is located between the NJ Transit Hoboken bus and train terminal and the Port Authority path tunnels and the twin outfalls run underneath the rail terminal, which has 18 train tracks.

CH2M's services during construction scope of work included administering the project bid phase, and overseeing the Authority's Socially, Economically and Disadvantaged Business participation program. CH2M provided a full range of construction phase services, including; providing a resident engineer, performing construction inspections and shop drawing reviews, conducting construction progress meetings, responding to requests for information, processing payment applications, value engineering proposal reviews, compliance with NJDEP's loan and project construction certification requirements, and ARRA certification requirements.

H1 Screening and Wet Weather Pump Station – Similarities to PVSC's Site Conditions

CH2M's design and construction of the H5 wet weather pump station was delivered in similar conditions to those that will be encountered at PVSC's project locations:

- High water table
- Close proximity to critical infrastructure including historic building, buried utilities, and railroad lines requiring excavation support and water cut-off
- Close coordination with multiple entities including NJ Transit – both rail traffic and ferry boat traffic, Hoboken for streets, and the power company
- Connection to new and old infrastructure including 100 yr old sewer lines under the railroad lines and ferry docks, as well as new power systems and sewers

H5 Wet Weather Pump Station Services During Construction

Currently one of the pump stations (H5) is under construction. CH2M has been providing services during construction for this complex project since July 2015. The H5 Wet Weather Pump Station was designed to relieve the flooding associated with storm events occurring at high tide in the western portion of Hoboken. The wet-weather pump station will operate during storm events that coincide with high

tide in order to allow overflow discharge during these conditions.

The project requires close coordination with the Maxwell Place Home Owners Association and the City of Hoboken as the construction of the pump station is located on private property and the project is being funded by the City of Hoboken.

CH2M's services during construction scope of work includes administering the project bid phase, and overseeing the Authority's Socially, Economically and Disadvantaged Business participation program. CH2M currently provides a full range of construction phase services, including; providing a resident engineer, performing construction inspections and shop drawing reviews, conducting construction progress meetings, responding to requests for information, processing payment applications, and compliance with NJDEP's loan and project construction certification requirements. The project will be completed in October 2016 as scheduled and on budget.

Hartford Water Pollution Control Facility Wet Weather Expansion Project; Hartford Metropolitan District Commission, Hartford, CT

Relevant Project Highlights

- Provided design and DSDC for a 200 mgd combined effluent pump station
- $250M project managed by proposed PM, Shivani Patel
- Performed hydraulic and physical modeling, with Alden Labs, to confirm design

Proposed Staff that Worked on This Project

Shivani Patel, Kevin Nielsen, Ghazail Ghaffoor, Muhammad Shafiquzzaman, David Everson, Augustus Tweneboa-kodua, Kristen Horton, Tom Bechtel, Mark Chrzanowski and Ron Lawson

Client Reference:

As part of the Long Term Control Plan approved by the Connecticut Department of Energy and Environmental Protection (CTDEEP), the Metropolitan District (MDC) is upgrading and expanding the Hartford Water Pollution Control Facility (HWPCF) to provide treatment of wet weather flows of up to 200 mgd.

The project required close coordination with the various firms on the design team for the estimated $250 Million in capital improvements while maintaining uninterrupted operation of the existing facilities.

CH2M's scope of work consisted of designing eight new Dual Use Primary Clarifiers (DUPCs), a 200 mgd Combined Effluent Pump Station (CEPS) (with ultimate capacity of 250 mgd), Odor Control System Preliminary Design and cost estimating for the entire wet weather program.

The new tanks for the DUPCs are designed for use under dry weather operating conditions as well as with Chemically Enhance Primary Treatment (CEPT) for wet weather flows. The DUPCs are equipped with instruments to provide for automated dry weather and wet weather treatment.

The new CEPS was designed to allow for the discharge of plant effluent consisting of final effluent (FE) and wet weather effluent (WWE) to the Connecticut River when river stages are such that plant effluent cannot be discharged by gravity. The CEPS contains six 40 mgd (5 duty, 1 standby) submersible mixed flow pumps. CH2M utilized computation fluid dynamic (CFD) modeling and a scaled physical model to confirm design assumptions and optimize the station and pumping configurations.

CH2M provided preliminary design services for an odor control system for the Influent Pump Station (designed by others), Headworks Facilities (designed by others), and DUPCs. The exhaust air from these facilities are conveyed to a Biofilter System for odor control.

CH2M provided cost estimating services at the various design stages for the entire wet weather expansion program.

The design was completed in the Summer of 2014 and the construction is scheduled to be completed the Fall of 2018.

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Rocky Hill Water Pollution Control Facility Upgrad; Hartford MDC, CT

Relevant Project Highlights

- Included design improvements to both effluent and stormwater pump stations
- Hydraulic modeling throughout plant including pump stations

Proposed Staff that Worked on This Project

Martin Moore, Augustus Tweneboa-kodua, Kristen Horton, Richard Siebers, and Muhammad Shafiquzzaman

Client Reference: [redacted]

As part of the Districts SSO's objectives and EPA consent decree the Rocky Hill WPCF is required to hydraulically accept 27 MGD by 2018. As a result, the MDC hired CH2M to prepare an assessment of rehabilitation requirements and contract drawings and specifications to upgrade their facility to increase peak wet weather flow capacity, and replace dated infrastructure.

CH2M has designed improvements to headworks, primary clarifiers, primary effluent pump station, stormwater pump station, solids handling and odor control and coordinated with another consultant leading aeration, final clarifier, disinfection and electrical improvements. CH2M also led the design of instrumentation and control improvements and hydraulic modeling through the plant.

A few highlights of this comprehensive plant upgrade are described below:

Plant Outfall Improvements

The plant effluent is currently discharged to the Connecticut River by a single gravity main. Hydraulic modeling indicated that this main was insufficient to meet peak wet weather capacities when the Connecticut River was at flood stage. CH2M conducted an extensive alternatives analysis to help determine the best way to increase capacity. As a result of that analysis CH2M has been engaged to start the design of outfall improvements including the rehabilitation of an abandon 36-inch outfall that parallels the existing outfall. A separate outfall contract will be designed and constructed in parallel to the existing plant upgrade.

Along with plant outfall improvements CH2M is coordinating the design of a new influent pipe to the plant to deliver up to 27 MGD to the plant. Design of this comprehensive upgrade included coordination of the following improvements throughout the facilities CH2M designed:

- Various pumps/motors/drive shafts, piping, valves and replacements
- Structural/Architectural improvements, including; coating system on tank interior, sludge holding tank cover improvements separation of process areas from electrical areas; improvements to meet building code requirements
- Installation of new electrical and pumping control equipment, including; Motor Control Centers, PLC-based main control panel, variable frequency drives, conduits, conductors, and disconnect switches in a new electrical rooms
- HVAC improvements in various buildings to replace aging equipment and meet building codes

The construction cost estimate is approximately $50 million.

Flood Protection for Central Treatment Plant; City of Tacoma, WA

Relevant Project Highlights

- Includes a stormwater pumping station design to work in conjunction with a floodwall similar to PVSC's preliminary design
- Required coordination with WWTP site stormwater collection system, similar to PVSC
- High groundwater table similar to PVSC conditions

Client Reference: [redacted]

Tacoma's Central Treatment Plant (CTP) is located along the Puyallup River, and is identified as one of the highest flood risks in the region. Due to environmental restrictions, the river is no longer dredged and the risk of flood waters overtopping or damaging the USACE dikes has increased.

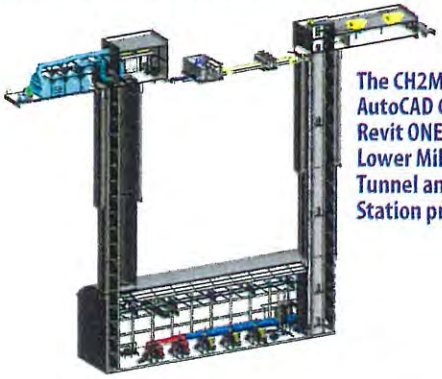
The CTP receives and treats 20 MG of wastewater each day. During heavy rain events, the plant can see 100 MG of wastewater each day. Within the past 10 years, flooding threats have required emergency measures to protect above and below ground utilities from damage. If the CTP were to go off-line during a flood event, hundreds of millions of gallons of untreated wastewater could flow directly into Commencement Bay, causing irreprible damage to the environment.

CH2M developed a unique approach to provide flood protection to this critical facility. 2500 feet of sheet pile was installed from one end of the CTP to the other to form a cutoff wall for flood water. The floodwall is embedded 15 to 25 feet below ground, and typically extends 3' to 7.5' above ground to an elevation of 1 foot above the 500 year flood level.

As CH2M worked with the City of Tacoma in design of the floodwall project, it became apparent that a stormwater pumping system would be needed within the perimeter of the CTP. The team realized that additional care would be needed to control both stormwater and groundwater that would collect within the confines of the perimeter floodwalls and dikes. The design concept for controlling this water relied first upon gravity flow into existing stormwater catch basins located throughout the CTP site, and gravity flow through a 30" deep storm drain pipe to an external pump station located outside the limits of the CTP, where the water would then be pumped into the Puyallup River. At various times in the past, the external pump station has been unable to handle all the stormwater flows, resulting in water backing up into the stormdrain pipelines, blowing manhole lids, and resulting in upstream flooding.

Design of Stormwater Protection. The 30" stormwater pipeline that collects water from within the area of the CTP, also serves 500 or more acres of land outside of the central treatment plant. When the external downstream pump station is unable to handle all the stormwater flows, the water backs up in the pipeline and has in the past, blown off lids from manholes, distributing water to lowlands and contributing to flooding in these areas. The City chose to develop a monitoring system that would inform them when the external pump station would no longer handle the flows, and the floodwall project would install a new valve in the 30-inch stormwater drain pipe at the point where the pipe exits the CTP site. The City chose to install a valve at the point where this same drain line entered the perimeter floodwall, so the flow from upstream locations would be prevented from entering the CTP. The effect of these shutoff valves is to isolate the CTP from entry of water into the CTP from external sources. All other stormdrains and conduits that enter the CTP from external sources are controlled with valves as well. This allows the stormwater collection system within the walls of the CTP to continue to function in collection of stormwater and groundwater, but a new pumping station would be required to remove the water during flood periods. The City elected to have CH2M design a portable pump station consisting of multiple pumps mounted on trailers that could be easily set up to pump water from a central collection vault. The portable pumps were designed to be installed into intake piping installed for that purpose, and water would be discharged to a pipe that pumped the water to a location outside of the floodwall.

Lower Mill Creek Partial Remedy Phase 1 Tunnel Deep Pumping Station, Cincinnati, Ohio



The CH2M team used AutoCAD Civil 3D and Revit ONEBOX on the Lower Mill Creek Tunnel and Pumping Station project

Relevant Project Highlights

- Design of a pump station for dewatering
- Utilized Revit for pumping station design
- Utilized CFD modeling analyses to confirm design parameters

Proposed Staff that Worked on This Project:

Jim Gagnon, Kevin Nielsen, and Daniel Morse

Client Reference: [redacted]

As part of a multi-consultant team, CH2M provided planning and design services for a deep CSO tunnel, associated CSO diversion and consolidation sewers, and deep tunnel pumping station. The project was to comply with the Wet Weather Improvement Program Plans recommended in the MSDGC Consent Decree with the EPA and Sierra Club. This project was a focal point project to resolve 9 CSO's closest to MSDGC's largest wastewater treatment plant at the end of the Mill Creek Drainage Basin, the largest of the three major drainage basins in their services area. Project elements include the following:

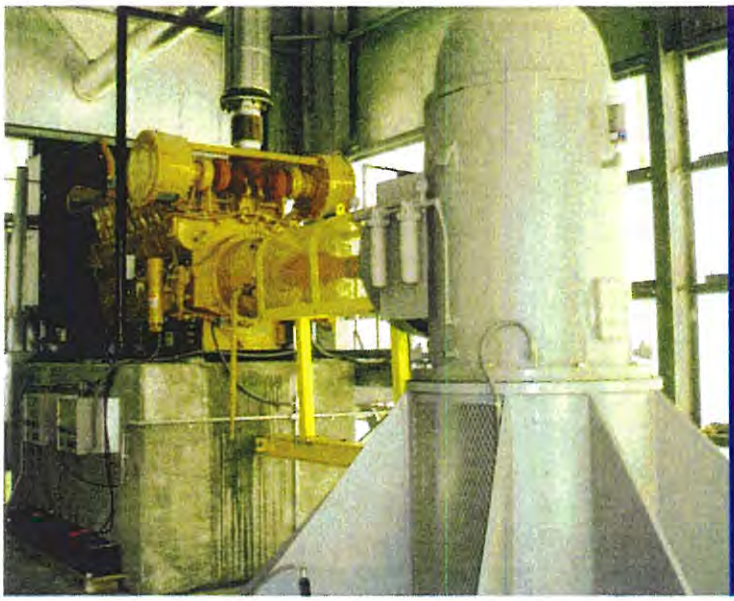
- Approximately 7,600 linear feet of 30-foot diameter, 300-feet deep tunnel in rock.
- Approximately 6,700-feet of new consolidation sewers 24 to 144 inches in diameter.
- 9 new CSO diversion structures that separate underflow to interceptors, and route overflows through consolidation sewers to the tunnel and with residual overflows to the Mill Creek.
- Design and construction of a deep tunnel screening system pump station for dewatering the tunnel.

The project area consists of older and redeveloping industrial and residential neighborhoods west of the downtown area. Subsurface infrastructure is similarly old, with the added complication of trunk utilities serving the downtown area. In addition, there is new infrastructure serving redevelopment. The alignment is below the existing Mill Creek ending at a dam that protects the area from the Ohio River. The challenge was to route the new sewer up the Mill Creek with minimum disruption of existing utilities and locating reasonable drop shaft locations.

With the guidance of District staff and the rest of Tunneling team CH2M evaluated numerous construction techniques and routes with a focus on the Consent Decree Requirements and sewer system improvement objectives. Conflicts and risks were further reduced by collaborating with utilities during the design process to establish relocation plans and produce cost quotes that were included in the contract documents. The objective is reduced risk, reduced uncertainty and very competitive bidding.

CH2M provided conceptual and detailed design services for the CSO diversion structures and drop shafts and for the deep tunnel screening system and dewatering pump station. The screening system and pump station were designed for an initial capacity of 84 MGD, expandable to 168 MGD. The screening system design was based on a cable-driven, mechanically cleaned bar screen. Numerous pump and pump station types were investigated, including submersible, dry-pit submersible, and vertical solids handling. The design was based on a cavern-style pump station with two access shafts and horizontal split-case pumps. CH2M performed detailed CFD analyses of the diversion structures, drop shafts, screening shaft, and pump station. The CFD analysis provided relative comparison of various alternatives, examining air volume fraction and air migration, water velocity, air bubble sweep potential, swirl angle, and velocity distributions.

Post-Katrina Pump Station Rehabilitation; US Army Corp of Engineers, New Orleans, LA



Relevant Project Highlights

- Performed in response to Hurricanes Katrina and Rita, similar to PVSC's program in response to Superstorm Sandy
- Design services and DSDC for major high volume, low-head pump stations
- Worked closely with federal and state agency representatives in accomplishing this corrective action design and construction inspection/management services work assignment
- Hydrologic and hydraulic analysis and design activities of flood risk management measures
- Provided staff to support the work of the Program/Project Planning and Management Division (PPPMD) in a wide range of capacities
- Value engineering study

Client Reference: [redacted]

CH2M assisted USACE with the development of multiple project management plans after Hurricanes Katrina and Rita ravaged the Gulf Coast, including one for a feasibility study of water resources modifications to enhance water and sediment distribution and increase hurricane protection across the Chenier Plains and another for a feasibility study and hydrodynamic model of the Mississippi River, including the analysis of delta alternatives.

Design and Construction Management Services for the Rehabilitation of 66 Drainage Pump Stations throughout the Metropolitan New Orleans Area. CH2M provided field inspection, engineering, design, and development of plans and specifications to bring 66 pump stations and pump structures and facilities to full operational status. These services covered pumps, motors, flood gates, flood control structures, control centers, and station infrastructure throughout St. Bernard, Plaquemines, Orleans, and Jefferson parishes after Hurricanes Katrina and Rita. Work included structural design, mechanical and electrical design, architectural elements, emergency systems, fuel systems, interior spaces and finishes, and communication systems.

Master Drainage Plan Study for Lafayette Parish. CH2M is conducting a master drainage plan study for Lafayette Parish in close cooperation and collaboration with the New Orleans District and the Lafayette Parish Consolidated Government and other Lafayette Parish stakeholders. The study will include hydrologic and hydraulic modeling analyses of project scenarios provided by Lafayette Parish.

Value Engineering Study: Lock Gates and Guide Walls. CH2M specialists in the fields of cost estimating, structural engineering, materials engineering, and corrosion engineering participated in a value engineering study that assessed alternatives to improve the life-cycle construction/operations/maintenance costs of lock gates, operating equipment, and guide walls.

Project Management Support – Various Projects Planned Prior to and In Response to Hurricanes Katrina and Rita. CH2M is providing project management staff augmentation to the PPPMD Branch in an effort to accelerate delivery of critical projects for the District. Projects being supported include the Southwest Coastal Louisiana Reconnaissance Study for Hurricane Protection, Calcasieu River and Pass Dredged Material Management Plan, Calcasieu River and Pass Navigation Reconnaissance Study, and Lafayette Parrish DFIRM and Master Drainage Plan Study, and various environment and infrastructure projects in the Ascension, East Baton Rouge, Iberia, and Livingston parishes, as well as the West Bank Hurricane Protection Public Outreach Materials Development project.

Appraisal, Design and Supervision of Altmouth and Crossens Pumping Stations Environmental Agency, United Kingdom

Relevant Project Highlights

- Hydrology and hydraulic modeling
- Provided site supervision and technical assurance support during construction
- Design of pumping stations to address similar 100-year storm parameters
- High profile project due to the number of properties and businesses involved and the politically sensitivity

The Alt Crossens area is low lying with considerable areas of high grade farmland. Approximately 28% of the area, which is located in the northwest of England, is urbanized. The hydrology of the area is complex because much of the catchment is at or below sea level. Ultimately, heavy reliance is placed upon the two main pumping stations of Altmouth and Crossens to remove water from the Alt and Crossens catchments respectively. The pumping stations also prevent tidal ingress. There is little or no capacity for gravity drainage from the catchments, requiring over-pumping to maintain water levels within the catchment, to support farming and to remove excess surface water.

CH2M oversaw the appraisal design and redevelopment of the Altmouth and Crossens pumping stations. The work included the hydrology, and hydraulic assessment of the 2 sub-catchments (including suitable climate change allowances) along with the project appraisal of various solutions to support a business justification.

Upon approval, CH2M completed the civils and M&E designs for the refurbished schemes, including upgrading the HV supplies and renewing the pumps. CH2M also provided site supervision and technical assurance support during construction.

The site's facilities were also upgraded to ensure safe access for maintenance, repair and future upgrade. The completed project has now raised the standard of flood protection against a 1- in 100-year event to some 6,700 properties, mixed agricultural land and to a range of critical infrastructure, such as roads, rail, water treatment works, waste management sites and electricity/gas sub-stations.

This was a high profile project within the region as so many properties and business were protected and as such it was politically sensitive. This was one of the reasons CH2M was selected to support to the Environment Agency. CH2M is the Environment Agency's biggest supplier of services. As such, we are often entrusted with helping them solve their biggest problems as we can call on a range of skills and specialisms to deliver their projects. In this case, it was providing specialist pump and electrical, mechanical and civil engineering knowledge, combined with state of the art hydraulic modelling techniques.

Section 4

Project Approach/Schedule

Successful stormwater pumping station design and construction will result in reliable assets that are easy to operate allowing PVSC to focus on more important operations during wet weather events. Our holistic approach will achieve these goals – while emphasizing collaboration, working in a programmatic environment, and delivery quality.

CH2M's proposed project management and technical approach emphasizes the achievement of a handful of core objectives, with the overall goal of delivering a reliable stormwater pumping stations:

- **Delivering in a programmatic environment:** We will build efficiently on the predesign developed by AECOM/HDR. Collaboration with the program manager will be key – and so will collaborating with other ongoing projects during design and construction, which must be considered for overall facility resiliency.
- **Designing for reliability:** We will model and design the stormwater pump stations to achieve all Hydraulic Institute requirements as well as PVSC's objective of capacity to pump out the 100-year rainfall event coincident with the 500-year flood.
- **Emphasizing operability:** The stormwater pump stations must be designed with consideration for minimal disruption during construction, and longer term, with a focus on streamlined operations and control features during precipitation events.
- **Streamlined delivery:** CH2M is proposing a team that has successfully delivered multiple wet weather pump station designs and construction which will result in streamlined delivery for PVSC.
- **Maximizing FEMA funding:** FEMA is the primary funding mechanism for this project, and efficient steering of the funding application process is necessary.
- **Optimizing the schedule:** A key objective for the proposed project approach is to achieve the most efficient schedule, and expedite it to the extent possible. PVSC is at risk from another storm event until the flood wall, stormwater pump stations and drainage improvements are completed. Therefore, CH2M's approach is designed specifically to get the stormwater pump stations built with the most efficient schedule so PVSC is prepared and assets are protected.

In order to achieve these objectives, CH2M has prepared project management and technical approaches that include detail on these concepts in the following sections:

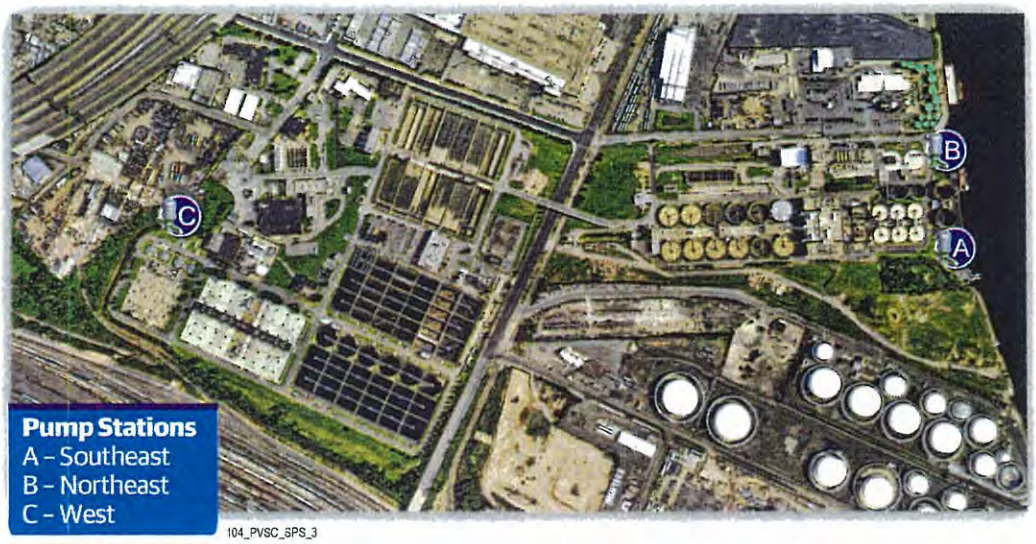
- Project Understanding
- Approach to Project Management
- Approach to Modeling
- Approach to Design
- Approach to Design Services During Construction
- Detailed Scope of Work
- Project Drawing List and Specifications
- Proposed Project Schedule
- Man-Day Estimate

Project Understanding

CH2M understands that the stormwater pumping stations are an integral part of PVSC's overall program, designed to make your facilities more resilient to the effects of climate change and extreme storm events, be they storm surge or storms of historic precipitation. Because the floodwall will be designed to keep storm surges out of the facility, it is inherently understood that stormwater will no longer be able to exit the site via overland flow or the existing stormwater drainage system, and therefore stormwater pumping will be required to keep precipitation events from flooding the facility. CH2M has thoroughly reviewed the preliminary design in the BODR that was provided with the RFP and clearly understands PVSC's key objectives for the stormwater pumping stations to be:

- Pumps that work for an extensive range of wet weather events that may occur at the PVSC WWTP
- That the pump station designs and construction be developed and implemented in close coordination with other ongoing projects and the Program Manager
- That the design and construction be performed in a manner that is compliant with all FEMA requirements for reimbursement

Exhibit 4-1
While PVSC's three planned pump station locations, as shown on the figure, are located in areas that do not conflict with current ongoing operations, CH2M is aware that these pump stations will need to be designed and constructed in conjunction with the planned floodwall and will be constructed at a time when PVSC has multiple other on-going construction projects. We are committed to working closely with PVSC, the Program Manager, other designers and other ongoing construction projects to minimize conflicts and to keep all projects on schedule.



- A design and construction schedule that is as accelerated as feasible to result in a reliable design to reduce risk from future events

Exhibit 4-1 highlights the proposed pump station locations as presented in the BODR as well as the locations of other key projects that will interact with the design and construction to showcase CH2M's understanding of how this project will require close coordination with PVSC's overall resiliency program.

Our design team's extensive knowledge of stormwater pump station design will result in reduced risk to PVSC. Risk Mitigation is a core element of our approach to successfully complete this project and is critical to identifying technical challenges that our team must subsequently address during design. While not exhaustive, the following are examples of the PVSC specific approaches the CH2M team will undertake to mitigate identified risk.

- **Hydraulic Institute Standards** – Having industry standards that set protocols for design, material, performance, etc. is critical to efficient and effective design development, which ensures reliability in the system. CH2M follows Hydraulic Institute Standards for pump station design developed by industry experts to ensure a reliable system that will work under all operating conditions.
- **Hydraulic Modeling** - The stormwater pump stations will be designed for a 100-year, 24-hour rainfall event that coincides with a 500-year flood; however, the pump stations will convey any and all storm flows from the PVSC WWTP. The complexity of the range of flows will be modeled with a physical hydraulic model to define the general flow characteristics form the influent lines to the pump intakes, determine the existence magnitude of adverse flow phenomena that may propagate to the pump suctions, and define the geometric configuration of the wet wells and transition from the influent line(s) to the pump suction to meet the performance objectives of the pump stations.
- **Start-Up/Testing** – As the influent flow into the pump stations is dependent on storm conditions, valves and piping will be incorporated into the design to allow for the pump station to be isolated in order to start-up and test the pumps. This will allow for the pump stations to become operational in a timely manner.
- **Operation and Maintenance** – The successful implementation of this project will allow for unmanned operation of the pump stations to operate various pumping flow scenarios through the design of a complex control narrative. Based on previous stormwater pump station design experience, this can be achieved by understanding the capabilities of the constant speed pumps. Additionally, by exercising the system on a regular basis, very little maintenance will be required to keep the pump stations functional for all storms.

Approach to Project Management

A Strong Project Management Approach Drives Adherence to Scope, Schedule, and Budget

The CH2M team's project management approach leverages our expertise in stormwater pump station design with a team that has been delivering similar design, construction, and operations related projects in New Jersey and Connecticut for the last decade. Our

approach, including previous work experiences with PVSC, ensures the stormwater pump stations will be designed by industry leading experts, with top notch level service and delivery.

The project will be managed locally by Shivani Patel. During kick-off, Shivani will discuss communication methods with PVSC, recognizing that input will be required regularly from PVSC engineering staff, PVSC operations, PVSC operations staff, PVSC's Program Manager, and other on-going construction projects. This need for extensive communication will include all of these parties and lay out:

- A clear understanding of PVSC's drivers and key metrics for the stormwater pump stations project (quality, schedule, FEMA requirements, etc.)
- Detailed understanding of the site conditions and constraints in order to tailor construction documents
- Clearly defined requirements for coordination with operations and contracts
- Defined communication requirements with PVSC and the Program Manager

CHARTERING

1 During this project phase, we define the roles and responsibilities of each project team member and stakeholder. We also define and establish appropriate communication protocols that will be observed during performance of the project.

PLANNING

2 Our Project Manager builds upon the initial detail outlined in our proposal, and develops a Project Execution Plan (PxP) to establish formal requirements. Elements of the plan include definition of the work requirements and deliverables, scheduling, resource planning, logistics, communications, safety and health, and reviews and performance measures (quality control).

ENDORSING

3 During this critical step, the entire project delivery team is convened and the contents/detail of the PxP are reviewed. Each team member, including integrated subconsultant staff, are required to endorse the overall plan and their specific role, technical duties, budget, and schedule.

MANAGING CHANGE

4 During performance of the project, our Project Manager monitors team performance in accordance with the requirements outlined in the PxP, paying close attention to any developing issue that may impact performance or require a change to the project's approach or scope.

CLOSING

5 Upon successful completion of work, we close projects and collect and record lessons learned that can be shared with other (and future) project teams.

121_PVSC_SPS_1

To deliver success to PVSC it is imperative that the project management approach also have a proven process for completing quality work, delivered on time and on budget. CH2M specializes in public infrastructure projects, currently delivering over 15,000 projects annually. Accordingly, we maintain an Enterprise Quality Management System (QM) that is consistent with the principles outlined in International Standards Organization (ISO) 9001. Our QMS provides the foundation for applying sound QA/QC procedures to our broad spectrum of projects.

CH2M's Project Delivery System (PDS) is an integral component of our QMS and serves as the basic framework for our consistent delivery of work. It is driven by an understanding of a client's and project stakeholder's definition of success – a process authored by CH2M in the book ***Project Delivery Systems: A System and Process for Benchmark Performance.*** Our PDS is based on following five generalized steps:

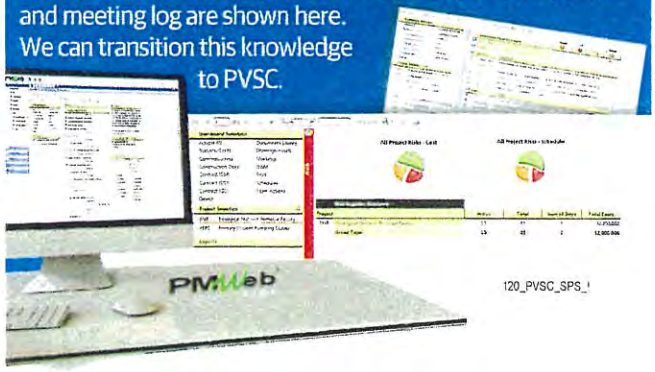
1| Chartering
2| Planning
3| Endorsing
4| Managing Change
5| Closing

Using excellent communication, effective chartering and CH2M's proved PDS, Shivani will manage the team to deliver to PVSC a quality project that is not disruptive to operations or other on-going construction projects, and meets the proposed delivery schedule.

Collaboration underpins our approach to achieve coordination with PVSC, integration with the Program Managers, and appropriate engagement of outside stakeholders, including the community. We are experienced at the use of PMWeb, as illustrated in **Exhibit 4-2.**

Exhibit 4-2.

PMWeb is an essential communications and collaboration tool. CH2M is experienced at supporting Programs with PMWeb. In fact, for Sacramento Regional County Sanitation District (CA)'s EchoWater Program, where HDR is part of the Program Management Team, CH2M was at the forefront of the use of PMWeb. Samples of the home page, risk register, and meeting log are shown here. We can transition this knowledge to PVSC.



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In addition to our own proven PDS, CH2M is prepared to deliver the Stormwater Pumping Station project to PVSC according to your delivery requirements as defined in the ***Program Procedures Manual*** that was supplied with the RFP. CH2M has familiarized itself with the requirements of the Program Procedures Manual and will implement its requirements throughout the duration of our delivery.

Defined Quality Management Approach Assures Quality Documents

Our Quality Control Manager, John Tobia, will develop a Quality Management Plan that complies with the requirements of PVSC and our Enterprise Quality Management System, and establishes the foundational requirements for all work that will be performed under the contract. The QMP will be developed based on a template that has been used to successfully deliver thousands of design and construction contracts for our clients, including the CH2M projects highlighted in this submittal.

We perform quality assurance in the form of project audits, addressing our quality process and procedures. These audits are both routine and unscheduled, and are performed by the Quality Control Manager to ensure conformance with our written procedures.

Construction Management Approach to Support Low-Impact Construction and Managed Risk

CH2M will provide an onsite RPR for inspections to monitor compliance and coordination with all contract documents. Upon completion of the inspections, CH2M will prepare a daily construction report summarizing the construction activities for the day. CH2M will create a non-conformance report for any inspection findings that may require remedial action(s) by the contractor. These reports work and make any recommendations for required corrective actions to the inspected work. The report will also contain digital photographs where appropriate.

Third party special inspectors, meeting the code of New Jersey Administration Code, N.J.A.C. 5:23-5.4 (f) will be utilized for certain inspections required during construction. The inspection requirements are defined in Chapter 17 of the 2015 IBC. These inspectors will oversee all required special inspections and testing, including concrete construction, reinforcing bars, concrete field testing; sheets pile driving records, h-pile driving records, micro pile installation, and dynamic pile testing; masonry; structural steel; excavation, subgrade preparation, backfill, and compaction; and seismic resistance of structural systems.

Approach to Modeling

Hydraulic Institute Pump Intake Design Criteria

The Hydraulic Institute (HI) provides approach flow design guidelines to help ensure proper pump performance. Adherence to these guidelines can reduce the risk of poor pump performance. However, site constraints can often limit the ability to meet all the approach conditions recommended by the HI standards. Proper pump performance may still be achieved through wet well modification or remedial corrections. To ensure that these modifications will achieve the desired goal can often require construction of a physical hydraulic model of the pump station wet well.

109_PVSC_SPS_1

CH2M and Alden Labs worked collaboratively on the physical modeling of the Primary Effluent Pumping Station at the Sacramento Regional County Sanitation District in California. Our continuing relationship and experience working together will benefit PVSC's physical modeling efforts.

110_PVSC_SPS_1

Our team knows the importance of physical modeling to ensure that our clients' pumps don't experience problems during operations. The photo shows pump cavitation damage due to poor approach flow conditions that could have been eliminated through physical modeling.

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HI standards provide physical model approach flow modeling and acceptance criteria that can be used to identify unacceptable flow patterns at the pump suction. The acceptance criteria in **Exhibit 4-3** (based on HI Standards [1]) will be used to evaluate the hydraulic performance (as indicated by the model study results) and select a satisfactory final modified design.

Exhibit 4-3

Acceptance Criteria	Maximum Acceptable Values
Free surface Vortices	Type 2 for normal operating conditions Type 3 < 10% of time, or for unusual conditions.
Subsurface Vortices	Type 1 for normal operating conditions. Type 2 < 10% of time, or for unusual conditions.
Swirl Angles	30-second and 10-minute (model) averages < 5 degrees for normal operating conditions. Higher values (up to about 7 degrees) may be allowed, if < 10% of time.
Velocity Distribution	Time-averaged point velocities, taken at the pump throat to be within 10% of the cross-sectional area average velocity.

CH2M's Successful History of Utilizing Physical Hydraulic Modeling to Achieve Hydraulic Institute Standards for Pump Station Designs Will Result in Reliable Stormwater Pump Stations for PVSC

CH2M has successfully applied physical hydraulic modeling to test and refine numerous designs of upgraded and new pump stations for standard Hydraulic Institute (HI) layouts and variations. We will apply this experience to result in a design for PVSC that achieves HI requirements.

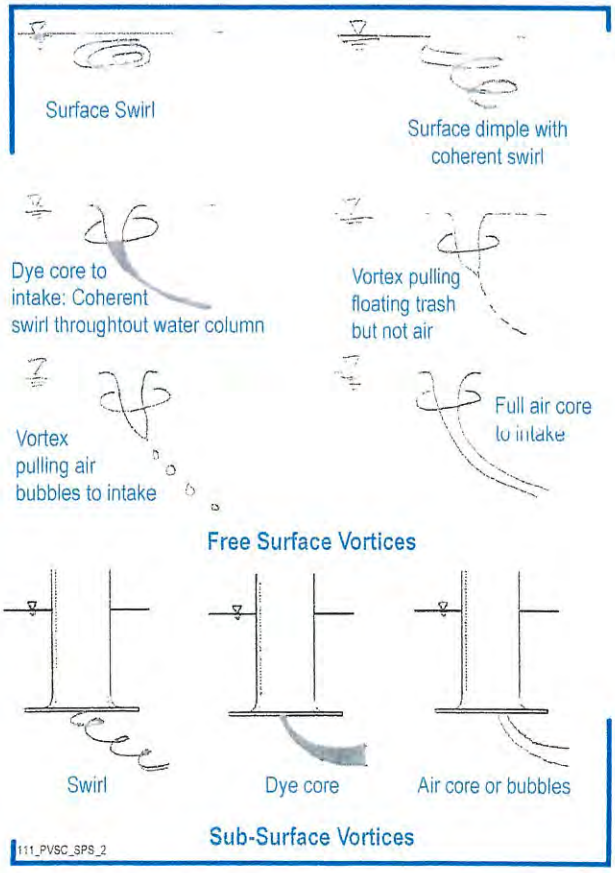
Pump station designs sometimes need to deviate in some respects from the HI's standard layouts due to site specific constraints. CH2M has used physical modeling to provide insights into the performance of these pump stations with respect to HI criteria. Through the relative comparison of alternatives, valuable insight into the merits of different configurations will be gained and whether adequate performance can be achieved by incorporating proposed design modifications. CH2M will work closely with Alden Labs, as we have done for other projects (see inset), to develop a physical model of each of the three planned stormwater pumping stations to result in a satisfactory final design.

The testing of the initial designs will include operating the models at multiple test conditions, starting with the lowest wet well operating level, which is the most likely to produce adverse hydraulic conditions. The data gathered in Phase 1 will include approach flow patterns as identified by dye; free surface and subsurface vortex types and persistence; and swirl angles. If the Phase 1 test results show unacceptable hydraulic conditions, testing will move on to Phase 2 to determine modifications, using the operating conditions that showed the most severe conditions. Phase 3 testing will evaluate the final design at further operating conditions. If during Phase 3 testing the HIS acceptance criteria are not satisfied, further fine-tuning of modifications will be incorporated as needed. The physical modeling will be scheduled to allow visits from PVSC and the Program Manager in accordance with Task 3 of the RFP.

Alden & CH2M Project List in last 10 Years:

As a direct subcontractor to CH2M:

- King County Brightwater Influent Pump Station Physical Model
- King County Brightwater Treatment Plant Weir Physical Model (2 separate contracts)
- Sacramento EchoWater Primary Effluent Pump Station Physical Model
- Lane City, TX Relift Pump Station Physical Model
- King County Georgetown Influent Pump Station Physical Model
- Dayton, WA Little Goose SFB Sectional Model
- In partnership with CH2M:
- C Water Technologies Screen Testing
- Tarrant Regional Water District CFD and Physical Modeling of Integrated Pipeline Project Booster Stations



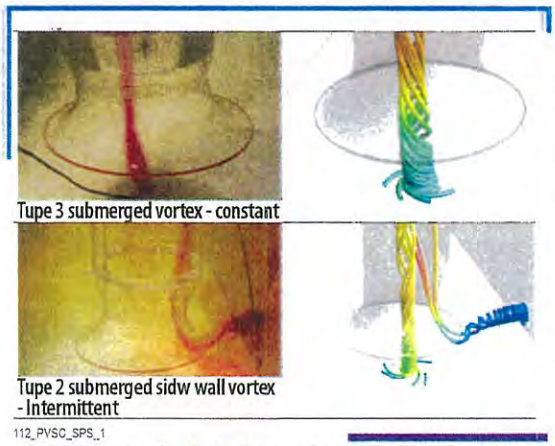
NORTH HUDSON SOLIDS/FLOATABLES SCREENING TECHNOLOGY PHYSICAL MODELING

The North Hudson Sewerage Authority was challenged to screen solids/floatables in its CSO discharges beneath new open spaces, tree-lined esplanades, and luxury developments along New Jersey's Gold Coast to comply with New Jersey statutes. CH2M formed a research and development team of engineers and scientists from various backgrounds in planning, design, construction, and operations. The design objective was to have minimal aesthetic impacts, no bypass, and belowground maintenance to minimize nuisance impacts on nearby waterfront developments. The primary performance goals of the new technology were to minimize head loss, maximize the capture of solids and floatables greater than a ½ inch, and facilitate maintenance. After establishing hydraulic performance goals, a physical prototype was developed and computer modeling was conducted to optimize the design. Alden Labs constructed a physical prototype model of the design. The technology was tested using floatables typically found in combined sewer flows during wet weather, namely small candy wrappers, coffee cup lids, sandwich bags, water bottles, and polystyrene products including cups and plates and paper products. The prototype featured baffles and screens with pumping capabilities to simulate wet weather flows. Rigorous testing ensured the final design would meet all goals. The physical dimensions of the baffle and screening chamber were altered until a balance was achieved to minimize head losses.

Physical modeling tested and optimized the screening technology

Alternative Approach: CFD Models in Conjunction with Physical Hydraulic Models

CH2M understands that PVSC has requested that a physical model be developed for each of the three stormwater pumping stations. Based upon the proposed capacity of the three pumping stations, only one, the West Pumping Station, is required to have a physical model per HI standards based on the proposed station capacities (HI 9.8.4.1). Our experience shows that the use of Computational Fluid Dynamics (CFD) provides an equal or greater benefit to physical modeling for smaller sized pump stations, such as the planned Southeast and Northeast Pumping Stations.



By performing both physical and computational modeling our team can compare the outputs of both methodologies to best determine the optimal pump layout. This example shows how pump vortices are identified and evaluated through both modeling methodologies.

CFD provides detailed three-dimensional simulation of multi-phase fluid flow to solve complex hydraulic flow problems. This allows the use of CFD to solve problems that would have previously required the use of physical models. CH2M has developed CFD simulation tools to provide valuable insights into the evaluation and design of pump approach flow conditions. We have successfully applied these CFD simulation tools to solve problems on several existing pump installations. In addition, we have utilized CFD to provide valuable guidance for numerous proposed pump stations and to minimize the required costs of physical modeling. Our CFD studies focus on analyzing swirl angles and average velocity distribution in the pump bell as defined by the Hydraulic Institute standards. In addition, flow characteristics in the wet well are reviewed to identify areas of poor approach flow conditions that could lead to development of free surface and submerged vortices. The results are compared against the HI acceptance criteria to identify undesirable pump approach flow conditions and evaluate improvement modifications if necessary.

CH2M has utilized the conjunctive use of CFD and physical models on numerous pump station projects. We have used several physical model studies to validate and refine our CFD pump approach evaluation methods. Through these comparisons, we have developed ways to identify in CFD models the potential for damaging vortices.

We have also been able to validate our CFD analysis of swirl angles and pump bell inlet velocities. We have utilized CFD to evaluate several alternatives to improve pump approach conditions and to investigate the performance of remedial measures to solve undesirable flow patterns. This has allowed us to minimize physical modeling costs by developing HI compliant pump station layout alternatives and remedial measures using CFD and then only using physical modeling for final refinement and performance documentation.

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CH2M proposes that if desired by PVSC, we could use a physical model for the West Pumping Station but replace the physical models for the Southeast and Northeast Pumping Stations with CFD models to result in cost and time savings to PVSC in the design of these two stations.

CFD evaluation of multi guide vanes with integral cone provides a visualization of the pump arrangements that can be integrated directly into the 3D design

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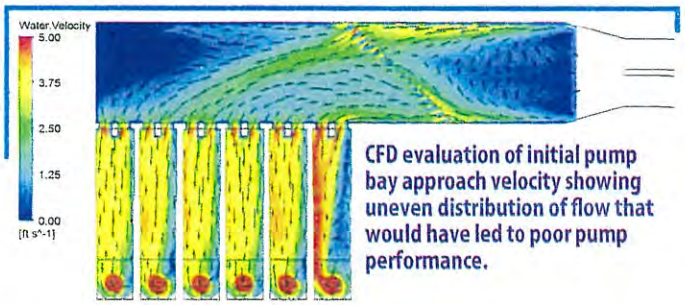
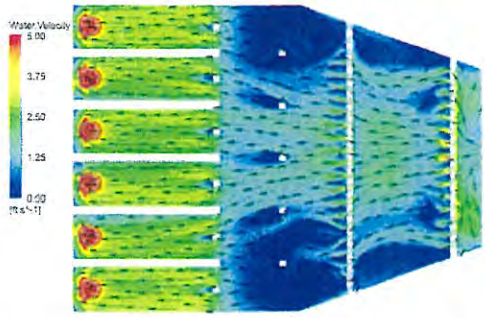


CFD evaluation of initial pump bay approach velocity showing uneven distribution of flow that would have led to poor pump performance.



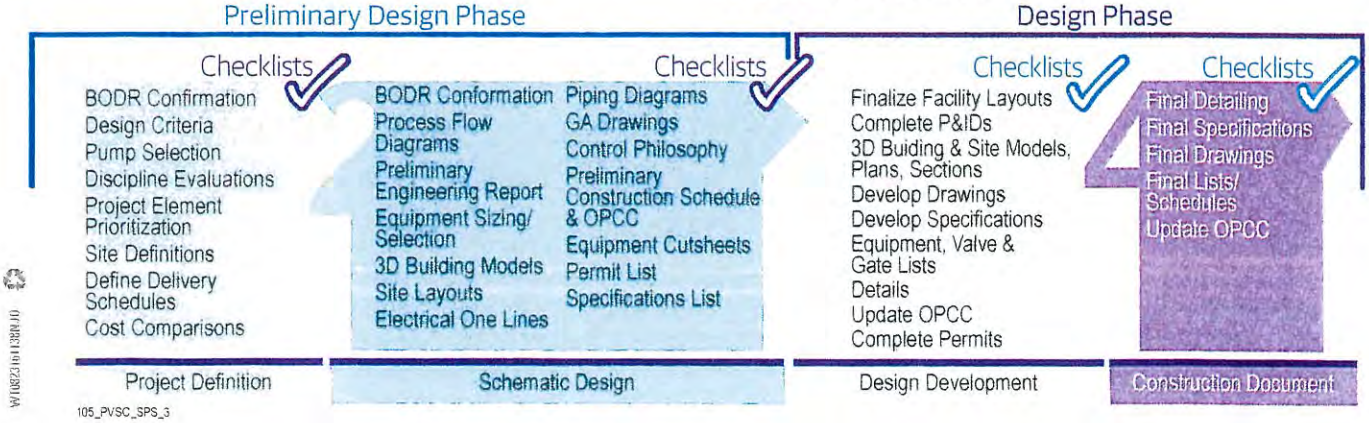
CFD evaluation of revised pump bay approach velocity showing even distribution of flow to each pump and improved pump performance. This configuration was then evaluated in a physical model.

Approach to Design

Our general approach is to implement the Design Services in close coordination with PVSC, NJDEP, FEMA, and the designers of the flood wall, the stormwater collection system, and the power plant. We will work methodically and communicate frequently, completing the project in a logical manner to avoid rework, lost time, or budget erosion.

As indicated in the RFP, the design will use the conceptual design in the Basis of Design Report (BODR) as a starting point. Certain concepts were identified as not subject to change, including the location, number, and overall capacities of each pumping station; the types of pumps each pumping station; certain design features such as the recycle lines, dewatering pumps, and hoists; and other items so noted in the BODR. The design activities will begin with a validation of the key BODR design concepts; identification of value added and cost-savings opportunities; and identification and resolution of constructability issues early so that we have a sound design base endorsed by PVSC and our design team.

CH2M will deliver the design using our 4-Phase Design Delivery Process, which ensures an orderly flow of work. We have built our reputation on delivering quality projects, and our four-phase approach has been integral to exceeding our clients' expectations for decades. Specifically designated milestone deliverables occur at the conclusion of each phase, which will be meshed with the submittal milestones described in Task 4 of the RFP. Integral to the delivery process is the use of time-tested design checklists and Quality Review Forms that will form the basis of documenting compliance with all QA/QC procedures. The 4-Phase Design Delivery Process helps ensure that major project concepts are understandable, that stakeholder buy-in occurs on decisions early in the project, and that all decisions are clearly documented.



Phases 1 and 2 of this process are Project Definition and Schematic Design, respectively. The primary purpose of the Project Definition phase is to firmly establish the project design criteria, culminating in the preparation of a Preliminary Engineering Report (PER). The Schematic Design phase uses the data and guidelines developed in the PER to develop and evaluate design concepts. The end product includes preliminary design drawings with sufficient information for stakeholder review and design coordination and review. Deliverables from these Phases will meet the requirements for the 30% design submittal, as defined in Task 4.1.2.1 of the RFP.

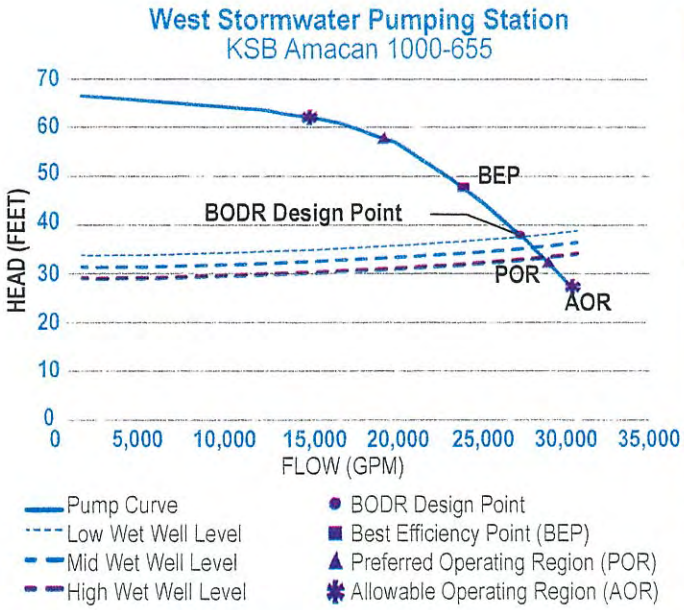
Integral to preparation of the 30% submittal will be a review and confirmation of the hydraulics and pump selections developed in the BODR. A key to success of this project is to ensure full compliance with Hydraulic Institute Standards—of the pumping station wet wells (as will be confirmed through physical modeling) and of the pump performance. CH2M will use AFT Fathom (a commercially available incompressible pipe flow analysis and system modeling software) to model the pumping stations and examine the performance of the pumps under various operating conditions. This analysis will help identify deficiencies in the pump selections that may not be readily apparent when a pump is selected to meet just the specified operating point.

In addition to validating the pump selections, we will also address other key pump design issues:

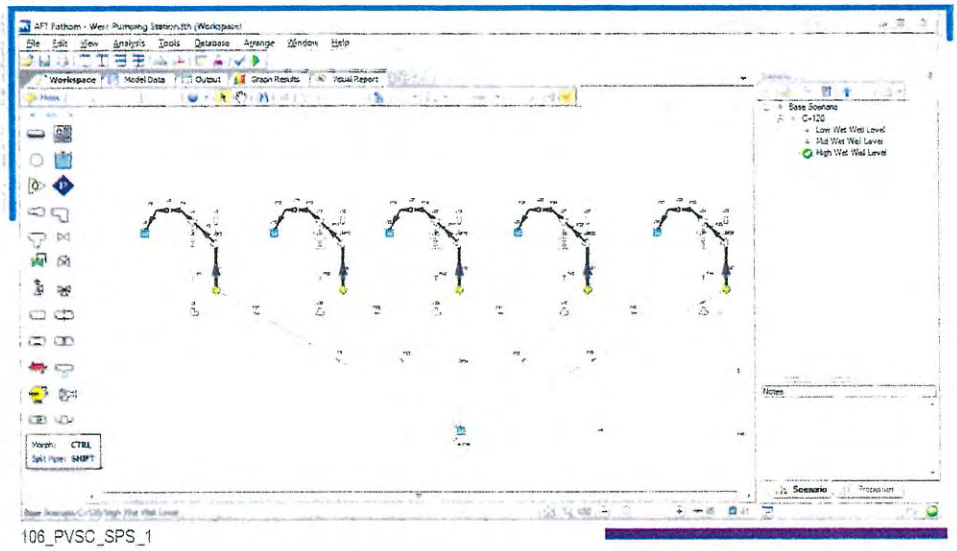
- Pump and valve configuration to protect equipment warranty: We will develop discharge piping and isolation valve needs including pump and piping foundation support systems. Discharge piping will be configured to meet or exceed HI and pump manufacture requirements so that any pump operational issues cannot be attributed (by the pump supplier) to piping, flow turbulence, or foundational supports.
- Identifying impellers that provide maximum hydraulic efficiency: We will perform a detailed specific speed and suction specific speed analysis for pump impeller sizing. This will be done to select pumps and corresponding operating speeds with the highest hydraulic efficiency for duty conditions and that operate free of damaging cavitation formation. This will be confirmed by establishing sufficient margin between the available net positive suction head available (NPSHA) and the pump impeller's net positive suction head required (NPSH3) throughout the entire required operating free-water surface level in each wet well.
- Specifications and factory testing for reliable pumps and motors: We will specify strict compliance with Hydraulic Institute requirements for submersible pump acceptance grades and motor testing. We will also specify a comprehensive factory performance validation test using the pumping units to be supplied on this project.
- Specify materials of construction for corrosion and erosion resistance: While corrosion was not specifically considered to be a concern in the BODR, it will be important to specify materials that last. We will recommend materials for pump components, piping, and valves to minimize long-term maintenance/reliability risks. Where additional protection is required, we will specify comprehensive corrosion protection systems for the coastal environmental conditions to ensure optimal coatings selections, proper surface preparation, and skilled coating application on installed assets.

Once PVSC has reviewed and fully endorses the 30% design deliverable, the design process moves into Phase 3, Design Development. The purpose of the phase is to develop the project design to achieve a true "design freeze" at the conclusion of this phase. This is an intensive phase of the project and requires the project team, technical advisers, and PVSC staff to work closely together. The phase starts with a more detailed presentation of the pumping systems but extends to all other areas of the project, such as architecture, electrical, I&C, structural, geotechnical, civil, and HVAC. This phase will include the 60% and 90% design submittals specified in Task 4.1.2.1 of the RFP, with the 90% documents reflecting a nearly biddable design. At each submittal, PVSC will have an opportunity to review and provide comments before the design is progressed further. Submittal drawings will be prepared using Revit to develop a 3D model of each pumping station, to accurately document the proposed layouts and facilitate the review process. CH2M has used Revit for numerous pumping station and wastewater treatment facility designs, ranging in capacity from less than 1 MGD to peak capacities of 200 MGD.

The process concludes with Phase 4, Construction Documents. This phase will culminate with the submittal of the 100% design documents that will be bid-ready. Progress from the 90% documents to the



CH2M has done a preliminary analysis of the proposed stormwater pumps for the West Pumping Station indicated in the Basis of Design Report that accompanied the RFP. The proposed pump and piping arrangement were modelled in AFT Fathom, and the resulting pump and system curves were analyzed in Excel. The curves show that, although the proposed pumps will operate within the Hydraulic Institute (HI) defined Preferred Operating Region (per HI Table 9.6.3.1), the pumps would operate entirely far to the right of the Best Efficiency Point (BEP). As the pumping stations are designed, CH2M will work closely with the acceptable pump manufacturers to select all of the pumps to operate closer to BEP, ensuring the most efficient pumps are installed. This will ensure that flow is well controlled through the pumps and that the pump service life is not significantly affected by hydraulic loads, vibration, or flow recirculation within impellers.



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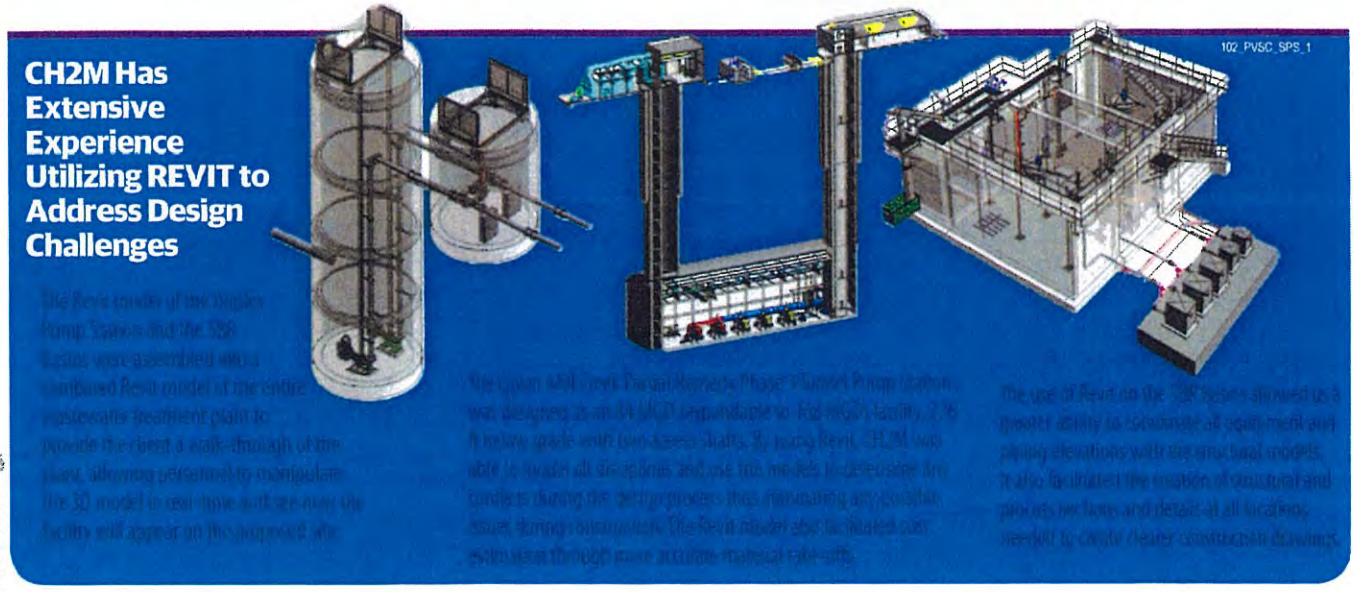


100% documents will reflect corrections that were identified as necessary during the 90% review.

An updated Opinion of Probable Construction Cost (OPCC) will be prepared with each submittal. The initial OPCC carries a higher degree of contingency and as each submittal is completed, greater detail is added to the backup documentation and the necessary contingency allowance shrinks.

Throughout the design process careful coordination with the other design projects being done for PVSC will be critical. Coordination with the stormwater collection system improvements design, the flood wall design, the power plant design, etc., will be required and will impact nearly every engineering discipline of the stormwater pumping stations design. To address this, a standing item for each review meeting and monthly meeting will include coordination with the other design projects. The stormwater pumping stations design team will also prioritize communication with the other projects between meetings to ensure a continuous coordination process.

Operability

The design process will provide PVSC with stormwater pumping stations that not only meet Hydraulic Institute Standards, all other applicable codes, and PVSC preferences, but also that operate in a manner that will not demand significant PVSC attention. The stormwater and dewatering pumps will be capable of fully automatic operation based on wet well level. CH2M will draw on our extensive pumping station experience to provide controls (both instrumentation and controls descriptions) that will establish acceptable sequencing of lead/lag operations and minimization of pump starts.

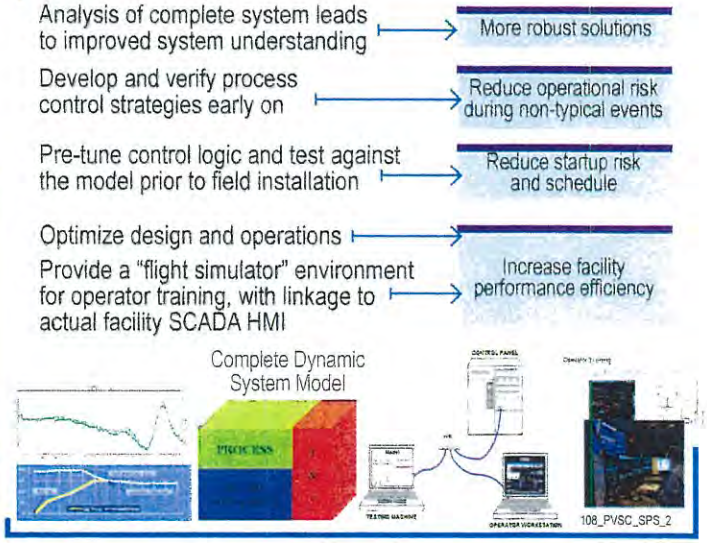
CH2M proposes to use our proprietary Replica model to dynamically test and validate each pump station's control strategy to confirm that the design results in an easily operable and highly efficient system. Replica is an advanced dynamic simulation tool, built upon the ExtendSIM platform. Replica can be used statically or dynamically to solve pumping station operations challenges under varying flow conditions, such as time dependent runoff flows, not only for the design 100-year 24-hour rainfall event but also for other rainfall events. This dynamic tool will be programmed to enable simulation of process operations and control alternatives under various flow scenarios to:

- Identify control strategies to optimize energy use;
- Simulate commissioning to optimize the program and minimize risk;
- Demonstrate control strategies to PVSC staff during design to facilitate input and support training; and
- Coordinate with the system integrator

CH2M proposes to use our proprietary Replica model to dynamically test and validate each pump station's control strategy to confirm that the design results in an easily operable and highly efficient system. We believe that this small up-front effort during design will result in much easier and less costly operations for PVSC.

Value of Replica Dynamic Simulation

Simulate all aspects of a new or existing process system allowing for more in depth knowledge and exploration which leads to cutting-edge solutions and more informed decision making.



This modeling enables in-depth analysis that will lead to improved system design, optimized operations performance, and reduced capital and operating costs.

Where PVSC personnel will need to interact with the pumping station equipment, our design will ensure that all systems are easily accessible and operable manually. This will include key features such as the hoisting systems that will have single-lift capability; accessibility to the valves of the recycle system or remote actuator capability on the valves; provision of ready-to-install spare pumps of each size for rapid deployment; and generous access throughout the dedicated electrical buildings.

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Start-up & Testing

Specific, well-focused start-up services will ensure a smooth transition from construction through commissioning to provide an effectively operating stormwater pumping system. Successful start-up begins with a design that clearly defines all testing requirements and accommodates all facilities required for commissioning of the pumping stations and their testing. The design of the start-up and testing systems will feed seamlessly into the development of a comprehensive Facility Start-up Plan and the Operation and Maintenance Manual included in Task 5 of the RFP. Start-up and testing will also consider careful coordination with the stormwater collection system, the flood wall, and the power plant projects. For CH2M, this effort will be led by John Tobia who led the successful start-up and testing for NHSA's H1 Wet Weather Pump Station.

CH2M's Start-Up and Testing efforts will be led by **John Tobia** who led the successful start-up and testing of NHSA's H1 Wet Weather Pump Station, including the above grade electrical and controls building shown above.

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The testing starts before equipment leaves the factory, with specified Factory Acceptance Testing of major items, including the storm water pumps and the PLC/control panels for each pumping station. Once equipment arrives on site, specified functional (dry) testing will ensure that any item that can be tested and checked without actually pumping flow will be verified, including all hardwired point-to-point I/O, control panel functionality, RVSSs, field instruments, etc. Only once all factory and functional testing has been completed, documented, and accepted will actual start-up of the pumping stations using their recirculation systems commence. The design documents will also specify requirements for equipment manufacturers to provide specific training sessions for PVSC staff, carefully coordinated with the Contractor and the Resident Project Representative, including hands-on training.

With specified functional testing completed and documented, start-up of the pump stations will move forward. The start-up process will be guided by the Facility Start-Up Plan, with step-by-step processes of how systems and the entire facilities will be started. The Facility Start-Up Plan will be informed by the detailed design, with specifics of how to use the recirculation system, consisting of common force mains routed to each wet well and manually actuated valves, to facilitate initial testing of the pumping station, testing of pumps after maintenance, and exercising of the pumps prior to storm events. The Facility Start-Up Plan will inform the development of an Operation and Maintenance (O&M) Manual, available in electronic format, which complies fully with N.J.A.C. 7:14A-6.12. The O&M Manual will provide describe personnel responsibilities, guidance for emergency situations, NJPDES permit requirements, common and emergency operating procedures, schedules for inspections and maintenance, and an emergency plan to ensure effective operation of the pump stations under emergency conditions.

Constructability

Delivering construction in congested urban environments is challenging, and is a CH2M team specialty – we have been delivering construction projects in cities throughout the world for decades-including Newark, Hoboken, and NYC, and can translate the lessons learned from those experiences to PVSC's stormwater pumping stations project. Constructability reviews are an essential part of the design, to identify opportunities to improve cost and reduce complexity and impact on PVSC staff.

Incorporating Constructability Reviews into the Design

Based upon our team's extensive construction management experience, we have identified constructability reviews that should occur at each of the key design stages, including the optimal time for certain elements to achieve the most cost efficiencies, without compromising the schedule:

- **30-% Design – Review of basic concepts**. The constructability review at the 30-% design stage will focus on basic design concepts, such as:
  - Adjacency to existing structures
  - Adjacency to public roads and easements
  - Plant traffic patterns for delivery of chemicals and solids
  - Conflicts in 3D model
  - Overlaying contractor traffic and staging areas

- **60-% Design – Focus on complex and longer lead elements.** The 60-% design will focus on elements of the design and construction that have added complexity and longer lead times:
  - Barge traffic and solids deliveries in the vicinity of the Northeast and Southeast Pumping Stations
  - Utilities available for contractor (water source and disposal, power sources, lay down areas, etc.)
- **90-% Design - Construction details.** At 90% design, the constructability review will focus on the final details for construction such as:
  - Site security
  - Finalize utilities for contractor
  - Maintenance and sequencing of traffic, both WWTP and public
  - Engaging Resident Project Representative for continuity throughout construction
- **Bid documents – Final preparation.** At the bid document phase, the purpose of the constructability review is to make sure all elements identified during previous reviews are included in the bid documents, as well as to find potential holes in the scope from a construction perspective.

Emphasizing Construction Sequencing

Throughout the constructability review process, our team will be developing requirements for construction sequencing:

- PVSC's access to plant – chemical deliveries, sludge hauling, etc.
- Coordination with the timing of other construction projects, such as the floodwall, storm drainage and generator projects
- Barge traffic for solids delivery must be accounted for to minimize disruptions to operations. CH2M will evaluate with PVSC and the Program Manager the barge delivery trends and determine all elements that must be incorporated into the bid documents so as not to impact solids deliveries

Cost Estimating

Construction cost estimates will be prepared at the completion of each design phase: Schematic Design (30%), Design Development (60% and 90%), and Bid Documents (100%). The design engineers prepare the earlier phase estimates through equipment quotes and enumeration of work items as the documents do not contain sufficient detail to accurately convey the scope of work to the cost estimator. The cost estimator transitions into the lead as the level of detail on the documents increases. At the 90 and 100% document completion levels the estimate is prepared by the cost estimator and is conducted by developing detailed take-offs of the information shown in the documents

Given the short timeframe required to design the three stormwater pumping stations, it may seem unnecessary to develop a construction cost estimate at each design phase, but this cost progression accomplishes several things:

- A planned and controlled transition of the primary responsibility for the estimate yields much better estimating accuracy
- Multiple passes at the same estimate increases completeness and accuracy, providing PVSC with better information going into construction
- Changes in scope that add cost, by additions made to the design through the design process are clearly flagged to be addressed during the next estimate cycle giving project team the opportunity to mitigate cost increases before a costly redesign or rebidding.

Permitting

Per the Basis of Design Report dated July 7, 2016 prepared by the Program Manager, the following permits and approvals are required for the stormwater pumping stations:

- NJDEP Federal Consistency (Hazard Mitigation Proposal) - As this approval has been previously obtained, should an extension be required, CH2M will prepare and submit the required documents.
- NJDEP Freshwater Wetlands Individual Permit/ Flood Hazard Area Individual Permit and FHA Verification/Water Quality (HMP) – A modification will be prepared and submitted to include the pump station project as part of the previous approval
- US Army Corp of Engineers Preconstruction Notification (PCN) for the Nationwide Permit No. 7
- Hudson-Essex-Passaic (HEP) Soil Conservation District (SCD) Soil Erosion and Sediment Control Plan Certification
- NJDEP Request for Authorization under Stormwater General Permit (5G3 – Construction Activities)

CH2M will prepare and submit permit applications and required attachments for submittal. PVSC will provide any fees required by the regulatory agencies.

To ensure that all required approvals have been granted CH2M will prepare a permit readiness checklist and submit to the NJDEP. CH2M will coordinate with the NJDEP Office of Permit Coordination & Environmental Review to setup and attend a Permit Coordination Meeting in order to discuss all permits required for the project. Should additional permits be identified other than the ones noted above, CH2M can prepare and submit the necessary permit applications as authorized by PVSC with the allowance in Task 8.

Services During Construction and Resident Project Representative

CH2M will provide a Resident Project Representative (RPR) onsite for inspections to monitor compliance and coordination with all contract documents. CH2M has proposed **David Missig** as our RPR given his experience in performing the same role for the NHSA's wet weather pumping stations. He will apply his experience from working in similar conditions to PVSC's stormwater pumping stations construction.

Upon completion of the day's inspections, CH2M will prepare a daily construction report summarizing the construction activities. CH2M will create a non-conformance report for any inspection findings that may require remedial action(s) by the contractor. These reports will summarize the observed condition of the inspected work and make any recommendations for required corrective actions to the inspected work. The report will also contain digital photographs where appropriate.

It is anticipated that some specialized expertise will be required during the construction of the stormwater pumping stations. Such specialized expertise may include site visits by a process-mechanical engineer to review the installation of the piping and valves, an electrical engineer to review the installation of the electrical gear and conduit, and an architect to review the construction of the electrical buildings. These visits will assist RPR and will ensure that the intent of the design documents is being followed where general installation details may be left to the contractor to determine in field.

An important aspect of the RPR's daily activities will be to observe that the contractor is following PVSC's safety requirements as defined by the **Construction Safety Manual** that was provided with the RFP. The RPR will familiarize himself with Construction Safety Manual in advance of the work and include any non-conformances in the daily reports.

Third party special inspectors, meeting the code of New Jersey Administration Code, N.J.A.C. 5:23-5.4 (f) will be utilized for certain inspections required during construction. The inspection requirements are defined in Chapter 17 of the 2015 IBC. These inspectors will oversee all required special inspections and testing, including concrete construction, reinforcing bars, concrete field testing; sheets pile driving records, h-pile driving records, micro pile installation, and dynamic pile testing; masonry; structural steel; excavation, subgrade preparation, backfill, and compaction; and seismic resistance of structural systems.

Detailed SOW

PVSC has provided a detailed Scope of Work (SOW) for the completion of this project. The CH2M team agrees with the scope elements, and will approach these tasks by addressing the considerations and best practices presented in the preceding pages. Additional comments to your scope of work is provided below:

Task 1 Review & Compilation of Data

The Team will review and verify documents provided by PVSC, including the basis of design report. Through this process, we will identify any additional scope of work items necessary to complete the project. If necessary, we will provide a letter documenting suggested changes, changes that will only be implemented upon PVSC's agreement.

Task 2 Project Work Plan, Schedule & Reporting

We will develop a project management plan and schedule conforming to the requirements stated in the SOW, including quality management. The project work plan will detail the communication protocol, expected number of meetings, and workshops with PVSC throughout the project duration.

Task 3 Physical Modeling

CH2M will work with Alden Labs to develop the physical models for the three pump stations as required by the RFP unless PVSC chooses to utilize CH2M's alternate approach presented in the Modeling section. If PVSC selects to utilize CH2M's proposed alternative

approach of CFD modeling, CH2M will provide a letter documenting this change to the scope of work that will only be implemented upon PVSC's agreement.

Task 4 Design Services

We will comply with the requirements of the SOW, and our proposed staff and additional resources include the necessary engineering disciplines and specialties required. The design will be completed using 3D models to promote constructability, operability, and other review/input, as well as identify conflicts. The use of 3D design is standard for CH2M. The design will include strict adherence to the quality management plan created for the project for all deliverables.

The Preliminary Engineering Report (PER) submitted at the 30% level is expected to be suitable for submission with project permit applications, include design criteria, and support a design workshop. Defensible, hard decisions are required to permit future design advancement and avoid future rework. We will communicate our proposed decision making model to PVSC, adapt it for PVSC preferences, secure buy-in, and then collaborate to make critical decisions impacting cost and operability.

Other activities include participating in a value engineering workshop, securing permitting, and providing bidding assistance.

Task 5 Design Services during Construction

Our team will provide design services to support construction activities as detailed in the SOW. We have included labor and expense effort associated with special inspections and testing, as required. We will provide a comprehensive Facility Start-Up Plan including a step by step description of how the equipment and facility will be commissioned. We will also develop an electronic O&M Manual.

Task 6 Resident Project Representative

We will provide a full time RPR to provide more extensive observation of the contractor's work, as indicated by the SOW. The RPR will be responsible for observing whether the contractor's work is generally in conformance with the plans and specifications. The Engineer has no control over the means, methods, techniques, or procedures of the Contractor, nor for the health and safety responsibilities held by the Contractor. Engineer's review of the Contractor's work is for the purpose of determining that the Contractor's work is in general conformance with the Contract Documents.

Task 7 Other Direct Costs

We will include the not-to-exceed value of $50,000 to account for expenses authorized by PVSC.

Task 8 Allowances

We will account for the allowances listed in the Scope of Work.

In soils, foundation, groundwater, and other subsurface investigations, the actual characteristics may vary significantly between successive test points and sample intervals and at locations other than where observations, exploration, and investigations have been made. Because of the inherent uncertainties in subsurface evaluations, changed or unanticipated underground conditions may occur that could affect total project cost and/or execution. These conditions and cost/execution effects are not the responsibility of the CH2M team. Our team will communicate frequently with PVSC and alert PVSC if we discover that changed conditions are going to be encountered.

Task 9 Administration of PVSC Funding Requirements

We will work with FEMA representatives to facilitate funding reimbursements as indicated in the SOW.

Task 10 Consultant Responsibility

We will complete work as noted in the SOW.

Sheet Count and Specifications List

CH2M's proposed Sheet Count and Specifications List are included in this section.

Sheet Count

Total Number of Sheets = 189

General Drawings

Sheet No.	Dwg No.	Sheet Title
1	G-01	Title Sheet
2	G-02	Drawing Index
3	G-03	Abbreviations

Civil Drawings

Sheet No.	Dwg No.	Sheet Title
4	C-01	Civil Legends/Notes
5	C-02	Overall Site Plan
6	C-03	Horizontal and Vertical Control Map
7	C-04	Project Site Key Map
8	C-05	Typical Civil Details I
9	C-06	Typical Civil Details II
10	C-07	Typical Civil Details III
11	01-C-01	West Pumping Station Existing Site Plan
12	01-C-02	West Pumping Station Modified Site and Roadway Plan
13	01-C-03	West Pumping Station Existing Yard Piping Plan
14	01-C-04	West Pumping Station Modified Yard Piping Plan
15	01-C-05	West Pumping Station Storm Drain Plan and Profile I
16	01-C-06	West Pumping Station Storm Drain Plan and Profile II
17	01-C-07	West Pumping Station Landscaping Plan
18	01-C-08	West Pumping Station Yard Electrical Site Plan
19	02-C-01	Northeast Pumping Station Existing Site Plan
20	02-C-02	Northeast Pumping Station Modified and Roadway Site Plan
21	02-C-03	Northeast Pumping Station Existing Yard Piping Plan
22	02-C-04	Northeast Pumping Station Modified Yard Piping Plan
23	02-C-05	Northeast Pumping Station Storm Drain Plan and Profile I
24	02-C-06	Northeast Pumping Station Storm Drain Plan and Profile II
25	02-C-07	Northeast Pumping Station Landscaping Plan
26	02-C-08	Northeast Pumping Station Yard Electrical Site Plan
27	03-C-01	Southeast Pumping Station Existing Site Plan
28	03-C-02	Southeast Pumping Station Modified and Roadway Site Plan
29	03-C-03	Southeast Pumping Station Existing Yard Piping Plan
30	03-C-04	Southeast Pumping Station Modified Yard Piping Plan
31	03-C-05	Southeast Pumping Station Storm Drain Plan and Profile I
32	03-C-06	Southeast Pumping Station Storm Drain Plan and Profile II
33	03-C-07	Southeast Pumping Station Landscaping Plan
34	03-C-08	Southeast Pumping Station Yard Electrical Site Plan

Architectural Drawings

Sheet No.	Dwg No.	Sheet Title
35	A-01	Architectural Legends/Notes
36	A-02	Door, Louver, and Finishes Schedules
37	A-03	Typical Architectural Details I
38	A-04	Typical Architectural Details II
39	A-05	Typical Architectural Details III
40	A-06	Pumping Station Electrical Building Life Safety Plan, Building Code Data
41	A-07	Pumping Station Electrical Building Elevations
42	A-08	Pumping Station Electrical Building Floor and Roof Plans
43	A-09	Pumping Station Electrical Building Sections

Structral Drawings

Sheet No.	Dwg No.	Sheet Title
44	S-01	Structural Legends/Notes I
45	S-02	Structural Legends/Notes II
46	S-03	Special Inspections I
47	S-04	Special Inspections II
48	S-05	Special Inspections III
49	S-06	Typical Structural Details I
50	S-07	Typical Structural Details II
51	S-08	Typical Structural Details III
52	S-09	Typical Structural Details IV
53	S-10	Typical Structural Details V
54	S-11	Typical Structural Details VI
55	S-12	Typical Structural Details VII
56	S-13	Typical Structural Details VIII
57	S-14	Typical Structural Details IX
58	S-15	Typical Structural Details X
59	S-16	Typical Structural Details XI
60	S-17	Typical Structural Details XII
61	S-18	Pumping Station Electrical Building Piling and Foundation Plan
62	S-19	Pumping Station Floor Plan and Roof Plan
63	S-20	Pumping Station Electrical Building Sections I
64	S-21	Pumping Station Electrical Building Sections II
65	01-S-01	West Pumping Station Piling Plan
66	01-S-02	West Pumping Station Foundation Plan
67	01-S-03	West Pumping Station Lower Plan

Structral Drawings (continues)

Sheet No.	Dwg No.	Sheet Title
68	01-S-04	West Pumping Station Upper Plan
69	01-S-05	West Pumping Station Monrail Framing Plan and Sections
70	01-S-06	West Pumping Station Sections I
71	01-S-07	West Pumping Station Sections II
72	01-S-08	West Pumping Station Sections III
73	01-S-09	West Pumping Station Sections IV
74	01-S-10	West Pumping Station Manhole 101 and 102 Piling and Foundation Plans
75	01-S-11	West Pumping Station Manhole 101 and 102 Lower and Upper Plans
76	01-S-12	West Pumping Station Manhole 101 and 102 Sections
77	01-S-13	West Pumping Station Transformer Pads Piling and Foundation Plans
78	01-S-14	West Pumping Station Transformer Pads Plans and Sections
79	01-S-15	West Pumping Station Energy Dissipation Structure Piling and Foundation Plans
80	01-S-16	West Pumping Station Energy Dissipation Structure Plans and Sections
81	02-S-01	Northeast Pumping Station Piling Plan
82	02-S-02	Northeast Pumping Station Foundation Plan
83	02-S-03	Northeast Pumping Station Lower Plan
84	02-S-04	Northeast Pumping Station Upper Plan
85	02-S-05	Northeast Pumping Station Monrail Framing Plan and Sections
86	02-S-06	Northeast Pumping Station Sections I
87	02-S-07	Northeast Pumping Station Sections II
88	02-S-08	Northeast Pumping Station Sections III
89	02-S-09	Northeast Pumping Station Sections IV
90	02-S-10	Northeast Pumping Station Manhole Plans and Sections
91	02-S-11	Northeast Pumping Station Transformer Pads Piling and Foundation Plans
92	02-S-12	Northeast Pumping Station Transformer Pads Plans and Sections
93	02-S-13	Northeast Pumping Station Energy Dissipation Structure Piling and Foundation Plans
94	02-S-14	Northeast Pumping Station Energy Dissipation Structure Plans and Sections
95	03-S-01	Southeast Pumping Station Piling Plan
96	03-S-02	Southeast Pumping Station Foundation Plan
97	03-S-03	Southeast Pumping Station Lower Plan
98	03-S-04	Southeast Pumping Station Upper Plan
99	03-S-05	Southeast Pumping Station Monrail Framing Plan and Sections
100	03-S-06	Southeast Pumping Station Sections I
101	03-S-07	Southeast Pumping Station Sections II
102	03-S-08	Southeast Pumping Station Sections III
103	03-S-09	Southeast Pumping Station Sections IV
104	03-S-10	Southeast Pumping Station Transformer Pads Piling and Foundation Plans
105	03-S-11	Southeast Pumping Station Transformer Pads Plans and Sections
106	03-S-12	Southeast Pumping Station Energy Dissipation Structure Piling and Foundation Plans
107	03-S-13	Southeast Pumping Station Energy Dissipation Structure Plans and Sections

Process/Mechancal Drawings

Sheet No.	Dwg No.	Sheet Title
108	M-01	Process/Mechanical Legend/Notes
109	M-02	Typical Process/Mechanical Details I
110	M-03	Typical Process/Mechanical Details II
111	M-04	Typical Process/Mechanical Details III
112	M-05	Typical Process/Mechanical Details IV
113	01-M-01	West Pumping Station Design Data, Schematic, and Hydraulic Profile
114	01-M-02	West Pumping Station Lower Plan
115	01-M-03	West Pumping Station Upper Plan
116	01-M-04	West Pumping Station Sections I
117	01-M-05	West Pumping Station Sections II
118	01-M-06	West Pumping Station Sections III
119	01-M-07	West Pumping Station Sections IV
120	02-M-01	Northeast Pumping Station Design Data, Schematic, and Hydraulic Profile
121	02-M-02	Northeast Pumping Station Lower Plan
122	02-M-03	Northeast Pumping Station Upper Plan
123	02-M-04	Northeast Pumping Station Sections I
124	02-M-05	Northeast Pumping Station Sections II
125	02-M-06	Northeast Pumping Station Sections III
126	03-M-01	Southeast Pumping Station Design Data, Schematic, and Hydraulic Profile
127	03-M-02	Southeast Pumping Station Lower Plan
128	03-M-03	Southeast Pumping Station Upper Plan
129	03-M-04	Southeast Pumping Station Sections I
130	03-M-05	Southeast Pumping Station Sections II
131	03-M-06	Southeast Pumping Station Sections III

HVAC Drawings

Sheet No.	Dwg No.	Sheet Title
132	H-01	HVAC Legends/Notes
133	H-02	Typical HVAC Control Schematic
134	H-03	HVAC Schedules
135	H-04	Typical HVAC Details I
136	H-05	Typical HVAC Details II
137	H-06	Typical HVAC Details III
138	01-H-01	West Pumping Station Plan and Sections
139	02-H-01	Northeast Pumping Station Plan and Sections
140	03-H-01	Southeast Pumping Station Plan and Sections

Electrical Drawings

Sheet No.	Dwg No.	Sheet Title
141	E-01	Electrical Legends/Notes I
142	E-02	Electrical Legends/Notes II
143	E-03	Electrical Legends/Notes III
144	E-04	Electrical Legends/Notes IV
145	E-05	Typical Electrical Details I
146	E-06	Typical Electrical Details II
147	E-07	Typical Electrical Details III
148	E-08	Typical Electrical Details IV
149	01-E-01	West Pumping Station One-Line Diagram
150	01-E-02	West Pumping Station Switchboard and Motor Control Center Elevations
151	01-E-03	West Pumping Station Panel Schedules
152	01-E-04	West Pumping Station Transformer Area Plan
153	01-E-05	West Pumping Station Electrical Building Power and Lighting Plan
154	01-E-06	West Pumping Station Power Plan
155	01-E-07	West Pumping Station Lighting Plan
156	01-E-08	West Pumping Station Power Conduit and Cable Schedule
157	01-E-09	West Pumping Station Control Diagrams I
158	01-E-10	West Pumping Station Control Diagrams II
159	02-E-01	Northeast Pumping Station One-Line Diagram
160	02-E-02	Northeast Pumping Station Switchboard and Motor Control Center Elevations
161	02-E-03	Northeast Pumping Station Panel Schedules
162	02-E-04	Northeast Pumping Station Transformer Area Plan
163	02-E-05	Northeast Pumping Station Electrical Building Power and Lighting Plan
164	02-E-06	Northeast Pumping Station Power Plan
165	02-E-07	Northeast Pumping Station Lighting Plan
166	02-E-08	Northeast Pumping Station Power Conduit and Cable Schedule
167	02-E-09	Northeast Pumping Station Control Diagrams I
168	02-E-10	Northeast Pumping Station Control Diagrams II
169	03-E-01	Southeast Pumping Station One-Line Diagram
170	03-E-02	Southeast Pumping Station Switchboard and Motor Control Center Elevations
171	03-E-03	Southeast Pumping Station Panel Schedules
172	03-E-04	Southeast Pumping Station Transformer Area Plan
173	03-F-05	Southeast Pumping Station Electrical Building Power and Lighting Plan
174	03-E-06	Southeast Pumping Station Power Plan
175	03-E-07	Southeast Pumping Station Lighting Plan
176	03-E-08	Southeast Pumping Station Power Conduit and Cable Schedule
177	03-E-09	Southeast Pumping Station Control Diagrams I
178	03-E-10	Southeast Pumping Station Control Diagrams II

I&C Drawings

Sheet No.	Dwg No.	Sheet Title
179	I-01	I&C Legends/Notes I
180	I-02	I&C Legends/Notes II
181	I-03	System Architecture
182	I-04	Typical I&C Details I
183	I-05	Typical I&C Details II
184	01-I-01	West Pumping Station P&ID
185	01-I-02	West Pumping Station Panel Elevation
186	02-I-01	Northeast Pumping Station P&ID
187	02-I-02	Northeast Pumping Station Panel Elevation
188	03-I-01	Southeast Pumping Station P&ID
189	03-I-02	Southeast Pumping Station Panel Elevation

Specification List

Part 1—Procurement Requirements

Invitation to Bid
Instructions to Bidders
Bid Form
Bid Bond
Bidder's Experience and Qualifications
List of Subcontractors
Other forms as required by PVSC

Part 2—Contracting Requirements

Contract/Agreement
Performance Bond
Payment Bond
Other forms as required by PVSC
General Conditions
Special Conditions
Other Conditions as required by PVSA and Regulatory Agencies

Part 3—Specifications

DIVISION 1—GENERAL REQUIREMENTS

01 11 00	Summary of Work
01 26 00	Contract Modification Procedures
01 29 00	Payment Procedures
01 31 13	Project Coordination
01 31 19	Project Meetings
01 32 00	Construction Progress Documentation
01 33 00	Submittal Procedures
01 42 13	Abbreviations and Acronyms
01 43 33	Manufacturers' Field Services
01 45 16	Contractor Quality Control
01 45 33	Special Inspection, Observation, and Testing
01 50 00	Temporary Facilities and Controls
01 57 13	Temporary Erosion and Sediment Control
01 61 00	Common Product Requirements
01 77 00	Closeout Procedures
01 78 23	Operation and Maintenance Data
01 88 15	Anchorage and Bracing
01 91 14	Equipment Testing and Facility Startup

DIVISION 2 - EXISTING CONDITIONS

02 41 00	Demolition
02 61 50	Handling, Transportation and Disposal of Regulated Materials

DIVISION 3 - CONCRETE

03 01 32	Repair of Vertical and Overhead Concrete Surfaces
03 01 33	Repair of Horizontal Concrete Surfaces
03 10 00	Concrete Forming and Accessories
03 15 00	Concrete Joints and Accessories
03 21 00	Reinforcing Steel
03 24 00	Fibrous Reinforcing
03 30 00	Cast-in-Place Concrete
03 39 00	Concrete Curing
03 62 00	Nonshrink Grouting
03 63 00	Concrete Doweling
03 64 23	Crack Repair Epoxy Injection Grouting

DIVISION 4 - MASONRY

04 21 13.13	Masonry Veneer
04 22 00	Concrete Unit Masonry

DIVISION 5 - METALS

05 05 23	Welding
05 12 00	Structural Steel Framing
05 31 00	Steel Decking
05 50 00	Metal Fabrications
05 53 00	Metal Gratings

DIVISION 6 - WOOD, PLASTICS, AND COMPOSITES

06 82 00	Glass-Fiber-Reinforced Plastic

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07 11 13	Bituminous Dampproofing
07 21 00	Thermal Insulation
07 26 16	Vapor Retarders
07 52 16	SBS Modified Bituminous Membrane Roofing
07 62 00	Sheet Metal Flashing and Trim
07 70 01	Roof Specialties and Accessories
07 92 00	Joint Sealants

DIVISION 8 - OPENINGS

08 11 16	Aluminum Doors and Frames
08 71 00	Door Hardware
08 90 00	Louvers

DIVISION 9 - FINISHES

09 90 00	Painting and Coating

DIVISION 10 - SPECIALTIES

10 14 00	Signage
10 44 00	Portable Fire and Safety Equipment

DIVISIONS 11 THROUGH 22 - NOT USED

DIVISION 23 - HEATING, VENTILATING, AND AIR - CONDITIONING (HVAC)

23 05 93	Testing, Adjusting, and Balancing for HVAC
23 07 00	HVAC Insulation
23 09 00	Instrumentation and Control Devices for HVAC
23 09 13	HVAC Controls, Field Components, and Instruments
23 23 00	Refrigerant Piping
23 31 13	Metal Ducts and Accessories
23 81 00	Unitary Air-Conditioning Equipment

DIVISIONS 24 THROUGH 25—NOT USED

VOLUME II

DIVISION 26—ELECTRICAL

26 05 02	Basic Electrical Requirements
26 05 04	Basic Electrical Materials and Methods
26 05 05	Conductors
26 05 26	Grounding and Bonding for Electrical Systems
26 05 33	Raceway and Boxes
26 05 70	Electrical Systems Analysis
26 08 00	Commissioning of Electrical Systems
26 09 13	Power Measurement and Control
26 12 02	Liquid-Filled Pad Mounted Transformers
26 13 13	Medium-Voltage Circuit Breaker Switchgear
26 13 16	Pad Mounted Switch Gear
26 20 00	Low-Voltage AC Induction Motors
26 22 00	Low-Voltage Transformers
26 23 00	Low-Voltage Switchgear
26 24 16	Panelboards
26 24 19	Low-Voltage Motor Control
26 27 26	Wiring Devices
26 36 23	Automatic Transfer Switches
26 41 00	Facility Lightning Protection
26 43 00	Transient Voltage Suppression
26 50 00	Lighting

DIVISIONS 27—THROUGH 30—NOT USED

DIVISION 31—EARTHWORK

31 09 17	Dynamic Pile Testing
31 10 00	Site Clearing
31 23 13	Subgrade Preparation
31 23 16	Excavation
31 23 19.01	Dewatering
31 23 23	Fill and Backfill
31 23 23.15	Trench Backfill
31 32 19.16	Geotextile
31 41 00	Shoring
31 62 16	Steel Piles
31 68 13	Permanent Ground Anchors

DIVISION 32—EXTERIOR IMPROVEMENTS

32 11 23	Aggregate Base Courses
32 12 16	Asphalt Paving
32 13 13	Concrete Paving
32 16 00	Curbs and Gutters
32 17 23	Pavement Markings
32 31 13	Chain Link Fences and Gates
32 91 13	Soil Preparation
32 92 00	Turf and Grasses

DIVISION 33—UTILITIES

33 05 01.12	Gravity Sewer Pipe and Fittings
33 05 13	Manholes
33 44 13.13	Catch Basins

DIVISIONS 34 THROUGH 39—NOT USED

WT0823161138NJO

DIVISION 40—PROCESS INTEGRATION

40 05 15	Piping Support Systems
40 27 00	Process Piping
40 27 01	Process Piping Specialties
40 27 02	Process Valves and Operators
40 80 01	Process Piping Leakage Testing
40 91 00	Instrumentation and Controls Components
40 90 01	Instrumentation and Control for Process Systems
40 95 80	Fiber Optic Communication System

DIVISION 41

41 22 23.19	Monorail Hoists

DIVISION 42— THROUGH 43—NOT USED NOT USED

DIVISION 44—POLLUTION CONTROL EQUIPMENT

44 42 56.04	Submersible Centrifugal Pumps
44 42 56.09	Submersible Dewatering Pumps

DIVISIONS 45 THROUGH 49—NOT USED

Schedule

While PVSC's stormwater pumping stations project has all of the standard drivers to minimize schedule such as cost management, project reimbursement deadlines, minimized disruptions to operations, it has a significantly stronger driver – the need to improve resiliency from extreme storm events. Between hurricanes in the summer and fall, nor'easters in the winter, and heavy springtime precipitation, PVSC is at risk from extreme weather year round. Given the devastating effects of Superstorm Sandy to both assets and operations, it is critical that PVSC have a functioning stormwater pumping station to work in conjunction with the planned floodwall as quickly as possible. ***The CH2M team understands and shares these schedule drivers with PVSC and is bringing to this project the approaches and construction delivery experience necessary to maintain the best possible project schedule.***

As we have shown throughout this section, our key technical approaches and construction management experience provide the elements needed to keep this project on a schedule that will meet FEMA funding requirements. Based upon the instructions in the BODR regarding the 700 calendar days for construction and our understanding of the design schedule, as well as our experience from similar projects, we expect the design would take approximately one year from notice to proceed; accordingly, we have developed a baseline schedule as presented in **Exhibit 4-4**. Key elements that will be required to maintain this schedule include:

- Construction oversight delivery schedule – Utilizing our CM expert, Paul Whitener, we will vet out construction sequencing and oversight issues during the design phase.
- The Project Manager will work in close coordination with the team, PVSC and the Program Manager to stay on schedule.

Schedule evaluation and optimization will be a key activity during the 30% design process. We will consider the construction marketplace, competing local projects and construction labor availability as we finalize our schedule evaluation.

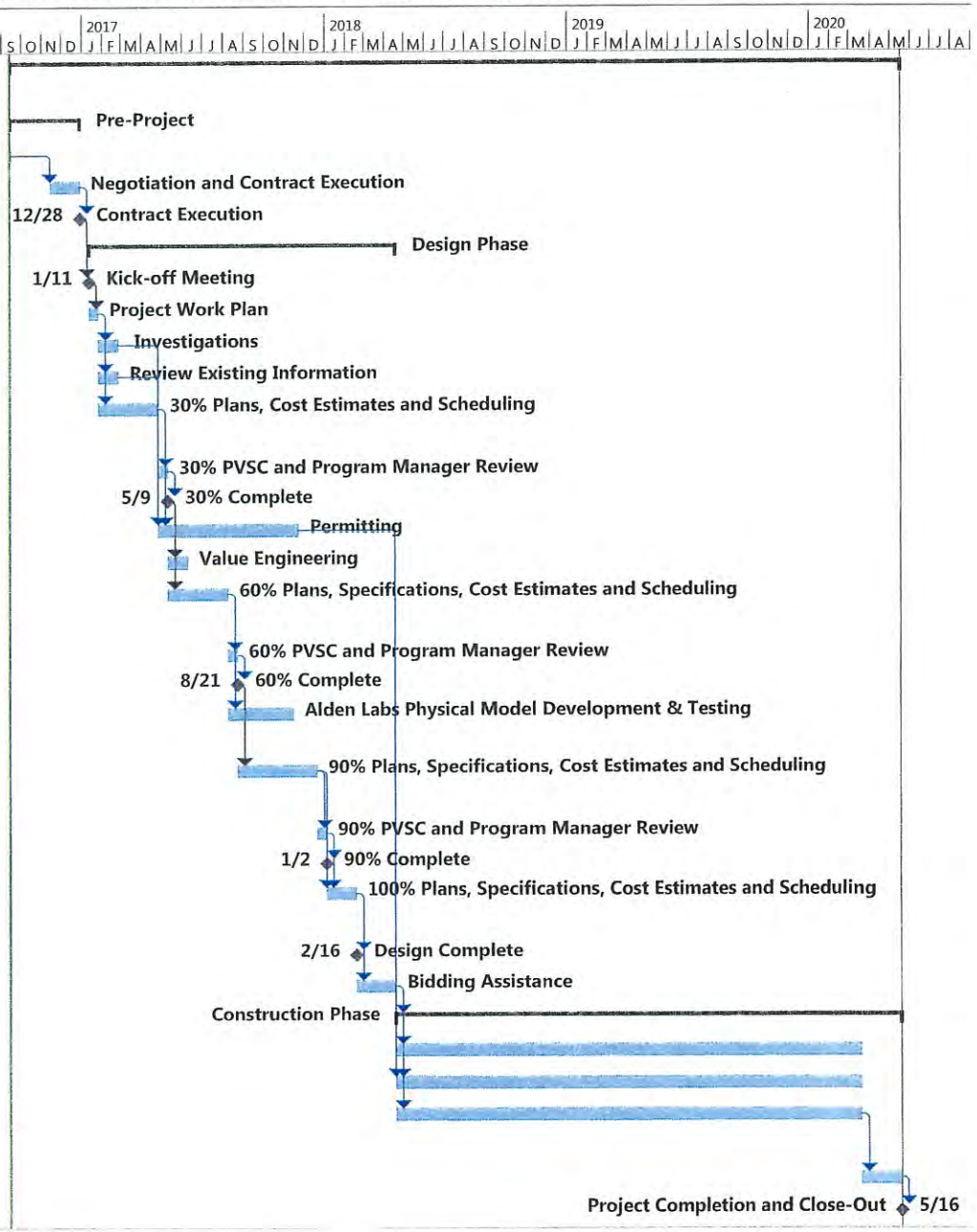
Summary of Total Man-Day Estimate

The Total Man-day Estimate (form Attachment G) is located in Appendix B.

Exhibit 4-4: Proposed Schedule for the Stormwater Pumping Stations Design and Construction

Passaic Velley Sewerage Commision
Design Services and Design Services During Construction for Stormwater Pump Stations

ID	Task Name	Duration	Start
1	**PVSC Stormwater Pump Stations Design and Construction**	**1341 days**	**Wed 9/14/16**
2	**Pre-Project**	**106 days**	**Wed 9/14/16**
3	Proposal Due	1 day	Wed 9/14/16
4	Negotiation and Contract Execution	45 days	Mon 11/14/16
5	Contract Execution	0 days	Wed 12/28/16
6	**Design Phase**	**461 days**	**Wed 1/11/17**
7	Kick-off Meeting	0 days	Wed 1/11/17
8	Project Work Plan	14 days	Thu 1/12/17
9	Investigations	30 days	Thu 1/26/17
10	Review Existing Information	30 days	Thu 1/26/17
11	30% Plans, Cost Estimates and Scheduling	90 days	Thu 1/26/17
12	30% PVSC and Program Manager Review	14 days	Wed 4/26/17
13	30% Complete	0 days	Tue 5/9/17
14	Permitting	210 days	Wed 4/26/17
15	Value Engineering	30 days	Wed 5/10/17
16	60% Plans, Specifications, Cost Estimates and Scheduling	90 days	Wed 5/10/17
17	60% PVSC and Program Manager Review	14 days	Tue 8/8/17
18	60% Complete	0 days	Mon 8/21/17
19	Alden Labs Physical Model Development & Testing	98 days	Tue 8/8/17
20	90% Plans, Specifications, Cost Estimates and Scheduling	120 days	Tue 8/22/17
21	90% PVSC and Program Manager Review	14 days	Wed 12/20/17
22	90% Complete	0 days	Tue 1/2/18
23	100% Plans, Specifications, Cost Estimates and Scheduling	45 days	Wed 1/3/18
24	Design Complete	0 days	Fri 2/16/18
25	Bidding Assistance	60 days	Sat 2/17/18
26	**Construction Phase**	**760 days**	**Wed 4/18/18**
27	Design Services During Construction	700 days	Wed 4/18/18
28	Resident Project Representative	700 days	Wed 4/18/18
29	Stormwater Pump Stations Construction	700 days	Wed 4/18/18
30	Post Construction Assistance	60 days	Wed 3/18/20
31	Project Completion and Close-Out	0 days	Sat 5/16/20



Shivani Patel, PE

Project Manager
FEMA Funding Compliance & NJEIT Grant Funding

Education

BS, Environmental Engineering, University of Southern California

Professional Registration

Professional Engineer: NJ, CA

Shivani was hand-selected to serve as project manager for this PVSC pump station project based on her strong project management skills and similar experience. With more than 17 years of directly relevant experience, Shivani has managed or held a key role on similar projects in New Jersey and the Northeast. For example, she served as the Project Manager for North Hudson Sewerage Authority's four Wet Weather Pump Station projects, with capacities from 80-100 mgd. Similar to this PVSC project, the North Hudson pump stations will alleviate flooding Hoboken during wet weather events. In another example, Shivani served as the project manager for design services from planning to final construction documents and for engineering services during construction for upgrades and expansions to the City of Hartford's (CT) wet weather treatment facilities, with average capacities from 120 mgd to 200 mgd. Under this contract, she managed the design of eight new Dual Use Primary Clarifiers; a 200 mgd Combined Effluent Pump Station, with the possibility of future use up to 250 mgd; Odor Control System Preliminary Design; and cost estimating for the entire wet weather program. Shivani will draw from best practices and lessons learned on these and her other relevant projects to achieve success on this PVSC project.

Rounding out Shivani's qualifications are her experience in design and management of water and wastewater improvement projects, including traditional and innovative designs of water and wastewater facilities. This includes project management, permitting, development and review of construction plans, preparation of specifications and construction management. She has a broad range of design experience in the civil and environmental engineering field. She has over 10 years of experience with working with NJDEP and NJEIT for State Revolving Loan Fund projects.

Representative Projects

Project Manager, H5 Wet Weather Pump Station, North Hudson Sewerage Authority (NHSA), Hoboken, NJ. Managed the design services of an 80 mgd pump station to alleviate flooding in the western portion of Hoboken during wet weather events that occur during high tide. The project required close coordination with the City of Hoboken and the Maxwell Place Homeowners Association, as the project is located on private property. She assisted in the design services from the planning stages through construction contract documents including, obtaining permits from local/state agencies (Waterfront Development, Treatment Works Approval, Soil Erosion and Sediment Control, and U.S. Army Corps of Engineers signoff), obtaining funding through NJDEP state revolving loan fund, coordination with stakeholders, and procurement of easements with property owners.

Project Manager, H1 Screening and Wet Weather Pump Station, NHSA, Hoboken, NJ. Managed the design services of a screening facility to meet NJDEP outfall discharge regulations and a 100 mgd pump station to alleviate flooding in the south western portion of Hoboken during wet weather events that occur during high tide. The project required close coordination with NJ Transit, Hudson County Engineer's Office, City of Hoboken, and Port Authority of New York and New Jersey, as the construction of the pump station is located between the NJ Transit Hoboken bus and train terminal and the Port Authority path tunnels; the twin outfalls run underneath the rail terminal, which has 18 train tracks.

Shivani assisted in the design services from the planning stages through construction contract documents including, obtaining permits from local/state agencies (Waterfront Development, Treatment Works Approval, Soil Erosion and Sediment Control, and U.S. Army Corps of Engineers signoff), obtaining funding through NJDEP state revolving loan fund, coordination with stakeholders, and procuring easements with property owners. Because the project was funded through both NJDEP state revolving loan fund and the American Recovery and Reinvestment Act of 2009, she was responsible for program compliance reporting to NJDEP on a monthly and quarterly basis during the construction phase.

Project Manager, Wet Weather Pump Stations, NHSA, Hoboken, NJ. Project Manager for design work associated with NHSA's Wet Weather Pump Station design program. Pump stations include; H3/H4/HSI Wet Weather Pump Station and H6/H7 Wet Weather Pump Station.

Project Manager, Wet Weather Treatment Facilities, Hartford, CT. Project Manager for design services from the planning stages to final construction documents and engineering services during construction for upgrading and expanding the WWTP's average capacity from 120 mgd to 200 mgd. Scope of work consisted of designing eight new Dual Use Primary Clarifiers (DUPCs), a 200 mgd Combined Effluent Pump Station (CEPS) with the possibility of future use up to 250 mgd, Odor Control System Preliminary Design and cost estimating for the entire wet weather program. The new tanks for the DUPCs were designed for use under dry weather operating conditions as well as with Chemically Enhance Primary Treatment (CEPT) for wet weather flows. The DUPCs are equipped with instruments to provide for automated dry weather and wet weather treatment. The new CEPS was designed to allow for the discharge of plant effluent consisting of final effluent (FE) and wet weather effluent (WWE) to the Connecticut River when river stages are such that plant effluent cannot be discharged by gravity. The CEPS contains six 40 mgd (5 duty, 1 standby) submersible mixed flow pumps. CH2M utilized computation fluid dynamic (CFD) modeling and a scaled physical model to confirm design assumptions and optimize the station and pumping configurations.

Design Manager, Combined Sewer WWTP and Pump Station Improvements Project, NHSA, NJ. Design services for the installation of gas detection systems at 5th Street Pump Station, 11th Street Pump Station, 18th Street Pump Station, and Baldwin Avenue Pump Station. Replacement of process pumps and pedestrian doors at the Adams Street WWTP. Replacement of the Administration Building Roof, HVAC equipment and various exterior doors at the River Road WWTP. And, the replacement of sewage pumps, valves, variable frequency drives and installation of emergency lighting and ductwork at the 11th Street Pump Station.

Project Manager, W1234 Solids/Floatables Screening Facility, NHSA, NJ. Project Manager for design services for solids/floatable screening facility at the end of the W1234 Outfall. The project satisfies a consent decree for the Authority and will be the largest S/F facility in the service area. The S/F Facility is divided into two trains under a new pier structure in the Hudson River at the end of the existing W1234 outfall. The structures are completely below grade with flush-mounted access doors at grade for access to replace nets and maintain the S/F facility. A public access open space is provided above the structure with enhanced river and a Manhattan skyline viewing platform, park seating, and plantings on the pier extension above the S/F facility to minimize visual impacts of the below-grade netting structures and the vehicular access road. Shivani assisted in design services from the planning stages through construction contract documents, including obtaining permits from local/state agencies (Waterfront Development, Treatment Works Approval, Soil Erosion and Sediment Control, and U.S. Army Corps of Engineers approval), obtaining funding through NJDEP state revolving loan fund, coordination with stakeholders, and procurement of easements with property owners.

Jerry Notte, PE

Principal-in-Charge

Education

BS, Civil Engineering, New Jersey Institute of Technology

BS, Biology/Chemistry, Seton Hall University

Professional Registration

Professional Engineer: NJ, NY

Licensed T-4 Water Treatment Operator: NJ

Licensed W-4 Water Distribution Operator: NJ

Licensed UST Operator: NJ

As principal-in-charge, Jerry will provide accountability to PVSC and will make sure our project manager and team members have the resources they need to successfully deliver design services and design services during construction for this stormwater pumping stations project. Knowledgeable of your facilities, operations, procedures, and staff, Jerry served as principal-in-charge for PVSC's Sodium Hypochorite Storage Facilities Upgrade Project and Newark Bay Outfall Dechlorination Facilites Project. As a lifetime resident of New Jersey, Jerry understands the importance of this project, having helped his clients and friends cope with the damages of Superstorm Sandy. For example, he worked with CH2M's operations group to help the North Hudson Sewerage Authority prepare for, respond to, and recover from Superstorm Sandy damages to the wastewater facilities after being inundated from 14-foot storm surge. For PVWC, he was Program Manager for its $150 million Emergency Power and Water Storage Program. A former general manager for the North Jersey District Water Supply Commission, he directed over $350 million in capital improvements and addressed risk management, NJ stakeholder liaison, and downstream flooding and resiliency issues, including flood control design and operations.

Representative Projects

Program Manager, Emergency Back-Up Power and Water Storage Facilities Design, Permitting and Construction Administration Services, Passaic Valley Water Commission (PVWC), Clifton, NJ. Responsible for directing and coordinating the design, permitting, loan assistance, and construction administration services associated with three projects with estimated construction costs of $35 million. The projects include a 12 MW power emergency back-up generation facility for the PVWC Little Falls Water Treatment Plant, two 2.5 million gallon prestressed concrete water storage tanks located within the footprint of the existing Levine Reservoir in Paterson and a 2 million gallon steel water storage tank in Verona.

Program Manager, $13 billion NYCDEP Capital Program, NY. Managed efforts to drive superior CIP delivery, including developing guidance documents and training staff in project management and delivery, developing cost estimating and cost estimating guidance documents, creating a permit department and tracking database, implementing and staffing project controls program, developing a training program and design standards and interviewin and recommending new hires to staff the program.

General Manager, North Jersey District Water Supply Commission, Wanaque, NJ. Served as General Manager of the 210 mgd system. Managed numerous capital projects including the $350 million Wanaque South Water Supply project; the $178 million Wanaque Water Treatment Plant and Expansion, including construction of a 160 mgd Water Filtration Plant and a 40 mgd facility expansion; and $30 million in Residuals Handling Facility improvements. Jerry planned and directed activities of 120

employees for operation, maintenance and management of one of NJ's largest water supplies and treatment facilities serving 84 municipalities and more than two million residents. Facilities included two water supply reservoirs and watersheds, dams and intake structures, two large river pumping stations, transmission and distribution systems, wastewater treatment facilities, and state-certified water and wastewater laboratory.

Principal-in-Charge, Sodium Hypochorite Storage Facilities Upgrade Project and Newark Bay Outfall Dechlorination Facilites, PVSC, Newark, NJ. Responsible for overseeing and directing the acitivties of the technical team responsible for the feasibility evaluation and the design and design services during construction of PVSC's upgrades to their Sodium Hypochlorite storage and handling facilities and the feasibility evaluation and the design and design services during construcion for PVSC's new Newark Bay Outfall Dechlorination facilities.

Special Reliability Master Investigation of the Swimming River Water Treatment Plant Pipe Bridge Collapse, New Jersey American Water, Monmouth County, NJ. In the wake of Hurricane Irene, at the provocation of Governor Christie, the New Jersey Board of Public Utilities (NJBPU) asked Jerry to perform a forensic evaluation of a major pipe bridge collapse of one of New Jersey American's (NJAW) water treatment plant supply and feed lines, which left 95,000 people without water. Services included a review and assessment of: NJAW's historic operation and maintenance practices, circumstances surrounding the bridge collapse, the Company's efforts post-Hurricane related to restoring service and post-Hurricane Irene inspection of the SRWTP pipe bridge. He conducted more than 40 interviews ranging from the President of NJAW to the Project Manager, evaluated NJAW's asset management plan, governance, capital prioritization program and public relations program. He prepared a report and presented it to NJBPU.

JV Board, Advanced Wastewater Treatment System, NYCDEP, NY. Member of the JV Board of Directors for NYCDEP's AWT Program, consisting of an aggregate capacity of 690 mgd (Bowery Bay, Hunts Point, Tallman Island, Wards Island, 26th Ward).

Project Director, Trenton Water Works, Pre-Treatment and Facilities Improvement Project, Trenton, NJ. Responsible for a comprehensive facility evaluation and assessment, design, SRF funding, and construction administration for this $65 million upgrade to Trenton's Water Filtration plant. Improvements included addition of new superpulsators, new chemical feed systems, lime storage and feed system, upgrades to pumping systems, and piping. Also evaluated improvements to intake structures to eliminate frazzle ice.

Program Manager/Principal-in-Charge, Lackawanna Watershed Improvement Program, PA. Managed the $ 80 million watershed improvement program in the anthracite region of Northeastern Pennsylvania to address Acid Mine Drainage and CSOs impacting the Lackawanna River, funded by a grant from the U.S. EPA to Lackawanna County.

Project Director, Trenton Water Works, "Outside the City" Distribution System Asset Valuation, Trenton NJ. Responsible for directing the hydraulic feasibility of separating the City of Trenton's Water Distribution System into an "inside "and "outside" system. Directed the efforts in identifying, cataloging, and determining a value of the assets outside the city for possible sale. System was valued at $120 million.

Project Director, Membrane Filtration Plant, Town of Newton, NJ. Managed, planned, designed, and provided construction services for new, 1.5-mgd membrane filtration plant that provided a filtration system to treat drinking water in compliance with the Surface Water Treatment Rule and Enhanced Surface Water Treatment Rule requirements in response to NJDEP mandate.

Kevin Nielsen, PhD, PE

Technical Advisor and QA/QC – Pump Station Modeling

Education

PhD, Civil and Environmental Engineering, University of Iowa

MS, Civil and Environmental Engineering, Utah State University

BS, Civil and Environmental Engineering, Utah State University (magna cum laude)

Professional Registration

Professional Engineer: ID, MT

Kevin specializes in fluid mechanics, hydraulic design, hydrology studies, and environmental water resources project planning. He is experienced in the design and study of water control and conveyance systems and has been responsible for several hydrologic studies. He has worked on feasibility studies and final design of projects for storm drainage, flood control, hydroelectric power development, dams, hydraulic structures, irrigation, fish hatcheries, fish passage, stream stabilization, municipal water supply, wastewater treatment, and transportation. He has participated in Value Engineering (VE) studies to review designs associated with river protection and control structures, energy dissipation, pipeline and pump station systems, and several other associated hydraulic components. He has also been involved in the preparation of environmental assessments and environmental impact statements. Kevin is currently CH2M's global hydraulics leader for hydraulic transient analysis, application of computational fluid dynamics (CFD), and advanced hydraulic modeling, evaluation and design.

Representative Projects

CFD Hydraulics Model Task Leader, Integrated Pipeline Pump Stations Project, Tarrant Regional Water District, TX. Led the CFD analysis effort for the three large raw water pump stations associated with the Integrated Pipeline (IPL) Project. The program includes raw water pipelines, raw water intakes and pumping stations, booster pumping stations, and storage reservoirs. Each pump station consists of several can pumps sharing a single wet well connected to t-screen filter intakes in the reservoir. A CFD analysis of the raw water intakes, wet wells, and pump can hydraulics was conducted. Performed CFD modeling to evaluate the proposed wet well configurations prior to the physical model testing of the pump intake and wet well designs. Results were compared against the HI acceptance criteria to identify undesirable pump approach flow conditions. The analysis identified key parameters to consider during the physical modeling of the pump station wet well and open top pump can systems.

CFD Hydraulics Model and Physical Model Task Leader, Primary Effluent Pumping Station (PEPS), Sacramento Regional County Sanitation District, CA. Led the team that performed a CFD simulation study and a Physical Model study. Kevin led the CFD analysis and physical modeling effort for this pump station evaluation. The CFD analysis evaluated pumping performance for several different pump and wetwell configurations. The analysis compared general approach flow conditions, swirl angle, and velocity distribution criteria to acceptance criteria established in the American National Standards Institute (ANSI) Hydraulic Institute (HI) Standards. The analysis included CFD evaluation of 25 alternatives with different pump modifications and wetwell configurations to help select a configuration that met HI criteria under different flow conditions. The alternatives included different configurations of layouts, baffle walls, splitter plates, floor cones, fillets, and bay entrance arrangements. The final alternative based on the CFD modeling was then evaluated with a physical model. The physical model confirmed that the selected alternative would meet HI standards and provided some additional refinements to the final design. His conjunctive use of CFD modeling to investigate several alternatives

and physical modeling to provide final confirmation of HI compliance proved to be an efficient and cost-effective means of developing an HI compliant pump station.

CFD Hydraulics Model Task Lead, Skyway WWTP Pump Station Analysis, Region of Halton, Burlington, Ontario, Canada. Lead the modeling effort for the proposed upgrades to the Burlington Skyway WWTP (from 118 MLD/pump to 140 MLD/pump). Used CFD model to investigate the general approach flow patterns of the proposed pump station wet well layout at a max inflow of 580 MLD.

CFD Modeling Lead, Kitchener WWTP Plant 2 and UV Disinfection Upgrade Project, Regional Municipality of Waterloo, Canada. Senior CFD analysis and lead for development of CFD models for new pump station attached to UV immediately downstream as part of expansion to the 100 (400 peak) ML/d facility. Kevin used CFD modeling to effectively evaluate several flow enhancements alternatives to bring the pump flow conditions into compliance with the HI standards for pump suction flow. The CFD modeling provided a cost effective solution to maintain appropriate flow conditions while staying within restrictive site constraints.

CFD Modeling Lead, Toronto Horgan WTP Expansion, Toronto, Ontario, Canada. Senior Technical Modeler for CFD analysis for new lift station and chlor/dechlor facility. Used CFD modeling to effectively implement flow enhancements to bring the pump flow conditions into compliance with HI standards for pump suction flow. The CFD modeling provided a cost effective solution to maintain appropriate flow conditions while staying within restrictive site constraints.

CFD Modeling Lead, Louisville Southwest Pump Station (LSWPS) Capacity Investigation, Louisville Water Company, Louisville, KY. Conducted CFD analysis on the 92-MGD pump station. Used CFD to evaluate the existing system to look for potential unexpected headloss or confirm that high headloss was unusual. Pressure gages confirmed an enormous headloss across the "open" valves in the suction line; once the client decided to go ahead with a redesign of the facility (150 MGD), used CFD to evaluate the efficiency of various pump station configurations.

CFD Hydraulics Model Task Leader, Ute Reservoir Intake Pump Station, Eastern New Mexico Rural Water System, NM. Led CFD analysis effort for the intakepPump station, which delivers raw water to a 1-MG storage tank located at the high point of the raw water conveyance system. Used CFD model to investigate the general approach flow patterns of the proposed pump station wet well layout. Focused on analyzing swirl angles and average velocity distribution in the pump bell as defined by HI standards. Evaluated several improvement modifications, such as splitter walls between pump intakes, flow alignment cross vanes in the pump intake bells, and various fillets and wedges to better align flow into the pump intakes to identify methods to reduce swirl angles, improve velocity distribution, and provide better approach flow characteristics to meet HI criteria.

Hydraulic Task Leader, California Department of Water Resources (CA DWR) Bay Delta Conservation & Conveyance Project (BDCCP) Surge Analysis, DWR; Sacramento, CA. Performed surge analysis to determine the magnitude of potential surge pressures experienced in the case of a catastrophic power failure at the proposed river intake pump stations. The project consisted of three, 3,000 cfs river intake structures. Each intake led to six intake pumps through 8 foot diameter pipes. Each pump station connected the individual pumps through a manifold into 20 foot diameter tunnels. Each tunnel was between 8,000 and 28,000 foot long. he three tunnels converged at an intermediate forebay, which then conveyed all 9,000 cfs into two 40 foot diameter tunnels. The 40 foot diameter parallel lines conveyed the water 33 miles to an existing forebay for use. Surge tanks at each PS were sized for 20 foot-diameter up to 52 foot-diameter tanks to keep pressures within acceptable limits.

Jim Gagnon, PE

Technical Advisor and QA/QC – Pump Station Design

Education

MS, Environmental Engineering, Rensselaer Polytechnic Institute

BS, Civil Engineering, University of Massachusetts (Lowell)

Professional Registration

Professional Engineer: OH, KY, MI, MA

Jim has 21 years of experience in treatment plant and pumping station operational evaluations and process systems optimization as well as design, construction administration, and research for various water, wastewater, and odor control projects. His primary responsibilities currently include process and hydraulic evaluations; process and equipment selection and review; process and civil systems design; detailed design and specifications preparation; and construction phase administration. Prior to joining CH2M, Jim worked as a Project Manager responsible for design and construction phase engineering services for water and wastewater facility projects throughout the Northeast.

Representative Projects

Construction Manager, Rockaway WPCP Superstorm Sandy Emergency CM Services, NYCDEP, NY, NY. On October 29, 2012, the Rockaway WPCP experienced inundation, loss of power and other damage due to the effects of Superstorm Sandy. The record storm surge that accompanied Superstorm Sandy submerged process equipment and electrical systems in seawater thereby rendering the Rockaway WPCP unable to pump and treat wastewater in the immediate aftermath of the storm. Served as part of the recovery team that worked for 10 days around the clock to stabilize primary treatment, establish secondary treatment, and re-establish permanent electrical power. Worked closely with client staff, design engineers, and contractors to prioritize and manage efforts during the recovery phase. Project was recognized as the 2013 CM Project of the Year by the NY/NJ Chapter of the Construction Management Association of America for projects less than $20M in value.

Senior Technical Consultant, Smith Road Lift Station, City of Fort Wayne, IN. Providing process-mechanical and general pump station design oversight for a new 4 MGD submersible pump station, mentoring and guiding junior engineers through the design process. The design required careful coordination with another new lift station (designed by others) to ensure both pump stations can discharge to a common force main. Pumps have been evaluated for several operating conditions to ensure compliance with client requirements and Hydraulic Institute Standards and expandability in the future. Pump station design includes duplex pumps, valve and meter vaults, bypass pump connection, and related gravity and force main piping and appurtenances.

Project Technologist, Advanced Facilities Plan and Program Support Services Project, Westerly and Southerly Tunnel Dewatering Pump Stations Basis of Design Reports, Northeast Ohio Regional Sewer District, Cleveland, OH. Project Technologist for conceptual planning and refinement of project scope, schedule, and cost for two deep tunnel dewatering pump stations, including analysis of feasible pump station configurations, pump types, and screenings removal options. Led the development of the pump station concepts, providing lead process-mechanical design, coordinating the various design disciplines leads, and coordinating with the parallel development of the deep tunnel design concept effort.

Project Technologist, Lakeview Pumping Station Pump Replacement Project, Sanitation District No. 1, KY. Project consists of pump replacement and capacity upgrade to 22.7 mgd at an existing and mission critical pumping station. Was responsible for modeling of the proposed pumping system and selection of the specified pumps. He worked closely with the pump manufacturers to select a pump that would meet

the demanding application and would operate within the recommendations of the Hydraulic Institute, and with the check valve and existing surge tank manufacturers to ensure the design would minimize the impact of surge conditions. Produced the process-mechanical drawings and specifications, incorporating SD1's preferences for the mechanical systems, vibration monitoring systems, and performance of the surge control system. During construction, he provided shop drawing reviews of the process and mechanical equipment and systems and engineering support for the field activities.

Project Technologist, Narrows Road Diversion Pump Station, Sanitation District No. 1, KY. Project consists of a new 17 MGD wastewater pumping station, including four 450 hp pumps configured as two series pump sets, screenings facilities, and a surge control system. Responsible for the modeling of the proposed pumping system and selection of the specified pumps. Produced the process-mechanical drawings and specifications, and reviewed shop drawings of the process and mechanical equipment and systems and engineering support for the field activities.

Senior Technical Consultant, St. Louis MSD Facilities Construction Services, MO. Providing construction services for wet-weather control facilities, including biddability and constructability reviews of proposed wet weather facility designs. Provided extensive process-mechanical reviews of several CSO storage and conveyance facilities, WWTP improvements, and pumping station designs. Reviewed facility designs have included the Coldwater CSO Storage Tank, Lemay No. 3 Deep Tunnel Dewatering Pump Station, Maline Creek Deep Tunnel Pump Station PDR, Cold Water Creek WWTP Washer-Compactor Improvements, Deer Creek Sanitary Tunnel Pump Station, LMRDP Tunnel Dewatering Pump Station, and Gravois Trunk Sanitary Storage Facility.

Project Technologist, Wastewater Treatment Facility Phase 1 and 2 Improvement, Village of Covington. Project technologist for the initial assessment, evaluation, planning, and detailed design of phase improvements to the treatment plant. Assessed all process equipment and assisted with development of a comprehensive plan to upgrade facilities to meet the client near- and long-term goals. Developed design documents to address the first two phases to make improvements to preliminary treatment and to alleviate flooding risks with a new effluent pump station. Mentored and guided junior engineers through design process. Because of available capital funding, client decided to separate the first two phases; consequently, revised 90% complete design documents into two separate packages and included design of new post-aeration and UV disinfection facilities to the effluent pump station design. Phase 1 (effluent pump station, post-aeration, and UV disinfection) bid documents will be complete in the fall of 2016, and Phase two bid documents will be complete in the spring of 2017.

Project Engineer, Muddy Creek Wastewater Treatment Plant Secondary Flow Enhancements and Influent/Effluent Pumping Upgrades, Municipal Sewer District of Greater Cincinnati, OH. Project Engineer for the design of secondary enhancements and upgrades to the influent and effluent capacities of the treatment plant. Responsible for the hydraulic design and the detailed design of the process and mechanical equipment of the secondary flow enhancements, including revising portions of the design that were completed but were tabled by Cincinnati MSD until funding was available. Also responsible for the hydraulic design and evaluation of the influent and effluent pump stations and the effluent outfall under various flood stages of the Ohio River. Work includes revision of the specifications and drawings and inclusion of new design documents for the pump stations, and providing overall QA/QC and constructability review of the design.

Project Engineer, McDowell Street Pump Station Relocation, Village of Bloomingburg, OH. Project Engineer for the design of a new pump station, which replaces one that was no longer reliable and was of great concern to the Village and OH EPA. Responsible for the mechanical and hydraulic design, and was in charge of the engineering services during construction.

Bill McMillin, PE, DWRE

Senior Modeler

Education

MEE, Environmental Engineering, Manhattan College

BCE, Civil Engineering, Manhattan College

Professional Registration

Professional Engineer: NJ

Diplomate, Water Resource Engineer

Based in Parsippany, Bill has a broad base of public and private sector experience in delivering evaluations, planning, design, and implementation of water resources, collection system, wastewater treatment, and environmental management projects. Bill is experienced in the regulatory, planning, design and implementation aspects of wet weather flow management. He participated in authoring federal guidance documents for CSO controls and professional publications on wet weather management and related use attainability analyses. He has voluntarily assisted the State of New Jersey in developing its CSO policies and permits for long-term control planning, and has extensive experience in working with local and state agencies for conducting projects that address regulatory and permit compliance issues. He served on the EPA's Environment Technology Valuation (ETV) technology panel for Wet Weather Modeling. In addition to his involvement in professional society activities and public education, he has served on the Manhattan College Dean of Engineering's Consulters Committee in New York City.

Representative Projects

Technical Consultant to Wet Weather and Wastewater Management Capital Designs, North Hudson Sewerage Authority (NHSA), Hudson County, NJ. Technical consulting on CSO wet weather management, permitting, design, hydraulic analyses, and state revolving funding for ongoing capital design projects. These projects included the River Road Diversion Project (diverting 1 mgd of wastewater between WWTP service areas) and the H1 Screening and Wet Weather Pump Station (CSO solids/floatables controls and flooding relief). Worked closely with NJDEP on the Authority's behalf and obtained the maximum stimulus dollars available to a single utility under the American Recovery and Reinvestment Act of 2009 (ARRA). The Authority received $10 million dollars, $5 million of which will be forgiven and will not need to be paid back.

Project and Design Manager for Collection System and Wastewater Treatment Plant Capital Designs, NHSA, Hudson County, NJ. Managed capital improvements design projects for NHSA's collection system, two wastewater treatment plants, and inline solids/floatables controls for combined sewer overflows. With a design budget of more than $900,000, managed both project delivery and design of capital improvements with an initial estimated capital cost exceeding $30 million. Collection system designs included cleaning, inspection and rehabilitation, pump station improvements, and inline solids/floatables controls. Wastewater treatment designs included improvements to liquid treatment processes, general facilities, odor control, residuals handling, and a replacement of chlorine disinfection with ultraviolet radiation without interrupting treatment operations. Also coordinated designs with state revolving fund submittal requirements to assure low-interest financing of the projects.

Task Leader and Technical Consultant, Wastewater and Storm Drainage Facilities Plan, Boston Water and Sewer Commission, Boston, MA. Leading the climate change task in a project that is developing a drainage facilities plan that will establish a sustainable framework for planning and management for the next 25 years of capital and operational improvements. The climate change task incorporates the

development and evaluation of climate change adaptation strategies for changing wet weather conditions, sea level rise and storm surge scenarios. An extensive data analysis of regional and local rainfall gages was performed to generate updated intensity/volume-duration-frequency design storms. A range of climate change scenarios with global, regional and localized considerations through the year 2100 were then developed. Collection system and 2-D surface water modeling using ISIS were applied to identify flooding and inundation zones. Recommendations will focus on modifying and managing sewer and storm drain systems in light of potential flooding from higher intensity rain events, higher tides and storm surge. CH2M is identifying and prioritizing at-risk wastewater infrastructure based on future forecasts to inform long-term capital improvement planning.

Senior Technical Consultant on Lower Passaic River Remedial Investigations and Feasibility Studies, Newark, NJ. CH2M is contracted by the Lower Passaic River Cooperating Parties Group to assist them on completing an ongoing remedial investigation/feasibility study with the U.S. Environmental Protection Agency on the Lower Passaic River Restoration Project. Leading watershed, water quality, and mathematical modeling work efforts related to developing a sustainable remedy. Activities include watershed management analyses to calculate annual loadings of suspended solids and contaminants of potential concern, and identifying sustainable watershed control alternatives including green infrastructure practices to prevent future recontamination.

Senior Technical Consultant on CSO Program Management, Newport, RI. Consulting on combined sewer overflow characterization and long-term control planning activities. Managed a $1 million metering task for a calendar year and within one month of a notice to proceed, led the identification, verification and installation of sewer flow and groundwater meters at 35 locations plus 3 rain gages throughout the City of Newport to meet an EPA deadline associated with a consent decree. Currently consulting on collection system modeling, water quality characterizations, condition assessments, RDII identification and trackdown, affordability analyses, collection system capacity assessments, long-term CSO control panning, and master planning.

Technical Consultant and Task Manager for CSO Planning, Greater New Haven Water Pollution Control Authority, New Haven, CT. Technical consultant for the preliminary design of the Authority's short- and long-term CSO control plan. Directed and reviewed modeling and planning efforts to select alternatives that will maximize wet weather flow to the Authority's wastewater treatment facility. Directed a short-term flow monitoring program and model-verification effort to update the Authority's collection system model to simulate implemented elements of its CSO control plans. Consulted on additional modeling effort to measure progress and optimize the LTCP. Performed hydraulic analyses of existing facilities for design of upgraded or new facilities.

Senior Technical Consultant on Environmental, Conceptual Engineering, and Economic Analyses of the Scope and Extent of Future Modifications to Infrastructure that are Advisable to Manage Climate Change and Population Growth Effects On New York City Sewer and Wastewater Systems, New York City Department of Environmental Protection. Leading CH2M's effort as a subcontractor assisting with the development of an adaptation and optimization strategy for addressing increased demand and minimizing risks of global climate change to New York City drainage and wastewater management systems. CH2M is applying its experience and expertise with GHG mitigation, sustainable planning principles, climate change adaptation services, and risk management to addresses population increases, sea level rise, storm surge effects, temperature increases, and increased extreme wet weather events on infrastructure and operations.

Martin Moore, PE

Design Manager

Education

BS, Engineering Technology, University of Carleton

Professional Registration

Professional Engineer: VA

Martin has nearly three decades of experience in pump station and large-scale water/wastewater facility design and construction administration projects in the United States and Canada. He has managed the design of anaerobic digester systems, pumping stations, and other related treatment plant facilities from concept to initial operations, often coordinating the work of large, multi-discipline design teams. He is knowledgeable in complex construction sequences and construction around operational facilities and has procurement experience with a variety of models, ranging from equipment sole source, per-select, pre-purchase, and bidding and negotiation of construction contracts. Recently, Martin served as De sign Manager for North Hudson Sewerage Authority's Wet Weather Pump Stations project in Hoboken, whose scope of work is similar to this one. In that role he managed the design for the following pump stations: H5 (80 mgd) Wet Weather Pump Station; H3/H4/HSI Wet Weather Pump Station; H6/H7 Wet Weather Pump Station; and H1 (100 mgd) Wet Weather Pump Station and screening facility.

Representative Projects

Project Manager, Pump Station Condition Assessment and Prioritization of Capital Improvements, Fairfax County, VA. Project manager for the condition assessment of multiple pump stations and the use of a decision science model to prioritize capital improvements.

Design Manager, Combined Sewer Overflow Screening and Wet Weather Pump Station, North Hudson Sewerage Authority, NJ. Design Manager for a wet weather screening and low lift pump station in a heavily urbanized area. Construction cost $18.1 million.

Project Manager, Wet Weather Capacity Improvements and Nitrogen Reduction at the East Shore Water Pollution Abatement Facility, New Haven CT. Responsible for the planning and design of nitrogen reduction facilities and storm water treatment at the East Shore WPAF and major collection system pump stations. Nitrogen reduction included IFAS, wet weather treatment includes grit, screening, enhanced primary treatment and disinfection. Estimated program costs $245 million.

Project Manager, Advanced Waste Water Treatment Plant Upgrade, Alexandria Sanitation Authority, Alexandria, VA. Project Manager for the construction of the Advanced Waste Water treatment upgrades, start up and operational assistance. Estimated program cost $300 million.

Design Manager/Assistant Project Manager, Design of a Biological Nitrogen Removal Facility (BNR), Solids Processing Facility and Upgrades to Plant Process' and Services, Alexandria Sanitation Authority, Alexandria VA. Work also included design and construction of a biosolids processing facility, and upgrades to all other plant processes and services. Construction cost was $265 million.

QC Manager, Clayton County Water Authority, Water Reclamation Facility Expansion and Upgrade, Clayton County Water Authority. Responsible for ensuring CH2M's work met the technical/process objectives and the work of all disciplines was coordinated. Also had the additional responsibility to remain with the allocated funds for the project.

Project Manager, Comprehensive Water Resources Study; Nairobi, Kenya. Project Manager for the development of a comprehensive water resources management plan which would ensure adequate drinking water supply to the US Embassy. Design of the recommended improvements.

Project Manager, St. Mary's County MetCom, Water and Sewer Facility Planning Project. Performed evaluations of multiple alternatives for upgrading Marlay-Taylor, determining engineering and construction requirements, and developing cost estimates.

Engineering Design Manager, Waste to Energy Facility; City of Wilmington, DE. Engineering Design Manager for a waste to energy facility using landfill and digester gas to generate heat for thermal drying of biosoilds and 4.5MW of electrical power. Estimated construction cost $40 million.

Design Manager, Process and Ventilation Improvements to the Toronto Pumping Station, Canada. Provided process and ventilation improvements and replaced/upgraded raw sewage pumps, bar screens and material handling systems. Added process ventilation and odor control in hazardous areas. Station capacity was 4,700 liters per second (90 MGD). Construction cost was $4.5 million.

Mark Chrzanowski, PE

Senior Structural Engineer

Education

BSCE, Structural Engineering and Construction Management, University of Cincinnati

Professional Registration

Professional Engineer: NY, PA, CT, OH, NC, GA, AL, MI

As a Senior Structural Engineer and Technologist, Mark provides PVSC the benefit of 35 years of experience that include the design and construction of facilities associated with water and wastewater treatment throughout the United States. His experience encompasses a diverse spectrum of capabilities including practicing lead structural engineer, structural quality control reviewer, technology management, front-line management, program management, and project management, as well as experience gained from being a co-founder and former principal of a structural consulting firm. Mark is fluent in the design of the overall structural system using a variety of materials including concrete, masonry, steel, aluminum and wood. He also possesses extensive knowledge in concrete materials, structural condition assessment and rehabilitation, and repair of concrete construction. Through his involvement at the national level of the American Concrete Institute, Mark investigates technological advances in the concrete industry that bring additional value to CH2M's global enterprises and more importantly to clients.

Representative Projects

Structural Lead Engineer, Hartford WPCF Expansion, Hartford, CT. Part of a $400 million expansion, served as the structural lead and oversaw the teams of structural engineers who designed approximately $150 million worth of facilities. The facilities include the dual use primary clarifiers, combined effluent pump station, and various process and electrical facilities to support the expanded facility. There are an estimated 31 miles of steel piles supporting the facilities.

Structural Lead Engineer/Structural Quality Control Reviewer, JEA Blacks Ford Water Reclamations Facility – Phase IV Expansion; Jacksonville FL. The $60 million expansion will increase plant capacity from 2.25 mgd to 6 mgd facilities sized to accommodate build-out for future capacity of 12 mgd. Served as the structural lead through the design development phase at which point he switched roles to the structural QC reviewer. New facilities include oxidation ditch (two trains), headworks, odor control, secondary clarifiers, pump stations, filters, reclaimed water storage tanks, biosolids processing building, maintenance building, electrical building, and operations building. In addition to the new facilities, a number of existing structures are being repurposed.

Structural QC Reviewer, Forsyth County WTP Expansion, Forsyth County, GA. Served as the structural QC reviewer for this project, which involved design of a 12-mgd expansion to 28 mgd, utilizing UF membrane technology. In addition, site planning for an ultimate expansion up to 72 mgd, including three additional finished water clearwells and a second high service pump station, was included as part of the design.

Structural Quality Control Reviewer, Forsyth County Shakerag Water Reclamation Facility, Forsyth County GA. The $29 million project was a 1.25-mgd expansion of an existing facility, and capable of facilitating an ultimate expansion to 10 mgd. Served as the structural engineer of record, oversaw the team of structural engineers who designed the structures, served as structural quality control reviewer, and supported services during construction. The facilities include pump stations, headworks, odor

control systems, EQ tank, biological basins and membrane tanks, operations and membrane equipment buildings, storage tanks, dewatering facility, and electrical buildings.

Structural Lead Engineer, Rocky River WWTP EQ Project, Town of Mooresville, NC. The project consisted of a sewer pump station and two new 75-foot-diameter equalization tanks. As structural lead engineer, oversaw the structural design of all components to support the equalization project.

Structural Lead Engineer, Rocky River WWTP Expansion Project, Town of Mooresville, NC. The $100 million project consists of upgrading and expansion of the existing treatment facility from the current design capacity of 5.2 mgd to 15 mgd, with provisions for future expansion to 25 mgd. As structural lead engineer, oversaw the structural design of all components of the project from preliminary treatment through tertiary treatment of the liquids as well as the pump station that will convey the treated effluent to Lake Norman.

Structural Lead Engineer for Program Management Team, Wet Weather Improvements Projects – Sanitary Sewer Overflow Control and Wastewater Facilities Improvements Program, Baton Rouge, LA. CH2M is the program manager for the SWWTP and NWWTP Wet Weather Improvement Projects. Became involved in the program as a structural QC reviewer in the Immediate Action Projects 1 through 3. In Phase 1 of the SWWTP Wet Weather Improvement Project, served as the structural lead on the program management team, and continues to serve in that capacity in the NWWTP Wet Weather Improvement Projects. Authored the structural sections of the Discipline Design Requirements for both the SWWTP and NWWTP projects. The discipline design requirements establish the basis of design and design parameters for use by consultants who design the actual facilities of the project. Also reviews the consultants' work at design-phase milestones. When necessary, provides value engineering services to the program management team.

Structural QC Reviewer, Residuals Collection and Treatment Facilities, Washington Aqueduct, Washington, D.C. Built in 1853, the Washington Aqueduct supplies, more than 1 million people with potable water. This $100 million project involves expanding the current treatment facilities to remove, dewater and dispose process residuals in a manner that complies with Washington Aqueduct National Pollution Discharge Elimination System Permit. Responsible for overseeing the teams of structural engineers who designed four new 105-foot-diameter thickeners, new dewatering facility, and a number of modifications to the Dalecarlia and Georgetown facilities.

Project Team Engineer; $23 million Leesburg Water Pollution Control Facility Upgrade and Expansion Project 7.5; Leesburg, VA. As a member of the project team, duties included the structural design of two new BNR-reactor basins and two new secondary clarifiers, as well as providing significant structural modifications to two existing secondary clarifiers. The capacity of the facility will increase from treating 4.85 million gallons of wastewater per day to 7.5 mgd.

Structural Engineer, Albuquerque WTP, Albuquerque, NM. Designed structural support systems for multiple buildings for a new 92-mgd WTP that uses ozonation for primary disinfection and taste and odor control. Facility designed to meet house treatment equipment that support EPA's new arsenic groundwater standards. Designed structures housing GAC filtration equipment and chemical building for onsite hypochlorite generation.

Peter Sokolow, PE

Senior Electrical Engineer

Education

BS, Electrical Engineering, Pratt Institute

Professional Registration

Professional Engineer: NJ, NY, PA, DE

Pete brings to PVSC a 48-year career specializing in engineering, permitting, and construction for power distribution and generation for public utilities, including pump stations, water, and wastewater facilities. He led the electrical engineering portion of Climate Resiliency report for wastewater facilities in the five boroughs of New York, conducting a thorough infrastructure investigation and recommending necessary storm resiliency improvements. He brings a thorough understanding of PVSC facilities, having served as electrical engineer for the WAS Pump Station Alternatives Study, Raw Water Pumping Station Upgrade, and Little Falls Water Treatment Plant Power Distribution System projects. His wide range of experience includes medium voltage substations, low voltage switchgear distribution apparatus and motor control centers, and supervision of electrical apparatus shutdown and alteration to equipment with minimal interruption to plant operations. Pete is familiar with electrical distribution switchgear (34.5KV, 26.4KV, 4.16KV, 480VAC and 120/208VAC) including 480 VAC Motor Control Centers (MCC) and 4.16KV MCC with variable frequency drives.

Representative Projects

Senior Electrical Engineer, Passaic Valley Sewerage Commission WAS Pump Station Alternatives Study, NJ. Provided electrical engineering support to produce a report for various pumping options for the facility to consider and select a final design. Several different electrical source options were presented for facility consideration including utilizing the existing VFD drives.

Senior Electrical Engineer, North Hudson Sewerage Authority (NHSA), H1 Screening and Wet Weather Pump Station, NJ. Performed engineering field services to commission and witness testing of the facility's 750 KW Diesel Emergency Generator Installation.

Senior Electrical Engineer, Modifications to Infrastructure to Manage Climate Change and Population Growth Effects on New York City Sewer and Waste Water Systems, New York City Department of Environmental Protection (NYCDEP), New York, NY. Performed field surveys of NYCDEP critical infrastructure; in particular, 50 pump stations in all five boroughs. In addition, he prepared report findings, equipment recommendations, estimate review and recommended resiliency measures such that catastrophic weather effects may be reduced during extreme events.

Senior Electrical Engineer, NHSA, Engineering Design and Emergency Services, NJ. Responsible for engineering design services for the Trickling Filter Pump Station Upgrade projects. Pete prepared design drawings to integrate new pump monitoring modules into an existing plant SCADA system. He also provided field investigation services to ascertain existing emergency generator operation, testing, and verification after an incident occurred where by the generator failed to pick up the facility loads during a utility electrical outage. Finally, he was responsible for emergency field services at the Adams Street WWTP to determine damage to the UV building electrical feeder. He assessed damages and recommended remedial work, which was completed on time and within budget without interruption to the UV process.

Senior Electrical Engineer, Modifications to Infrastructure for Nitrogen Removal, Advanced Water Treatment Program Assistance 02, NYCDEP, New York, NY. Performed electrical field surveys at five NYCDEP Waste Water Treatment Plants (Wards Island, Tallman Island, Bowery Bay, 26th Ward and Jamaica Bay). In addition, he assisted in preparing the 'Basis of Design Report' including preliminary design drawing list and DEP Specifications list. During the design phase, Pete reviewed the sub-consultants' progress and work content to maintain schedule and deliverable accuracy.

Senior Electrical Engineer, NHSA, OMI Adams Street WWTP Administration Building Electrical Feeder Replacement, NJ. Provided field investigation services to ascertain existing copper cabling and equipment ruined by Super Storm Sandy. Design services included a riser diagram for connectivity details and the use of existing drawings to supplement key location of electrical equipment.

Senior Electrical Engineer, NHSA River Road WWTP, Pier Improvements Project, NJ. Provided electrical design services for an outdoor, vandal proof, utility (PSE&G), service entrance pedestal with revenue meter socket to provide electrical power to pier lighting fixtures. Feeder size checking was included with this design such that feeder adequacy was established with respect to 'voltage drop,' and proper electrical power was provided to the lighting fixture lamps to attain maximum illumination.

Senior Electrical Engineer, Middlesex Water Company, Carl J. Olson Water Treatment Plant, NJ. Responsible for the electrical distribution system upgrade to facilitate the installation of Chlorination Improvements (Hypochlorite Generation System) to replace the existing Gaseous Chlorine Disinfection system. The electrical design services included modifications to the plant's 4.16KV main switchgear such that a new 1000 KVA substation could be installed to provide electric power to the new in plant Sodium Hypochlorite generation process. In addition, design services included modifying an existing General Electric 750 KVA double ended substation to provide a second source of 480 VAC electrical power to the new in plant Sodium Hypochlorite generation process. In addition, construction phase services were provided. He provided electrical engineering services for the Raw Water Intake Station after the facility experienced a complete outage caused by a faulted pump motor. The services included field investigation and providing a short circuit – protection study with Arc Flash Warning labels for the distribution equipment. For the Park Avenue Well field facility, Pete provided electrical engineering design services and township filing documents for permitting to replace an existing control building's power feeder.

Senior Electrical Engineer, The City of Philadelphia, Water Department, Southeast Water Pollution Control Plant, Scum Concentration Facility Upgrade, PA. Provided electrical design services including VFD retrofit to the existing MCC, power plans (with hazardous area equipment specification, control stations etc.), preparing wiring diagrams from P&ID loop schematics and review of specifications and preparing a new VFD specification for retrofitting the existing MCC.

Senior Electrical Engineer, NHSA, West New York WWTP, NJ. For the mixer upgrade to the Existing Sludge Holding Tank, engineering design services were provided for integrating the new equipment into the existing Motor Control Center.

Senior Electrical Engineer, Electrical Engineer, Little Falls Water Treatment Plant Power Distribution System, Passaic Valley Water Commission, NJ. Performed field surveys of the existing 26.4 KV electrical power distribution system and designed a new flow-through utility (PSE&G) approved switchgear and a new 26.4 KV distribution switchgear in separate outdoor protected aisle enclosures. Designed underground to distribute the power to the existing 7.5MVA transformers and new transformers (12.5 MVA each) were incorporated into the design to interface with a new 12 MW diesel emergency generating system.

Tom Bechtel, PhD, PE

Senior Mechanical Engineer

Education

PhD, Chemical Engineering, University of Missouri-Columbia

MS, Mechanical Engineering, Southern Illinois University-Carbondale

BS, Chemical Engineering, Iowa State University

Professional Registration

Professional Engineer: OH, IL, IN, MI

Tom is a senior engineer with more than 20 years of experience in chemical and mechanical engineering. Throughout his career, he has focused on providing mechanical and chemical engineering for water and wastewater clients throughout the United States. For example, over the past few years he has been serving as the Design Engineer for various project for the District of Columbia Water and Sewer Authority's Blue Plains AWTP. In this role, he was responsible for hydraulic modeling and the design of all pumping stations, as well as services during construction. He has been the author or co-author for numerous papers and articles, many focused on the design and treatment of water and wastewater facilities. He is adept in contract drawing and specification preparation; chemical and mechanical system modeling and calculations; process equipment layout and design; and construction phase engineering services.

Representative Projects

Design Consultant and QA/QC Reviewer, Sodium Hypochlorite Facilities Upgrade, Passaic Valley Sewerage Commission, NJ. Authored technical memorandum on outdoor sodium hypochlorite storage tank options. Responsible for technical guidance of design engineers and process QA/QC. Storage facility consisted of 5 FRP tanks with a total capacity of 75,000 gallons.

Design Engineer, OARS, Division of Sewerage and Drainage, Columbus, OH. Prepared hydraulics calculations, pump system simulation and pipe support and loading calculations for a 75 mgd combined sewer pump station.

Design Engineer, Sludge Thickening Improvements and Additional Renovations (S76), Southerly WWTP, City of Columbus, Division of Sewerage and Drainage, OH. Prepared design calculations for the sludge, polymer and odor control systems portions of the project. Analyzed and quantified sludge production data in order to determine polymer demand. Performed sludge and polymer hydraulics calculations and pump designs. Sized odor control blowers. Also prepared calculations, drawings and specifications for a new skimmings concentration system, including thermal design of the skimmings heating system. Assisted in shop drawing review during the construction phase.

Engineer, Sludge Dewatering and Miscellaneous Improvements (S64), Southerly WWTP, City of Columbus, Division of Sewerage and Drainage, OH. Responsible for reviewing process pump and HVAC shop drawings as part of the services during construction.

Design Engineer, Sludge Blending and Transmission Improvements, Blue Plains AWTP, District of Columbia Water and Sewer Authority, Washington, D.C. Responsible for design calculations for the sludge mixers and sludge pumping systems, and computer modeling and optimization of the sludge blending process. Also responsible for preparing drawings and specifications for the new submersible blend tank mixers, sludge grinders, and sludge recirculation and transfer pumping systems.

Design Engineer, Final Dewatering Facilities, Blue Plains AWTP, District of Columbia Water and Sewer Authority, Washington, D.C. Responsible for hydraulic modeling and design of all pumping systems on the project, including sludge, polymer and dilution water pumps, for this 850 contract drawing, $65 million dollar project. Also currently responsible for services during construction.

Design Engineer, Enhanced Nitrogen Removal Facilities, Blue Plains AWTP, District of Columbia Water and Sewer Authority, Washington, D.C. Responsible for aeration piping design and pump station modeling for this 1,300 contract drawing, $167 million dollar project. Also was responsible for services during construction.

Design Engineer, Gravity Thickener Facility Upgrades, Blue Plains AWTP, District of Columbia Water and Sewer Authority, Washington, D.C. Responsible for design calculations. drawings and specifications for the $14 million project, involving upgrades to eight gravity thickeners, including collection equipment, sludge and scum pumps, controls, and ancillary systems. Also participated in shop drawing review during the construction phase.

Design Engineer, Additional Chemical Systems and Transmission Improvements, Blue Plains AWTP, District of Columbia Water and Sewer Authority, Washington, D.C. Chemical engineer for this $55 million plant-wide chemical systems improvements project for the 750 mgd plant. Responsibilities included chemistry and dosage calculations for metal salts and polymer; sizing and design of the feed pumps and piping systems for metal salts and polymer solutions; determining chemical storage and day tank requirements; preparing general project chemical and mechanical calculations and drawings; and monitoring project scheduling and costs. Also participated in construction phase services.

Design Engineer, Low Service Pump Addition, Dublin Road Water Plant, Columbus, OH. Assisted with hydraulics calculations and performed Quality Control for the addition of two 30-inch low service vertical turbine pumps in the plant pump station, each sized to deliver 23,000 gpm. Contract value: $1.2 million.

Design Engineer, Sludge Pumping Renovation, Hap Cremean Water Plant, Columbus, OH. Performed a detailed rheological study of sludge behavior under pumping conditions, including data analysis and calculations, for a $32.5MM sludge pumping and electrical upgrade at the Plant.

Paul Whitener, PE, CCM

Constructability/Construction Sequencing

Education

MS, Industrial Technology - Construction Concentration, Eastern Michigan University

BS, Civil Engineering, Virginia Polytechnic Institute & State University

Professional Registration

Professional Engineer: NY, FL

Certified Construction Manager (CCM), Construction Manager Certification Institute

With more than 30 years of experience managing construction field operations and performing constructability/construction sequencing, Paul brings a strong and varied array of best practices to the projects he delivers. He emphasizes a stable organizational, communication, and procedural framework to take the delivery team from front-end design development, permitting and constructability phases, through the construction phase and ultimately to final occupancy with continuity. Utilizing sound controls for schedule, financial, risk/claim/change management, quality control, document/information control, commissioning planning, public relations, health and safety, procurement, data protection, and project resource/logistics coordination he establishes a protocol that is reliable, organized and sustainable over the long duration of a major project. Having extensively managed both in-house and outside design professionals, as well as contractors and process equipment suppliers, Paul understands the interests of each of the various project participants and strives to foster an environment of mutual respect and fair dealing, where all are given their best chance for success. His experience in managing large projects for public owners allows him the insight to integrate the efforts and interests of the municipality, regulators, designers, builders, suppliers, general public and other stakeholders.

Representative Projects

Project Director, Citywide CM Services, NYCDEP, NY. Overall director of construction management teams assigned to various capital projects. Responsible for staffing, CM practices, delivery quality and senior point of contact for DEP management. For the 26th Ward Main Sewerage Pump Replacement, Paul provided inspection staff augmentation for CM services associated with replacement of main sewage pumps at 26th Ward WWTP. For the Hunts Point Water Pollution Control Plant HP-3 project, he was responsible for CM services for digester refurbishment, polymer feed addition system, and miscellaneous plant upgrades.

Project Director/Resident Engineer, Rockaway WWTP Storm Recovery, NYCDEP, NY. Overall director, and on-site Resident Engineer during recovery phase, of construction management services for response, recovery and restoration of NYCDEP Rockaway WWTP inundated by Superstorm Sandy. Responsible for emergency work order scoping, sequencing, scheduling and cost control of multiple prime contractors. Work was successfully coordinated with plant operations, US Army COE, FEMA and public utilities to bring primary treatment and critical unit processes back on line within two weeks of the storm.

Deputy Program Director, CAT/DEL Ultra Violet Water Treatment Facility, NYCDEP, Valhalla, NY. As assistant to Program Director, was responsible for executing entire scope of agency construction management contract in joint venture partnership with a New York City-based engineering firm. Project features largest UV disinfection facility in the world, designed to treat 2.2 BGD supplying approximately

90% of New York City's drinking water demand. Project includes interception of existing access shafts to the Catskill and Delaware aqueducts, originally constructed in 1941, without interruption of service as well as commissioning and operational support upon construction completion. Scope of CM services included coordination of four major prime contracts working simultaneously on the site.

Project Manager, Fallingwater Wastewater Pumping, Treatment, and Reuse Systems, Western Pennsylvania Conservancy, Fallingwater, PA. Responsible for construction and commissioning of nine packaged wastewater lift stations and Zenon wastewater treatment process to treat sewage flows generated at the historic Frank Lloyd Wright Fallingwater site. Treated effluent is discharged to two subsurface drip irrigation systems constructed on the property. All work was performed in the environmentally sensitive Bear Run watershed, a Pennsylvania DEP Exceptional Value stream, and coordinated with public visitation of this national landmark. Recipient of Design-Build Institute of America's National Design-Build Award for Water Projects under $15 million.

Project Director, Coney Island Outfall CI-21, NYCDEP, NY. Overall director of construction management effort for construction and commissioning phases. Responsible for staffing, CM practices, delivery quality, safety and senior point of contact for DEP management. CM services for underwater replacement of approximately 600 lf of a 60" reinforced concrete outfall pipe and diffusers approximately 20 ft below Jamaica Bay in Coney Island, Brooklyn, NY. Work also includes the placement of approximately 1,500 lf of articulated concrete mattress to protect exposed areas of the existing pipe.

Project Director; Wards Island WI-78 Construction and Program Management, NYCDEP, NY. Project Director for third-party construction management services to perform screening and grit removal upgrades to two grit facilities serving the NYCDEP Wards Island WPCP. In replacing an incumbent CM firm, Paul brought CH2M staff and resources to this project within days in order to support DEP's desire to make urgent changes to a troubled project.

Project Director, NYCDEP Constructability Review CONREV-1A, New York, NY. Lead multi-disciplined teams to perform post-construction investigations of various DEP capital projects to identify conditions and practices that contribute to project success and failure. Outcomes include a successful series of internal lessons-learned training sessions presented by BEDC Accountable Managers to their peers and a body of project delivery best practice recommendations to DEP.

Project Manager, Stamford WPCA Solids Dryer Facility, Stamford Water Pollution Control Authority, Stamford, CT. Responsible for managing complete pre-design, design, permitting, construction and commissioning phases of an Andritz-Ruthner DDS-40 sludge drying/palletizing system installation in an operating wastewater treatment plant. Project features renovation of former solid waste incineration facility, originally constructed in 1958, to house new sludge drying process equipment. The reutilization of the incineration facility required significant structural analysis and reconstruction to accommodate new building codes and loading conditions. All construction and process integration must occur without impacting on-going WWTP operations. Recipient of Design-Build Institute of America's National Design-Build Merit Award for Water/Wastewater Projects under $25 million and the DBIA New York Tri-State Metro Region Project of the Year Award.

David Missig

Resident Project Representative

Education

MS, Construction Management, Stevens Institute of Technology

BS, Environmental Engineering Technology, University of Dayton

Professional Registration

Engineer-in-Training

Dave is a New Jersey resident with more than 21 years of directly relevant project experience, including providing Resident Project Representative (RPR) and construction phase services, ranging from construction management, inspection, and resident engineering for large, complex water and wastewater projects. Dave's construction experience with projects of similar scope and magnitude will be of value to PVSC as the RFR. He served as a resident engineer for North Hudson Sewerage Authority, including facilities installed to address storm/wet-weather events and provided construction management support for the largest Ultraviolet disinfection plant in the world—the $1.4 billion Cat/Del Ultraviolet Water Disinfection Facility for the NYC Department of Environmental Protection. His career has spanned wastewater treatment plant construction, design and inspection, combined sewer overflow systems design and construction, sanitary sewer design-rehabilitation and construction, with responsibilities typically involving construction management; construction inspection; design implementation of drawings and specifications; design review; shop drawing reviews; coordination between contractors, subcontractors, other engineers, operators, and the owner. He also performs redesigns in the field; responds to technical requests for information; prepares request for quotations, work change directives, and field orders; prepares and reviews change orders; assists with claims negotiations and in preparing as-built drawings. He processes contractor's monthly payment applications; conducts monthly progress meetings; prepares weekly project status reports; and maintains contractor's schedule and budgets.

Representative Projects

Project Manager/Resident Engineer, H1 Screening and Wet Weather Pump Station Project, North Hudson, Hoboken, NJ. The project consists of the construction of a pump station that will service the H0 and H1 combined sewer drainage areas. The station will pump CSO to the Hudson River during major storm events that coincide with high tide. Responsible for management of design, junior staff, and subcontractors; internal labor and budget management reporting; communication of project progress to owner; preparing monthly report to the owner's commissioning board; and implementing the health and safety program. Coordinated and prepared Socially Economically Disadvantage and the American Reinvestment Recover Act paperwork.

Project Engineer, Construction Management for Cat/Del UV Water Disinfection Facility, NYCDEP, Valhalla, NY. Work consisted of coordinating construction activities to construct the largest Ultraviolet disinfection plant in the world with a design capacity of 2.02 billion gallons per day (bgd) and an average flow of 1.31 bgd; coordinated with the design disciplines as construction issues occurred to implement proper design concepts with all contractors. Responsible for design implementation of drawings and specifications; coordinated construction issues with contractors; coordinated and reviewed Request for Information (RFIs); maintained and updated record drawings; reviewed, tracked monthly quantities, and approved monthly payment applications averaging approximately $25 million per month; designed, created, and maintained an internally designed monthly quantity computer program.

Construction Supervision, Miscellaneous Repair Annual Contracts, North Hudson; Hoboken, NJ. Provided construction supervision for the gunite rehabilitation of sewer-cleaning services in the collection system. Responsibilities included inspection, implementation of contract documents, and prepare cost estimates of monthly work.

Project Engineer/Construction Inspector, Solids/Floatables Control Facilities, North Hudson; Hoboken, NJ. Provided construction management, inspection, and bidding of combined sewer overflow screening facilities and outfall consolidations. Provided construction management and inspection of four packages (each of about $7 M construction costs). Responsibilities included inspection, engineering coordination between in-house staff (Project Manager and Resident Engineer), implementation of contract documents, bidding, construction management and claims negotiation.

Resident Engineer, Port Richmond WWTP Disinfection Demonstration Facility, NYCEP; Staten Island, New York. The project generally consists of the construction of a new sodium hypochlorite system to comply with the New York State Department of Environmental Conservation more stringent total residual chlorine State Pollutant Discharge Elimination System effluent limits for the WWTPs.

Lead Site/Civil Designer/Project Engineer, Stamford Solids Drying Facility Project, Stamford Water Pollution Control Authority, Stamford, CT. Responsible for the Site/Civil design of the project – coordinated design effort with other design disciplines, attended client workshops and design/build meetings for implementation of the D/B project. As the Project Engineer, implemented the plans and specifications, coordinated construction issues with subcontractors, coordinated all project documentation, maintained contractor's schedule and budgets, coordinate start-up and commissioning phase, liaison with City of Stamford officials, manager of junior level staff member, assisted with QA/QC project issues, and provided daily inspection of subcontractor's work. Work consisted of coordinating construction activities to renovate an existing building for installing Sludge Drying Equipment; coordinate equipment deliveries with subcontractor, coordinate with design disciplines as construction issues present occur to implement proper design concepts with all Subcontractors.

Project Engineer, Facility Upgrade and Expansion Project, Stamford Water Pollution Control Authority, Stamford, CT. Responsible for the implementation of plans and specifications, Responding to Requests for Information (RFI), Requests for Quotations (RFQs), maintaining contractor's schedule and budgets, and daily inspection of contractor's work. Work consisted of expanding the plant's average capacity to 24-mgd with upgrades and/or expansions in the following plant facilities: raw sewage pump station, primary clarifier flow distribution structure, primary clarifiers, new and existing aeration basins, new methanol building, new and existing secondary clarifiers, secondary clarifier flow distribution structure, new UV disinfection facility, new chemical building, the new effluent flow meter vault, primary sludge pumping station, thickening and degritting facility, the sludge processing building, power distribution system, new switchgear/generator building, expanded operations building, new maintenance and blower building, three new odor control facilities, and the new SCADA system.

Project Engineer/Designer, Harrison Street Rehabilitation Project, North Hudson Sewerage Authority, Hoboken, NJ. Provided initial design for 525-linear feet of a 30-inch Ductile Iron Pipe. Responsibilities included design, in-house engineering coordination, preparation of contract documents, and bidding.

Construction Supervision, W1234 and Park Avenue Project, North Hudson Sewerage Authority (NHSA). Provided construction supervision for the installation of two 36-inch and one 120-inch steel slip casings. The installed casings to be used for future projects for the collection system. Responsibilities included, implemented contract documents, verified contractor's quantities, and coordinated project issues with Project Manager.

John Tobia, PE

Start-up, Training, and Commissioning

Education

BS, Mechanical Engineer, Rutgers University College of Engineering

Professional Registration

Professional Engineer: NJ, PA, MD

Based in Parsippany, John brings to PVSC more than 30 years of experience in the planning, design, and construction of a diverse spectrum of municipal water and wastewater infrastructure improvement projects. His design experience includes design management, senior technical reviews, constructability reviews, and Engineer-of-Record responsibilities for potable water distribution system designs, and wastewater treatment plant and pumping station capital improvements projects. He also is a Construction Manager and Startup Engineer, with experience preparing construction documents and providing services during construction in accordance with the codes and standards of the NJ Environmental Infrastructure Trust and the State. John currently serves as the Project Delivery Coordinator and Design Group Leader for CH2M's New Jersey office. Prior to joining CH2M, John was a design and construction engineer, and also managed water and wastewater utility operations.

Representative Projects

Project Manager/Construction Manager, Final Clarifiers Phase V Modifications, Effluent Troughs and Weir Improvements - Services During Construction A-672, PVSC, Newark, NJ. Responsible for management of the project, including, staff assignments, project financials, and quality control. CH2M provided services during construction for this project, which was designed by others. Our services include resident engineering, resident inspection, specialty inspections, shop drawing review, RFI resolution and all other services during construction. The project included demolition and adjustment of the level and alignment of existing concrete effluent launders in the 12 secondary clarifiers for a 330 MGD wastewater treatment plant. Construction work also includes restoration of the joints between the effluent launder sections and adjusting the level of the existing fiberglass V-notch weirs to achieve the desired surface overflow rate.

Senior Design QC Reviewer, Senior Construction Project Manager and Lead Startup Engineer, H1 Wet Weather Pump Station, North Hudson Sewerage Authority, Hoboken, NJ. Performed senior QC review of the design concepts and construction documents during the design phase for this extremely complex project. During the bidding and construction phase of the work, responsible for overall project coordination, project quality and ARRA compliance. Responsible for startup and testing of the facility; including the pump control automation system. This $17.5 million project features construction of a below-grade 100 MGD pump capacity (50 MGD firm capacity) variable speed wet weather pump station with mechanically-cleaned CSO screens, and a new electrical power and control building. Construction included the rehabilitation of existing twin 48-inch diameter brick and cast iron outfall pipelines underneath the PATH train terminal for pressure service, and new outfall extensions to the Hudson River. The H1 pump station was designed to relieve the flooding associated with storm events occurring at high tide in the south western portion of the City of Hoboken. The project received a National Recognition Award in ACEC's 2012 Engineering Excellence Awards competition.

Design Engineer of Record, Design Manager and Project Manager/Construction Manager, Combined Sewer Wastewater Treatment Plant and Pump Station Improvements, NHSA, Hoboken, NJ. Engineer of Record and Design Manager for the project design phase of this $2.3 million project, which included

preparation of complete construction documents and NJ State Revolving Loan Fund (SRF) financing coordination. Responsible for overall project coordination, project quality and SRF compliance for the services during construction phase. The project included capital improvements at the two wastewater treatment plants and at three of the collection system pumping stations. Project features the following capital improvement work: 1) Adams Street WWTP: replacement of two trickling filter influent pumps, one trickling filter effluent pump and two plant effluent pumps, replacement of three PURAC recycle pumps and isolation valves, and installation of new corrosion-resistant doors in PFB. 2) River Road WWTP: replacement of the roof system and HVAC equipment on the administration building and sludge treatment building, replacement of chemical storage facility roll-up doors and structural joint repair within the Roto-Strainer influent channels. 3) Collection System Pump Stations: replacement of three pumps, isolation valves, check valves, PLC-based instrumentation and control system and adjustable frequency drives, and installation of emergency lighting at the 11th Street Pump Station, and installation of gas detection alarm panels at the 11th Street, Baldwin Avenue, and 5th Street Pump Stations.

Project Manager/Construction Manager, 18th Street Sanitary and Wet Weather Pump Station Improvements Project, Services During Construction, NHSA, Weehawken, NJ. Construction Manager who provided bidding and construction services for improvements to the pump station, which was designed by others. The improvements for this $3.5 million project include replacement of three sanitary wastewater pumps and two high capacity storm water pumps, the installation of a new sanitary force main, the installation of an odor control system, and the installation of a new emergency generator, new variable frequency drives and a modern pump control system.

Project Manager/Construction Manager, Adams Street WWTP Sludge Pump Replacement Project, NHSA, Hoboken, NJ. Managed the replacement of primary sludge transfer pumps and belt filter press feed pumps. The project also included the piping modifications and controls system integration. CH2M prepared design drawings and specifications for the project, and provided services during construction.

Project Manager/Construction Manager, Adams Street WWTP Pump Controls Replacement Project, NHSA, Hoboken, NJ. Managed the replacement of the 480 VAC variable frequency drives and construction and commissioning of new PLC-based automation systems for the trickling filter influent and effluent pump stations and the plant effluent pump station. CH2M prepared contract documents and provided services during construction.

Construction Manager, River Road WWTP Improvements to Liquid Treatment Processes Project, NHSA, West New York, NJ. Managed the construction of capital improvements at the 20 MGD WWTP; including replacement of variable frequency drives, replacement of rotating fine drum screens, installation of two new screenings conveyors and ram-press pumps and piping. CH2M prepared design drawings and specifications for these projects, and provided services during construction.

Engineering Project Manager, Super Storm Sandy Damage Recovery, NHSA, Hoboken, NJ. Responsible for the QC review of the rapid assessment of damage to process equipment, pumps, motors, valves, and building services equipment caused by submergence and flooding. Prepared bid packages and solicited competitive bids for repair and replacement of damaged mechanical equipment, field instruments, control panels and electrical infrastructure.

Gary Weil, PE

WWTP Impacts

Education

MS, Sanitary Engineering, Stanford University

BS, Civil Engineering, Tufts University

Professional Registration

Professional Engineer: NJ, PA, VA, MD

A Professional Engineer in New Jersey, Gary has more than 38 years of experience in wastewater facility projects, with construction values up to $250 million and capacities up to 370 mgd. He brings combined design and delivery management experience gained from having served as CH2M's northeast water and wastewater regional delivery manager, responsible for managing staff to achieve schedule, budget, and quality control for the successful delivery of hundreds of projects. He understands and designs for stormwater management on every wastewater facility. For example, for DC Water's Enhanced Nitrogen Removal (ENR) Facilities at Blue Plains Advanced Wastewater Treatment Plant, he commissioned and oversaw subconsultant design and installation of a 1,000 foot-long floodwall to provide flood protection from a 500-year storm event.

Representative Projects

Project Manager, Design of Enhanced Nitrogen Removal Facilities at Blue Plains AWT, DC Water and Sewer Authority, Washington, DC. Responsible for design and services during construction of improvements to existing nitrification reactors and carbon feed systems, new dentrification reactors and new post aeration tankage to treat average flows of 370 mgd and peak flows in excess of 900 mgd. The $250 million construction project includes a 12 foot diameter tunnel for flow conveyance, design for both methanol and alternative carbon sources, a 900 mgd submersible pump station and a deep denitrification tank with slurry wall construction on an extremely constrained site. Two construction contracts were prepared by a team of 10 subconsultants led by CH2M on a fast-track 16 month schedule, to meet regulatory deadlines. Preselection of major equipment using a competitive bidding process was being performed during design.

Project Manager, Design and Construction Services for AWTPA-02, NYCDEP, NY. Project manager providing design and services during construction at five wastewater treatment plants (Bowery Bay, 26th Ward, Wards Island, Jamaica and Tallman Island) ranging in capacity from 85 mgd - 275 mgd. To meet ever tightening denitrification requirements imposed on DEP, the project included new glycerol storage and feed systems to provide supplemental carbon to drive process improvement at the plants. Estimated construction cost for all WWTPs is $100 million.

Senior Consultant, Designs of the Fall River and Stamford Wastewater Treatment Plant, MA. The Fall River project involved process and hydraulic modifications to allow the facility to provide primary treatment and disinfection for combined sewage flows up to 106 mgd. Project elements included a new headworks facility/influent pump station, new sodium hypochlorite/bisulfite feed facilities, new flow diversion facilities, improvements to the chlorine contact tank, new outfall, new odor control facilities, and miscellaneous electrical/I&C improvements. The Stamford project involved retrofitting the 20-mgd wastewater treatment plant for biological nutrient removal. The project included adding baffles, recycle pumps, mixers and new diffusers to the aeration tanks and a new blower facility.

Project Manager, Design of Task Order 5 and 6 Improvements to Upper Occoquan Service Authority AWT, Centreville, VA. Managed design of five separate design contracts for the 54-mgd UOSA plant including: (1) new 10,000 lb/d multi-hearth furnace and building addition for granular activated carbon

regeneration, (2) new centrifuge for dewatering of organic solids, (3) new solids dryer, (4) new solids storage pad for staging loading operation and the on-site landfill, and (5) new primary clarifier, new covers and carbon scrubber odor control system for all six primary clarifiers and rehabilitation of clarifiers and pumping stations.

Project Manager, Wastewater Treatment Plant Design and Construction Improvements, Bangor, ME. Responsible for the design and construction improvements to the Kenduskeag Pump Station that provides primary treatment and chlorination for combined sewage flows while maintaining secondary treatment for the remainder of the flow.

Project Manager, Basic Ordering Agreement for Engineering Services, Fairfax County, VA. Tasks include designing and overseeing the construction of 2,500 feet of slip lining for rehabilitation of a 30-inch-diameter sewer, a sodium hypochlorite disinfection system for the Lower Potomac Water Pollution Control Plant, mechanical and electrical improvements to three wastewater pumping stations, a chemical injection system for sewer system odor control, annual sewer system certification reports, and general wastewater treatment consulting for the County.

Injection System Design, City of Pleasanton and San Joaquin County, CA. Designed hydrogen-peroxide injection systems for odor control at wastewater pumping stations. Prepared operation and maintenance manuals for the pump stations.

Project Manager, Parkway Wastewater Treatment Plant Facility Plan and Phase III Design, Washington Suburban Sanitary Commission, Laurel, MD. The project involved upgrading most of the processes at the plant for increased flow and reliability, including chemical addition for phosphorus removal, separation of primary and waste activated sludges, modification of the dewatering building to include new gravity belts and centrifuge for sludge thickening and dewatering, improvements to the influent pump station, odor control for the solids processing system, new grit removal facility, new chlorine contact tank, addition to the administration building, and conversion of the microstrainer building to house bulk chemical storage and feed facilities. The Parkway plant receives approximately 40% of its' influent solids load from residual discharges from the Patuxent Water Filtration Plant. Services during construction were also provided.

Project Manager, Improvements to the Dogue Creek Pump Station, Fairfax County, VA. The project included study and recommendations for overall rehabilitation of the County's 9.6 mgd pump station.

Project Manager, Morristown Wastewater Treatment Plant Upgrade, NJ. Manged design and oversaw construction of additions to an existing facility to reduce suspended solids and biochemical oxygen demand to less than 5 mg/l and ammonia to less than 1 mg/l year-round. The plant was constructed on a tight site constrained by the river and a railroad. The project also included extensive permitting and characterization and remediation of buried hazardous and industrial wastes. Responsibilities during construction of the $41 million facility included resident inspection, operator training, operation and maintenance manual preparation and startup.

Project Manager, Improvements to the Goose Creek Water Treatment Plant, City of Fairfax, VA. The project included design and construction of an 18-mgd high-service pump station, a 2.0-mgd steel reservoir, and 21,000 feet of 30-inch-diameter transmission main.

Project Manager, 36-mgd 37th Street Water Treatment Plant Upgrade, Norfolk, VA. Upgrade was to meet requirements of the Safe Drinking Water Act Amendments. The project included designing a new chlorine contact tank to meet DBP regulations, a filter backwash equalization and treatment system, new low lift pump stations and filtered water storage reservoirs, replacement of filter media, new chemical feed facilities and site planning for future expansion to 72 mgd.

Ronald Lawson, PE

Site/Civil

Education

MS, Civil Engineering, Northeastern University

Professional Registration

Professional Engineer: MA

Ron has more than 34 years of experience serving both public and private clients in the planning, design, and construction phases for a broad range of projects in the Northeast. His experience includes CSO abatement design, collection system design and rehabilitation, stormwater management, utilities design, construction oversight services, as well as VE and QC reviews, developing specifications, estimates and permitting support.

Representative Projects

Senior Technologist, Hartford Water Pollution Control Facility Master Plan, Metropolitan District Commission, Hartford, CT. Responsible for the influent and effluent pumping components for this master plan evaluation to upgrade the existing wastewater treatment facility. Evaluated numerous pumping schemes related to different dry weather and wet weather treatment process options with various flow rates up to 290 million gallons per day. Performed analysis of existing on-site pumping facilities to evaluate options of retrofitting to proposed conditions. Addressed coordination issue related to deep storage tunnel dewatering to facility headworks.

Project/Design Coordination Manager/PMO, NEORSD CSO LTCP, Northeast Ohio Regional Sewer District, Cleveland, OH. Acting in role of Program Management Office, main responsibility was to oversee, coordinate, and manage interrelated contracts associated with the 28-acre Nine Mile Creek Site. These contracts total approximately $500 million in capital improvements for the District and include design and construction of the following components; a 10MVA electrical substation for interim and final site power requirements, the deep tunnel dewatering pump station rated at 160 MGD, and two segments (24' diameters, total length approx. 7.5 miles) of the deep tunnel system in which the main mining operations will take place at the Nine Mile Creek Site. Also acted in support role for PMO related tasks as required. Tasks such as the following requested by USEPA and USDOJ; schedule compression of the 30-yr. CSO LTCP to 20-yrs., and risk analysis related to increasing tunnel sizes for improved CSO abatement level of control.

Project Engineer, Wastewater Treatment Facility Improvements, Department of Public Works, Gloucester, MA. Construction administration for the odor control, chlorination/de-chlorination, and clarifier upgrades at the treatment facility, including temporary resident engineer assignments on an as-needed basis.

Project Engineer, Drainage Improvements Project, Rockland, MA. Prepared contract documents to correct existing flooding problems to plant building resulting from existing drainage piping routed underneath the structure.

Project Manager, Massachusetts Avenue Drainage Improvements, Department of Public Works, Cambridge, MA. Prepared contract documents for this early phase drainage construction project in anticipation of a city wide stormwater management improvement plan.

Quality Control Manager/Senior Technologist, CSO Phase II Final Design, Narragansett Bay Commission Seekonk, RI. Project involved design of structures and piping for interceptor relief and CSO abatement to convey flows to a deep storage tunnel constructed under an earlier program phase.

Project Engineer, Pleasure Bay Storm Drainage Improvements Project, Massachusetts Water Resources Authority, Boston, MA. Project evolved in response to neighborhood concerns (during development of a CSO abatement project) of pollutant loads directly to Pleasure Bay Shore. Project required the discontinuance and relocation of numerous existing outfalls that discharged directly onto the beach to an area of less environmental impact. Responsible for preparing contract documents.

Senior Technical Specialist Manager, Goff Brook Overflow Closure, Hartford MDC, Hartford, CT. This project entails the hydraulic modeling, planning, detailed design and permitting for a new 5,500 linear foot interceptor. This new 30-inch interceptor will relieve flows from the Goff Brook Overflow to the Rocky Hill Treatment Plant. Several alternatives and trenchless technologies were analyzed to determine the most feasible and cost effective route.

Senior Technical Specialist, Bloomfield Ave Sewer Replacement, Hartford MDC, Hartford, CT. This project entails the planning, detailed design and permitting for 6,500 linear feet of 12 and 16 inch sewer. An alternatives analysis was conducted to determine if alternate routes were feasible due to several stream crossings and difficult geotechnical conditions. Design will include detailing complicated support of excavation and dewatering procedures to accomplish the sewer replacement.

Senior Technical Specialist, Thames Street and Wellington Sewer Rehabilitation and Replacement, City of Newport, RI. Interceptor Design and Construction Services for the open cut replacement of 2,800 LF of 24-inch on Wellington Avenue and the rehabilitation of 6,200 LF of 38-inch x 49-inch brick sewer on Thames Street utilizing glass reinforced plastic pipe (GFRP). The work included extensive utility coordination and relocation, geotechnical analysis, active lateral maintenance, manhole rehabilitation and replacement, traffic control, and public involvement.

Project Manager, Main Interceptor Improvements, Department of Public Works, Gloucester, MA. Prepared condition assessment report and contract documents for three rehabilitation contracts for the city's largest interceptor. The report identified and prioritized problem sections within the interceptor and provided rehabilitation schedule with associated costs for making necessary repairs and upgrades utilizing trenchless and open-cut methods. Included in the report were preliminary designs including costs to remedy related sections of the interceptor considered not to be of acceptable engineering practice. Performed construction administration for the first phase contract from assisting the city through the bid and award process to final completion.

Project/Resident Engineer, Pearson Ave./Josephine Ave. Sewer, Drain and Watermain Improvements Project, Department of Public Works, Somerville, MA. Prepared contract documents including construction cost estimate for this infrastructure rehabilitation and I/I reduction project. Project involved replacement of existing water and sewer mains, trenchless rehabilitation of compromised sewer mains, installation of new drainage system, and reclamation of existing roadway and sidewalks.

Assistant Resident Engineer, Wachusett Reservoir Sewer and Drainage Improvements Project, Department of Conservation and Recreation, West Boylston, MA. During construction of this environmentally sensitive sewer and drainage improvement project around the Wachusett Reservoir. Responsible for overseeing the daily operations of the contractors, including strict adherence to environmental mitigation issues. Coordinated project inspectors and sub-consultants regarding project surveying, record drawings and soil compaction/concrete testing. Led progress meetings with the Client, Town and the State Inspector. Prepared monthly requisitions and final as-built information. Roadway reclamation was a major effort of the project.

Emad Farouz, PE

Senior Geotechnical Engineer

Education

MS, Civil Engineering, Stevens Institute of Technology

BS, Civil Engineering, Cairo University

Graduate Studies, Geotechnical Engineering and Engineering Geology (Drexel University); Mechanical Tunneling and Microtunneling (Colorado School of Mines); Ground Treatment, Improvement, and Support (University of Wisconsin)

Professional Registration

Professional Engineer: NJ, CT, PA, OH, VA, IA

Emad has 25 years of geotechnical engineering experience involving design, project management, QA/QC, and construction management. He is knowledgeable in specifications, soil, rock, shallow and deep foundations, stability, and settlement analyses. Emad manages engineering aspects of projects involving geotechnical features, for water and wastewater treatment plants and pump stations, buildings, marine structures, commercial facilities, roads, and dams; work includes soil, rock, shallow and deep foundations, stability, and settlement analyses. He served as the lead geotechnical engineer for North Hudson Sewerage Authority's Solids and Floatable Facilities and Pump Station project, which included seven facilities along the Hudson River in Hudson County. Emad developed a subsurface investigation program, subsurface profiles, soil engineering properties, geotechnical report, and designed the excavation support system.

Representative Projects

Geotechnical Engineer, North Hudson Sewerage Authority, Solids and Floatable Facilities and Pump Station, Hudson County NJ. The project included seven different solids and floatable facilities generally along the Hudson River in Hudson County. The facilities were largely below ground in urban sitting and located over ground that varied from 85-ft soft clay to hard rock. The project included developing subsurface investigation program, developing subsurface profiles, soil engineering properties, geotechnical report, design of excavation support system that varied form 40-ft cofferdams in the Hudson River to 90-ft deep rock that was stabilized using rock nail and shotcrete including final rock like architectural shotcrete. The work included designing driven steel piles, pile dynamic testing, and static load testing. The work also included support during construction.

Geotechnical Engineer, Freund House Wastewater Pumping Station and Dogue Creek Force Main Design and Construction Services, Fairfax County DPWES, VA. The project included a review of the TM findings with Fairfax County, clarifications for all improvements, and completion of the design and construction phases of the project.

Lead Geotechnical Engineer, Geotechnical Services, Advanced Wastewater Treatment Plant, Alexandria Sanitation Authority, Alexandria, VA. Designed the pile foundation system composed of H-steel piles including vertical and developed earth pressure loading criteria for both temporary and permanent structures. Developed an instrumentation program to measure both settlement and ground water table and prepared the geotechnical report for this contract . In addition, prepared contract document including dewatering, fill and backfill, excavation, pile, instrumentation, excavation support specification. During construction phase, reviewed shop drawings.

Lead Geotechnical Quality Control Reviewer, Advanced Wastewater Treatment Plant, Digester Complex Conceptual Study, District of Columbia Water and Sewer Authority. Responsibilities included

developing conceptual design for various alternatives of excavation support systems including; slurry walls, soil mixing wall, Secant pile wall, sheet pile walls, and soldier pile and lagging; developing foundation alternatives including steel piles, auger-cast piles, and drilled shafts; preparing a geotechnical report to summarize the ground conditions and discuss dewatering, ground settlement, excavation support, and foundation support; and preparing quantity and cost estimate for various foundation and excavation support system.

Technical Consultant to Wet Weather and Wastewater Management Capital Designs, North Hudson Sewerage Authority (NHSA), Hudson County, NJ. Technical consulting on CSO wet weather management, permitting, design, hydraulic analyses, and state revolving funding for ongoing capital design projects. These projects included the River Road Diversion.

Geotechnical Engineer, Kerrigan Avenue Sewer Replacement, North Hudson Sewerage Authority, Hoboken, NJ. This project entailed planning, design permitting and services during construction for replacement of 3,200 linear feet of 36 to 53 inch pipe. Detailed design accounted for construction in a densely populated area, substantial traffic control, hard rock blasting, relocation of utilities and an accelerated schedule. Project construction was almost $3.5 million.

Geotechnical Task Leader, Water Treatment Facility Improvement Project, Poughkeepsie, NY. Managed the drilling subcontractor and performed a quality control during the drilling of the geotechnical borings. Additional responsibilities included supervising design engineers in developing subsurface profiles, and design the drilled shaft foundations to support the Chemical Building and the Sludge Tank. The team prepared earth pressure loading criteria for both temporary and permanent structures. Developed design criteria for excavation support system. Prepared baseline geotechnical report for the project. In addition, prepared contract document including dewatering, fill and backfill, excavation, drilled shafts, fill and backfill, underground storage tank removal, excavation support specification. Also provided construction support.

Geotechnical Engineer, Water Quality Infrastructure Improvements, Poughkeepsie's Joint Water Project Board, NY. Design of a new ozone system and replacement of existing centrifuges at an existing 19 MGD surface WTP. The project scope included replacement of existing low-lift (raw water) pumps with adjustable frequency drives, installation of a carbon dioxide system for pH adjustment, and modifications to filter media to enhance biological growth in the filters. The centrifuge replacement includes replacement of two existing centrifuges and ancillary systems (including feed pumps, grinders, piping, polymer system).

Geotechnical Task Lead, Potomac Water Filtration Plant, Laurel, MD. During construction, reviewed shop drawings, provided support (including request for information), and provided analysis and design for water holding retaining wall, including calculations and developing design sketches.

Geotechnical Designer, Mainside Treatment Plant Upgrade Evaluation, Quantico Marine Corps Base, VA. Geotechnical designer for modifications to the existing biological treatment tanks for the enhanced nutrient removal upgrade.

Lead Geotechnical Engineer, Little Blue Wastewater Treatment Plant, Independence, MO. Reviewed existing data, designed two alternative pile foundation systems that consisted of 12-inch H-piles and 14-inch auger cast concrete pile including vertical and lateral capacities and constructability analysis. Also developed earth pressure loading criteria for both temporary and permanent structures. Developed an instrumentation program to measure both settlement and ground water table as well as design criteria for sheet piling system to be installed in soft. Prepared Baseline Geotechnical report for the project. In addition, prepared contract document including dewatering, fill and backfill, excavation, driven piles, and excavation support specification.

Marialena Hatzigeorgiou, PE

Mechanical Engineer

Education

MS, Civil and Environmental Engineering, George Washington University

BS, Mechanical Engineering, National Technical University of Athens, Greece

Professional Registration

Professional Engineer: Wash. DC

Marialeana is a mechanical engineer, mainly focused on wastewater facilities. She is adept in using dynamic model software; for example, she used AFT Arrow to model the 150,000 scfm nitrification aeration system of the Blue Plains Advanced WWF in Washington D.C. She performed this modeling as part of the system expansion and seasonal operation and optimization under the enhanced nitrogen removal design, which yielded as much as 20% energy savings.

Representative Projects

Lead Mechanical Engineer, 100-mgd H1 Screening and Wet Weather Pump Station, North Hudson Sewerage Authority, NJ. Mechanical design responsibilities for the new screening and pumping station, including hydraulic calculations, equipment selection, specifications and drawings.

Design Coordinator Engineer, Multiple Projects, Upper Occoquan Sewage Authority, Centreville, VA. Services during construction responsibilities included submittal review, response to requests for clarifications and preparation of work change directives related to mechanical issues for the Flat Branch Pump Station and Force Main Improvements project and the Organic Solids Dewatering project.

Lead Mechanical Engineer, 32-mgd Dogue Creek Pumping Station, Fairfax County, VA. Mechanical design responsibilities for the rehabilitation of the pumping station and the addition of a screenings handling system, including hydraulic calculations, equipment selection, specifications and drawings.

Project Manager, Services during Construction for Western Branch WWTP, Piscataway WWTP and Seneca WWTP UV Disinfection Systems, Washington Suburban Sanitary Commission, MD. Responsibilities included preparing and leading the weekly internal coordination meetings, participation in the monthly progress meetings, reviewing and updating invoices to Client, preparing contract change orders, managing the structural and electrical subs, and setting up subcontracts with surveyor and with testing laboratory. Engineering responsibilities, as needed, included reviewing mechanical submittals, preparing UV disinfection testing and startup plan and providing answers to requests for information.

Process Mechanical Engineer, 60-mgd (dry weather) East Shore Water Pollution Abatement Facility Modified Facility Plan, Greater New Haven Water Pollution Control Authority, CT. Conceptual process and mechanical design responsibilities for the chemically enhanced primary treatment, UV disinfection, and solids treatment upgrades, including sizing calculations, lay outs, equipment selection and cost estimating.

Mechanical Engineer, 370-mgd Blue Plains Enhanced Nitrogen Removal Facilities, District of Columbia Water and Sewer Authority, Washington D.C. Evaluation and preliminary mechanical design responsibilities for the nitrification and post-aeration aeration system, including calculations, sizing, lay outs and cost estimating.

Process-Mechanical Solids Lead Engineer, Basham Simms Wastewater Facility Upgrades and Expansion, Town of Purcellville, VA. Process and mechanical design responsibilities for the expansion of the aerobic digestion, the addition of mechanical thickening and dewatering, the renovation of the two existing clarifiers for digested solids storage and recycles equalization uses respectively, and coordination with the architectural, structural and instrumentation disciplines.

Process Solids Lead Engineer, 54-mgd ENR+ (Master Planning), Alexandria Sanitation Authority, VA. Process conceptual design responsibilities, including sizing calculations, preliminary lay out and cost estimating, for the viable solids processing scenarios of mechanical thickening, cell lysis, anaerobic digestion, dewatering and drying, and preparing model criteria data sheets along with presentation material for a series of Client workshops.

Design Coordinator and Startup Process Lead Engineer, 54-mgd Anaerobic Digestion Facilities, Alexandria Sanitation Authority, Alexandria, VA. Services during construction responsibilities included, but not limited to, submittal review, response to requests for clarifications, preparation of work change directives and requests for proposals related to mechanical issues. In addition as the startup process lead engineer a detailed startup plan, process related training materials and startup assistance to ASA was provided. This was the last of six contracts with ASA of a total construction value of $360 million.

Evan Pantaleo

Mechanical Engineer

Education

BS, Environmental Engineering – Facilities Design and Construction, University of Delaware

BS, Environmental Engineering – Water Resources and Water Quality

BS, Civil Engineering, University of Delaware

Professional Registration

Engineer-in-Training

Based in Parsippany, Evan has project experience in emergency recovery work associated with Super Storm Sandy; design of headworks facilities including pump stations, screening facilities, grit removal facilities, wet-weather scenarios, equalization storage, and hydraulic capacity and modeling studies; and construction inspection and administration services.

Representative Projects

Design Lead, Sodium Hypochlorite Storage Facility Improvements, Passaic Valley Sewerage Commission, Newark, NJ. Evaluation of existing sodium hypochlorite storage facilities to confirm design criteria and storage capacity necessary for the development of facility upgrades. Desktop modeling of sodium hypochlorite dosages and required storage capacities to disinfect wet weather flows, including blended primary effluent and secondary effluent flows during wet weather events in the realm of 400-720 million-gallons-per-day. Worked with a team of engineers from investigation/evaluation of existing conditions and schematic level concepts through detailed design including coordinating design workshops with the client.

Project Engineer, Adams Street Wastewater Treatment Plant Super Storm Sandy Recovery Work, North Hudson Sewerage Authority, Hoboken, NJ. Evaluated the condition of existing equipment and coordinated manufacturer inspections to assess damage incurred by Super Storm Sandy. Developed various scopes of work and cost estimates for each project. All information was compiled and prepared with specifications for Requests for Proposals. Completed all work in accordance with required formats for FEMA reimbursement while working closely with Adjusters International. Each scope of work was developed to optimize the amount reimbursable to the Client. Cost proposals were received and reviewed for each project and provided as an enclosure in proposals that were prepared for the Authority. Proposals included "out of scope" emergency work, engineers estimates, contractor cost proposals and manufacturer letters of recommendation.

Resident Inspector, Adams St WWTP Primary Clarifier No. 3 and River Road WWTP Disinfection System Improvements, North Hudson Sewerage Authority, Hoboken, NJ. The project consists of the replacement of the sludge collection system equipment within Primary Clarifier No. 3 and replacement of the Clarifier Drain Valves on Primary Clarifiers No. 1, No. 2 and No. 3 at the Adams Street Wastewater Treatment Plant. Additionally, the project includes Disinfection System Improvements at the River Road WWTP, including; complete replacement of the Sodium Hypochlorite and Sodium Bisulfite chemical feed pumps and appurtenances, installation of process analyzers and a new automatic control system for the Sodium Hypochlorite and Sodium Bisulfite chemical feed systems. Resident Inspection responsibilities include design implementation of drawings and specifications; coordination of construction issues with contractors; coordination and review of Requests for Information (RFIs); maintaining and updating record drawings; reviewing and tracking monthly quantities, and preparing monthly payment applications.

Project Engineer, Water Treatment Plant Audit and Finished Water Pump Station Performance Evaluation, Easton Suburban Water Authority, Easton, PA. Examined a finished water pump station at a 16-mgd conventional surface WTP. The pump station, consisted of four horizontal split case centrifugal pumps operating under suction lift and had a history of cavitation. Performed a field assessment and hydraulic analysis of the facility to identify the major contributing factors causing cavitation and reduced capacity to the pumps. Completed comprehensive field testing and analysis of the pumps as individual units to benchmark actual performance and in various combinations to understand the system dynamics. Establish total and firm pump station hydraulic capacities. Analyzed acceptable operating regions where the installed pumps can run safely and as efficiently as possible without cavitation concerns or impacts to the expected useful service life of the equipment. Completed a WTP desktop study to establish the overall process capacity under varied raw water conditions. Data from raw, clarified, filtered and finished water was examined, along with design loading rates, and equipment redundancy to establish the process total and firm capacities for the WTP. Bottlenecks were discovered that hindered the WTP's reliable capacity if a single unit was required to be out of service whether it be for typical maintenance or due to failure. Recommendations were developed to increase the facilities firm capacity and reliability/redundancy.

Project Engineer, Finish Water Pump Station Analysis & Third Party Review, Easton Suburban Water Authority, Easton, PA. Completed a performance evaluation of the ESWA water treatment plant's 16 MGD finished water high service pump station. Identified and evaluated hydraulic conditions and pump performance as it related to cavitation and pump damage. Performed a best practice review of the Engineer of Record efforts and provided a comprehensive comparison of existing conditions to the industry standards during the time of design including any modifications to industry standards to present time. In addition, a study was completed on the overall capacity of the WTP unit processes based on industry standards and process performance observed from plant data.

Project Engineer, Chlorine Contactor Improvements, Southeast Morris County Municipal Utilities Authority; Morris County, NJ. This project included the assessment of the existing facilities treatment train and evaluation of membrane performance and the finished water clearwell design. The scope of the project was to fully define the issue and prepare a conceptual design and provide recommendations for implementation. Responsibilities included data analysis and evaluation of modifications to the clearwell design to achieve increased hydraulic efficiencies.

Process Design Lead, Solids Processing Building Upgrades – Thickened Sludge Mixing Tanks, Metropolitan District Commission, Hartford, CT. Project included development of a detailed design for rehabilitation of existing thickened sludge mixing tanks and modifications to include a hydraulic mixing system to replace the existing vertical paddle mixers. Responsibilities include, detailed design drawings and specifications, and process calculations.

Project Engineer, Ozone and Centrifuge Improvements, Poughkeepsie's Joint Water Project Board, Poughkeepsie, NY. Project included the addition of an ozone facility, replacement of existing centrifuges and conversion of existing anthracite filters to GAC filters operated in biological mode. Primary responsibilities include the point of contact for the Contractor and Owner throughout construction to coordinate design and implementation between various disciplines.

Ghazali Ghaffor

Structural Engineer

Education

Post Graduate Diploma, Construction Management, University of Sri Lanka

MS, Industrial & Civil Engineering, Belrussian Polytechnical Institute

Professional Registration

Chartered Engineer: Sri Lanka

Ghazali has 33 years of experience in structural analysis, design and detailing of concrete, steel, masonry and timber structures and concrete liquid retaining structures; on-site supervision of structural work; and inspection of existing structures for structural integrity. Current responsibilities include detailed drawings and specifications preparation; engineering studies, and report preparation; structural design and investigations; and shop drawing review during construction phase administration.

Representative Projects

Design Engineer, Advanced Wastewater Treatment Plant, DCWSA, Washington, DC. Responsible for the structural design and shop drawing review of the Area Substation.

Design Engineer, GNWPCD Wastewater Treatment Plant Improvements, Village of Great Neck, Town of North Hempstead, NY. Responsible for the structural design of the Oxidation Ditch.

Design Engineer, Wastewater Treatment Plant Expansion and Upgrade, City of London, OH. Responsible for the structural design and shop drawing review of the concrete tanks and buildings for the WWTP expansion.

Design Engineer, Wastewater Treatment Plant, City of Columbus, IN. Responsible for the structural design and shop drawing review of the Interchange and Aerated Solids Holding Tanks and Storage Structure.

Design Engineer, Hillsboro WWTP, Hillsboro, OH. Responsible for the structural design and shop drawing review of the Equalization, UV Disinfection and Post Aeration and Final Settling Tanks.

Design, New Effluent Pump Station and Effluent Conduit, Southerly WWTP, City of Columbus, OH. Responsible for the structural design and shop drawing review of the Effluent Control and Effluent Transition Chambers, Effluent Discharge Conduit and Discharge structures.

Design Engineer, Sludge Holding System Improvements, Jackson Pike and Southerly WWTPs, City of Columbus, OH. Assisted in the design and shop drawing review involving new dewatered sludge storage and loadout silo facilities at each plant.

Design Engineer, Fort Scott Wastewater Treatment Plant, Hamilton County, OH. Responsible for the structural design of new concrete tanks and structures for the new 250,000 gpd wastewater treatment plant.

Design Engineer, Wastewater Treatment Plant Hydraulic Expansion, City of Wapakoneta, OH. Responsible for the design of the new concrete structures associated with the $5 million expansion of the plant's wet stream processes to 3.4 mgd.

Design Engineer, Wastewater Treatment Plant Expansion, City of Waverly, OH. Participated in the design of the retaining walls and a flood gate for the $3.8 million expansion of the plant to 2.0 mgd. Also participated in show drawings review for the structural portion of the project.

Design Engineer, Water Pollution Control Plant Improvements, City of Marion, OH. Responsible for the review of the structural shop drawings and participating in the process design of improvements to the solids handling and odor control systems.

Design Engineer, Sludge Holding System Improvements, Jackson Pike and Southerly WWTPs, City of Columbus, Division of Sewerage and Drainage, OH. Responsible for the structural design of the new buildings for the $14.4 million project involving new dewatered sludge storage and loadout silo facilities at each plant.

Design Engineer, Additional Dewatering Facility, Blue Plains AWTP, District of Columbia Water and Sewer Authority, Washington, D.C. Responsible for the structural design of the centrifuge platform to support the static and dynamic loads created by seven large solid bowl centrifuges for the new $56 million centrifuge dewatering facility.

Design Engineer, Sludge Dewatering Facility and Miscellaneous Improvements, Southerly WWTP, City of Columbus, Division of Sewerage and Drainage, OH. Responsible for the design of the steel centrifuge platform and other access platforms for the new $11.7 million centrifuge dewatering facility.

Design Engineer, Wastewater Treatment Plant Biosolids Handling Facilities, City of Wapakoneta, OH. Responsible for the structural design of the concrete structure required for the new metal building to house new biosolids handling equipment, including a belt filter press for dewatering and cementaceous kiln dust (CKD) storage, handling, and feeding equipment.

Construction Phase Engineer, Wastewater Treatment Plant Expansion, Washington, DC. Participated in the review of structural shop drawings during construction of the $5.9 million expansion of the plant from 3.0 mgd to 6.0 mgd.

Design Engineer, UV Disinfection Treatment Improvements, City of Syracuse Water Department, Syracuse, NY. Responsible for the structural design two UV disinfection facilities.

Design Engineer, Zanesville Water Treatment Plant, City of Zanesville, OH. Responsible for the structural design and shop drawing review of the Administration, Filter Gallery and Chemical facilities and the Raw Water Storage Tank.

Design Engineer, Sludge Pumping Renovation, Hap Cremean Water Plant, City of Columbus, OH. Responsible for the structural design and shop drawing review of the concrete tanks and buildings for the $32.5 million sludge pumping and electrical upgrade.

Design Engineer, Water Treatment Plant, Village of Versailles, OH. Responsible for the design of concrete and steel structures for the new $6.2 million, 1.5 mgd groundwater softening plant.

David Everson, PE

Structural Engineer

Education

BS, Civil Engineering, University of Wisconsin

Professional Registration

Professional Engineer: WI, MN, MI, OH, SD, KS

David has more than 17 years of experience and is skilled in all phases of engineering operations. His experience includes wastewater and waste treatment plants, design-build projects in the U.S. and internationally, and working for both private and public projects. David's project experience has involved reinforced concrete tanks, and foundations, structural steel, reinforced concrete and masonry buildings, pile foundations, and retaining walls.

Representative Projects

Structural Engineer, Solids Processing Rehabilitation, Fairfax County, VA. Developed structural rehabilitation of Sludge Processing Building including new pile supported foundations for new Lime tanks, and Design of two new sludge storage tanks and enclosed pipe gallery supported on piles.

Lead Structural Engineer, HWPCF Solids Process Upgrade, The Metropolitan District, Hartford, CT. Developed structural rehabilitation of DAFT tanks and structural design for a new cake receiving and flow equalization facility. Design included partially buried equalization tanks, below grade pump rooms, and a concrete framed CMU superstructure. A high bay truck unloading metal building abutted the main structure.

Structural Engineer, Fowler Water Reclamation Facility, Forsyth County, GA. Developed structural design for multiple new facilities including bioreactor basin expansion, headworks facility and new CMU electrical buildings.

Structural Engineer, Resource Recovery and Electrical Energy (R2E2) Project, Green Bay, WI. Developed structural design for new digesters and gallery with connecting tunnel structure.

Structural Engineer, Complex E Industrial Landfill Project, BASF Corporation, Decatur County, IL. Developed structural design for new 200ft long waste storage building with concrete retaining walls. Design included a new concrete wheel wash structure for trucks entering and leaving facility.

Structural Engineer, Crooked Creek WRF Improvements, Gwinnett Count Dept of Water Resources. Developed structural design new solids handling tank supported by auger cast piles and adjacent odor control area. Design included supports for FRP odor control ducts.

John Brosnan, PE

Electrical Engineer

Education

BS, Electrical Engineering, The Ohio State University

Professional Registration

Professional Engineer: DC, MD, VA, OH, IN

Mr. Brosnan has more than 29 years of experience in electrical engineering and has been responsible for the electrical, instrumentation, and control systems designs for numerous water and wastewater treatment facilities. His extensive design experience includes the following: electric power distribution/substations for 15,000 down to 120 volts; complete power system analysis including harmonic analysis; and complete automation for plants, water towers, and pump stations including programmable logic controllers (PLCs), distributed control systems/ supervisory control and data acquisition (SCADA) including Ovation, various networks including Ethernet and Devicenet, Human Machine Interface (HMI) software, fiber optics, and all local and remote controls.

Representative Projects

Electrical Engineer, General Engineering Services, City of Columbus Division of Power and Water, Columbus, OH. Responsible for providing $1.7 million of engineering services to the Water Supply Group, specifically for the Dublin Road Low Service Pumps Replacement and Water Supply Facilities Elevator Replacement projects from pre-bid phase through final construction. Completed on schedule and on budget.

Design Engineer, Three Pumping Stations Design, District of Columbia Water and Sewer Authority, Washington, D.C. Electrical Project Engineer responsible for the electrical and controls systems design for the $13 million upgrade project to the Rock Creek, Upper Anacostia, and Earl Place sanitary pumping stations. Work included 15 KV switchgear, MCCs, generators, automatic transfer switches, breaker monitoring and complete instrumentation and controls for each pump station.

Project Engineer, Gravity Thickener Facility Upgrades, Blue Plains AWTP, District of Columbia Water and Sewer Authority, Washington, D.C. Project Electrical Engineer responsible for the design of all lighting, electrical, instrumentation, and controls for the $14 million upgrade project involving the rehabilitation of eight gravity thickeners including sludge pumps, scum pumps, and collectors and the degritting systems including sludge screens, scum screens, hydrocyclones, feed pumps, and associated screw conveyors.

Project Engineer, Additional Chemical Systems and Transmission Improvements – Phases 1 and 2 and Alternate Disinfection Facility, Blue Plains AWTP, District of Columbia Water and Sewer Authority, Washington, D.C. Project Electrical Engineer for the $70 million plant-wide chemical systems upgrade project. Responsibilities included the design of all lighting, electrical, instrumentation and controls for the receiving, storage, and feeding of metals salts, sodium hypochlorite, sodium bisulfite, and dry polymer throughout the entire plant utilizing PLCs with SCADA/HMI computers communicating via Ethernet. This project also included all electrical and controls for five 75 HP Reclaimed Secondary Effluent Pumps with a modulating flow control valve and four 125 HP Low Pressure Final Effluent booster Pumps. Phase 2 included the complete design of all electrical and controls for the world's largest dry polymer unloading, storage, batching, and feeding system.

Design Engineer, Sludge Blending and Transmission Improvements, Blue Plains AWTP, District of Columbia Water and Sewer Authority, Washington, D.C. Project Electrical Engineer responsible for the design of the electrical, instrumentation, and control system for the new sludge receiving station and for the improvements to the blending, storage, and conveyance systems. This project included the design of all electrical and controls for the world's largest sludge cake pumps. The control systems included PLCs and SCADA/HMI computers communicating via Ethernet.

Project Engineer, Low Service Pump Replacement Phase 1, Dublin Road WTP, Columbus OH. Lead electrical engineer responsible for the electrical, instrumentation, and controls for new low service pumps 2 and 5. Electrical includes providing new 4160 volt VFDs, control panel, PLCs, and integrating the controls into the existing plant SCADA system.

Project Engineer, Low Service Pump Additions, Dublin Road WTP, Columbus, OH. Lead electrical engineer responsible for the electrical, instrumentation, and controls for new low service pumps 1 and 6. Electrical included providing new 4160 volt starters, control panels, and integration of the controls into the existing plant RTU/SCADA system

Lead Electrical Engineer, Sludge Pumping Renovation and Electrical Upgrades, Hap Cremean Water Plant, Columbus, OH. Electrical Project Engineer responsible for overseeing the electrical and instrumentation design for new sludge control houses and a new sludge pump station as well as for general electrical upgrades throughout the plant. The design included a new main substation (15 KV to 4.16 KV), new main electrical room with two unit substations (15 KV to 480 V), RVSS High Service Pump Starters, motor control centers, and all associated instrumentation and controls. Extreme care regarding constructability issues were taken in the design. The new main substation was installed dual feed capabilities and in a new location to keep plant down time to a minimum. The new main Electrical Room is also in new location to install the new unit substation prior to removing existing. More than 50% of the existing SCADA/RTU system is being replaced. The existing RTUs are being replaced with the latest type of PLC. The new PLCs will be connected using an Ethernet network to the existing SCADA system. All new substation breakers and high Service Pump Starters were also connected to the SCADA system to better monitor the electrical system for plant staff. Instrumentation included using radar for level, microwave density meters, and magnetic flow meters. Along with the new sludge pumps which pump sludge 17 mile to the quarry, three new sludge metering vaults which monitor flow and pressure and transmit the signal back to the plant via telemetry.

Project Engineer, Wet Weather Secondary Treatment Expansion, Belmont AWWTP, City Of Indianapolis, IA. Lead electrical engineer responsible for the electrical, instrumentation, and controls for this new 156 MGD wet/dry weather facility. Electrical work included 15KV switchgear, 4160 volt medium voltage MCC, transformation, etc. for the five 1250 HP blowers. Instrumentation and controls included redundant Allen Bradley Control Logix PLC, redundant fiber optics network, SCADA/HMI system, and networking all VFPs and other starters to the new Ethernet network.

Project Engineer, Motor Control Centers and Distribution Centers Replacement, Noman M. Cole Jr. Pollution Control Plant AWWTP, Fairfax County, VA. Lead electrical engineer responsible for the electrical, instrumentation, and controls for this complex rehabilitation. All new electrical gear is being phased so that there will be minimal disruption to the plant operations. Electrical work includes replacing 7 distribution centers both 480 volt and 4160 volt, and 23 existing motor control centers along with associated transformers with arc resistant type gear. It also includes retrofitting all remaining DC's and MCC with arc detection relays for greater arc flash protection. The project also includes replacing most of the existing PLCs with redundant Allen Bradley ControlLogix PLC, redundant fiber optics network, SCADA/HMI system, and networking all VFDs, power monitoring and other starters to the new Ethernet network.

Kirsten Horton

Electrical Engineer

Education

BS, Electrical Engineering, Georgia Institute of Technology

Professional Registration

Professional Engineer: GA, FL, LA

Kirsten is an electrical and instrumentation and control (I&C) engineer with 26 years of experience, specializing in electrical design of water and wastewater treatment plants. Her experience includes treatment plants, treatment plant expansions, raw water intakes, and lift stations. Her primary responsibilities are power distribution of low and medium voltage systems, motor controls, and support during construction phases of projects. With extensive electrical design experience, she offers knowledge in every phase of design and construction, from Basis of Design reports, to detailed design, production of design building and traditional bid documents, bid phase services, and service during construction, including submittal review, request for information (RFI) response, and start-up and testing of electrical systems.

Representative Projects

Lead Electrical Engineer, Metropolitan District Wastewater Treatment Plant $250M Upgrade, Hartford, CT. Part of the team to provide final design services for upgrading and expanding the WWTP's average capacity from 120 mgd to 200 mgd. Scope consisted of a new influent pumping station and headworks facility. Team provided cost modeling, hydraulic modeling, process evaluation and coordination with stakeholders.

Lead Electrical Engineer, Hugh A. Wyckoff Raw Water Intake and Pump Station Electrical Improvements, Cobb County-Marietta Water Authority, GA. Provided electrical design services, bid phase services, and services during construction for improvements at the Wyckoff raw water intake. The project included converting the 2,300V electrical system to a 4,160V system, and providing new medium and low voltage electrical system. The design included medium voltage adjustable frequency drives and onsite standby bi-fuel generator system.

Lead Electrical Engineer, W.J. Hooper Water Production Plant (WPP) Improvements Phase II, Clayton County Water Authority (CCWA), Jonesboro, GA. Provided electrical design services for improvements and expansion of WPP to 25 mgd. Project also included onsite sodium hypochlorite generation, onsite chlorine dioxide generation for taste and odor control, new raw water pump station, new finished water pump station, new chemical building, upgrade of administration building, and upgrade of the flocculation and sedimentation basin, as well as upgrading the plant electrical distribution system. Electrical design included replacing the old overhead 2,400V distribution system with a new 4,160V underground plant distribution system. The electrical design included new medium voltage switchgear, pad-mounted switchgear, medium voltage and low voltage motor controls, and lighting and power plans for the facilities.

Lead Electrical Engineer, J.G. Beacham WTP, Athens-Clarke County Department of Public Utilities, Athens, GA. The project included upgrading the electrical plant distribution system, upgrade of existing filters, upgrade raw water pump station, new high service pump station, new chemical facility include sodium hypochlorite generation system, new UV disinfection facility, new clearwells and upgrade of the existing sedimentation basins. Electrical design included emergency generation system, medium voltage paralleling switchgear, medium voltage plant distribution system, medium voltage adjustable frequency drives, low voltage motor control center, and lighting and power plans for the facilities.

Lead Electrical Engineer, C.T. Perry WTP, Water Works and Sanitary Sewer Board of the City of Montgomery (MWWSSB), AL. Project included added raw water and high service pump capacity, new chemical systems, additional flocculation and sedimentation basins, and upgrade of existing filters. Electrical upgrades included medium voltage motor controls, low voltage motor controls, and power plans for the facilities.

Lead Electrical Engineer, Hanan WTP; MWWSSB, Montgomery, AL. Lead electrical engineer for the design of the Hanan WTP. This new WTP included 10 wells, clearwell, chemical facility, and finished water pumps. The electrical design included backup generator, paralleling switchgear, motor control centers, and power distribution.

Lead I&C Engineer, WTP Expansion, City of West Palm Beach, FL. Responsible for the package controlled chemical systems, including lime, power activated carbon, chlorine and polymer systems. Created specifications for the computer system, as well as control of the pump high service and finished water pump stations.

Assistant Project Manager, Southwest WTP, Huntsville Utilities, Huntsville, AL. Responsible for scheduling and budget tracking. Also served as lead electrical engineer for the expansion of the pump stations and design of new floc/sedimentation basin and filter gallery.

Lead Electrical Engineer, Advanced Ultraviolet (UV) Disinfection Systems Program, CCWA, Clayton County, GA. The project included adding UV disinfection treatment facilities to three of CCWA's existing WPPs: 20-mgd Hooper WPP, 12-mgd Smith WPP, and 12-mgd Freeman WPP. The program won a Grand Award from the American Council of Engineering Companies of Georgia and was later named a National Engineering Excellence Finalist at the American Council of Engineering Companies' Engineering Excellence Awards.

Electrical Engineer, Hot Springs Wastewater Treatment Plant Improvements, City of Hot Springs, AR. Responsible for I&C submittal review.

Assistant Project Manager/Lead Electrical and I&C Engineer, Ponte Vedra WWTP, United Water Florida, Ponte Vedra, FL. This plant serves as the domestic waste treatment facility for the City of Ponte Vedra. Responsible for budgets during construction documents preparation, project instructions, and schedule and budget tracking.

Augustus Tweneboa-Kodua, LEED AP

Cost Estimating/Scheduling

Education

BS, Building Technology (Construction Management and Quantity Surveying). Kwame Nkrumah University of Science and Technology

Professional Registration

LEED Accredited Professional

Certified Cost Consultant

Augustus is a cost estimator with more than 16 years of cost estimating, quantity surveying and construction management experience. He has developed cost estimates for a range of projects including, water and wastewater facilities, transportation facilities, institutional facilities, retail, office and medical facilities. As a trained quantity surveyor, he has the ability to prepare bills of quantity using the Standard Method of Measurement 7 or any of the previous editions. Augustus is proficient in leading construction industry software applications such as Success Estimator, Timberline, MC2, Microsoft Project and OnScreen Off.

Representative Projects

Lead Estimator, Rocky Hill WPCF Upgrade and Expansion, Rocky Hill, CT. Led cost estimating activities for the complete $50 million upgrade and expansion project. The project involves the construction of new water headworks, primary effluent pump station, primary clarifiers, aeration basins, odor control, stormwater pump station, final effluent pump station, electrical and I&C upgrades.

Lead Estimator, Open-End Basic Ordering Agreement, St. Mary's County Metropolitan Commission, St. Mary's, MD. Led cost estimating activities for the following projects:

- *Great Mills WWPS Replacement Pump Station* - construction of new pump station, odor control system, emergency bypass, 8' force main to new WWPS and all associated works
- *Piney Point WWPS* - rehabilitation of existing influent pump station, existing grit removal system, existing force main pump station, construction of new equalization tank, demolition, sitework and all related works.
- *Great Mills WWPS Replacement Pipeline Evaluation* - $1.3-million pipeline evaluation for Great Mills WWPS Replacement project.

Lead Estimator, Class 4 Estimate, Chloramination Facilities Planning, New York Department of Environmental Protection, New York City, NY. Led estimating for the capital improvement plan for the upgrade of existing water treatment facilities and construction of a new chemical facility.

Lead Cost Estimator, Solids Improvement Planning and Design. Hartford, CT. Led cost estimating activities for the Master Planning and the Phase 1 Solids Improvements including the DAFT Rehabilitation and Solids Upgrades.

Cost Estimator, Parkway Wastewater Treatment Plant Biosolids Handling Facility Improvements, Washington Suburban Sanitary Commission, Laurel, MD. Led cost estimating activities including a full evaluation of alternatives for upgrading all solids processing facilities at the plant. The plan included options for continued processing of WSSC's Patuxent Water Filtration Plan residuals versus separate solids processing at Patuxent.

Cost Estimator, Digester Complex and Residuals Handling Project – Preliminary Design, Upper Occoquan Service Authority (UOSA), Centreville, VA. Led estimating activities for a class 4 estimate for the $18.9 million improvements to existing digester and residuals handling facilities.

Cost Estimator, Cox Creek WRF Enhanced Nutrient Removal Upgrade, Anne Arundel County DPW, MD. Led cost estimating activities including a full evaluation of alternatives for improving the scum handling facility and all associated facilities at the plant. Total project cost $1.2 million.

Cost Estimator, State-of-the-Art Nitrogen Upgrade Program, Alexandria Renew Enterprises (AlexRenew), Alexandria, VA. Led estimating activities from conceptual design to final bid document for $130 million construction of new 25 million gallon nutrient management facility.

Lead Estimator, Class 2 Estimate, Rocky Pen Run WTP, Stafford County, VA. Lead estimator for the $37 million project, which involved the construction of new water treatment plant. Project scope included sitework, new treatment building, and pump stations, water storage tanks and sludge thickener.

Lead Estimator, Class 1 Estimate, Clark County Public Utility Plant, South Lake Water Treatment Plant, Vancouver, WA. Lead estimator for the $8 million project, which involved construction of new water treatment plant. Project scope includes sitework, new treatment building, and sanitary pump station, well house buildings, and brine tank.

Lead Cost Estimator, East Shore Water Pollution Abatement Facility, New Haven, CT. Led cost estimating activities for the $500 million facility planning and $45 million Phase 1 design of nitrogen reduction and solids improvements. Engineer's estimate was within 1% of project low bid.

Lead Cost Estimator, Goff Brook Overflow Closure, Hartford MDC, Hartford, CT. Led cost estimating activities. Project included full evaluation of alternatives for sewer routing.

Lead Estimator, Solids Upgrade, Windham, CT. Led cost estimating activities for the complete $3 million upgrade. Project involved construction of building addition, a new WAS storage, and associated odor control.

Lead Estimator, Class 3 Estimate, Western Wake Partners, Western Wake Water Reclamation Facility, Regional Wastewater Treatment Plant, Cary, NC. Lead estimator for the $134 million construction of the 18 MGD Water Reclamation Facility, which included the following facilities: preliminary treatment facility, splitter box, effluent disinfection building, chemical building, operations and maintenance building, biological treatment basins with attached rectangular clarifiers, blower room, and effluent filters.

Lead Estimator, Class 3 Estimate, James River Treatment Plant Improvement Project, Hampton Roads Sanitation District, Newport News, VA. Provided estimates for the $32 million upgrade of the existing James River Treatment Plant. The upgrades includes new IFAS system in aeration tanks, new blower system, new odor control system, modifications to existing screening facility, improvement to existing electrical systems, instrumentation and controls improvements, replacing of existing boiler/heater system, installation of new polymer system, demolition, and other site related work.

Daniel Morse, PhD

CFD/Pump Station Modeling

Education

PhD, Mechanical Engineering, Oregon State University

MS, Mechanical Engineering, Oregon State University

BS, Mechanical Engineering, Oregon State University

BS, Applied Science, George Fox University

With 13 years of experience, Daniel brings to PVSC expertise in computation fluid dynamic (CFD) analysis and the application of fundamental fluid mechanic principles to solve difficult engineering problems. During his tenure with CH2M, he has performed advanced hydraulic analysis of projects related to large hydroelectric reservoirs, high-volume water conveyance design, municipal pump station design, and modifications to wastewater facilities.

Representative Projects

Lead CFD Modeler, Lower Mill Creek Dropshaft and Pump Station CFD Analysis, Metropolitan Sewer District of Greater Cincinnati (MSD), Cincinnati, OH. Historically, sewer and stormwater from the Lower Mill Creek water shed in Cincinnati combine to overflow into the Mill Creek. The MSD Lower Mill Creek project was developed to substantially reduce the combined sewer overflows. Provided CSO design and modeling of numerous CSO pipelines and hydraulic structures. Used CFD to provide detailed analysis of flow at these structures resulting in value added design discussion and changes. Visualization of water velocities and levels in the system were used to shape subsequent designs.

Lead CFD Modeler, Oak Lodge Pump Station, Oak Lodge Sanitary District, OR. Performed pump station configuration evaluation using CFD techniques.

Lead CFD Modeler, Rock Island Pump Station, IL. Performed pump station configuration evaluation using CFD techniques.

Lead CFD Modeler, Mangere WWTP BNR Upgrade, Influent Pump Station 2, Watercare, Auckland, New Zealand. Provided analysis of the Influent Pump Station 2 (IPS2) for the Mangere WWTP BNR upgrade project. Used CFD analysis to evaluate several different configurations of pumps and inlet geometry arrangements. Identified potential pump performance issues and linked them to specific design components such as baffle walls, inlet distribution wall, and opening sizing. Evaluated remediation measures to improve the design and hydraulic conditions at the pumps. These recommended improvements included intake bell straightening vanes, ported distribution wall, and baffle wall sizing.

Lead CFD Modeler, Hydraulic Profile Modeler, Beenyup AWRP, Water Corporation, Perth, Australia. Was the lead CFD modeler providing ongoing analysis of the Finished Water Pump Station (FWPS). He supported design of FWPS with CFD analysis of the entire structure. Additionally, he provided CFD analysis for design of the Reject Return Line (RRL). The CFD analysis was used to improve hydraulic conditions for the pumps, provide critical comparison for out of spec performing components, and anticipate multiphase (air/water) phenomena in the RRL.

Lead CFD Modeler, Louisville New and Existing Pump Station, Louisville Water Company, Louisville, KY. The Louisville Water Company tasked CH2M with rehabilitating the current pump station and construction of a new station at the Derek R Guthrie Water Quality Treatment Center. He employed CFD to evaluate various pump station configurations for the facility.

Lead CFD Modeler, Abu Dhabi Dropshaft and Pump Station Analysis, Abu Dhabi, United Arab Emirates. Provided analysis of the Abu Dhabi large sewer project. Evaluated several configurations of vortex dropshafts for the Abu Dhabi deep sewer project using CFD techniques. In addition, he evaluated the high flow wet well pump station using CFD techniques.

Lead CFD Modeler, King County Water Treatment Division, Seattle WA. Provided CFD analysis of the influent drop structure, basin, and pump station of the Georgetown WWTS. The WWTS influent structure is a large storage basin and pump station for treating large periodic flows due to wet weather events. The analysis and hydraulic evaluation was used to develop improved design for the influent drop structure to reduce potential issues related to aeration and hydraulic scour. Performed an analysis for the pump intake structure in the basin. He provided CFD analysis of critical hydraulic characteristics related to pump performance including swirl angle, and intake velocity distribution. Analyzed several configurations to improve the overall design considering hydraulic, construction, and operational factors.

Lead CFD Modeler, Columbia Boulevard Wastewater Treatment Plant (CBWTP) Hydraulic Bottleneck Improvement, City of Portland Bureau of Environmental Services (BES), Portland OR. The CBWTP treats up to 450 mgd during wet weather events. The wet weather primary treatment capacity is 330 mgd. The flow path for the primary treatment during wet weather events experienced excessive head loss through a specific section which reduced the effective capacity and led to overflows in the primary effluent channel. Identified major sources of head loss and proposing an effective solution to mitigate this problem and allow the CBWTP to reach its intended capacity. Used CFD to identify and illustrate primary sources of head loss in the wet weather flow path. Proposed and modeled a solution that showed an effective reduction of head loss equal to 2.5 feet. This allowed full capacity service of the wet weather facility and provide improved flow conditions for flow measurement installation.

Lead CFD Modeler/Hydraulic Profile Modeler, Annacis Island Wastewater Treatment Plant, Stage V Expansion, Metro Vancouver; Vancouver, British Columbia, Canada. Oversaw the CFD modeling of the secondary clarifier distribution upgrade project, which includes capacity expansion with additional clarifiers, and upgrade of existing equipment to control flow to the clarifiers. The expansion increased the total flow to 1800 ML/d to 18 secondary clarifiers. Used CFD analysis to identify hydraulic issues in the current distribution control scheme with flumes. Analyzed several configurations for improved replacement concepts. The CFD analysis was coupled with other hydraulic analysis tools to select an option which successfully distributes flows for the expanded capacity of the plant.

Lead CFD Modeler, Portland Combined Sewer Overflow (CSO) Tunnel, City of Portland, OR. The City of Portland CSO project addressed storm event issues with the city's collection system. Used CFD to evaluate various dropshaft design configurations. A stilling basin was proposed and modeled to dissipate flow energy upstream of the dropshaft.

Lead CFD Modeler, East Park Reservoir, Philadelphia Water Department, Philadelphia, PA. Provided hydraulic analysis of the mixing performance and used CFD techniques to evaluate mixing time and detention time in the reservoir.

Lead CFD Modeler, Mixing Channel and Denitrification Tanks, District of Columbia Water and Sewer Authority, Washington DC. Used CFD to evaluate mixing channel and denitrification tank hydraulics. Passive mixing structures were proposed and modeled to optimize mixing capability while minimizing head loss.

Richard Siebers, AIA

Architect

Education

BS, Architecture, University of Wisconsin at Milwaukee

Professional Registration

Registered Architect: WI

American Institute of Architects (AIA)

With 26 years of experience, Richard is an architect who serves as a companywide resource on architecture, codes, security and target hardening. He has written several master specifications for CH2M and has led architectural design on numerous industrial, military and municipal projects. Among his tasks are condition assessments, life safety and building code reviews, risk assessments, space utilization assessments, project design and detailing, specification writing, producing construction documents, 3D CAD modeling, design and task management, and reviewing other designers' work.

Representative Projects

Lead Architect, Water Treatment Plant Upgrade, Township of North Brunswick, NJ. Lead Architect on all phases of design and construction for the Water Treatment Plant Upgrade project. The project included a new 2 story Filter Building with pump room, office area and laboratory. The building included solar collector panels on the roof. The project also contained modifications to existing facilities, including renovating 2 existing steel backwash thickening tanks, new backwash equalization tanks, and a new stair for the precipitators. The treatment plant is next to a nature trail, so the new work used colors to blend in with the existing trees and site. Also the new work would be visible from neighbors, so the Filter Building was designed to be aesthetically pleasing.

Lead Architect, Water Filtration Plant Modifications and Demolition Project, Oshkosh, WI. Lead Architectural Designer on all phases of design and construction for Water Filtration Plant Modifications and Demolition Project. The project included demolition of previously decommissioned treatment plant facilities. A new basin was designed to provide backup disinfection contact time and filter backwash supply storage. The basin was constructed concrete form liner and staining to look like stone. A new low lift pump station was constructed on the top of the existing concrete pump station foundation, which was part of the treatment facility being demolished. The existing high lift pump station was removed from the top of existing reservoir, and the new pump station was built. Both new pumps stations have a higher floor elevation and new pumps and equipment. Skylights are installed over the pumps in both new pump stations to allow for future removal of pumps and motors.

Lead Architect, De Pere and Green Bay Facility Upgrades for Green Bay MSD, Green Bay, WI. Lead Architectural Designer on all phases of design and construction for the De Pere and Green Bay Facility Upgrades project. The project included security upgrades to all the existing exterior doors at the De Pere Facility, including a new gate with brick and concrete gate enclosures. The project also included modifications and addition to existing Influent Pump Station, a new 2 story grit building, new chemical storage areas and modification to the existing Service Building, an addition to an electrical building, along with other modifications to De Pere and Green Bay Facilities.

Lead Architect, Cleveland Security System Project, Cleveland, OH. Worked with Cleveland Public Utilities to set a standard for target hardening of their critical facilities. Lead Architect for the design of security improvements for four water plants, maintenance and administration facilities, over 50 water tower, pump stations, power substation, water pollution control and emergency radio facilities. The design included security assessment and recommendation for improvements, surveillance and intrusion

detection systems, target hardening of critical assets and remote sites, and facility and site access monitoring and control.

Lead Architect, Water Plant Disinfection System Improvements, Cedar Rapids, IA. Lead Architect on all phases of design and construction for the project, which included adding a new UV disinfection building connected by a walkway to the Northwest Water Treatment Plant and new UV disinfection addition between the existing filter building and the existing reservoir/pump station at the J Ave. Water Treatment Plant. The project also included a new reservoir/pump station building which was connect by above ground walkway to the J Ave. UV disinfection building. The new J Ave. buildings were to match the existing historic brick and stone buildings.

Architectural Task Leader, Atherton WWTP Improvements, Little Blue Valley Sewer District, Independence, KS. Architectural designer and architectural task leader on all phases of design and construction for upgrade of this wastewater treatment plant. The treatment plant upgrades included a new raw wastewater pump station, headworks facility, primary pump station, and ferric and polymer building. To meet the deadline for state revolving fund loans, the facilities plan was completed in 100 days. The preliminary and final design was completed in 9 months and submitted to the state for review.

Architectural Task Leader, Dallas Central Wastewater Treatment Plant, Dallas TX. Architectural designer and architectural task leader on all phases of design and construction for the Grit Removal and Air Line Modifications. The project included the renovation of and addition to the Grit Removal Building at the With Rock Plant.

Architectural Task Leader, Mason Pump Station, Northern Kentucky Waterworks Road Pump Station, Warrensburg Water Treatment Plant Sulfide Removal Improvements, and Mexico Water Plant Improvements, KY. Design Manager for Mason Pump Station construction services and Northern Kentucky design and construction services.

Architectural Task Leader, Cedar Rapids Wastewater Treatment Plant, Cedar Rapids, IA. Architectural designer and architectural task leader on all phases of design and construction for the Anaerobic Treatment Facilities. The project included adding 3 new buildings; the Chemical Building, Process Building and Biogas Building. The Chemical Building was for process chemical storage and pumps. The Process Building included a large room for process equipment, a laboratory, toilet, and control room. The Biogas Building had a biogas processing room, gas handling room and a chemical room.

Architectural Task Leader and Architect, Grand Rapids Public Utilities Commission Wastewater Treatment Facility Improvements, Grand Rapids, MI. Architectural Task Leader on all phases of design and construction for the Wastewater Treatment Facility Expansion and Rehabilitation project. Architectural designer for the 2 story service center with office, laboratory, locker, shop and vehicle storage spaces. Architectural Task Leader for the design of numerous buildings, additions and modifications.

Jennifer Smith

Environmental/Regulatory/Permitting

Education

ME, Environmental Engineering, Stevens Institute of Technology

BS, Atmospheric Science, University of Albany

Based in Parsippany, Jennifer is a Water Engineer with experience includes analysis of precipitation and tide level data for climate risk projects, biological field surveying of endangered wetland plants, permitting, and GIS mapping. Her background includes hydrology of wetlands and groundwater and a broad range of atmospheric science topics, and she is certified in wetlands delineations.

Representative Projects

Project Engineer, North Hudson Sewerage Authority Permitting, NJ. Preparing permit applications for the W1234 Outfall and S/F Screening Facility and the H5 Pump Station projects. Permits included Waterfront Development, Treatment Works Authority, and dredging, and applications include the preparation of environmental impact statements and engineer's reports.

Project Engineer, Passaic Valley Water Commission Tracer Study, NJ. Conducting fluoride tracer study on ozone contactors of Little Falls drinking water plant to verify ozone contact time for disinfection credit from the State of New Jersey.

Project Engineer, NYCDEP Climate Change, New York, NY. Assessed pump station storm surge flood risk through drawing analysis and station visits.

Project Engineer, Suffolk County Sewer Study, NY. Completed a cost-benefit analysis of extending sewer service vs. existing service for five municipalities.

Project Engineer, Miami-Dade Water and Sewer District Ocean Outfall Legislation Climate Change Task, Miami, FL. Developed historical precipitation IDF record and calculated trends using data from a network of gauges and compared to published results. Ran climate models to determine future projections of precipitation IDF. Analyzed historical annual and seasonal precipitation amounts and trends.

Project Engineer, Louisville MSD Climate Change, Jefferson County MSD, Louisville, KY. Developed historical precipitation IDF record and calculated trends using data from a network of gauges to update previous results. Ran climate models to determine future projections of precipitation IDF. Included comparisons of methodology in technical memo.

Project Engineer, Columbia Line 1711 Anode Project Field Surveys. Surveyed pipeline for wetlands and water bodies, completing wetland delineations where appropriate. Mapped features by GPS. The CH2M 4-person team covered 16 miles in 4 days.

Project Engineer, Swamp Pink Monitoring, NJ. Conducted field survey to monitor swamp pink near the GEMS landfill site. Survey included identifying both shrubs and herbaceous plants and collecting detailed information about swamp pink plants, including counting plants and leaves, measuring leaves, and identifying plant color using a Munsell color chart.

Project Engineer, Boston Water and Sewer Commission Wastewater and Storm Drain Project, Boston MA. Analyzed historical and SimCLIM precipitation data to produce current and projected IDF curves, annual daily maximum series, and annual total precipitation for the BWSC service area using L-Moments and generalized extreme value (GEV) distribution.

Project Engineer, Newport CSO Project, Newport, RI. Analyzed historical and SimCLIM precipitation data to produce current and projected IDF curves, annual daily maximum series, and annual total precipitation for the Newport area using L-Moments and generalized extreme value (GEV) distribution. Analyzed facility drawings and FEMA FIRMs to determine coastal flood risk.

Project Engineer, Fairfax County Climate Change, Fairfax County, VA. Analyzed daily precipitation data for gauges surrounding the project area to determine annual daily maximum precipitation and used L-Moments and SimCLIM to determine return periods at current and future projection years.

Muhammad Shafiquzzaman, PE

Building Services

Education

MS, Mechanical Engineering, Catholic University of America

BS, Mechanical Engineering, Bangladesh University of Engineering & Technology

Professional Registration

Professional Engineer: VA

Muhammad is a mechanical engineer responsible for the design of HVAC, plumbing, and fire protection systems for buildings and other facilities. He has extensive experience in the design of under floor air distribution system, multiple chiller and boiler plants with primary and secondary pumping system, cooling tower systems, hot water, steam and process piping, VAV air distribution systems and HVAC controls for central plant facilities. His duties also include RFI responses, preparation of field and design reports, preparation of design drawings and specifications, coordinate of project design requirements with other disciplines, supervision of drafting, review of shop drawings, and review of construction work in progress. He is a member of the American Society of Mechanical Engineers (ASME) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

Representative Projects

Lead Mechanical Engineer, H1 Screening and Wet Weather Pump Station, North Hudson Sewerage Authority (NHSA), Hoboken, NJ. Responsibilities included conceptual design of HVAC/plumbing systems. Work included HVAC and plumbing equipment selection, distribution layout of HVAC and plumbing system and preparation of specifications for HVAC and plumbing systems.

Lead Mechanical Engineer, Adams Street Wastewater Treatment Plant Site Assessment, NHSA, Hoboken, NJ. Performed the site assessment on existing, ventilation system, boiler system and wet pipe fire protection system in the basement of the administration building damaged by flooding during Superstorm Sandy. Also assisted in developing scope of work for replacement of damaged ventilation system, hydronic boiler, and fire protection system with area of scope. Provided support during construction.

Lead Mechanical Engineer, Adams Street WWTP Administration Building Reallocation, Project, NHSA, Hoboken, NJ. Performed the site assessment on existing, ventilation and heating system for administration area, process space and 11th Street pump station. Provided recommendation, construction cost assessment, etc. During design phase, replaced existing units for administration area, new ventilation system including exhaust fans for the process area, as well as 11th Street pump station. Upgraded existing lab space with new fume hood and dedicated makeup air unit.

Lead Mechanical and Plumbing Engineer; Norfolk 37th Street, Water Treatment Facility, City of Norfolk VA. Responsible for the design and specification of the HVAC, plumbing and fire protection systems for a Settled Water Pump station, Filter building and UV disinfection building. Design provided packaged DX unit for occupied office area split DX systems for electrical room, high plume exhaust fan for Lab and make air handling unit for process area. Multiple make up air units & exhaust fans were designed for the process areas. Chemical and process areas were provided with ventilation and negative pressurization.

Lead Mechanical Engineer, Solids Processing Upgrade Project, Hartford Water Pollution Control Facility, Hartford, CT. Responsible for the design and specification of the HVAC, plumbing systems for existing Solids Processing building (58,000 sf),Incinerator Building (40, 000 sf), new Cake Receiving and

Equalization building. Design involve ventilation for process area per NFPA 820, air condition for occupied office area, split DX systems for electrical room, and make air handling unit for process area. Multiple make up air units & exhaust fans will be provided for chemical and process area ventilation and negative pressurization in different buildings.

Lead Mechanical Engineer, Distribution Centers and Motor Control Centers Replacement Project, Noman M Cole, Jr. Pollution Control Plant, Lorton, VA. Responsible for the design and specification of the HVAC, plumbing and fire protection systems for 12 buildings which includes gravity thickener building and blower building. Design provided VAV system for LEED certified occupied office area, split DX systems for electrical room, and make air handling unit for process area. Multiple make up air units and exhaust fans were designed for the process areas. Chemical and process areas were provided with ventilation and negative pressurization. The estimate construction cost is $60 million.

Lead Mechanical Engineer, Quantico Sewage Treatment Plant ENR Design, Quantico, VA. Provided conceptual design of HVAC/plumbing systems. Work included HVAC and plumbing equipment selection, distribution layout of HVAC and plumbing system and preparation of specifications for HVAC and plumbing systems.

Lead Mechanical Engineer, State-of-the-Art Nutrient Upgrade Program, Alexandria Renew Enterprises, Alexandria, VA. Responsible for the design and specification of the HVAC for a below grade Nutrient Management facility with a soccer field above the structure. Design provided packaged DX unit for occupied office area split systems for electrical room, high plume exhaust fan for Lab and make air handling unit for process area. Multiple make up air units and exhaust fans were designed for the process areas. Chemical and process areas were provided with ventilation and negative pressurization Estimated construction cost is $82 million.

Lead Building Mechanical Engineer, James River Treatment Plant Improvements, James River WWTP, Newport News, VA. Responsible to determine project needs, conceptual design of HVAC/plumbing systems, HVAC and plumbing equipment selection, distribution layout of HVAC and plumbing system and preparation of specifications for HVAC and plumbing systems.

Lead Mechanical Engineer, Solids Processing Rehabilitation Project, Noman M Cole, Jr. Pollution Control Plant, Lorton, VA. Responsible for the design and specification of the HVAC, plumbing systems for two incinerator building (30,000 sf each), solids processing building (60, 000 sf), and scum handlings buildings. Design involve ventilation for process area per NFPA 820, air condition for occupied office area, split DX systems for electrical room, and make air handling unit for process area. Multiple make up air units and exhaust fans will be provided for chemical and process area ventilation and negative pressurization in different buildings. The estimate construction cost is $90 million.

Lead Mechanical Engineer, Incinerator Rehabilitation, Contract IR-13B, Northeast Ohio Regional Sewer District, Cleveland, OH. Responsibilities included HVAC systems condition assessment of an existing 30 year old facility and upgrade existing HVAC system to meet current standard. Work included HVAC equipment selection, distribution layout of HVAC preparation of specifications for HVAC systems.

ATTACHMENT A

CERTIFICATION OF INSURANCE

I HEREBY CERTIFY THAT MY OFFICE CARRIES INSURANCE ADEQUATE TO COVER PASSAIC VALLEY SEWERAGE COMMISSION ("PVSC") AND PROTECT PVSC FOR ANY ERROR OR OMISSION BY THE UNDERSIGNED THAT CREATES LIABILITY TO PVSC. THIS INCLUDES ERRORS AND OMISSIONS POLICY AND ANY OTHER TYPE OF POLICY WHATSOEVER THAT CAN BE UTILIZED TO PROTECT THE INTERESTS OF PVSC. I HAVE ATTACHED HERETO COPIES OF THE DECLARATION PAGES OF EACH SUCH POLICY THAT I ASSERT DOES OR CAN PROTECT ANY ERROR, OMISSION OR ACTIVITY IN WHICH I OR ANYONE FROM MY OFFICE MIGHT ENGAGE ON BEHALF OF PVSC.

I FURTHER CERTIFY THAT THE POLICIES OF INSURANCE THAT ARE CARRIED BY MY OFFICE SHALL CONTINUE TO BE CARRIED DURING THE ENTIRE TERM OF MY APPOINTMENT AS **DESIGN SERVICES AND DESIGN SERVICES DURING CONSTRUCTION OF STORMWATER PUMPING STATIONS**, IN THE EVENT THAT MY OFFICE IS SELECTED TO SERVE IN THAT CAPACITY. IN THE EVENT THAT THE DECLARATIONS PAGE(S) SUBMITTED HEREWITH SHOWS THE POLICY OR POLICIES OF INSURANCE WILL LAPSE DURING THE COURSE OF THE TERM OF MY APPOINTMENT, I WILL PROVIDE TO PVSC A COPY OF THE RENEWAL POLICY DECLARATION PAGE. I FURTHER CERTIFY THAT THE RENEWED POLICY SHALL HAVE THE SAME OR GREATER LIMITS OF LIABILITY AS THE ONE PROVIDED FOR THE BEGINNING OF MY APPOINTMENT.

CERTIFYING OFFICIAL:

NAME: Jerry Notte, PE

TITLE: Vice President

SIGNATURE: Jerry Notte

DATE: September 12, 2016

INSURANCE CERTIFICATES ARE NOT REPRINTED HERE DUE TO SIZE

ATTACHMENT B

CONFLICT OF INTEREST CERTIFICATION

THE UNDERSIGNED CERTIFIES TO PASSAIC VALLEY SEWERAGE COMMISSION ("PVSC"), COUNTY OF ESSEX, STATE OF NEW JERSEY THAT IN PERFORMING SERVICES TO PVSC HE/SHE IS AWARE OF NO CIRCUMSTANCE THAT WOULD CONSTITUTE A CONFLICT OF INTEREST, FINANCIAL OR OTHERWISE, BETWEEN HIMSELF/HERSELF (OR HIS/HER FIRM) AND THE INTERESTS OF PVSC. THE UNDERSIGNED CERTIFIES THAT HE/SHE HAS MADE A SEARCH OF HIS/HER FIRM'S CLIENT BASE AND HAS EXECUTED THIS CERTIFICATION SUBSEQUENT TO SUCH SEARCH.

THE UNDERSIGNED ACKNOWLEDGES THIS IS A CONTINUING CERTIFICATION, AND SHALL REMAIN IN EFFECT FOR THE TERM OF THE SERVICES CONTAINED IN THE SOLICITED REQUEST FOR PROPOSAL. I CERTIFY THAT THE FOREGOING STATEMENTS MADE BY ME ARE TRUE. I AM AWARE THAT IF ANY OF THE FOREGOING STATEMENTS MADE BY ME ARE FALSE, PVSC IS FREE TO TERMINATE ANY PROFESSIONAL SERVICES AGREEMENT ENTERED INTO WITH THE UNDERSIGNED AND/OR HIS OR HER FIRM.

Applicant

Signature: Jerry Notte

Typed: Jerry Notte, PE

Firm Name: CH2M HILL Engineers, Inc.

Title: Vice President

Date: September 12, 2016

ATTACHMENT C

I HEREBY CERTIFY THE INFORMATION CONTAINED IN THIS PROPOSAL IS CORRECT AND ACCURATE TO MY PERSONAL KNOWLEDGE. I AM MAKING THIS CERTIFICATION IN GOOD FAITH.

CERTIFYING OFFICIAL:

NAME: Jerry Notte, PE

TITLE Vice President

SIGNATURE: Jerry Notte

DATE: September 12, 2016

ATTACHMENT F

P.L.1975.C.127 (N.J.A.C. 17:27)
MANDATORY AFFIRMATIVE ACTION LANGUAGE
PROCUREMENT, PROFESSIONAL AND SERVICES CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will take affirmative action to ensure that such applicants are recruited and employed, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor, where applicable, will send to each labor union or representative or workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

The contractor or subcontractor agrees to make good faith efforts to employ minority and women workers consistent with the applicable county employment goals established in accordance with N.J.A.C. 17:27-5.2, or a binding determination of the applicable county employment goals determined by the Division, pursuant to N.J.A.C. 17:27-5.2.

The contractor or subcontractor agrees to inform in writing its appropriate recruitment agencies including, but not limited to, employment agencies, placement bureaus, colleges, universities, labor unions, that it does not discriminate on the basis of age, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, and that it will discontinue the use of any recruitment agency which engages in direct or indirect discriminatory practices.

ATTACHMENT F (Cont.)

The contractor or subcontractor agrees to revise any of its testing procedures, if necessary, to assure that all personnel testing conforms with the principles of job-related testing, as established by the statutes and court decisions of the State of New Jersey and as established by applicable Federal law and applicable Federal court decisions.

In conforming with the applicable employment goals, the contractor or subcontractor agrees to review all procedures relating to transfer, upgrading, downgrading and layoff to ensure that all such actions are taken without regard to age, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, consistent with the statutes and court decisions of the State of New Jersey, and applicable Federal law and applicable Federal court decisions.

The contractor shall submit to the public agency, after notification of award but prior to execution of a goods and services contract, one of the following three documents:

Letter of Federal Affirmative Action Plan Approval

Certificate of Employee Information Report

Employee Information Report Form AA302

The contractor and its subcontractors shall furnish such reports or other documents to the Div. of Contract Compliance & EEO as may be requested by the office from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Div. of Contract Compliance & EEO for conducting a compliance investigation pursuant to **Subchapter 10 of the Administrative Code**

Do Not Leave Any Sections Blank

ATTACHMENT "G"

SUMM ARY OF TOTAL MAN DAY ESTIMATE

	Estimate of Man Days										
DESCRIPTION OF WORK	**Project Manager**	**Project Engineer**	**Principal Engineer**	**RPR**	**Senior Engineer**	**Engineer/ Scientist**	**Staff Engineer**	**Designer/ Drafter**	**Technician**	**Support**	**Total Man Days**
Title ---->											
Staff Name ---->											
Hourly Rates (Office) ---->	$ 182	$ 208	$ 234		$ 169	$ 143	$ 104	$ 117	$ 91	$ 78	
Hourly Rates (Field) ---->				$ 143						$ 71	
Task 1 - Re view and Compilation of Data											
1.1 Investigation	1.50	5.00	0.00	0.00	5.00	3.00	3.00	0.00	5.00	2.00	24.50
Task 2 - Project Work Plan and Reporting											
2.1 Project Work Plan	5.00	1.50	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00	16.50
Task 3 - Physical Modeling											
3.1 Physical Modeling	0.00	3.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	8.00
Task 4 - Design Services											
4.1 Design	75.50	160.63	15.50	0.00	265.50	114.00	114.00	94.50	233.50	46.50	1119.63
4.2 Meetings	23.50	37.50	4.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	68.00
4.3 Value Engineering	2.50	5.50	2.00	0.00	6.00	6.00	0.00	0.00	0.00	0.00	22.00
4.4 Permitting	7.00	0.00	0.00	0.00	0.00	0.00	13.00	4.50	0.00	0.00	24.50
4.5 Bidding Assistance	3.00	2.50	0.00	0.00	1.50	7.50	5.00	5.00	2.50	1.50	28.50
Task 4 - De sign Services During Construction											
5.1 Notice to Proceed	0.75	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	1.00	3.75
5.2 Construciton Liaison and Administration	69.00	0.00	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	92.00
5.3 Meetings	12.00	0.00	3.50	0.00	5.00	5.00	0.00	0.00	0.00	0.00	25.50
5.4 Baselines and Benchmarks	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00	0.00	10.00
5.5 Approval of Manufacturers/vendors	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	10.00
5.6 Review of Shop Drawings	0.00	25.00	0.00	0.00	75.00	100.00	0.00	0.00	0.00	0.00	200.00
5.7 Contractor Initiated Substitutions	0.00	0.00	0.00	0.00	6.00	6.00	0.00	0.00	0.00	0.00	12.00
5.8 Testing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.9 RFI's & Field Orders	0.00	12.50	0.00	0.00	25.00	37.50	0.00	0.00	0.00	0.00	75.00
5.10 Change Orders	0.00	10.00	0.00	0.00	10.00	30.00	0.00	0.00	20.00	0.00	70.00
5.11 Contractor Payments	5.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.75
5.12 Start-Up Services	0.00	0.00	0.00	0.00	23.75	25.00	35.00	0.00	0.00	10.00	93.75
5.13 Post Construction Assistance	4.00	0.00	0.00	0.00	3.00	22.50	0.00	0.00	37.50	0.00	67.00
Subtotals	209.50	263.13	48.00	0.00	440.75	364.50	177.00	109.00	298.50	66.00	1976.38
Task 6 - Resident Project Representative (per Scope of Work)											
Resident Project Representative	0.00	0.00	0.00	498.75	0.00	0.00	0.00	0.00	0.00	0.00	498.75
Part Time Administrative Assistant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	249.38	249.38
Subtotals	0.00	0.00	0.00	498.75	0.00	0.00	0.00	0.00	0.00	249.38	748.13
								Total Man Day Estimate			2724.50

ATTACHMENT I

ACKNOWLEDGEMENT OF RECEIPT OF CLARIFICATIONS

The undersigned Respondent hereby acknowledges receipt of the following clarifications to the Request for Qualifications and Compensation (Fee) Proposal. By indicating date of receipt, Respondent acknowledges the submitted qualifications and proposal takes into account the provisions of the issued clarification(s). Note that the PVSC's record of clarification(s) issued shall take precedence and that failure to include provisions of changes in qualifications and proposal may be submit for rejection of the qualifications and proposal.

PROFESSIONAL SERVICES FOR
DESIGN SERVICES AND DESIGN SERVICES DURING CONSTRUCTION FOR STORMWATER PUMPING STATIONS

Directions: Complete Part I or Part II, whichever is applicable

PART I: LISTED BELOW ARE THE DATES OF ISSUE FOR EACH CLARIFICATION RECEIVED IN CONNECTION WITH THIS RFQ/RFP:

CLARIFICATION #1, DATED _____ July 27 , 2016

CLARIFICATION #2, DATED _____ August 30 , 2016

CLARIFICATION #3, DATED _____ _____ , _____

CLARIFICATION #4, DATED _____ _____ , _____

PART II: ___ NO CLARIFICATION WAS RECEIVED IN CONNECTION WITH THIS RFQ/RFP.

DATE: September 12, 2016

NAME Jerry Notte, PE SIGNATURE Jerry Notte

Certification 47309

CERTIFICATE OF EMPLOYEE INFORMATION REPORT

RENEWAL

This is to certify that the contractor listed below has submitted an Employee Information Report pursuant to N.J.A.C. 17:27-1.1 et. seq. and the State Treasurer has approved said report. This approval will remain in effect for the period of 15-SEP-2014 to 15-SEP-2017

CH2M HILL ENGINEERS INC.
119 CHERRY HILL ROAD
PARSIPPANY NJ 07054

Andrew P. Sidamon-Eristoff
State Treasurer

Exhibit D

Compensation Proposal

CH2M developed this estimate in order to provide PVSC with a level of effort (LOE) and total project cost that is sufficient to address all of the required elements of the project as previously discussed at the best value to PVSC. This estimate was developed based off the following:

- This compensation proposal is based upon the scope of work provided in the RFP and the BODR provided with the RFP.
- The fee and scope presented here assumes that the BODR is complete and that any additional scope items that are identified after thorough review that we believe are necessary as indicted in the RFP Subtask 1.1, will be submitted to PVSC in a supplemental report for their review. Any additional work identified as part of Subtask 1.1 is not included in this scope and fee. Also, not included is an independent check of the accuracy of the assumptions or calculations which the RFP stated are to be relied upon.
- An assumption in the man-days in Task 6 that match the hours presented in the RFP for the RPR and the Admin labor categories.
- The use of a field overhead rate for the RPR and Admin for Task 6 services.
- Inclusion of travel costs in the hourly rates as required by the RFP.
- Costs in Task 2 for PMWeb licenses.
- Costs for specialty sub-contractors, specifically 3rd party special inspection services, in Subtask 5.8, Testing, have been estimated to be $100,000 based on our experience from similar projects. These costs are shown in Attachment H as an expense added to the Summary of Costs given that this work will be billed by unit cost rather than labor rate.
- Task 4.2, Meetings will include the following:
  - Monthly Design Meetings: 12 meetings, 2 attendees
  - 30%, 60%, 90% Design Review Workshops: 3 workshops, 4 attendees
  - Program/Project Management Training Workshops: 2 workshops, 1 attendee
  - Additional Workshops: 1 workshop, 2 attendees
  - Coordination Meetings with Stormwater Collection and Floodwall projects: 4 meetings, 2 attendees
- Task 4.5, Bidding Assistance will consist of a 6 week bid period.
- Task 5.3, Pre-Construction Meeting, Construction Site Visits and Progress Meetings will include the following:
  - Monthly Progress Meetings: 23 meetings
  - Engineering Site Visits: 10 visits
- Task 5.6, Review of Shop Drawings will include the following:
  - 200 submittals
  - 100 resubmittals
- Task 5.7, Evaluation of Contractor Initiated Substitutions includes 6 substitution requests.
- Task 5.11, Contractor Payments includes 23 payment application reviews.
- Task 5.12, Startup Services includes the startup plan only, and no commissioning as specified by the RFP.

Do Not Leave Any Sections Blank

ATTACHMENT "H"
SUMMARY OF TOTAL PROJECT COST

	Estimate of Labor Costs										
DESCRIPTION OF WORK	Project Manager	Project Engineer	Principal Engineer	RPR	Senior Engineer	Engineer/ Scientist	Staff Engineer	Designer/ Drafter	Technician	Support	Total Labor Cost
Title ---->											
Staff Name ---->											
Hourly Rates (Office) ---->	$ 182	$ 208	$ 234		$ 169	$ 143	$ 104	$ 117	$ 91	$ 78	
Hourly Rates (Field) ---->				$ 143						$ 71	
Task 1 - Review and Compilation of Data											
1.1 Investigation	$ 2,184.00	$ 8,320	$ -	$ -	$ 6,760	$ 3,432	$ 2,496	$ -	$ 3,640	$ 1,248	$ 28,080
Task 2 - Project Work Plan and Reporting											
2.1 Project Work Plan	$ 7,280	$ 2,496	$ -	$ -	$ -	$ -	$ 4,160	$ -	$ -	$ 3,120	$ 17,056
Task 3 - Physical Modeling											
3.1 Physical Modeling	$ -	$ 4,992	$ -	$ -	$ 6,760	$ -	$ -	$ -	$ -	$ -	$ 11,752
Task 4 - Design Services											
4.1 Design	$ 109,928	$ 267,280	$ 29,016	$ -	$ 358,956	$ 130,416	$ 94,848	$ 88,452	$ 169,988	$ 29,016	$ 1,277,900
4.2 Meetings	$ 34,216	$ 62,400	$ 7,488	$ -	$ -	$ 3,432	$ -	$ -	$ -	$ -	$ 107,536
4.3 Value Engineering	$ 3,640	$ 9,152	$ 3,744	$ -	$ 8,112	$ 6,864	$ -	$ -	$ -	$ -	$ 31,512
4.4 Permitting	$ 10,192	$ -	$ -	$ -	$ -	$ -	$ 10,816	$ 4,212	$ -	$ -	$ 25,220
4.5 Bidding Assistance	$ 4,368	$ 4,160	$ -	$ -	$ 2,028	$ 8,580	$ 4,160	$ 4,680	$ 1,820	$ 936	$ 30,732
Task 5 - Design Services During Construction (DSDC											
5.1 Notice to Proceed	$ 1,092	$ -	$ -	$ -	$ -	$ -	$ 1,664	$ -	$ -	$ 624	$ 3,380
5.2 Construciton Liaison and Administration	$ 100,464	$ -	$ 43,056	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 143,520
5.3 Meetings	$ 17,472	$ -	$ 6,552	$ -	$ 6,760	$ 5,720	$ -	$ -	$ -	$ -	$ 36,504
5.4 Baselines and Benchmarks	$ -	$ -	$ -	$ -	$ 6,760	$ -	$ -	$ 4,680	$ -	$ -	$ 11,440
5.5 Approval of Manufacturers/vendors	$ -	$ -	$ -	$ -	$ 6,760	$ 5,720	$ -	$ -	$ -	$ -	$ 12,480
5.6 Review of Shop Drawings	$ -	$ 41,600	$ -	$ -	$ 101,400	$ 114,400	$ -	$ -	$ -	$ -	$ 257,400
5.7 Contractor Initiated Substitutions	$ -	$ -	$ -	$ -	$ 8,112	$ 6,864	$ -	$ -	$ -	$ -	$ 14,976
5.8 Testing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5.9 RFI's & Field Orders	$ -	$ 20,800	$ -	$ -	$ 33,800	$ 42,900	$ -	$ -	$ -	$ -	$ 97,500
5.10 Change Orders	$ -	$ 16,640	$ -	$ -	$ 13,520	$ 34,320	$ -	$ -	$ 14,560	$ -	$ 79,040
5.11 Contractor Payments	$ 8,372	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,372
5.12 Start-Up Services	$ -	$ -	$ -	$ -	$ 32,110	$ 28,600	$ 29,120	$ -	$ -	$ 6,240	$ 96,070
5.13 Post Construction Assistance	$ 5,824	$ -	$ -	$ -	$ 4,056	$ 25,740	$ -	$ -	$ 27,300	$ -	$ 62,920
Subtotals	$ 305,032	$ 437,840	$ 89,856	$ -	$ 595,894	$ 416,988	$ 147,264	$ 102,024	$ 217,308	$ 41,184	$ 2,353,390
Task 6 - Resident Project Representative (per Scope of Work)											
Resident Project Representative	$ -	$ -	$ -	$ 568,814	$ -	$ -	$ -	$ -	$ -	$ -	$ 568,814
Part Time Administrative Assistant	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 142,204	$ 142,204
Subtotals	$ -	$ -	$ -	$ 568,814	$ -	$ -	$ -	$ -	$ -	$ 142,204	$ 711,018
										Total Labor Cost	$ 3,064,408

Summary of Costs

Description	Specialty Subconsultant Expense*	Cost
Task 1 - Review & Compilation of Data		$ 28,080
Task 2 - Project Work Plan & Reporting	$ 30,000	$ 47,056
Task 3 - Physical Modeling	$ 277,500	$ 289,252
Task 4 - Design Services		$ 1,472,900
Task 5 - Design Services During Construction (DSDC)	$ 100,000	$ 923,602
Task 6 - Resident Project Representative (RPR)		$ 711,018
Task 7 - Other Direct Costs		$ 50,000
Task 8 - Allowances		$ 550,000
Task 9 - Admin. of PVSC Funding Requirements		$ 30,000
TOTAL PROJECT COST		$ 4,101,908

This table shall be submitted with the "Compensation Proposal".

* Task 2 requires PMWeb licenses. Task 3 requires specialty subconsultants for Physical Modeling. Task 5 requires specialty subconsultants for Special Inspections. Because this work will be billed as a unit rate there are no man-day estimates to be provided.

Exhibit E

Form **W-9**
(Rev. December 2014)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Give Form to the requester. Do not send to the IRS.

Print or type
See Specific Instructions on page 2.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.
CH2M Hill Engineers, Inc.

2 Business name/disregarded entity name, if different from above

3 Check appropriate box for federal tax classification; check only **one** of the following seven boxes:
☐ Individual/sole proprietor or single-member LLC ☑ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate
☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶
Note. For a single-member LLC that is disregarded, do not check LLC; check the appropriate box in the line above for the tax classification of the single-member owner.
☐ Other (see instructions) ▶

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):
Exempt payee code (if any)
Exemption from FATCA reporting code (if any)
(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.)
9127 S. Jamaica Street

Requester's name and address (optional)

6 City, state, and ZIP code
Englewood, CO 80112

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the instructions for line 1 and the chart on page 4 for guidelines on whose number to enter.

Social security number
[redacted]

or

Employer identification number
[redacted]

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 3.

Sign Here | **Signature of U.S. person ▶** Jerry Motte **Date ▶** 1/3/17

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. Information about developments affecting Form W-9 (such as legislation enacted after we release it) is at *www.irs.gov/fw9*.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following:

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See *What is backup withholding?* on page 2.

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and
4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting?* on page 2 for further information.

Exhibit F

N.J.S.A. 10:5-31 et. seq. P.L.1975.C.127 (N.J.A.C. 17:27)
MANDATORY AFFIRMATIVE ACTION LANGUAGE
PROCUREMENT, PROFESSIONAL AND SERVICES CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will take affirmative action to ensure that such applicants are recruited and employed, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor, where applicable, will send to each labor union or representative or workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

The contractor or subcontractor agrees to make good faith efforts to meet targeted county employment goals established in accordance with N.J.A.C. 17:27-5.2.

The contractor or subcontractor agrees to inform in writing its appropriate recruitment agencies including, but not limited to, employment agencies, placement bureaus, colleges, universities, labor unions, that it does not discriminate on the basis of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, and that it will discontinue the use of any recruitment agency which engages in direct or indirect discriminatory practices.

The contractor or subcontractor agrees to revise any of its testing procedures, if necessary, to assure that all personnel testing conforms with the principles of job-related testing, as established by the statutes and court decisions of the State of New Jersey and as established by applicable Federal law and applicable Federal court decisions.

In conforming with the targeted employment goals, the contractor or subcontractor agrees to review all procedures relating to transfer, upgrading, downgrading and layoff to ensure that all such actions are taken without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, consistent with the statutes and court decisions of the State of New Jersey, and applicable Federal law and applicable Federal court decisions.

The contractor shall submit to the public agency, after notification of award but prior to execution of a goods and services contract, one of the following three documents:

Letter of Federal Affirmative Action Plan Approval

Certificate of Employee Information Report

Employee Information Report Form AA302 (electronically provided by the Division and distributed to the public agency through the Division's website at:
www.state.nj.us/treasury/contract_compliance)

The contractor and its subcontractors shall furnish such reports or other documents to the Div. of Purchase and Property, CCAU, EEO Monitoring Program as may be requested by the office from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Div. of Purchase and Property, CCAU , EEO Monitoring Program for conducting a compliance investigation pursuant to **Subchapter 10 of the Administrative Code at N.J.A.C. 17:27.**

Exhibit G

ATTACHMENT D

State of New Jersey
Division of Purchase and Property
Two-Year Chapter 51 / Executive Order 117 Vendor Certification and Disclosure of Political Contributions

CHAPT 51/EO 117-1

For AGENCY USE ONLY

General Information

Solicitation, RFP or Contract No _____ Award Amount _____

Description of Services _____

Agency Contact Information

Agency _____ Contact Person _____

Phone Number _____ Agency Email _____

Part 1: Vendor Information

Full Legal Business Name CH2M HILL Engineers, Inc.
(Including trade name if applicable)

Business Type [X] Corporation [ ] Limited Partnership [ ] Professional Corporation [ ] General Partnership
[ ] Limited Liability Company [ ] Sole Proprietorship [ ] Limited Liability Partnership

Address 1 119 Cherry Hill Road Address 2 _____

City Parsippany State NJ Zip 07054 Phone 973-316-3543

Vendor Email jerry.notte@ch2m.com Vendor FEIN [redacted]

Part 2: Public Law 2005, Chapter 51/ Executive Order 117 (2008) Certification

I hereby certify as follows:

1. On or after October 15, 2004, neither the below-named entity nor any individual whose contributions are attributable to the entity pursuant to Executive Order 117 (2008) has solicited or made any contribution of money, pledge of contribution, including in-kind contributions, company or organization contributions, as set forth below that would bar the award of a contract to the vendor, pursuant to the terms of Executive Order 117 (2008).

   a) **Within the preceding 18 months,** the below-named person or organization has not made a contribution to:

      (i) Any candidate committee and/or election fund of any candidate for or holder of the public office of Governor or ***Lieutenant Governor;***
      (ii) Any State, county, ***municipal*** political party committee; OR
      (iii) Any ***legislative leadership committee.***

   b) **During the term of office of the current Governor(s),** the below-named person or organization has not made a contribution to

      (i) Any candidate, committee and/or election fund of the Governor or ***Lieutenant Governor;*** OR
      (ii) Any State, county or ***municipal*** political party committee nominating such Governor in the election preceding the commencement of said Governor's term.

   c) **Within the 18 months immediately prior to the first day of the term of office of the Governor(s),** the below-named person or organization has not made a contribution to

      (i) Any candidate, committee and/or election fund of the Governor or ***Lieutenant Governor;*** OR
      Any State, county, ***municipal*** political party committee of the political party nominating the successful gubernatorial candidate(s) in the last gubernatorial election.

PLEASE NOTE: Prior to November 15, 2008, the only disqualifying contributions include those made by the vendor or a principal owning or controlling more than 10 percent of the profits or assets of a business entity (or 10 percent of the stock in the case of a business entity that is a corporation for profit) to any candidate committee and/or election fund of the Governor or to any state or county political party within the preceding18 months, during the term of office of the current Governor or within the 18 months immediately prior to the first day of the term of Office of Governor.

Part 3: Disclosure of Contributions Made See Attachment D1 CHAP 51/ EXO 117-2

☐ **Check this box if no reportable contributions have been made by the above-named business entity or individual.**

Name of Recipient	Address of Recipient
Date of Contribution	Amount of Contribution
Type of Contribution (i.e. currency, check, loan, in-kind	

Contributor Name

Relationship of Contributor to the Vendor

Contributor Address

City State Zip

if this form is not being completed electronically, please attach pages for additional contributions as necessary. Otherwise click "Add a Contribution" to enter additional contributions.

ATTACHMENT D1

Following are CH2M's political contributions for 2015 and 2016 to date.

2015 Political Contributions

Date	State	City	Amount	Organization
04/29/2015	NJ	Weehawken	$2000	Weehawken & You Action Committee
09/02/2015	NJ	Gibbstown	$700	Taliaferro for Assembly
09/10/2015	NJ	Paulsboro	$1200	Taliaferro for Assembly

2016 Political Contributions (to date)

Date	State	City	Amount	Organization
01/13/2016	NJ	Gibbstown	$500	Taliaferro for Assembly

Part 4: Certification CHAPT 51/EO 117-3

I have read the instructions accompanying this form prior to completing this certification on behalf of the above-named business entity I certify that, to the best of my knowledge and belief, the foregoing statements by me are true I am aware that if any of the statements are willfully false, I am subject to punishment.

I understand that this certification will be in effect for two (2) years from the date of approval, provided the ownership status does not change and/or additional contributions are not made. If there are any changes in the ownership of the entity or additional contributions are made, a new full set of documents are required to be completed and submitted By submitting this Certification and Disclosure, the person or entity named herein acknowledges this continuing reporting responsibility and certifies that it will adhere to it

(CHECK ONE BOX A, B or C)

(A) ☐ I am certifying on behalf of the above-named business entity and all individuals and/or entities whose contributions are attributable to the entity pursuant to Executive Order 117 (2008)

(B) ☒ I am certifying on behalf of the above-named business entity only

(C) ☐ I am certify ng on behalf of an individual and/or entity whose contributions are attributable to the vendor

Signed Name Jerry Notte Print Name Jerry Notte, PE

Phone Number (973) 316-3543 Date September 12, 2016

Title/Position Vice President

Agency Submission of Forms

The agency should submit the completed and signed Two-Year Vendor Certification and Disclosure forms, together with a completed Ownership Disclosure form, either electronically to cd134@treas state nj us, or regular mail at Chapter 51 Review Unit, P.O Box 039, 33 West State Street, 9th Floor, Trenton, NJ 08625 The agency should save the forms locally and keep the original forms on file, and submit copies to the Chapter 51 Review Unit

Exhibit H

ATTACHMENT E

STATEMENT OF OWNERSHIP
NOTICE FOR CORPORATIONS AND PARTNERSHIPS

Chapter 33 of the Public Laws of 1977 (N.J.S.A 52:25-24.2 et seq.) provides that no Corporation or Partnership shall be awarded any State, County, Municipal or School District contracts for the performance of any work or the furnishing of any materials or supplies, unless prior to the receipt of the proposal or accompanying the proposal of said corporation or partnership there is submitted a statement. The statement shall set forth the names and home addresses of all stockholders in the corporation or partnership who own ten percent (10%) or more of its stock of any class or all individual partners in the partnership who own ten percent (10) % or greater interest therein. If one or more such stockholder or partner is itself a corporation or partnership, the stockholders holding 10% or more of the corporation stock, or the individual partners owning 10% greater interest in that partnership, as the case may be shall also be listed. See below:

STOCKHOLDER OR PARTNERSHIP DISCLOSURE STATEMENT

CONSULTANT: (CHECK ONE)

____SOLE PROPRIETORSHIP ____PARTNERSHIP _X_CORPORATION

____JOINT VENTURE ____OTHER-specify_____

Please check the appropriate paragraph:

( ) I certify that the list below contains the names and home addresses of all individuals holding 10% or more ownership of the undersigned. If no, so state.

(X) I certify that no one individual owns 10% or more of the undersigned.

CH2M HILL Engineers, Inc.
NAME OF CONSULTANT

Jerry Notte
SIGNATURE OF PRESIDENT, VICE PRESIDENT

Jerry Notte, PE
PRINT NAME

THIS STATEMENT MUST BE SIGNED BY A DULY AUTHORIZED COMPANY OFFICIAL SIMULTANEOUS WITH THE CONTRACT TO BE ENTERED WITH PASSAIC VALLEY SEWERAGE COMMISSION

Vice President
TITLE

OWNERS

NAME:
HOME
ADDRESS:

NAME:
HOME:
ADDRESS:

PERCENTAGE OF OWNERSHIP:____ **PERCENTAGE OF OWNERSHIP:__**

PLEASE ADD ADDITIONAL SHEETS FOR NAMES IF NECESSARY

Exhibit I

AMERICANS WITH DISABILITIES ACT OF 1990
Equal Opportunity for Individuals with Disability

The contractor and the Passaic Valley Sewerage Commission (hereafter "owner") do hereby agree that the provisions of Title 11 of the Americans With Disabilities Act of 1990 (the "Act") *(42 U.S.C. S121 01* et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs, and activities provided or made available by public entities, and the rules and regulations promulgated pursuant there unto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the owner pursuant to this contract, the contractor agrees that the performance shall be in strict compliance with the Act. In the event that the contractor, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the contractor shall defend the owner in any action or administrative proceeding commenced pursuant to this Act. The contractor shall indemnify, protect, and save harmless the owner, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages, of whatever kind or nature arising out of or claimed to arise out of the alleged violation. The contractor shall, at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the owner's grievance procedure, the contractor agrees to abide by any decision of the owner which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the owner, or if the owner incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the contractor shall satisfy and discharge the same at its own expense.

The owner shall, as soon as practicable after a claim has been made against it, give written notice thereof to the contractor along with full and complete particulars of the claim, If any action or administrative proceeding is brought against the owner or any of its agents, servants, and employees, the *owner shall* expeditiously forward or have forwarded to the contractor every demand, complaint, notice, summons, pleading, or other process received by the owner or its representatives.

It is expressly agreed and understood that any approval by the owner of the services provided by the contractor pursuant to this contract will not relieve the contractor of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the owner pursuant to this paragraph.

It is further agreed and understood that the owner assumes no obligation to indemnify or save harmless the contractor, its agents, servants, employees and subcontractors for any claim which may arise out of their performance of this Agreement. Furthermore, the contractor expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the contractor's obligations assumed in this Agreement, nor shall they be construed to relieve the contractor from any liability, nor preclude the owner from taking any other actions available to it under any other provisions of the Agreement or otherwise at law.

Exhibit J

Attachment J

DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

RFP/BID: Professional Services for Design Services and DSDC for Stormwater Pumping Stations Bidder/Offeror: CH2M HILL Engineers, Inc.

Pursuant to Public Law 2012, c. 25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract with the Passaic Valley Sewerage Commission must complete the certification below to attest, under penalty of perjury, that the person or entity's, subsidiaries, or affiliates is not identified on a list created and maintained by the N.J. Department of the Treasury as a person or entity engaging in investment activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List") The Chapter 25 list is found on the Division's website at

http://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf

Bidders must review this list prior to completing the below certification. Failure to complete the certification will render a bidder's proposal non-responsive.

If PVSC finds a person or entity to be in violation of the principles which are the subject of this law, it shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the person or entity.

PLEASE CHECK THE APPROPRIATE BOX:

☒ I certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. I will skip Part 2 and sign and complete the Certification below.

☐ I am unable to certify as above because the bidder and/or one or more of its parents, subsidiaries, or affiliates ***is*** listed on the New Jersey Department of Treasury Chapter 25 list. I will provide a detailed, accurate and precise description of the activities in Part 2 below and sign and complete the Certification below. Failure to provide such will result in the proposal being rendered as nonresponsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.

PART 2: PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN

You must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran outlined above by completing the boxes below.

Name:_____ **Relationship to Bidder/Offeror:**_____

Description of Activities:_____

_____

_____

Duration of Engagement: _____ **Anticipated Cessation Date:**_____

Proposer Contact Name:_____ **Contact Phone Number:**_____

Certification: I, being duly sworn upon my oath, hereby represent and state that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I attest that I am authorized to execute this certification on behalf of the above-referenced person or entity. I acknowledge that the State of New Jersey is relying on the information contained herein and thereby acknowledge that I am under a continuing obligation from the date of this certification through the completion of any contracts with the State to notify the State in writing of any changes to the answers of information contained herein. I acknowledge that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I recognize that I am subject to criminal prosecution under the law and that it will also constitute a material breach of my agreement(s) with the State of New Jersey and that the State at its option may declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print) Jerry Notte, PE
Signature Jerry Notte
Title Vice President
Date: September 12, 2016