Expression of Interest

Water Treatment Plant

Denmar Correctional Center and Jail

AEOI 0608 DCR2400000002

May 9, 2024

TETRA TECH

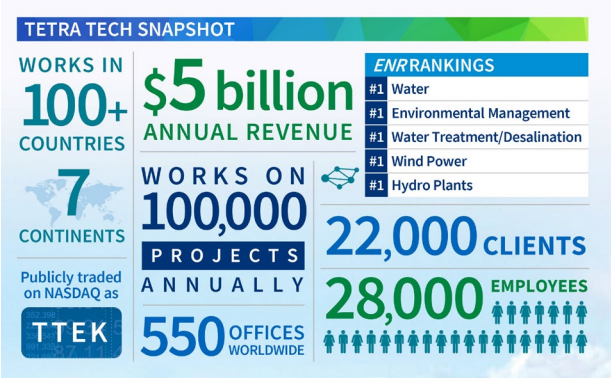
WV DIVISION OF CORRECTIONS & REHABILITATION

Contact Information/Firm Type

Tetra Tech, Inc.
661 Andersen Dr, Suite 200
Pittsburgh, PA 15220

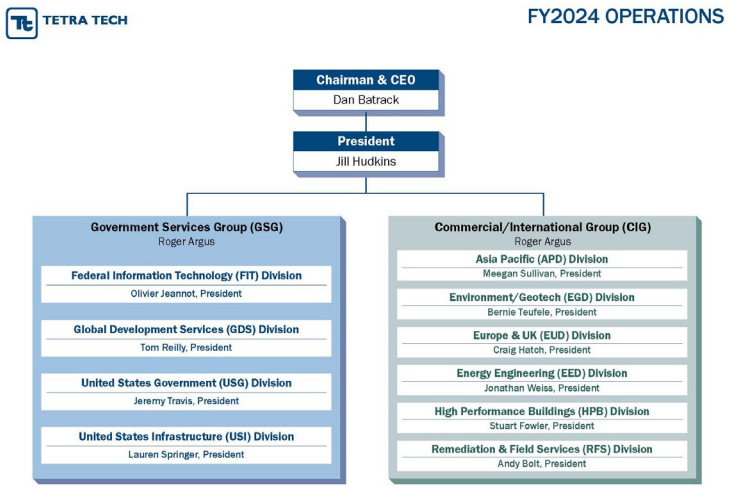
Rangesh Srinivasan
Senior Process Engineer
513-496-6362
Rangesh.srinivasan@tetratech.com

Tetra Tech, Inc (Tetra Tech) has been a corporation for more than 50 years and has provided full lifecycle support for clients' most challenging projects around the world. Our capacity encompasses more than 80 disciplines with engineers, scientists, and support staff to fulfill contracts in our markets, including air, water, environment, infrastructure, resource management, energy, and international development sectors.



Tetra Tech is organized into two major business groups that align with our core markets and enhance the development of high-end consulting and technical solutions to meet our growing client demand:

Government Services Group (GSG) provides consulting and engineering services worldwide for a broad range of U.S. government clients (federal, state, and local) and all activities with development agencies. Services include water and waste management, environmental restoration, international development, sustainable infrastructure design, and a broad range of civil infrastructure design for facilities, transportation, and regional and local development.



Commercial/International Services Group (CIG) provides consulting and engineering services worldwide for a broad range of commercial and international clients. Services include management consulting, environmental remediation, geotechnical investigations, and design engineering.

There have been no recent or materially significant proposed changes in ownership. This year, Tetra Tech did acquire the RPS Group, Inc. For more information on our financials please see Tetra Tech, Inc. - Financials - Annual Reports.

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May 10, 2024

Philip Farley
Director, Engineering, Construction & Maintenance
West Virginia Division of Corrections and Rehabilitation
1409 Greenbrier Street
Charleston, WV 25311

RE: Expression of interest for a Water Treatment Plant at the Denmar Correctional Center and Jail (AEOI 0608 DCR2400000002)

Introduction

As part of this project, Division of Corrections and Rehabilitation (DCR) is soliciting expressions of interest to provide architectural/ Engineering design to replace the existing water treatment plant and associated equipment at the Denmar Correctional Center and Jail (DCC&J) located in Pocahontas county.

Project Scope includes the following main components:

- Schematic design
- Design development
- Construction documents
- Cost estimates
- Construction bid services
- Construction administration services

Tetra Tech is a licensed Architectural/Engineering (A/E) firm in the State of West Virginia and has a long and successful track record of delivering design services on small and large water treatment projects. Tetra Tech is the industry leader in water treatment and has implemented a wide range of projects for public and industrial clients with the goal of treating the water to meet local, state and federal water quality standards. Tetra Tech has executed numerous surface water treatment projects for industrial and public sector clients that include upgrades and improvements to maximize use of available infrastructure as well as grassroots design of a new water treatment facility.

Best Regards,

Rangesh Srinivasan, PhD, PE
Project Manager
Tetra Tech

STATEMENT OF QUALIFICATIONS

For more than 50 years, Tetra Tech, Inc. (Tetra Tech) has provided full lifecycle support for clients' most challenging projects around the world. Our capacity encompasses more than 80 disciplines with engineers, scientists, and support staff to fulfill contracts in our markets, including air, water, environment, infrastructure, resource management, energy, and international development sectors.

In 2020 and 2021, a year marked by the world's response to the global pandemic, **Tetra Tech demonstrated that our unwavering focus is on our clients and our work, providing essential services in sustainable infrastructure, mine development and sustaining capital, environment, water, renewable energy, and international development**.

As we have grown, we have built upon our founders' vision of a consulting and engineering company dedicated to Leading with Science®. This core philosophy enables us to safely deliver solutions to our clients that reduce cost, reduce risk, and deliver high-quality results. We continue to innovate and adapt to help our clients operate more efficiently and address changing environmental conditions.

Tetra Tech offers our clients a trusted, reliable, financially stable partner. In 2023 Engineering News-Record, the leading trade journal for our industry, ranked Tetra Tech number one in **Water for *20 consecutive years.***

RECENT RECOGNITIONS

Newsweek recognized Tetra Tech as one of America's Most Responsible Companies 2022: Tetra Tech was among 499 firms selected for the list out of more than 2,000 companies evaluated. We also ranked among the top 20 companies in the Professional Services category. This accomplishment was achieved through our commitment to our environmental, social, and governance (ESG) goals.

Using Innovative Technology to Recharge the Groundwater in Southern California the Water Replenishment District of Southern California (WRD) selected Tetra Tech to design the ARC. Tetra Tech used multiple technologies to treat secondary effluent to a near distilled water quality and re-inject into the groundwater basin. The effluent will be treated at a higher level than drinking water with less impurities or constituents in the water, allowing for a high-quality groundwater recharge.

Tetra Tech's design included ultrafiltration, reverse osmosis, and ultraviolet technologies. The plant is designed to treat 14 million gallons of groundwater per day and is expandable to 28 million gallons per day. The facility includes an operation and learning center to teach the local community about water reuse and water education and includes space for events or seminars. The design also incorporates a stream that runs through the property and mimics the local river traveling into a recharge basin, which can be used as a learning tool.

PROJECT APPROACH

The overall objective of the project is to relace the existing DCC&J water treatment plant with the most technically feasible and cost-effective design. Because of the age and condition of the equipment, it will likely be challenging to reuse existing infrastructure. However, Tetra Tech will consider repairs and modifications where possible and consider the addition of new equipment as required.

Key components of the treatment system include:

- Raw water intake
- Sedimentation/Flocculation Basin
- Filtration Basin
- Clear Well
- Distribution Pumps

The initial schematic design would be critical to address the issues currently being experienced at the facility and for longevity of the new plant. Tetra Tech proposes to perform a quick evaluation to identify potential options and support selection of the most feasible option for design. The first step is establishing a design basis that will identify the feed water quality and treatment requirements. Available plant operations data will be used for the design basis with additional sample data requested if needed. Once the design basis is established, Tetra Tech will perform an alternative screening to identify potential upgrade options to meet project goals. The options screening will include pros and cons as well as qualitative information of the costs associated with each option. Packaged tank/vessel based equipment could be considered in lieu of concrete basins to address maintenance and flooding issues currently being experienced at the facility. Tetra Tech will facilitate a workshop with the project stakeholders to select options for design development.

Tetra Tech will advance the selected option to design engineering and develop the required deliverables to support the required cost estimates. Tetra Tech will also support development of the vendor and construction bid packages per DCR requirements.

Past Performance

Project 1	
Project Name: Bailey Water Treatment Project	
Client Name: Consol Energy	**Client Address:** Greene County, PA
Client Contact Name: Matt Petrovich	**Client Telephone:** 724 416 8329
Client Email: matthewpetrovich@consolenergy.com	**Project Value**: $2 MM

Scope/Project Description:

Tetra Tech is currently working on a project to support installation of a potable water system at the Bailey Mine Portal in Aleppo Township in Greene County, PA. The 40 gpm treatment system would treat well water for potable water use at the portal building. Tetra Tech is providing permitting and engineering support on the project. Engineering scope includes conceptual design, detailed design and development of specifications and construction bid packages. The proposed treatment system will include filtration, greensand filtration and chlorination for treatment of the well water. The system will be designed to meet PA and federal drinking water standards. Permitting support includes development of the required permit applications.

Project 2

Project Name: 7.0 MGD Lime Softening WTP

Client Name: City of Bartow	**Client Address:** Bartow, Fl
Client Contact Name: Ron Johnson	**Client Telephone:** 863 534 0159
Client Email : rjohnson@cityofbartow.new	**Project Value**: $13.5 MM

Scope/Project Description:

The City of Bartow's existing water treatment facilities included a main water treatment plant (WTP) and an air base WTP. The majority of equipment at both of these facilities surpassed its normal useful service life, creating high operation and maintenance demands. In addition, treatment process equipment was obsolete and did not meet environmental and safety regulations. The City of Bartow's 10-Year Water System Master Plan prepared by Tetra Tech recommended a new raw water wellfield and lime softening WTP to meet the City's long-term water needs. In July 1998, Tetra Tech presented a preliminary design report, and initiated final design in September 1998. In March 1999, an optimization study of the treatment processes was completed to determine the chemical requirements for the new WTP. Final design was completed in November 1999, and construction was capped off in May 2002. The new WTP includes:

- Four production wells w/vertical turbine pumps, each capable of 1,800 gallons per minute
- Prechlorination for hydrogen sulfide removal
- One cone-type solids contact clarifier to lime soften a design flow of 7.0 million gallons per day.
- Chemical feed facilities for lime, wet and dry polymer, coagulant, chlorine, ammonia, polyphosphate, and carbon dioxide storage and feed equipment
- A recarbonation basin to provide 2-minutes of contact time for pH adjustment with carbonic acid at a design usage rate of 2,400 lbs/day
- Four 400-square foot rapid-rate gravity filters with rate of flow control; the filter system includes a staged concurrent air/water backwash system, including 10,000 gpm variable speed backwash pumps and 2,000 SCFM positive displacement backwash blowers
- Two separate chlorine contact chambers with a detention time of 30 minutes at design flow and a design chlorine usage rate of 500 lbs/day

Project 3

Project Name: 4 MGD Water Treatment Plant

Client Name: Ohio County Water District	**Client Address:** Ohio County, Kentucky
Client Contact Name: Walt Beasley	**Client Telephone:** 270 298 7704
	Project Value: $11 MM

Scope/Project Description:

Tetra Tech designed an $11 million improvements project to build a new 4 MGD water treatment plant near Cromwell, Kentucky. The new plant replaces an existing 45-year-old, 2 MGD plant owned and operated by Ohio County Water District and offsets up to 1 MGD supplied by a local industry-owned water plant.

This project included evaluation of purchasing water from Owensboro Municipal Utilities, including construction of a 20-mile transmission main, and purchasing water from Grayson County Water District. Although long-term regional benefits of the connection to Owensboro were significant, financial feasibility led to selection of the new plant alternative. Tetra Tech assisted the Water District in obtaining state and federal funding for the project.

The new water plant employs state-of-the-art ultrafiltration membrane filtration and granular activated carbon (GAC) filters. Tetra Tech performed a pilot study of these two “Best Available Technology” processes at the request of Kentucky Division of Water (KDOW). The new plant includes upgrades to the existing raw water intake, new raw water main extension, new rapid mix, flocculation, and sedimentation facilities, submerged ultrafiltration system, split treatment granular activated carbon absorption, chlorination, fluoridation, new clearwell, new high service pumps serving two separate pressure zones, new administration buildings, sludge lagoons, and site improvements. Construction began in August 2009 and the new facility has been operating since August 2011.

Project 4

Project Name: UF Surface Water Treatment Plant

Client Name: Eagle Pass, Texas	**Client Address:** Eagle Pass, TX
Client Contact Name: Jorge Barrera	**Client Telephone:** 830 773 2351
Client Email: jbarrera@epwaterworks.org	**Project Value: over** $2.5 MM

Scope/Project Description:

Tetra Tech has been involved with bringing clean, safe drinking water to Eagle Pass, Texas, for almost 20 years. In 2002, Tetra Tech conducted an extensive evaluation of the Eagle Pass Water Treatment Plant as part of Eagle Pass Water Works System's (EPWWS) regional water supply expansion program. The results of the evaluation recommended the construction of a new 15 MGD, expandable to 19 MGD, surface water treatment plant on the Rio Grande River. Pilot testing was completed, resulting in the selection of an ultrafiltration (UF) membrane system using an equipment pre-purchase process and based on the lowest life-cycle cost, including membrane replacement, chemical feed, and energy costs.

The facility was designed, constructed, and began operation in 2007. Features of the UF Surface Water Treatment Plant, designed by the Tetra Tech team, consisted of upgraded raw water and reservoir pump stations, solids contact clarifiers, alum and polymer chemical feed systems, sludge ponds and pump station, UF system, chlorination building, dual zone finished water pump stations, and two 0.5 MG finished water steel reservoirs. Our team also design a SCADA system to include the treatment plant and the outlying surface water reservoirs.

The project included electrical, instrumentation and controls (I&C) design for the expansion of the raw water and finished water pump stations and the treatment plant. Electrical services included installation and replacement of variable frequency drives and Soft Starter for pumps up to 400hp. I&C services included replacing aged field instrumentation and upgrade of the existing Allen-Bradley FlexLogix PLCs to CompactLogix PLCs; updating the existing ContolLogix PLC to current version; and upgrading SCADA HMI to Rockwell FactoryTalk View SE.

The river intake structure of the 15 MGD Eagle Pass Water Treatment Plant utilizes a traveling screen to prevent debris and floating algae from clogging the 48-inch diameter intake pipe and the pumps that supply raw water to UF membrane skids. The traveling screen is a hydraulically driven model manufactured by US Filter with screens measuring 3 feet in width and 19 feet in depth. The screen is located on the bank of the Rio Grande River approximately 10 feet above the normal river level elevation. The hydraulic nature of the drive system allows the screen to be subjected to submergence in the event of flooding. A crescent shaped concrete wall protects the screen from floating debris during flooding events and a corrosion resistant stainless-steel cage protects it from vandalism.

Project 5

Project Name: Southeast Water Treatment Plant

Client Name: Huntsville Utilities	**Client Address:** Huntsville, Alabama
Client Contact Name: Frederick Mucke, PE	**Client Telephone:** 256 535 1200
Frederick.mucke@hsvutil.org	**Project Value**: $74,860 (pilot study), $4.6M (design), $3.7M (construction admin), $250,000 (Hampton Cove)

Scope/Project Description:

Tetra Tech was selected to provide design, permitting, and construction services for the Southeast Water Treatment Plant (WTP). Huntsville Utilities currently operates two surface water treatment plants that treat water from the Tennessee River. As a result of high seasonal demands, the Utility decided to begin planning for a third surface WTP in 2005. Tetra Tech performed a site selection study in 2006 to assist with determination of the location of the new WTP and raw water source. The study recommended that a new raw water intake be located on Guntersville Lake and that property be purchased north of the site for the construction of the new WTP site.

Tetra Tech was later selected to provide the pilot study, final design, permitting and construction management services for the Huntsville Utilities Southeast Water Treatment Plant Program which included four main projects: 1) Southeast Water Treatment Plant with an initial phase of 24 MGD (master planned for 96 MGD), 2) Raw Water Intake Pump Station 3) Raw Water Main and 4) Finished Water Main. The Hampton Cove Water System improvements were added to the project during construction as an Owner added scope item

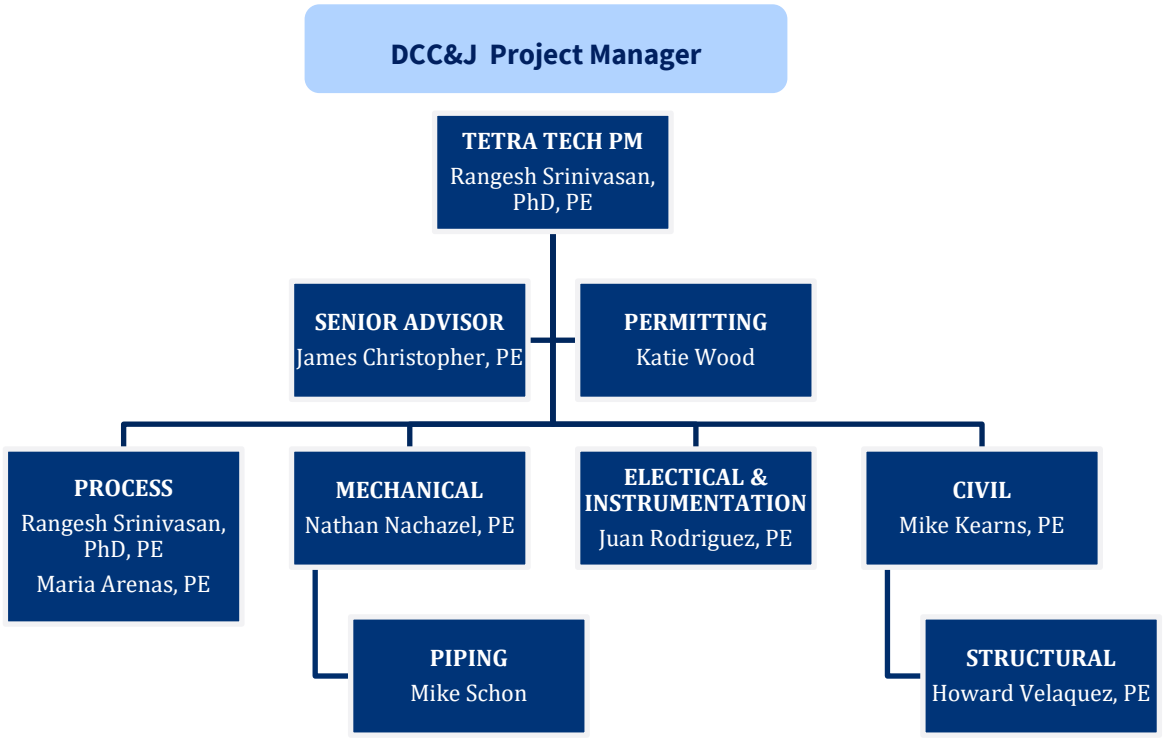
Personnel

The proposed Tetra Tech water team is uniquely qualified to support the Water Treatment Plant design project for DCR at the DCC&J. The proposed team has executed several projects from feasibility study to detailed design and construction for similar applications at municipal and industrial facilities across the US. We also support permitting on these projects and are familiar with the local, state and federal regulations to successfully execute these projects in a timely manner.

The Tetra Tech team has experience performing feasibility studies and design of surface water treatment systems for potable water use. Projects typically include lift stations, conveyance, clarifiers with chemical addition (lime, alum, bleach), filtration, disinfection, and distribution.

Tetra Tech's experience would be directly applicable for identifying upgrades and perform the engineering design for the new water treatment plant at the DCC&J.

Tetra Tech proposes the following team for the Engineering Services for the Water Reuse Expansion Project:



Rangesh Srinivasan, PhD, P.E, Project Manager

Rangesh is a Senior Environmental Engineer with over 17 years of experience in industrial water and wastewater treatment. He will serve as the project manager and lead engineer. He has been involved in a wide variety of consulting and design projects for refining, petrochemical, mining, power, and manufacturing.

facilities. He also has experience in research related to physical-chemical-biological water and wastewater treatment systems, including bench-scale and pilot testing.

James Christopher, PE, BCEE, Senior Consultant

Mr. Christopher is a vice president and practice leader for water treatment for Tetra Tech. His knowledge of water chemistry and water infrastructure design makes him highly qualified in defining, evaluating, and implementing water quality solutions to the most challenging problems. He has 43 years of professional engineering experience and is highly qualified in environmental engineering, with special expertise in water quality and treatment, wastewater treatment, effluent reuse/utilization/disposal, water resources, reverse osmosis and nanofiltration, granular activated carbon, pumping system analysis/station design, facility planning, construction administration.

Katie Wood, Subject Matter Expert, Permitting

Ms. Wood is an Environmental Scientist with over 8 years of industry experience. Ms. Wood works on all phases of permitting for a wide range of projects. This includes performing preliminary field investigations, permitting and compliance. Ms. Wood has worked on numerous projects for active mining operations and abandoned mine lands. These include water treatment, reclamation and operations.

Mike Kearns, PE Sr. Civil Engineer

Michael Kearns has over 47 years of diversified engineering experience in Civil Engineering field. Mr. Kearns is a licensed Professional Engineer in the States of West Virginia, Ohio, Pennsylvania and Maryland. He is also a licensed Professional Surveyor in the State of West Virginia. Mr. Kearns attained his master's degree in civil engineering specializing in soils and foundations. He has approximately 47 years of experience in geotechnical engineering performing stability analyses associated with slip remediation, impoundment design, the evaluation and design of numerous different types of retaining walls including cast-in-place, segmental and modular retaining walls as well as reinforced earth designs. Mr. Kearns' past professional experiences has been in the mining industry, site development, municipal engineering and highway engineering as well as environmental engineering disciplines.

Juan Rodriguez, PE Sr. Electrical Engineer

Accomplished electrical engineering professional with experience in Power Plant Electrical and Instrumentation. Twenty years of control systems experience in Process Optimization, Instrumentation, Automation Process Automation, PLC, DCS, Controls, Instrumentation, Electrical design, Power Plant & Controls and ten years of heavy industry project management experience in the Power Generation, Mining industry and Oil & Gas. Experienced Project Management providing high level consultations to the upper level management on the most unique and complex design problems and alternatives. Project management, strategic sourcing, negotiating, developing, & managing detailed contracts that cover all aspects of corporate capital equipment systems, facilities construction, contractor agreements, asset management, energy efficiency & management, Reliability and Optimization.

Nathan Nachezel, PE, Sr. Mechanical Engineer

Mr. Nachazel specializes in mechanical engineering, oil and gas, field service work, process piping, Renewable Natural Gas (RNG), and HVAC. His experience includes equipment specification, process design calculations, project engineering, technical direction, and direct work on projects related to natural gas transmission, industrial piping, dust collection, power generation, water treatment, and excavation. He has experience with process improvements related to manufacturing and nuclear reactor modifications. He also has experience designing specialized tooling and writing procedures for usage and maintenance. Additionally, he has experience supervising work of other technicians and professionals.

Howard Velasquez, Senior/Structural Engineer

Mr. Velasquez has 21+ years of broad experience in civil/structural engineering performing greenfield & brownfield Oil and gas, power generation, and mining projects. He also posses on-shore and off-shore engineering experience as well as comprehensive understanding of civil and structural work related to large industrial mining and oil and gas facilities. Mr. Velasquez has familiarity with applicable codes and standards (ACI, AISC, ASTM, ASME, ANSI, AWS, PIP, API, etc.) and the ability to make, read, and understand complex civil, structural, mechanical, and piping engineering 2D & 3D design plans. He possesses years of experience with SAP-2000, STAAD Pro, STAAD Foundations, RAM & RFEM. He has been AutoCAD designer since the 90s and adheres to QAQC/document control best practices philosophy.

Mike Schon, Senior Designer

Mr. Schon is a Senior Designer with over 25 years of experience. He has previous experience in structural and civil design, calculations, preparation of construction documents (including roadway, pipeline, foundation plans, framing plans, details and specifications) and construction administration for buildings, civil and structural elements.

Detailed resumes attached

APPENDIX A: RESUMES

Rangesh Srinivasan, PhD, PE

Senior Engineer/ Project Manager

EXPERIENCE SUMMARY

Mr. Srinivasan is a Senior Environmental Engineer in the OGA group at Tetra Tech. Mr. Srinivasan has 17 years of experience in industrial water and wastewater treatment. He has been involved in a wide variety of consulting and design projects for refining, petrochemical, mining, power generation and manufacturing facilities. He also has experience in research related to physical-chemical-biological water and wastewater treatment systems, including bench-scale and pilot testing.

RELEVANT EXPERIENCE

Mining

Confidential Mine, PA

- Conceptual and Detailed Design – Potable Water Treatment
  - Project Manager & Lead process engineer
    - Engineering evaluation and ongoing design of a 40 gpm potable water system. Led development of equipment sizing, PFDs, site layout and bid packages.

Confidential Mine, PA

- Conceptual Design – Acid Mine Drainage Treatment
  - Lead process engineer
    - Engineering evaluation and design of an AMD treatment system. Led development of equipment sizing, PFDs, site layout and bid packages.

Confidential Mine, MT

- FEL4 Design – Mine Water Treatment
  - Project Manager/Lead process engineer
    - Engineering design of mine water treatment to meet low discharge limits for metals and TDS at an active precious metal mine. Led development of process deliverables including vendor technology screening, sizing, PFDs, site layout, P&IDs and bid packages.

USEPA, Multiple Sites

Education

B.S. Civil Engineering

M.S. Environmental Engineering

Ph.D. Environmental Engineering

Area of Expertise

Industrial Water & Wastewater Treatment

Registrations/ Affiliations

Professional Engineer - OH

Office

Cincinnati, OH

Years of Experience

17

Years within firm

2.5

Contact

Rangesh.Srinivasan@tetratech.com

- Mining Influenced Water (MIW) Treatment Technology Demonstration Program
  - Process engineer
    - Part of the EPA Optimization and Technology Demonstration program – scope includes reviewing treatment process performance at various Superfund and MIW sites; and provide technical support to the project team for optimization and improvement to meet target treatment goals.

PA DEP Quintette Mine, PA

- Final Design – Acid Mine Drainage Treatment
  - Lead process engineer
    - Detailed engineering design of an AMD treatment system. Led development of equipment sizing, PFDs, P&IDs, site layout and bid packages.

Confidential Mine, CO

- Conceptual Design – Mine Water Treatment
  - Lead process engineer
    - Conceptual evaluation of mine water treatment to meet low discharge limits for metals and sulfate at an active gold mine. Led development of vendor technology screening, sizing, PFDs, site layout, review of treatability testing and bid packages.

Confidential Mine, MT

- Detailed Design – Mine Water Treatment
  - Lead process engineer
    - Preliminary engineering design for system upgrades at a mine water treatment facility for metals removal. Led development of process material balance, sizing, PFDs, P&IDs, site layout and bid packages.

Confidential Mine, MT

- Detailed Design – Mine Water Treatment
  - Lead process engineer
    - Preliminary and detailed engineering design of mine water treatment for metals and TDS removal. Led development of process deliverables (material balance, PFDs, P&IDs) and review of vendor submittals for a filtration and reverse osmosis (RO) based system.

Confidential Mine, Appalachia

- Detailed Design & Startup – Selenium Treatment
  - Lead process engineer
    - Supported the start-up of a full-scale biological selenium treatment system, which is the first of its kind for selenium treatment. Provided onsite process support to operations personnel for successful start-up of the facility, which is currently operational and in compliance.

- Lead process engineer and operator on a pilot study to demonstrate Selenium treatment using Zero-valent Iron (ZVI). Study included dye testing to evaluate residence time and short-circuiting issues in the ZVI reactor tanks. Developed pilot test and sampling plan and final pilot test report.
- Lead process engineer and operator on two pilot studies to demonstrate Selenium treatment using a biological anoxic fluidized bed reactor (FBR) followed by an aerobic moving bed bioreactor (MBBR). Developed pilot test and sampling plans. Developed final pilot test reports which included cost estimates for full-scale systems at various flows based on pilot study results.
- Supported conceptual evaluation of multiple Selenium and phosphorous treatment alternatives for surface mine water discharge including physical, chemical and biological treatment alternatives. Assisted in the development of the conceptual treatment alternatives report providing a thorough comparative analysis of the technological and economic feasibility of the proposed treatment alternatives.

Downstream Oil & Gas

Marathon Refinery, Garyville, LA

- Detailed Design – Potable Water Upgrades
  - Lead Process Engineer
    - Supported tempered water upgrades throughout the potable water network. Scope included hydraulic, temperature and chlorine modeling followed by detailed design and development of construction packages for the selected upgrades.

Confidential Refinery, WY

- FEL-3/FEL-4 Design – Biological Wastewater Pond Upgrades
  - Project Manager
    - Engineering design and construction support for installation of a temporary biological wastewater system as well as permanent pond upgrades including dewatering and replacement of liners.
- FEL-3/FEL-4 Design – Renewable Diesel Unit (RDU) Wastewater Treatment
  - Lead process engineer
    - Detailed engineering design of a new RDU wastewater treatment facility at the refinery. Led development of process material balance, sizing, PFDs, P&IDs, site layout and vendor submittal reviews.

Confidential Refinery, TX

- Conceptual Evaluation – Nitrate Removal
  - Lead Process Engineer

- Conceptual treatment evaluation for nitrate removal from a low flow, high concentration wastewater at the refinery. Led development of technology screening, BFDs, alternatives scoring and cost estimates.

Confidential Refinery, TX

- Study – Selenium Treatment Evaluation
  - Lead Process Engineer
    - Primary author on a white paper developed to identify and compare selenium removal technologies, which are applicable for oil refinery wastewater. The paper focused on treatment processes that have been demonstrated through pilot or full-scale installation or have potential to be successful in refinery wastewater.

Chevron Terminal, TX

- Detailed Design – Stormwater Upgrades
  - Lead Process Engineer
    - Supported equipment upgrades at the terminal wastewater treatment plant for meeting compliance for stormwater discharge. Led development of engineering design package and procurement.

Confidential Refinery, CO

- Detailed Design – Selenium Treatment System
  - Lead Process Engineer
    - Detailed engineering design of a DAF based selenium removal system at the refinery wastewater treatment plant. Led development of process design package and supported the completion of mechanical package for generating construction documents.

Confidential Refinery, Midwest

- Study – Mercury Treatment Evaluation
  - Lead Process Engineer
    - Conceptual engineering design of a MBR system for mercury control for a refinery processing challenging crude slate. Led development of the engineering design, including drawings and cost estimates, followed by a detailed technical project report and presentations for the refinery leadership team.

P66 Refinery, Borger, TX

- Detailed Design – Primary OWS Treatment
  - Process Engineer
    - Preliminary and detailed engineering design of primary oil-water separation at the refinery wastewater treatment plant. Supported development of process material balance, sizing, PFDs, P&IDs, site layout and bid packages.

P66 Refinery, Billings, MT

- FEL-1 – Arsenic Treatment Evaluation
  - Lead Process Engineer
    - Conceptual treatment evaluation for arsenic removal at the refinery wastewater treatment plant. Led development of process material balance, PFDs, site layout and cost estimates.

Confidential Refinery, NM

- Preliminary Design – Selenium Treatment
  - Lead Process Engineer
    - Preliminary engineering design of a physical-chemical selenium treatment system for refinery wastewater. Led development of process material balance, PFDs, P&IDs, site layout and general arrangements and equipment procurement specification packages.

HollyFrontier Refinery, WY

- Pilot Study – Selenium Treatment
  - Lead Process Engineer
    - Pilot study to demonstrate selenium treatment using a biological anoxic fluidized bed reactor (FBR) followed by a Lamella plate clarifier in refinery wastewater.

Upstream Oil & Gas

Confidential Client, TX

- FEL-4 Design – Water Recycle Facility
  - Lead process engineer
    - Detailed engineering design of a water recycle/treatment facility with large storage tanks, chemical addition and an aerated storage pond. Led development of process material balance, sizing, PFDs, P&IDs, site layout and vendor specifications.

Petrochemical

Confidential Client, TX

- FEL-2/FEL-3 Design – Cracker and Polyethylene Facilities
  - Lead process engineer – Water Team
    - Preliminary engineering design of raw water, boiler feed water and wastewater for multiple greenfield facilities. Led development of process material balance, sizing, PFDs, P&IDs, site layout and bid packages.

Power

Confidential Power Plant, KY

- Operations – Pond Dewatering & Closure

- Lead process engineer
  - Supported water management and water quality monitoring on a project dealing with closure of bottom ash and gypsum storage ponds. Led development of water management and dewatering plans and supported procurement and installation of water quality monitoring instruments.

Confidential Power Plant, TX

- Detailed Design – Arsenic Treatment
  - Lead process engineer
    - Project to support installation of an arsenic treatment system on a landfill leachate stream at the power plant. Led development of vendor technology evaluation, sizing, PFDs, site layout and bid packages.

Confidential Power Plant, KY

- Conceptual Evaluation – Arsenic Treatment
  - Lead process engineer
    - Project looking at conceptual treatment evaluation including bench-scale testing for arsenic removal from a highly concentrated landfill leachate stream.

Confidential Power Plants, KY

- Conceptual Evaluation – FGD Treatment at Multiple Plants
  - Lead process engineer
    - Conceptual treatment evaluation of FGD wastewater for mercury and selenium treatment for ELG compliance. Performed water characterization, plant-wide flow and material mass balance, followed by conceptual design.

Confidential Power Plant, OH

- Detailed Design – Mercury Treatment
  - Lead process engineer
    - Engineering design of a chemical feed system for mercury control in FGD wastewater. Led development of process flow diagrams (PFDs), process and instrumentation diagrams (P&IDs), site layout and general arrangements and equipment procurement specification packages.

Confidential Power Plant, NJ

- Due Diligence Study – Water Reuse

- Process engineer
  - Study looking at process modifications at a water treatment plant using recycled secondary effluent for boiler feed and cooling water requirements. Also included preliminary engineering design of a dewatering system to handle solids from the biological treatment system. Led development of process material balance, PFDs, P&IDs, site layout and general arrangements and equipment procurement specification packages.

Kentucky Utilities Power Plant, KY

- Pilot Study – FGD Sorbent Reuse
  - Staff engineer
    - Involved with demonstration of an advanced sorbent reuse process for FGD control at a coal-fired power plant. Responsible for overall operation of the demo/pilot plant such as start-up, testing and calibration. Responsible for collection and analysis of data pertaining to process chemistry and control. Supervised lab technicians involved in sampling and qualitative/quantitative analyses.

Anaerobic Digestion/ Biogas to RNG

Confidential Client, NE

- Preliminary Design – AD and Wastewater System Upgrades
  - Process Engineer
    - Engineering evaluation and design for upgrades to AD and wastewater treatment equipment for restart of an existing RNG facility. Led development of engineering deliverables including process material balance, sizing, PFDs, site layout.

Manufacturing

Confidential Facility, OH

- Permitting – Bioplastics Manufacturing Facility
  - Process Lead
    - Led permitting support for a NPDES application for a new facility – developed process wastewater sampling plans, conceptual treatment system design (BOD, ammonia, phosphorous treatment), antidegradation report to support the application.

Confidential Facility, WI

- Design – Landfill Leachate Treatment System
  - Process Lead
    - Led engineering design and permitting support for installation of a biological wastewater system for treating landfill leachate to meet stringent industrial pretreatment discharge limits for BOD, ammonia, phosphorous, metals, TSS.

Confidential Chemical Manufacturing Facility, TX

- FEL-3/FEL-4 Design –Wastewater Treatment
  - Lead process engineer
    - Detailed engineering design of a new wastewater treatment system at the facility. Led review of process material balance, sizing, PFDs, P&IDs, site layout and vendor submittals.

PUBLICATION(S)

- Rangesh Srinivasan, Kar Munirathinam, Phil Facer and Tom A. Sandy. "Start-up and commissioning of a full-scale selenium treatment facility for mine water treatment", presented at WEFTEC 2014 in New Orleans, LA and at Mine Water Solutions in Extreme Environments Conference 2015 in Vancouver, BC.
- Matthew Gay, Rangesh Srinivasan, Kar Munirathinam, and Tom A. Sandy. "Pilot Testing for Selenium Removal in a Surface Coal Mine Water Containing High Nitrate and Selenium Concentrations", presented at WEFTEC 2012 in New Orleans, LA.
- Ken Martins, Jeremy Johnson, Karen Leber, Rangesh Srinivasan, and Bo Heller. "Bench- and Pilot-Scale Testing of Ion Exchange and Zero Valent Iron Technologies for Selenium Removal from a Surface Coal Mine Run-Off Water", presented at WEFTEC 2012 in New Orleans, LA.
- Kar Munirathinam, Rangesh Srinivasan, Jeff Tudini, Tom sandy and Tim Harrison. "Selenium Treatment of Mine Water Effluent in a Fluidized Bed Reactor (FBR)", presented at WEFTEC 2011 in Los Angeles, CA.

AWARDS

- Water Environment Federation WEFTEC 2013 New Orleans, LA – Rudolf's Industrial Waste Management Medal Recipient
- 2nd International Conference on Environmental Science & Technology Houston, TX – Best Student Paper Award

EMPLOYMENT HISORY

- Tetra Tech, Senior Engineer/Project Manager (05/2021 – Present)
- Wood PLC, Senior Process Engineer, Houston, TX (08/2018 – 05/2021)
- AECOM, Senior Project Engineer (05/2015 – 08/2018)
- CH2M Hill, Environmental Engineer (06/2008 – 05/2015)
- University of Cincinnati, Graduate Researcher (04/2004 – 06/2008)
- Icon Construction, Staff Engineer (12/2002 – 04/2004)

TETRA TECH

James E. Christopher, PE, BCEE

Vice President

Mr. Christopher is a vice president and practice leader for water treatment for Tetra Tech. His knowledge of water chemistry and water infrastructure design makes him highly qualified in defining, evaluating, and implementing water quality solutions to the most challenging problems. He has 43 years of professional engineering experience and is highly qualified in environmental engineering, with special expertise in wastewater treatment, effluent reuse/utilization/disposal, water resources, water quality and treatment, reverse osmosis and nanofiltration, granular activated carbon, pumping system analysis/station design, facility planning, construction administration.

Education:

MS, Environmental Engineering and Science, University of Central Florida, 1980

BS, Chemistry, Duke University, 1976

Registrations/Certifications:

Professional Engineer:
Florida, No. 34204, 1984
Georgia, No. 40943, 2016
Texas, No. 134780, 2019

Board Certified Environmental Engineer (BCEE)

Professional Affiliations:

American Water Works Association

Florida Pollution Control Association

Southeast Desalting Association

American Membrane Technology Association

WateReuse Association

American Academy of Environmental Engineers

Office:

Orlando, Florida

Years of Experience:

(1980) 43

Years with Tetra Tech:

(9/1990) 33

EXPERIENCE

Water

End of Pipe at the Ottawa WTP, Dayton, Ohio.2023-Ongoing. Technical Leader. Performing work to add PFAS treatment after filtration to the 96.0 MGD Ottawa Water Treatment Plant. The work includes a treatment technology evaluation, residuals management study, bench and pilot scale testing, facility layout, preliminary design and evaluation of project delivery options.

Water Treatment Plant Study, City of Jackson, MI. 2023–Ongoing. Water Quality Advisor. Preparing a study of the WTP to determine the optimal course to sustain it for the next 50 years. Performed a Visioning Workshop to start work on the study. Study will be written based on EGLE's Drinking Water State Revolving Fund Project Plan format to expedite the City's ability to seek state grant or low interest loan funding. Study will include a Capacity Analysis comparing current capacity to meet current and future demands. Tasks include EGLE sanitary survey response, ferric chloride injection point analysis, and a backup chlorination system.

WTP Miscellaneous Improvements, City of Jackson, MI. 2021–2023.Water Quality Advisor. City's trusted advisor to complete engineering services for miscellaneous improvements at the WTP and high service pump station. Work typically includes on-site inspections, comparative studies, designs, bidding assistance, and construction administration.

Water System Corrosion Control Analysis and Testing Program, City of Kalamazoo, MI. 2016 –2023. Lead Investigator. Lead Investigator for desktop analysis and review of the prior corrosion control practices. The City was considering changing the corrosion control chemical to an orthophosphate-based solution to provide a higher level of corrosion control against lead and other metallic components within the distribution system. The City retained Tetra Tech to develop a recommendation relative to the product(s) that would be appropriate for their system. The review of corrosion control practices and recommendation for a liquid phosphate corrosion inhibitor included the following: recent lead and copper tap sampling results, water quality from each source individually and of blends, USEPA and AWWARF water quality information, and information from corrosion control treatment manufacturers. Following completion of the desktop corrosion study, a three-phase testing program was performed to support the selection of the best corrosion inhibitor product for lead corrosion control. Responsibilities for each phase included preparation of the draft and final testing plans, reviewing the plans with Michigan EGLE to obtain approval, procuring materials and supplies for testing and analysis, supervising the testing and analyzing and reporting on the results. The first two phases included bench scale lead solubility testing following the methodology developed by Cornwell using different types of corrosion inhibitor products and different doses. The final phase of the testing program included the installation of corrosion test racks at four of the City's pumping stations to test the recommended corrosion control product at two different doses using lead, copper and ductile iron coupons.

Currently providing review and oversight of the design of the new chemical feed systems that will be installed at each of the City's 16 pumping stations.

Master Plan for Water Supply and Treatment Facilities, Department of Water, Dayton, OH. 2021–Ongoing (Est 2023). Principal Engineer. Master plan development to guide infrastructure needs, budget, and schedule of capital projects over the next 20 years. Through this process, we will evaluate the Division's infrastructure, make recommendations for repairs and improvements, and prioritize resulting projects. The Master Plan will take into consideration existing and developing EPA regulations, current and future water demands, and necessary adjustments to operations that will move the City on a path towards a sustainable future. Scope included Levels of Service Statement and alternatives analysis, electrical infrastructure risk mitigation, controlling water loss, analysis of staffing levels, energy survey audit, opinion of probable construction cost, energy savings, and economic analysis. The emergency plan, risk management plan, and asset management plan will also be updated.

Pine Valley/McCullough Facility Plan, Colorado Springs, CO. year-year. QA/QC, Technical Advisor. Project included a review and condition assessment of the assets at the two existing surface water treatment plants, updated hydraulic analysis of the facilities, process performance analysis and a proposed capital improvements plan.

On-Call Engineering Services for PFAS Treatment Systems Design, Orange County Water District (OCWD), Orange County, CA. 2020–Ongoing. QA/QC. Tetra Tech was selected by OCWD to design the first three PFAS projects (six affected wells) as part of their program to construct treatment facilities for 66 affected wells in Orange County. Provided quality control review of the designs for the Serrano, Kimberly 1A and the Yorba Linda PFAS treatment facilities.

Lily Pond WTP-GAC Pilot Test and Final Design, Town of Cohasset, MA. 2020–2022. Lead Process Engineer. Developed testing plan and permitted through Massachusetts Department of Environmental Protection a GAC pilot program to test the removal of TOCs from the filtered water at the 3 MGD Lily Pond surface water treatment plant to reduce the level of disinfection byproducts within the distribution system. The pilot test was run for six months across the summer, fall and winter seasons and tested the removal in the adsorption and biologically active modes. Sampling and analysis of the influent and GAC columns' effluent was performed twice per week. Testing also included limited sampling of PFAS compounds in the pilot column feed and effluent to assess the occurrence and the removal effectiveness of the GAC. A summary report was prepared to document the results, provide design criteria and costs for implementation of the full-scale system. Continued leading the process team through the final design of the full-scale facility which was completed in December 2022.

Ellms Meadow PFAS Pilot Testing and Final Design, Town of Cohasset, MA. 2021 Project Manager for the RSSCT testing of ion exchange and GAC for the removal of six regulated PFAS compounds to comply with the Massachusetts maximum contaminant level of 20 ng/L. The work was funded by a grant from the Massachusetts Department of Environmental Protection. The scope of work included the design of the testing program using RSSCT to test GAC and IX resin, interpretation and presentation of the results and design of a full-scale system to remove PFAS from this groundwater supply to the potable water system. Ion exchange was selected for the full-scale design.

Reverse Osmosis Water Treatment Plant Expansion, Charlotte Harbor Water Association, Punta Gorda, FL. 2020–Ongoing. Technical lead for the expansion of the existing reverse osmosis water treatment plant, including new raw water meter, replacement of the sand separators, expansion of the three reverse osmosis skids, automation of the process, new concentrate storage tank, deep injection well facilities and high service pumping expansion.

Hidden Springs Water Treatment Plant Pilot Testing Program, Orange County, FL. 2023–2024 Lead Process Engineer. Providing technical support for the design and implementation of a pilot testing program to select a process for removal of total sulfides and total organic carbon from the existing ground water source. The pilot test will test ozonation, catalytic GAC, GAC in the adsorption.

Corrosion Inhibitor Evaluation and Coupon Study, City of Clearwater, FL. 2017-2020. Provided quality control review and comments on the corrosion inhibitor desktop evaluation. Reviewed and analyzed the water

quality and coupon corrosion rate data from the corrosion rig study conducted by the City staff with direction from Tetra Tech. The study was performed over a 90 day period with coupons being withdrawn and weighed every 30 days. There were 27 coupon racks each containing three lead, copper and iron coupons. Six different phosphate corrosion inhibitor products were tested at two different doses and there was one control. Reviewed the study results and prepared the final memo to document the test performed, water quality data obtained, coupon weight loss and corrosion rate data and recommendations for product selection.

Central Water Integration Pipeline (CWIP) Project, San Antonio Water System, San Antonio, TX. 2017 – 2020. Senior Process Engineer. Project consisted of treatment facilities, conveyance pipelines, and improvements to existing pump stations and distribution facilities to integrate a new 48.6 MGD potable water supply source into the utility's potable water distribution system. Treatment was provided to make the water quality compatible with the existing sources of supply. Treatment included injection of carbon dioxide for pH adjustment, lime addition with saturators (solids contactors) for calcium remineralization, dual media pressure filters, sodium hypochlorite and fluoride addition. The project specifications called for a minimum calcium level in the finished water to maintain optimum corrosion control. To optimize the level of calcium remineralization while minimizing creation of turbidity prior to filtration, a series of 22 separate jar tests were performed. The jar tests performed included the use of different strength lime solutions, varying lime doses, varying initial Langelier Saturation Indices and pH adjustment with carbon dioxide. Responsible for development of the tests, performed the jar tests, performed routine analysis of the solutions after treatment and prepared summaries and presentations of the results. Recommended design criteria for the full-scale design and managed the full-scale design.

Advanced Water Treatment Demonstration Program, Phase 2, Hillsborough County, FL. 2017–2019. Senior Process Engineer/Quality Control. Development of the basis of design report, design drawings, technical specifications and permitting assistance for bidding and construction of a pilot scale indirect potable reuse treatment facility. The pilot facility will include pasteurization, biologically active carbon filtration, ultrafiltration, reverse osmosis, UV advanced oxidation process, calcite contactors and all supporting chemical feed systems and controls.

Buena Ventura Lakes Water Treatment Plant Full-Scale GAC Pilot, Toho Water Authority, Kissimmee, FL. Technical Advisor. Toho Water needed to provide service from their Buena Ventura Lakes WTP to an area outside of its normal service area which caused THMs to exceed the regulatory limit and the Florida Department of Environmental Protection requested the utility take corrective action to lower the concentrations. GAC treatment was considered as an alternative that could be implemented quickly within the constraints of the existing plant site. The full-scale installation was proposed as a pilot test to expedite permitting. Four 20,000-pound carbon contactors were installed operating in parallel. Water quality and supplemental disinfection byproduct (DBP) testing was performed during the initial 90-day operating period. Review, comment and editing of the testing plan and final report were provided along with directions for the DBP testing and a GAC isotherm test to estimate the carbon usage rate. A data analysis report and modelling of carbon change out frequencies versus TOC removal was prepared to assist the utility with ongoing operation and optimization of system performance.

Integrated Utility Master Plan, Palm Beach County, FL. 2019–2020. Water Facilities Lead. Developing an Integrated Utility Master Plan that guides the operations, maintenance, and capital improvements of the utility through 2050. The project is focused on developing a process rather than a document that leverages the County's CMMS, SCADA, and GIS information to identify issues and develop effective solutions for implementation. The goals and metrics will align with and support the County's goal to achieve ISO 55001 certification in Asset Management.

Shingle Creek Treatment Study, Toho Water Authority, Kissimmee, FL. Feb. – Apr. 2019. Technical Manager. Tetra Tech evaluated the technical and economic feasibility of producing potable water from Shingle Creek by means of a treatment system, including refurbishment of the existing Actiflo system. The study found that Toho's existing water use permit for 6 MGD of surface water from Shingle Creek, near the South Bermuda Water Reclamation Facility (WRF), could be developed as a potable water supply source via construction of surface water treatment processes near the South Bermuda WRF site.

North County Regional Water Treatment Plant Degasifier and Turbidity Evaluation, Collier County, FL. 2020–2021. Lead Investigator. Reviewed existing information and previous evaluations, investigated potential causes of turbidity spikes, performed field sampling and analysis, identified potential causes, and developed potential alternatives to help address turbidity spikes.

Judge Farms Alternative Water Supply Feasibility Analysis, Toho Water Authority, Kissimmee, FL. 2020. Technical Adviser. The Judge Farms Reclaimed Water Augmentation Facility, a proposed 135-acre water storage reservoir to serve as an alternative water supply system for Toho Water Authority, will accept surface and stormwater flows from three main tributaries. Toho Water Authority applied for and received a water use permit (WUP) for the Judge Farms Reclaimed Water Augmentation Facility from the South Florida Water Management District, allowing for withdrawal of up to 8.22 MGD AADF per day and maximum 500 MG per month. The WUP classifies the Judge Farms reservoir for public access supply; however, Toho Water Authority requested a modification to the WUP to supplement their reclaimed and potable water supply systems on an as needed basis. To support the WUP modification, Tetra Tech identified a potential site for the location of a potable water treatment facility using the Judge Farms reservoir as a source water supply as well as developing alter.

Potable Water Chlorination Protocol Development, Pasco County, FL. 2020. Senior Project Manager. The County currently receives potable water from Tampa Bay Water (TBW) and distributes it through customers through a large network of potable water mains. The water from TBW is disinfected via chloramines. The County would like to implement a 'free chlorine conversion' for the Shady Hills service area, which involves turning the ammonia feed off and increasing the free chlorine dosage to provide disinfection and an appropriate residual. Tetra Tech assisted the County with development of a free chlorine implementation protocol.

Direct Potable Reuse Demonstration Test System Design and Operations, Daytona Beach, FL. 2018-2022. Quality Control Review. Identified routine water quality data collection requirements for the demonstration to support the future full-scale DPR facility. Reviewed and recommended online monitoring tools for demonstration. Evaluated the potential of online monitoring tools to minimize the size of engineered storage buffers, potentially saving $1.5M in capital cost. Predicted finished water quality impacts of DPR blending advanced purified water with the City's existing ozone and lime-softening water treatment plant process.

Water Pump Stations, Phosphate, Electrical and Instrumentation Upgrades, Kalamazoo, MI. 2019–2021. Process Leader. The City retained Tetra Tech to design upgrades to the phosphate storage, chemical pumps, and antiquated instrumentation and electrical controls at 15 pump stations. Improvements will include potential changes to the chemicals the City uses for corrosion control. In addition, Tetra Tech will design an automated system to allow for real-time measurement of chemicals in the water and treatment of the water. The current opinion of probable construction cost is $6.5 million. Improvements are scheduled to be operational in 2021.To support selection of a corrosion inhibitor product for lead corrosion control for the full-scale facilities in 2020 performed a bench scale lead solubility test for six weeks to test five different corrosion control products. Prepared the testing plan, procured equipment, obtain Michigan EGLE approval, and prepared the final report.

Pine Valley/McCullough Facility Plan, Colorado Springs, CO. 2018–2019. Technical Advisor. Project included a review and condition assessment of the assets at the two existing surface water treatment plants, updated hydraulic analysis of the facilities, process performance analysis and a proposed capital improvements plan.

Taste and Odor Study, City of Adrian, MI. 2019. Senior Process Engineer. Reviewed existing treatment data for the existing facility treating a blend of surface and groundwater and developed immediate and potential long-term alternatives for taste and odor compound reduction. Performed bench scale jar tests to look at separation of the surface water and groundwater treatment using ferric sulfate coagulant, potassium permanganate and PAC on the surface water, softening the groundwater and combining the two streams before filtration.

Lake Lanier Filter Plant Pretreatment Improvements, Gwinnett County, GA. 2017–2018. Senior Process Engineer for the modifications to the rapid mixers and flocculators, updating of the standard operating procedures for this process, and performance of a streaming current detector demonstration study.

McCarty Ranch Master Water Supply Plan, City of Port St. Lucie, FL. 2017–2019. Project Manager. The project includes creating 30-year growth projections for the water, wastewater, and reclaimed water systems; determining future water supply needs over the planning period; evaluating the capacity of the existing sources of supply; updating the system hydraulic models; developing future water supply alternatives; performing a cost and non-cost evaluation of alternatives; and preparing a conceptual layout and cost estimate for the selected water supply alternative. Future water supply alternatives evaluated included expansion of the brackish water wellfield, indirect potable reuse, seawater desalination, and withdrawal of surface water from the C-23 canal for storage in a reservoir, treatment facility, and ASR facility proposed to be constructed on the 3,900-acre McCarty Ranch site owned by the City as a water supply alternative. Provided a cost budget phasing plan and schedule for the selected alternative.

Lime Reclamation Facility Improvements, Department of Dayton, Dayton, OH. 2015–2018. Technical Lead. Performed a solids mass balance of the expanded facilities to determine sizing of the receiving station, thickening, blending, equalization storage and dewatering facilities to feed the lime kiln and the storage required to handle the quicklime produced. Worked on the design of the full-scale facilities. Construction Cost: $9M.

TA 13 Water Supply and Interim Facilities Planning (20-Year), Miami-Dade Water and Sewer Department, FL. 2017–2020. Senior Process Engineer responsible for the alternatives development, analysis, and evaluation to develop the future facilities plan for the 225.0 MGD Hialeah-Preston water treatment plant lime softening facilities. Performed a statistical analysis using Monte Carlo simulation to assess the reliable capacity of each facility versus exceedance probability.

Cook County Jail Water Management Planning Document, Chicago, IL. 2017. Project Manager for the preparation of a water safety management plan for the Cook County Jail complex following the World Health Organization guidelines for water safety plans. Services included a site visit to review all the water systems in each of the buildings in the complex including domestic hot and cold water, heating, chilled water, fire, and steam. All potential health hazards were identified in each building and control measures were recommended to minimize risks to the jail population and employees.

Water Treatment Plant #3 Reverse Osmosis Addition, City of Clearwater, FL. 2017–2018. Project Manager. Due to increases in the raw water total dissolved solids (TDS) the City needed a method to reduce the finished water TDS to be able to use all the existing wells. The project includes the design and permitting of a 1.5 MGD reverse osmosis treatment facility, associated chemical feed and storage facilities, 10,000 linear foot concentrate disposal force main, and site improvements to the City's existing Water Treatment Plant #3.

Reverse Osmosis Water Treatment Plant Nos. 1 and 2 Fluoride Addition, City of Clearwater, FL. 2016–2017. Senior Process Engineer/Engineer of Record. Addition of fluoride storage and feed systems at the City's Reverse Osmosis Water Treatment Plants 1 and 2. Services included the preparation of a preliminary design report, final design documents, and obtaining required environmental regulatory permits.

City Water Analysis Study, University of Michigan, Ann Arbor, MI. 2015 – 2017. Lead Investigator. Corrosion control water analysis study to assess plumbing system failures on the University of Michigan main campus, especially of copper and brass in the domestic hot water system. Project efforts included a review of existing records, survey of the University maintenance staff, collection and materials analysis of failed plumbing fixtures, and onsite water quality sampling. Reviewed failed plumbing samples and supervised materials analysis. Analyzed data and prepared a written report explaining evidence in support of observed plumbing failure mechanisms including dezincification of brass, corrosion of tin solder joints, scaling by zinc and copper solids, and general copper corrosion. Provided recommendations to improve the University specifications. Evaluated nine corrosion control alternatives, including phosphate corrosion inhibitor addition, estimated implementation costs, and presented a plan for pilot testing phosphate inhibitors as the preferred corrosion control approach.

Harmony Water Treatment Plant Disinfection By-Product Technology Review, Toho Water Authority, Kissimmee FL. 2017. Project Manager. Review of technologies for disinfection by-products (DBPs) control for the Harmony water treatment plant as an alternate to the existing MIEX system. Services included the identification and listing of over 14 different treatment technologies to control or reduce disinfection by-product formation. A

description and summary of each technology was developed to describe their application, performance, limitations, reliability, design criteria, equipment suppliers, cost, and example installations. Phased improvements were recommended for implementation of facilities to improve disinfection by-product compliance.

Water System Corrosion Control Analysis, **City of Kalamazoo, MI.** 2016–2017. Lead Investigator. Lead Investigator for desktop analysis and review of the current corrosion control practices. The City was considering changing the corrosion control chemical to an orthophosphate-based solution to pro-vide a higher level of corrosion control against lead and other metallic components within the distribution system. The City retained Tetra Tech to develop a recommendation relative to the product(s) that would be appropriate for their system. The review of corrosion control practices and recommendation for a liquid phosphate corrosion inhibitor included the following: recent lead and copper tap sampling results, water quality from each source individually and of blends, USEPA and AWWARF water quality information, and information from corrosion control treatment manufacturers.

Water System Master Plan, City of Atlanta Watershed Management Department, Atlanta, GA. 2012–2013. Technical Advisor for water system master plan including 50-year CIP planning for the City of Atlanta whose system includes the following major components: two intake structures, two raw water pumping stations, three reservoirs, three treatment plants with a total permitted capacity of 246.5 MGD, 15 pump stations, 12 storage tanks, 5 major administrative facilities and approximately 2,700 miles of water mains. The master plan included an analysis of system-wide and plant redundancy and reliability constraints and pressure zone refinement. A WaterCAD hydraulic model was developed to evaluate 3,000 miles of pipes.

Sodium Hydroxide Feed System, City of Tarpon Springs, FL. 2017–2018 Project Manager. Design, permitting and construction services for the addition of a sodium hydroxide storage and feed system at the existing City of Tarpon Springs reverse osmosis water treatment plant for post treatment final pH adjustment of the finished water.

Alternative Water Supply Design/Build, City of Tarpon Springs, FL. 2012–2015**.** Design Manager for design and technical services associated with the design/build construction of the City's 6.4 MGD alternative water supply facility. The facility is designed to accommodate high salinity brackish water, 16,000 mg TDS/L, from a group of 15 Floridan aquifer supply wells and includes three 2.0 MGD reverse osmosis skids, degasification, biotrickling filters for odor control, chlorine contact, transfer pumping, 5 MG ground storage reservoir, and high-service pumping. Raw water system and reverse osmosis skids are designed using duplex stainless steel to accommodate high salinity and seawater membranes. Services included preparing the final design, services during construction, and facility startup and testing. Construction cost: $35.9 M.

City Water Analysis Study, University of Michigan, Ann Arbor, MI. 2015–2017. Lead Investigator. Corrosion control water analysis study to assess plumbing system failures on the University of Michigan main campus, especially of copper and brass in the domestic hot water system. Project efforts included a review of existing records, survey of the University maintenance staff, collection and materials analysis of failed plumbing fixtures, and onsite water quality sampling. Analyzed data and prepared a written report explaining evidence in support of observed plumbing failure mechanisms including dezincification of brass, corrosion of tin solder joints, scaling by zinc and copper solids, and general copper corrosion. Provided recommendations to improve the University specifications. Evaluated nine corrosion control alternatives, including phosphate corrosion inhibitor addition, estimated implementation costs, and presented a plan for pilot testing phosphate inhibitors as the preferred corrosion control approach. Reviewed failed plumbing samples and supervised materials analysis.

Cypress Lake Water Treatment Plant, Toho Water Authority, Kissimmee, FL. 2013–2014. Process Team Leader for the preparation of the conceptual and preliminary design reports, cost budgets, and schedules for a proposed 34.0 MGD regional reverse osmosis water treatment supply facility, raw water supply well field, and deep injection well disposal system.

Rivanna Water & Sewer Authority Value Engineering Study, Charlottesville, VA. 2014. Process Team Member of Robinson, Stafford & Rude, Inc., value engineering team contracted to perform value engineering study of proposed project to add granular activated carbon to three existing water treatment plants to control disinfection by-product formation.

Alexander Orr Jr. WTP Process Optimization Study, Miami-Dade County Water and Sewer Department, FL. 2013–2014. Project Manager responsible for Tetra Tech's work as subconsultant to HDR for bench scale testing, field testing, review of plant operating information, development of water quality goals, and development of alternatives to optimize the cost-effective operation of the lime softening and stabilization process for this 262.0 MGD facility.

Southeast Water Treatment Plant, Huntsville Utilities, AL. 2010–2017. Technical Leader responsible for the facility layout and process design of a surface water treatment facility with an initial capacity of 24.0 MGD and an ultimate capacity of 96.0 MGD. The water treatment plant obtains raw water from the Guntersville Reservoir segment of the Tennessee River.

Bench Scale and Pilot Testing Program, Huntsville Utilities, AL. 2010–2011. Project Manager responsible for the development and implementation of a bench and pilot scale testing program to test the effectiveness of a variety of treatment methods including ion exchange, granular activated carbon, PAC, MIEX, and MIOX for the removal of disinfectant by-product precursors and reduction of finished water disinfection by-product concentrations.

Fort Detrick Water Treatment Plant and Supplemental Water Storage 30 Percent Value Engineering Study, Frederick, MD. 2010. Process Team Member. Served on value engineering team contracted to the U.S. Army Corps of Engineers to perform a value engineering study of the proposed upgrades and repairs to the existing Fort Detrick 4.0 MGD surface water treatment plant and the proposed 2.0 MG supplemental storage and pumping facility projects.

Alternative Water Supply Blending Study, Orange County Utilities, FL. 2009–2014. Technical Leader. Blending study to determine the best method and required treatment to accept a supplemental source of water from another utility treating both surface and groundwater. Services included development of sampling programs to determine the quality and efficiency of the other utility's treatment at various stages in the process; bench scale testing; laboratory analysis to determine total organic carbon and disinfectant by-product removal by membranes, MIEX, and granular activated carbon; and development and costing of blending and treatment alternatives.

Development and Implementation of a DBP Treatment Bench Scale Testing Program for the Sergio Cuevas Water Treatment Plant, Puerto Rico Aqueduct and Sewer Authority (PRASA), San Juan, Puerto Rico. 2014. Technical Advisor to perform a bench scale study to test the effectiveness of various treatment techniques to reduce the level of disinfection by-products. The bench scale study scope included the testing of different alternatives for removal of total organic carbon and reduction of disinfection by-products in the finished water including: powdered activated carbon, granular activated carbon, fixed bed ion exchange, MIEX®, chlorine dioxide, and permanganate. Tetra Tech also performed limited bench scale coagulant optimization testing.

Development and Implementation of a DBP Treatment Bench Scale Testing Program for the Betances Water Treatment Plant, Puerto Rico Aqueduct and Sewer Authority (PRASA), San Juan, Puerto Rico. 2014. Technical Advisor to perform a bench scale study to test the effectiveness of various treatment techniques to reduce the level of disinfection by-products. The bench scale study scope included the testing of different alternatives for removal of total organic carbon and reduction of disinfection by-products in the finished water including: powdered activated carbon, granular activated carbon, fixed bed ion exchange, MIEX®, chlorine dioxide, and permanganate. Tetra Tech also performed limited bench scale coagulant optimization testing.

Groundwater Replenishment (GWR) Feasibility Study and Advanced Pilot Plant Demonstration, City of Clearwater, FL. 2010-2011. Technical Leader responsible for oversight of the development of the preliminary process layout and cost estimates for a 3.0 MGD treatment system to convert reclaimed water from the Northwest wastewater treatment plant to suitable quality for injection into the potable water aquifer to supplement the drinking water supply.

Shell Creek Water Treatment Plant Reverse Osmosis Addition, City of Punta Gorda, FL. 2014–2021. Technical Leader. Responsible for supervision and oversight. The project includes the final design of a brackish reverse osmosis (RO) treatment facility to provide low total dissolved solids (TDS) permeate for blending with TDS treated surface water containing seasonally elevated TDS. Ongoing services to be provided for the project include

final design, permitting, and construction administration for the proposed 4.0 MGD expandable to 8.0 MGD RO treatment facilities. The proposed improvements include conversion of existing Aquifer Storage and Recovery wells to be used for RO supply wells and construction of an on-site deep injection well. The proposed RO treatment facilities will be located on undeveloped land at the existing 10.0 MGD surface water treatment plant site.

Alexander Orr Jr. WTP Facility Assessment, Miami-Dade County Water and Sewer Department, FL. 2008–2009. Project Manager. Responsible for Tetra Tech's work as subconsultant for the on-site inspection and evaluation of the 262.0 MGD lime softening water treatment plant including mechanical, HVAC, electrical, and instrumentation systems.

Seawater Desalination Feasibility Study, Port St. Lucie, FL. 2008–2009. QA/QC Lead. Feasibility study that included the development of alternative site locations, intakes, concentrate disposal, process layouts, and cost analyses for a future seawater desalination facility of 10.0 MGD expandable to 50.0 MGD.

4.0 MGD Water Treatment Plant, Ohio County Water District, KY. 2007–2011. Technical Leader responsible for the development of process alternatives and preparation of comparative cost estimates for alternatives to expand the existing surface water treatment plant from 2.6 to 4.0 MGD and reduce total haloacetic acids (TTHAs) in the finished water to meet the Stage II D/DBP disinfection by-product rule. Also, responsible for value engineering and completion of the final design, which included modifications to the existing surface water intake structure and conventional coagulation/flocculation process followed by 4.0 MGD submerged ultrafiltration membranes and split treatment granular activated carbon.

Al Rusafa Water Treatment Plant, Baghdad, Iraq. 2008. Process/Mechanical Engineer. Responsible for review, quality control, value engineering, and proposal preparation services provided to El Concorde Construction, Ltd., Amman, Jordan, for the design required for the tendering of a design-build proposal for the El Rusafa water treatment plant. The project included a new surface water treatment plant to be constructed in five phases to provide an initial capacity of 455.0 mld (120.0 MGD) and a buildout capacity of 2,275.0 mld (600.0 MGD). The project included the design of the 670.0 MGD intake structure on the Tigris River, which was the source of raw water for the project.

James E. Anderson Water Treatment Plant Expansion, City of Port St. Lucie, FL. 2006–2009. Engineer of Record. Project included the construction of seven Floridan aquifer supply wells, one blend well, and the addition of seven 2.0 MGD reverse osmosis skids, addition of feed and blend micron filters, expansion of the chemical feed system, and expansion of the degasification and odor control facilities to increase the capacity in three construction milestones from 6.0 to 22.0 MGD.

Consulting Engineer's Report, City of Palm Bay, FL. 2005. Engineer of Record. Preparation of the engineer's report for the $17,260,000 City of Palm Bay, Florida, Utility System Improvement Revenue Bonds, Series 2005 to fund the construction of additional wastewater treatment capacity and wastewater collection/transmission system extensions. Services included preparation for and participation in rating agency presentations to the bond underwriters and insurers to support the bond issuance.

South Regional Reverse Osmosis Water Treatment Plant, City of Palm Bay, FL. 2000–2006. Program Manager for the conceptual layout, cost estimating, exploratory well program, and preliminary and final design for the construction of a new 4.0 MGD expandable to 10.0 MGD reverse osmosis facility to treat brackish water from the upper Floridan Aquifer.

Deep Injection Well, City of Palm Bay, FL. 2002–2009. Engineer of Record responsible for preparation of permitting documents, preliminary and final design, and construction services for the construction of a Class I tube and packer design injection well, dual zone monitoring well, 5.0 MG concentrate holding pond, and concentrate pumping station to serve the South Regional utility site.

Regional Reservoir—Ace USA Builders Risk Claim, Tampa Bay Water, FL. 2003–2005. Technical Expert. An extreme rainfall event occurred during the construction of the Tampa Bay water regional reservoir and intake structure in December 2002 that caused a large quantity of material to be deposited inside the reservoir footprint and

the requirement to construct a temporary treatment system to remove, treat, and discharge the highly turbid water to allow removal of the sediment deposits and continuation of the reservoir and intake structure construction. Responsible for reviewing construction activities before and after the December 2002 rainfall event, design and operation of the temporary treatment system, and the quantities of runoff produced, stored, and treated. Responsibilities also included reviewing and analyzing the contractor's claim and providing an expert opinion to the insurance company relative to the settlement of the claim.

Consulting Engineer's Report, City of Palm Bay, FL. 2001. Engineer of Record responsible for the preparation of the engineer's report for the $25,000,000 City of Palm Bay Utility System Capital Improvement Revenue Bonds, Series 2001 to fund the construction of the South Regional water treatment plant. Services included preparation for and participation in rating agency presentations to the bond underwriters and insurers to support the bond issuance.

Water Expansion Program, City of North Miami Beach, FL. 1999–2009. Program Manager. The water program was initiated so the City could become independent of Miami-Dade Water and Sewer Department as a source of finished water to serve its customers. The program included the expansion of the existing Biscayne Aquifer wellfield, construction of a new Floridan Aquifer brackish water supply, construction of a deep injection well, increasing the City's water use permit from 17.67 to 41.0 MGD, and the construction of a new membrane treatment facility at the site of the existing Norwood-Oeffler WTP. The new membrane facilities included sand separators, micron filtration, pre- and post chemical feed systems, three 3.0 MGD nanofiltration skids, three 2.0 MGD reverse osmosis skids, degasification and odor control facilities, blending of water from five different sources, a new prestressed concrete storage tank, new high-service pumping facility, and a new operations building and laboratory. Construction Cost: $39 M.

Corkscrew Lime Softening Water Treatment Plant Expansion, Lee County, FL. 2001–2006. Project Manager responsible for preliminary and final design, permitting, and construction administration services for the expansion of the existing 10.0 MGD lime softening plant to 15.0 MGD. The project included the design of a new aerator, lime silo and slaker, solids contact unit, recarbonation basin, dual media filters, and the expansion of chemical feed, transfer pumping, and sludge lagoon systems. Construction Cost: $9.8 M.

LTC Reverse Osmosis Water Treatment Plant Phase 2, City of Port St. Lucie, FL. 2000–2003. Senior Project Manager responsible for oversight of exploratory Floridan Aquifer well program, design, and construction of four new supply wells, preliminary and final design of a 6.0 MGD reverse osmosis facility expandable to 20.0 MGD, permitting, and construction administration.

LTC Reverse Osmosis Water Treatment Plant Storage & Pumping Phase, City of Port St. Lucie, FL. 2001–2009. Senior Project Manager responsible for oversight of the design and layout of initial storage and pumping facilities on the new LTC site, which included reverse osmosis treatment facilities to be constructed in a subsequent phase. Design included high-service pumping, gas chlorination and ammoniation facilities, one 4.0 MG finished water prestressed ground storage reservoir, two 4.0 MG power plant blow down prestressed concrete ground storage reservoirs, and connections to the on-site deep injection well.

Prineville Reverse Osmosis Water Treatment Plant Expansion, City of Port St. Lucie, FL. 2000–2003. Senior Project Manager/Engineer of Record responsible for oversight of the preliminary and final design, permitting, and construction administration services to expand the existing Prineville reverse osmosis water treatment plant from 4.0 to 10.0 MGD. The project included the construction and equipping of three new Floridan aquifer supply wells, addition of three 2.0 MGD reverse osmosis skids, micron filters, new chemical bulk storage tanks, transfer, and high-service pumps, and degassifier.

Prineville Reverse Osmosis Water Treatment Plant, City of Port St. Lucie, FL. 1996–1999. Project Manager. The project included an exploratory Floridan aquifer well program, construction of three Floridan aquifer supply wells, water use permitting, construction of a new 4.0 MGD reverse osmosis treatment facility expandable to 10.0 MGD on the site of the City's existing 6.85 MGD lime softening water treatment plant, integration of the facilities, blending of the finished waters, a new utilities administration building, and concentrate disposal via deep well injection at the Northport wastewater treatment plant. Responsible for providing project management, design, and

professional services for every aspect of the project from inception through startup of the new facilities. Construction Cost: $10.5 M.

7.0 MGD Lime Softening Water Treatment Plant, City of Bartow, FL. 2002. Senior Project Manager for the process design, raw water supply, site layout, and design oversight for the new lime softening plant.

Consulting Engineer's Report, City of Palm Bay, FL. 1998. Engineer of Record responsible for the preparation of the engineer's report for the $23,215,000 City of Palm Bay's Utility System Capital Improvement Revenue Bonds, Series 1998, to fund the expansion of the water distribution and wastewater collection systems to provide water service to 3,200 lots and wastewater service to 4,500 lots. Also, responsible for development of the revenue source for the program, the main line extension charge, and growth projections to project the anticipated revenue stream. Services included preparation for and participation in rating agency presentations to the bond underwriters and insurers to support the bond issuance.

9.5/12.0 MGD Reverse Osmosis Membrane Softening Water Treatment Plant, City of Dunedin, FL. 1988–1992. Project Manager. Decision document, brackish water membranes, and media filtration pilot testing, preliminary design, final design, and construction administration for the County Road 1 reverse osmosis water treatment facility with an initial capacity of 9.5 MGD expandable to 12.0 MGD.

T.B. Williams Water Treatment Plant Filter Upgrade, Lakeland, FL. 1995–1999. Principal for the upgrades to the existing 30.0 MGD filtration system that included replacement of the filter underdrains and media, new internal coating of the filter cells to stop leakage, addition of an air backwash system, and new filter controls. Construction Cost: $11 M.

1.5 MGD Troutman Boulevard Reverse Osmosis Water Treatment Plant, City of Palm Bay, FL. Project Manager for evaluation of the used reverse osmosis equipment procurement and design and permitting of the two new Floridan aquifer supply wells and concentrate disposal force main discharging the concentrate to the head of the Port Malabar wastewater treatment plant.

Water System Master Plan, Pinellas County, FL. 1993–1997. Project Manager for the water system master plan and water transmission system hydraulic analysis. A computerized hydraulic model was developed based upon the system atlas maps for the transmission system that included all pipes 12 inches up to 84 inches. The project developed a 20-year capital improvements program for this utility that serves a population of over 650,000 and supplies an average of 70.0 MGD to serve its customers.

Consulting Engineer's Report, Series 1992 Bonds, Hernando County, FL. 1992. Project Manager. Consulting engineer's report to support the issuance of the $21,755,000 Series 1992 Water and Sewer Revenue Refunding and Improvement Bonds to fund the five-year capital improvement program for the utility system.

Consulting Engineer's Report, Series 1992 Bonds, City of Palm Bay, FL. 1992. Consulting engineer's report to support the issuance of the $59,695,000, Series 1992 Utility System Refunding and Utility System Revenue Bonds to fund the acquisition of the General Development Utilities system and utility system improvements.

Water and Wastewater System Master Plan and Capital Improvements, University of South Florida Main Campus, Tampa, FL. 1992–1997. Project Manager/Principal for the hydraulic analysis and development of the master plan and capital improvements for the water system to supply future domestic usage and fire flow requirements. The project also included the design, permitting, and construction administration services for the water system improvements, which included two new supply wells, a 1.2-MG elevated storage tank, and approximately 16,600 linear feet of 6- through 20-inch water mains.

Publications/Presentations

Christopher, James; Beatty, Deborah; Turner, Leslie. "Bubble or Spray? Tank Aeration for THM Removal." Proceedings of the 2014 FSAWWA Florida Section Fall Conference, Kissimmee, Florida, December 2014.

Christopher, James; Glatthorn, Stephen, "Stage II DBP Compliance: Utilizing Bench Scale Testing to Determine Cost Effective Treatment Options for Different Source Waters." Presented at the Puerto Rico Water & Environment Association 2012 Annual Conference & Technical Exposition, San Juan, Puerto Rico, May 2012.

Christopher, James; "Future Water Supply Planning in Florida: Do We Need to Reconsider Our Approach?" Presented at the 87th Annual Florida Water Resources Conference, Orlando, Florida, April 2012.

Christopher, James; "Utilizing Bench Scale Testing in Determining Cost Effective Treatment Options." Presented at the 2011 AWWA Alabama/Mississippi Section Annual Conference, Biloxi, Mississippi, October 4, 2011.

Christopher, James, Moore, Emilie, et. al; "Challenges of Indirect Potable Reuse in Florida: Clearwater's Groundwater Replenishment Program." Proceedings of the 26th Annual WateReuse Symposium, Phoenix, Arizona, September 2011.

Christopher, James; Owens, Tony; "Bench-Scale Testing for Selection of a DBP Control Technique." Poster Presentation at the AWWA Annual Conference and Exposition, Washington, D.C., June 13, 2011.

Christopher, James; "Search for The Optimum Corrosion Control for Brackish Water RO." Proceedings of the 86th Annual Florida Water Resources Conference, Orlando, Florida, May 2011.

Balaban Desalination Publications; The Guidebook to Membrane Technology for Wastewater Reclamation; Author of Chapter 20, "Project Implementation," 2010.

Christopher, James; Kuzler, Christopher; "Membrane Plant Residuals Disposal Regulatory Issues." Presented at the Florida Section AWWA Fall Conference, Orlando, Florida, December 1, 2009.

Christopher, James; "Lime Softening" and "RO Normalization." Presented at the Florida Water Pollution Control Operators Association Region V Short School, Port St. Lucie, Florida, November 17, 2009.

Christopher, James; "Ohio County Water District Water Treatment Plant Expansion." Presented at the Southeast Desalting Association 2009 Fall Symposium-Ultrafiltration & Microfiltration, Miami Beach, Florida, October 26, 2009.

Christopher, James; "Designing for Future SDWA Compliance." Presented at the AWWA Annual Conference and Exposition, San Diego, June 16, 2009.

Christopher, James; "Designing for Future Safe Drinking Water Act Compliance in Ohio County, Kentucky." Presented at the Southeast Desalting Association Spring Symposium-Making the Best of Existing Infrastructure, Clearwater, Florida, June 10, 2009.

Christopher, James; "Case Study-City of North Miami Beach Norwood-Oeffler Water Treatment Plant." Presented at the 2009 Water Facility State Revolving Fund (SRF) Workshop, June 3, 2009.

Christopher, James; Dufresne, Douglas; "City of Port St. Lucie, FL: Proactive Approach to Alternative Water Supply Planning." Presented at the Florida Water Resources Conference, Tampa, Florida, May 2008.

Christopher, James; "Treatment Technology Selection for Future Regulatory Compliance." Presented at the Florida Section AWWA Fall Conference, Orlando, Florida, November 2007.

Christopher, James; "Alternative Use of Nanofiltration Concentrate: Nanofiltration Concentrate Recovery as a Supply Source for Brackish Water Reverse Osmosis." Presented at the Florida Section AWWA Fall Conference, Orlando, Florida, November 2007.

Christopher, James; "City of North Miami Beach-NF/RO-Water Treatment Plant." Presented at the Southeast Desalting Association Spring Symposium, Ft. Lauderdale, Florida, June 2007.

Christopher, James; "Post Treatment: Disinfection and Corrosion Control." Presented at the Southeast Desalting Association Spring Symposium, Captiva Island, Florida, June 27, 2006.

Christopher, James; "Reliable Membrane Treatment Facilities." Presented at the Southeast Desalting Association Spring Symposium, June 2005.

Christopher, James; "Membrane Plant Start-up, How Should it be Administered?" Presented at AMTA/SEDA Joint Symposium, Duck Key, Florida, October 13, 2004.

Christopher, James; "The Basics of Membrane Treatment Technologies." Presented at the Southeast Desalting Association Utility Management Workshop, Melbourne, Florida, August 2004.

Christopher, James; "Benefits and Limitations of Utilizing a Raw Water Blend Stream to Meet Production and Quality Goals at a Membrane Facility." Florida Water Resources Journal, Volume 55, Number 11, November 2003.

Christopher, James; Manning-Hudkins, Jill; Morretta, Melanie; "Preparing for the Inevitable: A Survey of Membrane Cleaning Practices in the State of Florida." Presented at the AWWA Membrane Technology Conference, March 2003 and the 78th Annual Florida Water Resources Conference, May 2003.

Christopher, James; "The City of Milwaukee *Cryptosporidium* Outbreak: What Really Happened? How Vulnerable Are We? What Can We Learn?" Presented at the Florida Section AWWA Fall Conference-Safe and Secure Water, Palm Harbor, Florida, November 12, 2002.

Christopher, James; Sundaramoorthy, Srini; "Membrane Applications in Potable Water Treatment." Presented at the AWWA Southwest Section Annual Conference, Oklahoma City, Oklahoma, October 8, 2002.

Christopher, James; Manning-Hudkins; "Cost Effective Program Implementation for Independence: A Water Improvement Program for the City of North Miami Beach." Presented at the AMTA Biennial Conference and Exposition-Water Quality Enhancement through Membrane Technology, August 2002.

Christopher, James; Manning, Jill; Ikeler, Mark; "Reducing Acid Demand and Enhancing Membrane Treatment Operations by Optimizing Acid Feed Point Locations." Presented at the AMTA Biennial Conference and Exposition- Water Quality Enhancement through Membrane Technology, August 2002.

Christopher, James; Manning, Jill; Ikeler, Mark; "Reducing Acid Demand and Enhancing Membrane Treatment Operations by Optimizing Acid Feed Point Locations." Presented at the 77th Annual Florida Water Resources Conference, Orlando, Florida, March 26, 2002.

Christopher, James; "Ozone and Ozonation." Presented at the Northeast Florida Operators Association Short School, Lake City, Florida, March 2002.

Christopher, James E.; Yousef, Yousef A.; Wanielista, Martin P.; Harper, Harvey A.; "Management of Drainage Systems from Highway Bridges for Pollution Control," Transportation Research Record 896, Hydrology and Hydraulics: Water, Noise, and Air Quality, Transportation Research Board, National Research Council, National Academy of Sciences, Washington, D.C., 1982.

Christopher, James; "Impact of Highway Bridge Runoff on Adjacent Receiving Water Bodies," Master's Thesis, July 28, 1980, University of Central Florida.

TETRA TECH

Katherine A. Wood
Environmental Scientist

EXPERIENCE SUMMARY

Ms. Wood is an environmental and permitting professional with 14 years experience in industry and working for both global and regional consulting firms. Her experience encompasses positions of Project Management, Permitting Manager, and Environmental Lead for projects requiring federal and state permitting.

Ms. Wood's expertise encompasses field biology, wetland delineations, all aspects of environmental permitting including SMCRA, Clean Water Act 401/402/404 and Clean Air Act permitting. She also has extensive experience with endangered plant and animal species coordination specifically Indiana Brown Bat and development and installation of mitigation projects. In addition, Ms. Wood has worked extensively in the environmental compliance field. Ms. Wood has extensive experience in water sampling in both field and industrial settings. Her experience includes SPCC and Stormwater development and compliance, TRI reporting, NPDES compliance including water treatment, sampling and reporting and mitigation monitoring and reporting.

EDUCATION

B.S., Environmental Biology, 2009, Heidelberg University

B.S. Water Resource Management, Heidelberg University

AREA OF EXPERTISE

Environmental Permitting and Compliance

REGISTRATIONS/ AFFILIATIONS

SME

TRAINING/CERTIFICATIONS

US Army Corp of Engineers Wetland Delineation Training

Ohio EPA Qualitative Habitat Evaluation Index (QHEI) Level II Certification

OFFICE

St. Clairsville, OH

YEARS OF EXPERIENCE

14

YEARS WITHIN FIRM

8

RELEVANT EXPERIENCE

Stormwater Permitting Support *Various Clients:* Provide stormwater permitting for various industries including industrial and AML relate projects in Ohio, Pennsylvania, West Virginia and Maryland.

NPDES Permitting Support *FirstEnergy Mitchell FGD Landfill:* Provided support for the preparation and submission of the NPDES permit major amendment application for relocation of an NPDES outfall located at the Mitchell FGD Landfill.

NPDES Permitting Support *North American Dismantling Corp. / FirstEnergy Hatfield Power Station Demolition:* Provided support for the preparation and submission of the NPDES General Permit (PAG-02) application for the Hatfield Power Station demolition and closure of the wastewater lagoons.

Permitting Support *Fishing Run Stream Sealing:* Responsible for obtaining permits for a project to seal streams effected by mining. The streams beds were cracked due to past subsidence and water was entering a mine pool which contributed to a large discharge. Sealing the stream bed allowed for less water through the discharge and returned function of the stream. Permits were obtained from both the PADEP and the USACE.

NPDES Permitting Support *NRG Homer City Generating Station*: Provided support to the Homer City Generating station for the renewal of their NPDES permit. Included coordination and meetings with PADEP along with regular meetings with the station to ensure compliance.

Permitting Support *Gladden AMD Treatment Plant:* Responsible for obtaining permits for all aspects of the *design*, build, and operation of a water treatment facility to restore eight miles of impacted stream in Allegheny County Pennsylvania. The $13 M project will lower an existing discharging mine pool, treat the Acid Mine Drainage utilizing

hydrogen peroxide as an oxidizing agent, and pump the precipitated sludge into underground mine working for disposal.

Watershed Implementation Plan Development *Upper Jennings Run Watershed Implementation Plan:* Developed a Watershed Implementation Plan for Upper Jennings Run watershed located in Frostburg Maryland. The plan identified impairments in an AMD effected watershed and developed a plan for future treatment.

Sample Support and Data Management *Technology Laboratory, Rare Earth Elements Associated with Coal and Coal By-Products, Appalachian Coal Basins***:** Organizing sample collection, packaging and shipment to lab and Data Management of sample information for a federal project to identify and quantify the existence high levels of rare earth elements in coal seam and associated geology in the Northern Appalachia and Central Appalachia coal basins.

Sample Support and Data Management *Technology Laboratory, Rare Earth Elements Associated with Coal and Coal By-Products, Rocky Coal Basins***:** Organizing sample collection, packaging and shipment to lab and Data Management of sample information for a federal project to identify and quantify the existence high levels of rare earth elements in coal seam and associated geology in the Rocky Mountain coal basins.

Permitting Support *Various Oil and Gas Pipeline Projects* Have assisted multiple pipeline projects in various permitting roles. Have assisted in different roles in the permitting process such as stormwater permits and LEDPA analysis. Have worked on both state and local permitting actions.
Field Reconnaissance Leader *Maryland Department of the Environment, Scenic Rail Road Subsidence Evaluation*. Lead the field reconnaissance in subsidence the identification along an undermined section of the Maryland Scenic Railroad in Frostburg Maryland.

Sampling Lead, *AEP, ELG Water Balance Monitoring* Responsible for developing and executing sampling plans for multiple power plants. The sampling plan captures water quality at all stages of the power generation process and all sampling events are performed in one day to allow for a representative snap shot of the plant's operations.

Permit and Compliance Manager, AK Coal Resources subsidiary of AK Steel Holdings located in Somerset County Pennsylvania. Was in charge of obtaining all necessary permits for opening and operation of an underground coal mining complex. Also was responsible for all environmental compliance requirements for the operation.

> **Project Manager;** SPCC Plan Development. In charge of writing, updating SPCC plans for multiple active operations.
>
> **Project Manager;** TRI Reporting, Responsible for collecting and compiling information to be submitted for the EPA's annual TRI report for multiple active operations.
>
> **Project Manager;** Permitting. Responsible for all aspects of permitting for multiple coal mines and associated preparation plant. Agency coordination included PADEP Bureau of District Mining Operations
>
> **Project Manager;** CWA 402 Compliance. Responsible for compliance of several CWA 402 permits which included water treatment and reporting. PADEP Bureau of Clean Water.
>
> **Project Manager;** Coal Innovations Refuse. Responsible for all aspects of overseeing design and permitting of both the existing coarse coal refuse disposal site and a proposed site. PADEP Bureau of District Mining Operations, PADEP Bureau of Clean Water, Army Corps of Engineers, US Fish and Wildlife Service.

Biologic Coordinator, Murray Energy Corporation Responsible for all permitting, monitoring and compliance of all biological related functions for all coal mining, processing and waste disposal operations for a national company. These functions included CWA 401/402/404 permitting, air permitting, endangered species coordination specifically Indiana Brown Bat, water quality treatment SPCC and Stormwater development and compliance

> **Project Scientist;** SPCC Plan Development. In charge of writing, updating SPCC plans for multiple active operations.
>
> **Project Manager;** TRI Reporting, Responsible for collecting and compiling information to be submitted for the EPA's annual TRI report for multiple active operations.
>
> **Project Scientist;** Andelex Mine Drainage Sulfate Reducing Bioreactor, KenAmerican Resources, McLean County KY. Worked as project scientist to install a Sulfate Reducing Bioreactor to treat mine drainage. Oversaw the sampling and compliance of the system.

Project Scientist: Century Mine Wetland and Stream Mitigation, American Energy Company, Belmont County, Ohio. Worked on overseeing compliance and remediation of a large wetland and stream mitigation site. Included coordination with both the Army Corps of Engineers and Ohio EPA

Project Manager; 401/404 Permitting; Responsible for all aspects of 401/404 permitting for Murray Energy in multiple states for underground mines, surface mines and refuse disposal sites. Responsibilities included delineations and biological sampling, preparation and submittal of permits, agency coordination, mitigation and compliance. Agency coordination included Army Corps of Engineers, Ohio EPA and US Fish and Wildlife Service.

Project Manager; AMEI Mining Permit, AmericanMountaineer Energy, Harrison County, WV. Responsible for coordinating all aspects of permitting for a greenfield longwall coal mine, prep plant and refuse disposal area. Responsibilities included coordination of SMCRA, 401/402/404 and Air permits along with development of extensive mitigation plan and agency coordination. Agency Coordination included WVDEP, Army Corps of Engineers and US Fish and Wildlife Service.

Project Scientist; Casey Run, Ohio Valley Coal, Belmont County Ohio. Responsible for coordinating all aspects of permitting refuse disposal area in an exception value watershed. Responsibilities included coordination of SMCRA, 401/402/404 permits along with development of extensive mitigation plan and agency coordination. Agency coordination included ODNR, Army Corps of Engineers, US Fish and Wildlife Service, Ohio EPA and USEPA.

OTHER INFORMATION (EX.: PUBLICATION(S), AWARD(S)…)

Secretary, Captina Creek Conservancy 2011-2013

TETRA TECH

MICHAEL S. KEARNS, P.E.

Senior Civil Environmental Engineer

EXPERIENCE SUMMARY

Michael Kearns has over 40 years of diversified engineering experience in Civil Engineering field. Mr. Kearns is a licensed Professional Engineer in the States of West Virginia, Ohio and Pennsylvania. He is also a licensed Professional Surveyor in the State of West Virginia.

Mr. Kearns attained his Masters Degree in Civil Engineering specializing in soils and foundations. He has approximately 40 years of experience in geotechnical engineering performing stability analyses associated with slip remediation, impoundment design, the evaluation and design of numerous different types of retaining walls including cast-in-place, segmental and modular retaining walls as well as reinforced earth designs.

Mr. Kearns' past professional experiences has been in the mining industry, site development, municipal engineering and highway engineering as well as environmental engineering disciplines.

Mr. Kearns also has extensive experience in the areas of Surface and Underground coal mine permitting, Preparation of the Storm Water Pollution Prevention Plans and mine plan aspects which consist of the drainage and sedimentation control design, sedimentation pond design, diversion ditch design, surface mine planning, preparation of wetland and stream mitigation plans and design and evaluation of Division of Water and MSHA size impoundment structures. Mr. Kearns also performs the calculation of earthwork quantities, stability analyses of slopes and the preparation of the final plans for permitting or bidding purposes. He has also prepared Emergency Action Plans (EAP) for these types of structures and has designed large raw coal storage and refuse facilities. Mr. Kearns is an MSHA certified impoundment inspector and instructor.

Mr. Kearns has worked on hundreds of surface mine and deep mine permits over his career. As an engineering consultant in his field, Mr. Kearns coordinates all engineering work, manages budgets, schedules tasks, prepares proposals, and oversees all designs. Mr. Kearns responsibility is the coordination of the engineering regulatory aspects associated with the mining industry and requirements of West

EDUCATION

B. S., Civil Engineering, 1977
West Virginia University

M.S. Civil Engineering, 1982
WV College of Graduate Studies

REGISTRATIONS AFFILIATIONS

Professional Engineer, WV
1981, #08748

Professional Engineer, OH
1991, #46650

Professional Engineer, PA
1992, #43471-R

American Society of Civil Engineers

National Society of Professional Engineers

National ASCE Committee on Employment Conditions

OFFICE

St. Clairsville Ohio

YEARS WITH TETRA TECH

1 Year

Virginia, Pennsylvania DEP and Ohio ODNR-DMRM. Permit requirements would also include property research, hydrologic investigations and determination of hydrologic consequences, stream and wetland delineation, associated 404/401 permitting, NPDES permitting, performing associated due diligence, sub-surface investigation and addressing all other state and federal regulatory requirements. Other areas of expertise include soils engineering, water/sewer engineering, transportation engineering, and site development.

RELEVANT EXPERIENCE

Senior Civil Environmental Engineer, The Marshall County Coal Company, 6 North 6 South Bleeder Shaft Sites (2018-2019): Performed the site design for the two (2) bleeder shaft sites located in Marshall County near the Pennsylvania/West Virginia border. Design included determination of earthwork quantities, preparation of the E&S plan, determinization of permit issues and addressing slope stability for the site.

Senior Civil Environmental Engineer, The Marshall County Coal Company, 6 North No 1 Bleeder Shaft Site (2018-2019): Performed the site design for the two (2) bleeder shaft sites located in Marshall County, near Cameron, West Virginia. Design included determination of earthwork quantities, preparation of the E&S plan, determinization of permit issues and addressing slope stability for the site.

Engineering Manager, The Marshall County Coal Company, Annual Impoundment Inspections (2013-2018): Performed the Annual Impoundment Inspections of the permitted sediment ponds and submittal of the annual certifications to WVDEP.

Engineering Manager, The Ohio County Coal Company, Annual Impoundment Inspections (2013-2018): Performed the Annual Impoundment Inspections of the permitted sediment ponds and submittal of the annual certifications to WVDEP.

Engineering Manager, The Marshall County Coal Company, Package Sewer Plant Design (2018) Design and NPDES & WV Bureau of Health Permitting for a sewage treatment plant for a coal facility located in Marshall County, Franklin-Woodland area. Preparation of the contract/permit drawings and specifications.

Senior Project Manager, The Marshall County Coal Company, 5 North No 2 Portal Site Design: Performed the site design and WVDEP & NPDES permitting for a 26 acre mine portal site located in Marshall County, near Cameron, West Virginia Design included overall site design, determination of earthwork quantities, preparation of the E&S plan, determinization of permit issues and addressing slope stability for the site, Sewage Package Plant (25,000 gpd) design and permitting.

Senior Project Manager, The Marion County Coal Company, 7 North No 1 Portal Site Design: Performed the site design and WVDEP & NPDES permitting for a 32 acre mine portal site located in Marion County, West Virginia. Design included overall site design, determination of earthwork quantities, preparation of the E&S plan, determinization of permit issues and addressing slope stability for the site, Sewage Package Plant (25,000 gpd) design and permitting.

Senior Project Manager, The Tunnel Ridge Coal Company, Short Creek Preparation Plant Site: Performed the site design and WVDEP & NPDES permitting for a 40 acre coal mine preparation plant site located in Ohio County, north of Wheeling West Virginia. Design included overall site design, determination of earthwork quantities, siting of the prep plant facilities, preparation of the grading plan, design of the sediment and treatment ponds on the preparation plant site and preparation of the overall E&S plan.

Senior Project Manager, Rayle Coal Company, Short Creek, Clearview Mining Area: Preparation of a WVDEP Surface Mine and NPDES permit for mining of the No 11 coal approximately 124 acres adjacent to a coal refuse facility. Preparation of the erosion and sediment control, coordination of sub-surface investigation, prime farmland investigations, and other aspects and requirements of the surface mine permit.

Project Manager/Engineer, The Penn Ridge Coal Company, Avella Preparation Plant Site: Performed the site design and WVDEP & NPDES permitting for a 35 acre coal mine preparation plant site located in Washington County, Pennsylvania. Design included overall site design, property research, determination of earthwork quantities, siting of the prep plant facilities, preparation of the grading plan, design of the sediment and treatment ponds on the preparation plant site and preparation of the overall E&S plan.

Senior Project Manager, Confidential Client, Expert Witness/Testimony. Appeared before the Ohio Division of Reclamation Review Board as an expert witness relative to the condition and acceptability of an existing impoundment that was to remain permanent on a property owner's land.

Project Engineer, Jack A. Hamilton & Associates, Flushing, Ohio. (2003-2011) As a consultant with this firm, performed hundreds of annual pond inspections/certifications for numerous clients. Field reviewed ponds for maintenance and functionality issues or defects. Annual pond inspections were completed in West Virginia and Ohio.

Project Engineer, Rosebud Mining Company, Rosebud Prep Plant and Refuse Site : Performed the site design and WVDEP & NPDES permitting for a coal mine preparation plant site and coal refuse disposal site Design included overall site design, property research, determination of earthwork quantities, siting of the prep plant facilities, preparation of the grading plan, design of the sediment and treatment ponds on the preparation plant site and preparation of the overall E&S plan.

Project Engineer, Various Mining Companies, HEC-RAS Drainage Studies: Performed numerous flood studies associated with the mining areas that crossed existing streams. Numerous evaluations were made to determine the impact of a bridge structure installed over a streams which a hydrologic and hydraulic evaluation had to be made to determine if and to what degree the structure could potentially impact flow.

TETRA TECH

Juan Rodriguez

Sr. Electrical Engineer- Department Manager, PM, MBA

EXPERIENCE SUMMARY

Accomplished electrical engineering professional with experience in Power Plant Electrical and Instrumentation. Twenty years of control systems experience in Process Optimization, Instrumentation, Automation Process Automation, PLC, DCS, Controls, Instrumentation, Electrical design, Power Plant & Controls and ten years of heavy industry project management experience in the Power Generation, Mining industry and Oil&Gas.

Experienced Project Management providing high level consultations to the upper level management on the most unique and complex design problems and alternatives. Project management, strategic sourcing, negotiating, developing, & managing detailed contracts that cover all aspects of corporate capital equipment systems, facilities construction, contractor agreements, asset management, energy efficiency & management, Reliability and Optimization.

Education:

Utah Valley University- MBA. Orem, Utah. 2019

New Jersey Institute of Technology, Master's degree, Electrical Engineering, emphasis in Intelligent Systems, 2005

World Education Services New York, NY, Bachelor's Degree, Electrical Engineering, 2000

Autonomous University of West Colombia, Master's Degree, Automation of processes and industrial devices, 2000

Bachelor's degree in Electrical Engineering, 1998

S.E.N.A. Cali, Colombia, Technical Degree, Electrical & Electronic Industrial Devices, 1991

Office:

Salt Lake City, UT, USA

Years of Experience:

25+

Areas of Expertise:

Electrical Engineering

RELEVANT EXPERIENCE

TETRA TECH (Salt Lake City, UT) 2012 - Present

ACCOUNT MANAGER FOR NEVADAGOLDMINES.

- Focused on growing account revenue & size.
- Performed all efforts necessary to both short-term and long-term success with the account.
- Developing internal capabilities & capacity.
- Identifying and evaluating new key accounts.
- Actively seeking best practices within TT key accounts and outside the company
- Identify and position Tt for existing and future opportunities.
- Lead collaboration with Tt PM's and business units working for the client.
- Understand client's business, goals, and needs and ensure a positive and growing relationships exists between Tt and the Client.

DEPARTMENT MANAGER ELECTRICAL & INSTRUMENTATION ENGINEER.

Mr. Rodriguez has provided electrical project engineering to Power Distribution, Power Transmission Instrument and equipment controls support for Mining and Oil and Gas facilities and their Asset Management Groups.

- Provide improvements, modifications or additions to plant electrical and related Process instrumentation and ensure all process is well documented.
- Responsible and accountable for area business objectives and optimization of processes, methodology, and technological applications to achieve reliability and availability of Electrical/Process Control Systems.
- Mr. Rodriguez has provided engineering and designing on small and medium sized projects for NioCorp Mineral Processing and Pyromet plant, RIO TINTO (Kennecott) at the Concentrator, Smelter and Refinery, BARRICK GOLDSTRIKE, BIG WEST / FLYING J, DYNO NOBEL, ROBINSON QUADRA FNX , Enbridge Sandpiper Pipeline, Silver Bell Mining, CHEVRON,SIMPLOT.
- SUNOCO refinery in Texas. Engineering and designing projects of multiples electrical stations expansion of oil-gas Interconnection Diagrams, Motor Schematics, One Line Diagrams, P & ID's, Flow Diagrams and Block Diagrams and Loop Drawings for the following projects: Sunoco MagTex, Sunoco Granite Wash, Sunoco Permian Express.'
- Managing Electrical Engineering Department Salt Lake City Office.

DAIFUKU WYNRIGHT CORPORATION. (Salt Lake City NV) 2017 to 2018

Sr. Electrical Controls Engineer

Mr. Rodriguez has design control systems for industrial material handling solutions. Includes development of specifications.

Mr. Rodriguez has worked closely with the overall project team to design systems that exceed the project

requirements. Uses creativity and innovation to tailor the standard product offering to meet customer needs. Responsible for electrical scope of the project, design, automation, integration, robotics and commissioning work and provide direction to less-senior team members. Provide solutions in the design, programming, installation and implementation of automatic control systems and power monitoring systems.

BARRICK GOLDSTRIKE (28 Miles North of Carlin, NV) 2012 to 2017
Sr. Electrical Engineer - Project Manager.

Mr. Rodriguez has been responsible for the entire electrical capital projects and modernization for the company.

- Developed physical and functional power and control system requirements based on customer discussion and data such as Substations 120KV/13.8KV, Power Distribution, MCCs designing, P&ID's and standard specifications.
- Project Engineering and installation of MEGA VFDs Power flex 7000 for Sag Mills and Ball Mills,
- Project Engineering and installation of Cyclo-Converter for Sag Mills 10000HP
- Managed Automation and Controls integration, Reliability and Optimization of sourcing, PLC and HMI Allen Bradley, Ethernet, Control Net and Device Net, Reliability techniques experience CMMS, training and support.
- Ensured ongoing improvement through evaluation of current processes and Reliability.
- Maintained a regular, dependable attendance and high level of performance.
- Supervised electrical power and control systems. Lead I&E Tech team.
- Successfully PM and completed capital projects within the same time frame of execution with 15M overall costs.

KENNECOTT UTAH COPPER CORP. Salt Lake City, UT
Sr. ELECTRICAL ENGINEER 2010 to 2012

Mr. Rodriguez performs as the subject matter expert with respect to power, instrumentation, and controls for the development of new designs and the support of existing designs for equipment and systems used in the processing of minerals. This includes all project phases from conceptualization through design, including support of fabrication, construction, and installation activities. Mr. Rodriguez also provides leadership on small and medium sized projects. Rodriguez develops electrical deliverables implementing solution to the client's control system in compliance with their standards and requirements.

Engineering, design, and reviewing multiples project for RIO TINTO (Kennecott) in Concentrator, Smelter and Refinery.Mr. Rodriguez has worked on several projects including:

- RTKC Smelter Acid Platform Replacement and PLC upgrade.
- RTKC Smelter OBRM Gas detection plant perimeter.
- RTKC Smelter New Cyclone Crusher
- RTKC Smelter Dust Process Improvements
- Smelter HRS Towers Replacement.
- RTKC OBRM Smelter Derail Toxic Gas Release Mitigation.
- RTKC 6190 Mine Expansion.
- Barrick El Nino Expansion Project.
- Feasibility Study Grinding Lines Mill Motor Upgrades.
- SAG Mill Conveyors Upgrade.
- Smelter Blister Tap Upgrade.
- Refinery Basement Lighting Update.
- Refinery chemical unloading.
- Refinery Tank house VFD PP507.
- Ball Mill Fans Upgrade.
- Waste Dump Relocation.
- Corner Stone Project Mine Expansion.
- New Core Storage Power lines relocation and Distribution power designing.
- Engineering and electrical designing Decon Pad Automation.
- Engineering and electrical designing conveying and Crushing Lunchroom.
  Engineering and electrical and instrumentation design for New East Co-Jet Furnace.
- Engineering and electrical designing New FCF Bottom cooling fan.

- Engineering and electrical designing counterweight winch lifting devices.
- Engineering and electrical designing Refinery parking lot gate.
- Slag Civil Modification.
- Engineering and electrical designing Hydromet Overhead Crane.
- Engineering and electrical designing Uptake Shaft Accretion.
- Engineering and electrical designing Cooling Water Headers.
- Engineering and electrical designing Tap Hole Vent Ductwork.
- Engineering and electrical designing New Preheater PLC.
- Engineering and electrical designing South Wall Facilities at RioTinto Mine.
- Smelter P&ID updated.

RELIABLE CONTROLS CORP. Salt Lake City, UT,
ELECTRICAL CONTROL SYSTEMS ENGINEER 2008 – 2009

Mr. Rodriguez has worked on several projects including:

- FMI (Freeport-McMoRan) Coppermine (AZ): Engineering support, maintenance and troubleshooting. Maintained PLC A-B, RS Logix 5000 based on systems for motor controls and instrumentation, Network communication, alarming, process controls commissioning, HMI development, DeviceNet, ControlNet and EtherNet, Maintained ABB soft starter and VFD of low, medium and high voltage, GE 469 Multilin, MCC's, process and safety interlocks, and sequential logic.
- MAxrt (UT): Development of new design for data historian monitoring and recording module.
- KUCC- Kennecott Copper Mine (UT): Drills & Shovels data monitoring installation system.
- Minera Mexicana Farallon (Mexico): Engineering, panel view and technical field support, Tested and commissioned control systems and instrumentation.
- Cortez-Barrick Gold (NV): As built in electrical control systems, redline software and network structure, instrumentation data inspections and validations, testing and electrical CAD design, P&ID's, electrical schematics and wiring drawings redline and take offs.

COVANTA ENERGY, The Union County Resource Recovery Facility - Rahway, NJ 2002 – 2008
POWER PLANT INSTRUMENT AND CONTROLS SPECIALIST.

Responsible for the entire electrical equipment troubleshooting and repair and major procedures development, executing measurements, field elements repair, performed electrical repairs under complex and time constrain situations by applying troubleshooting techniques including hardware and software. High involvement and participation actively in committees of industrial health & safety (LOTO) and developed engineering and techniques design by programming and maintaining installations of A-B PLC 5000 and DCS 90-infi 90 systems to control automated processes, VFD, alarming and emergency shutdown systems associated with power plant.
Mr. Rodriguez provided technical support to the plant operation, thermal and combustion engineering, electrical equipment evaluation, upgrades, and optimization, knowledge in P&H cranes. He maintained analyzers for CEMS (continuous emission monitoring systems) and continuous opacity analyzers.

Worked in switchyard 13.8Kv,26.4Kv, MCC's, field engineering, testing and maintenance of electrical gear, protection devices AC and DC. Tested Medium and high voltage motor protection relays and motors; high/medium voltage transformer protection relays; high/medium voltage transmission lines and feeder protection; low/medium voltage VFD; switching procedures and safe energizations of electrical gear. Analyzed job functions to ensure compliance with ISO and NEMA electrical standards.

OTHER EXPERIENCE

BAXTER International Health Care, KELLY SERVICES, Engineering Resources (Miami, Florida)
ELECTRICAL CONTROL TECH. 2001-2002

- Managed the control systems operations and electrical attention to extrusion and injection processes and high-speed machinery. Applied CGMP principles to the production process.

COLGATE PALMOLIVE (Cali, Colombia) 1993-2000
SR. ELECTRICAL PROJECT ENGINEER.

- Managed the planning, design, and construction of multiple medium scale capital projects
- (Modifications/additions to facilities and infrastructure) Skilled in the evaluation of manufacturing requirements, flow, time and motion, the design of specialized machines and equipment, and other related manufacturing tasks.
- Automation of production machinery line and Controls.
- OSHA & Developed an upgraded control system and machinery, CGMP principles.
- Provided for procurement, logistics, facilities, and capital equipment, automation of production manufacturing machinery, high performance in control systems and mechanical operations.
- Provided definition input to all proposed, scheduling planning, control, problem reporting and solving support.
- Supervised consumer product development from inception to the end, applying instrumentation, electromechanical and electrical knowledge, application of technical and technology for the development of the production and the improvement of the processes regarding the worker and machinery.
- Operation of power plant and cogeneration during rush-hours.

RICA RONDO (Cali, Colombia) 1991-1993

ELECTROMECHANICAL TECH

- Maintained automatic, hydraulic, and pneumatic systems in the food processing industry, optimization and reliability to the process and operations.

ALMACENAR (Cali, Colombia) 1988-1991

Electrical Tech

- Supervised and maintained the company's entire electrical system, including control panels, industrial AC/DC motors, servomotors, generators and transformers, electrical circuits and controllers.

Nathan R. Nachazel, PE

Senior Mechanical Engineer

EXPERIENCE SUMMARY

Mr. Nachazel specializes in project management, mechanical engineering, oil and gas, industrial and process piping, Renewable Natural Gas (RNG), field service work, and HVAC. His experience includes equipment specification, process design calculations, project engineering, technical direction, and direct work on projects related to natural gas transmission, industrial piping, dust collection, power generation, water treatment, and excavation. He has experience with process improvements for industrial facilities and nuclear reactor modifications.

RELEVANT EXPERIENCE

- **Mechanical Engineer; Owner's Engineer for LFG to RNG facility; Nopetro; Florida.** The scope of the project was to develop facilities to convert collected landfill gas to renewable natural gas. Tetra Tech provided services of the Owner's Engineer including reviewing design packages. Mr. Nachazel performed duties as the mechanical engineer.
- **Project Manager; Meyer and Solhawk Dairy RNG; Liberty Utilities; Wisconsin.** The scope of these projects was to build anaerobic digesters to produce renewable natural gas from cow manure. Tetra Tech provided the preliminary balance of plant design for these facilities. The preliminary design included process, mechanical, electrical, structural, and civil design. Mr. Nachazel performed duties as the mechanical engineer as well as the project manager.
- **Mechanical Engineer; Steam System Evaluation and P&IDs; CertainTeed; Norwood, MA.** The CertainTeed Norwood facility had no documentation for the steam system. Mr. Nachazel created new P&IDs of the entire system from field sketches and other drawings. He also evaluated and issued a report on the system for safety and efficiency.
- **Project Manager; Owner's Engineer for Norswiss Dairy RNG; Liberty Utilities; Wisconsin.** The scope of the project was to build anaerobic digesters to produce renewable natural gas from cow manure. Tetra Tech provided services of the Owner's Engineer including reviewing and approving the digester design package. Tetra Tech also provided foundation designs for the digesters to be installed. Mr. Nachazel performed duties as the mechanical engineer as well as the project manager.
- **Mechanical Engineer; Vapor Phase Separator Replacement; CertainTeed; North Charleston, SC.** The CertainTeed North Charleston facility had trouble with moisture bypassing their vapor phase separators and causing mechanical problems with their blowers. Mr. Nachazel investigated the system and designed new vapor phase separators to separate more liquid from the vapor stream.
- **Project Manager and Mechanical Engineer; Owner's Engineer; Waste Management; Multiple Locations, USA.** The scope of the project was to develop facilities to convert collected landfill gas to renewable natural gas. Tetra Tech provided services of the Owner's Engineer including reviewing design packages. Mr. Nachazel performed duties as the mechanical engineer as well as the project manager.

Education

B.S. Mechanical Engineering, Case Western Reserve University, 2016

Area of Expertise

Mechanical Engineering

Industrial Facilities

Natural Gas Transmission

HVAC

Renewable Natural Gas

Registrations/ Affiliations

Professional Engineer, PA, No. PE094283

Professional Engineer, LA, No. PE0047949

Professional Engineer, MA, No. 58408

American Society of Mechanical Engineers Member, 000103773115

Training/Certifications

ASHRAE HVAC Design: Level 1

Solidworks Certified Associate, 2016 No. C-Y8FDRDAHSN

First Aid CPR,2019, American Heart Association

Certified Rigging and Lifting

Office

Monroeville, PA

Years of Experience

7

Years within firm

5

Contact

nathan.nachazel@tetratech.com

- **Project Engineer / Mechanical Engineer; Pipeline Replacement Projects; TC Energy; Multiple, USA.** Multiple natural gas pipelines were replaced for various reasons. Mr. Nachazel acted as the project engineer by coordinating work, attending meetings, and documenting project status. He also performed duties of the mechanical engineer such as pipe wall thickness calculations, piping design, and flow calculations.
- **Project Engineer / Mechanical Engineer; Pipeline Exposure Projects; TC Energy; Multiple, USA.** Multiple natural gas pipelines were exposed in ditches, creeks, and other water bodies. These projects aimed to mitigate the exposures through a combination of revetment mat systems and pipeline replacements and lowerings. Mr. Nachazel acted as the project engineer by
  coordinating work, attending meetings, and documenting project status. He also performed duties of the mechanical engineer such as pipe wall thickness calculations, piping design, and flow calculations.
- **Mechanical Engineer; BulkMelter Removal Project; CertainTeed; Oxford, NC.** The scope of the project was to remove an offline sealant supply system with a new supply system integrated with the production line. The project required new sealant tanks, piping, pumps, and a new fume system. Mr. Nachazel designed the mechanical systems and performed necessary calculations.
- **Mechanical Engineer; Dust Collection and Pneumatic Conveying System; CertainTeed; Kansas City.** The pneumatic conveying system at the CertainTeed Kansas City facility transported fiberglass insulation from a flail to a bagger. Mr. Nachazel designed the pneumatic conveying system and associated dust collection system. He specified blowers, baghouses, and the ductwork system.
- **Project Engineer / Mechanical Engineer; Plano Class Change; TC Energy; Plano, IL.** A new housing development caused the TC Energy Line 301 pipeline to be placed in a new class location resulting in a pipe replacement. Mr. Nachazel acted as the project engineer by coordinating work, making site visits and documenting project status. He also performed duties of the mechanical engineer such as pipe wall thickness calculations, piping design, and flow calculations.
- **Mechanical Engineer; HVAC Design; Acid Mine Water Treatment Plants; Pennsylvania Department of Environmental Protection; Quakake Tunnel Water Treatment Plant.** Mr. Nachazel designed the HVAC system for the Quakake water treatment plant. He was responsible for ventilation and design calculations and equipment specification.
- **Engineer; RNG Due Diligence Analysis; Confidential Client.** The client was interested in purchasing multiple landfill gas facilities and contracted Tetra Tech to do a due diligence study and identify any potential liabilities. Mr. Nachazel analyzed the gas to renewable natural gas projects in difference phases of execution. He reviewed equipment specifications, design documents, lease agreements, purchase agreements, and construction schedules. A report commenting on the project status, design choices, agreements, and liabilities was delivered to the client.
- **Mechanical Engineer; Hot Oil System P&IDs; CertainTeed; Norwood, MA.** The CertainTeed Norwood facility had inadequate P&ID drawings for the hot oil system. Mr. Nachazel created new P&IDs of the entire system from field sketches and other drawings.
- **Mechanical Engineer; HVAC Design; CertainTeed; Hagerstown, MD.** The CertainTeed Hagerstown plant was interested building a new warehouse and office building inside of the warehouse. Mr. Nachazel was responsible for the heating and ventilation of the new warehouse. He also designed the HVAC system and ductwork for the new office.
- **Mechanical Engineer; Water Treatment Plant; Glenn Springs Holdings; Lower Possaic River, NJ.** The Lower Possaic River was to be dredged and the water from the dredging to be treated and used for processing and returned to the river. Mr. Nachazel was responsible for the mechanical design of the water treatment plant. He witnessed bench tests, created general arrangement, and designed the pumping and piping systems.
- **Engineer; RNG Due Diligence Analysis; Confidential Client.** The client was interested in purchasing the two facilities and contracted Tetra Tech to do a due diligence study and identify any potential liabilities. Mr. Nachazel analyzed the two landfill gas to renewable natural gas projects in difference phases of execution. He reviewed equipment specifications, design documents, lease agreements, purchase agreements, and construction schedules. A report commenting on the project status, design choices, agreements, and liabilities was delivered to the client.
- **Mechanical Engineer; HVAC Design; CertainTeed; Little Rock, AR.** The CertainTeed Little Rock plant planned to build a new locker room in the process building. Mr. Nachazel was responsible for the HVAC system design for the new locker room.

- **Engineer; RNG Permit Assessment; Confidential Client.** The client was interested in building a new RNG facility in Washington state. Tetra Tech was tasked with creating a permitting matrix for the client to begin the permitting process for the new facility. Mr. Nachazel provided guidance and context to the permitting team regarding general RNG design.
- **Mechanical Engineer; Mechanical Systems Analysis; Mucci Farms; Huron, OH.** Mr. Nachazel did a due diligence study on the mechanical systems for three greenhouses, each spanning 25 acres. These systems included boilers, CO2 capture, water storage tanks, and pumps. He determined capacity requirements and reported on redundancies.
- **Mechanical Engineer; Dust Collection System; CertainTeed; Norwood, MA.** The dust collection system at the CertainTeed Norwood granule plant was insufficient to the point that there was layered dust on the floor and personnel needed to wear respirators inside the plant. Mr. Nachazel was responsible for surveying and analyzing the existing dust collection system. He identified problem areas in the system and provided recommendations to the plant for how to fix it. These recommendations included designing for proper airflow at pickup points, fixing hoods, correcting improperly sized duct runs, and balancing of the overall system. The existing system was modeled in an analyses software using surveyed data. Using existing data and best industry practices an optimal system was modeled which the client could use to make replacements of the system.
- **Mechanical Engineer; Hot Oil Heater Replacement; CertainTeed; Wilmington, CA.** The CertainTeed Wilmington plant was not receiving enough heat from the hot oil heater to meet existing or future demand. The hot oil heater and system were analyzed to be replaced to meet demand. Mr. Nachazel was responsible for specifying the heater replacement and designing the accompanying piping system. This required heat loss and transfer calculations, sizing piping, calculating pressure drops, and selecting equipment.
- **Project Engineer / Mechanical Engineer; L-501 Replacement Project; TC Energy; Medina, OH.** Natural gas pipeline L-501 was located along a tree line and on the berm of a pond. The goal of the project was to relocate a section of 8" pipeline. Mr. Nachazel acted as the project engineer by coordinating work, making site visits and documenting project status. He also performed duties of the mechanical engineer such as pipe wall thickness calculations, piping design, and flow calculations.
- **Engineer / Construction Manager; Carbon Beds Installation Project; Amp Americas; Stevens County, MN.** Amp Americas had issues with the quality of their biogas at three farms in Stevens County, MN. Tetra Tech was hired to design a system and piping to install additional carbon beds to improve the biogas quality. Mr. Nachazel made site visits to the farms to survey the area and determine how to feasibly install the carbon beds. He also acted as the construction manager during the carbon bed foundation installation.
- **Mechanical Engineer; Fume Collection; CertainTeed; Avery, OH.** The CertainTeed Avery plant removed a faulty regenerative thermal oxidizer. The fumes handled by the regenerative thermal oxidizer had to be redirected towards a different existing thermal oxidizer. Mr. Nachazel was responsible for designing the new fume collection and transfer system. This required sizing piping, calculating pressure drops, minimizes heat loss, and selecting equipment.
- **Project Engineer / Mechanical Engineer; SR-596, SR-597, and SR-598 Pipeline Exposure; TC Energy; Vinton County, OH.** Natural gas pipelines SR-596, SR-597, and SR-598 were exposed in creeks. These projects aimed to mitigate the exposures through a combination of revetment mat systems and pipeline replacements and lowerings. Mr. Nachazel acted as the project engineer by coordinating work, attending meetings, and documenting project status. He also performed duties of the mechanical engineer such as pipe wall thickness calculations, piping design, and flow calculations.
- **Mechanical Engineer; Heat Transfer Analysis; CertainTeed; Gads Hill, MO.** The CertainTeed Gads Hill plant was interested in insulating a calciner to save on heating costs. Mr. Nachazel analyzed the system to determine the existing heat transfer rate and determine the effects of adding additional insulation.
- **Mechanical Engineer; Dust Collection System; CertainTeed; Jonesburg, MO.** The CertainTeed Jonesburg plant added a new rock crushing circuit that required a dust collection system. Mr. Nachazel was responsible for designing the dust collection system. This required sizing ductwork, calculating pressure drops, and propose an operating point for a new fan. Developing isometric, plan, and detailed drawings of new ductwork. Specifying aspects of duct fabrication and assembly such as flanges, supports, gaskets, and hoods. He also verified natural gas piping sizes based on process demands and gas velocity.

- **Project Engineer / Mechanical Engineer; EM-63 Gas Leak; TC Energy; Jackson County, WV.** Natural gas pipeline EM63 had a grade 2 leak at an old consumer tap. This project aimed to remove the tap and replace with new pipeline. Mr. Nachazel acted as the project engineer by coordinating work, making site visits and documenting project status. He also performed duties of the mechanical engineer such as pipe wall thickness calculations, piping design, and flow calculations.
- **Mechanical Engineer; Dust Collection System; CertainTeed; Gads Hill, Missouri.** The CertainTeed Gads Hill plant added a new rock crushing circuit that required a dust collection system. Mr. Nachazel was responsible for designing the dust collection system. This required sizing ductwork and arranging the system to optimize material conveying, calculate pressure drops, and propose an operating point for a new fan. Developing isometric, plan, and detailed drawings of new ductwork. Specifying aspects of duct fabrication and assembly such as flanges, supports, gaskets, and hoods.
- **Project Engineer / Mechanical Engineer; Sault Ste Marie Launcher Barrel Replacement; TC Energy; Sault Ste Marie, MI.** The GLGT 1100 line had a launcher barrel too small to load the EMAT tool. The project involved replacing the old barrel with a new barrel capable of housing the tool. The NPS 10 line has an MAOP of 1142 psig. Mr. Nachazel acted as the project engineer by coordinating work, making site visits and documenting project status. He also performed duties of a mechanical engineer such as pipe wall thickness calculations, validating piping design, and flow calculations.
- **Mechanical Engineer; Sludge Injection Project; Murray Energy; Belmont County, OH.** Mr. Nachazel designed piping system to pump 1800 gpm of coal slurry into 16 different injection bore holes. The system configuration was designed to promote efficiency in 16 different pumping scenarios. He also specified all piping, valves, and related equipment.
- **Project Engineer / Mechanical Engineer; Weaver Drip Removal; TC Energy; Lucas, OH.** Natural gas pipeline L-2150 had two plugged drips due to improper maintenance. This project aimed to replace the drips with new siphon lines. Mr. Nachazel acted as the project engineer by coordinating work, making site visits and documenting project status. He also performed duties of a mechanical engineer such as pipe wall thickness calculations, validating piping design, and flow calculations.
- **Project Engineer / Mechanical Engineer; Smith Twp and White Station Plastic Replacement; TC Energy; Belmont County, OH.** The V-146, V-147, and V-148 lines were steel lines that carry natural gas in Belmont County, OH with an MAOP of 25 psig. This project included replacing these lines with 4” HDPE pipe. Mr. Nachazel acted as the project engineer by coordinating work, making site visits and documenting project status. He also performed duties of a mechanical engineer such as pipe wall thickness calculations, validating piping design, and flow calculations.
- **Project Engineer / Mechanical Engineer; Brinker Storage Retirement and Replacement; TC Energy; Leetonia, OH.** The Brinker storage field contains many natural gas lines. Among them are lines 39066, 9090, and 19052 which all have an MAOP 300 psig. This project meant to retire and/or replace sections of these lines. Mr. Nachazel acted as the project engineer by coordinating work, making site visits and documenting project status. He also performed duties of a mechanical engineer such as pipe wall thickness calculations, validating piping design, and flow calculations.
- **Project Engineer / Mechanical Engineer; St. Clair River Valve Site Pipe Settlement Remediation; TC Energy; East China Township, MI.** The South St. Clair River Valve Site is a pig-able valve site with two NPS 24 lines and a NPS 36 line with an MAOP of 974 psig. This project meant to mitigate pipe stress due to settlement of the NPS 36 line by redesigning the piping configuration with more flexible branch connections and remove the current hot tap crossovers. Mr. Nachazel acted as the project engineer by coordinating work, making site visits and documenting project status. He also performed duties of a mechanical engineer such as pipe wall thickness calculations, validating piping design, and flow calculations.
- **Project Engineer / Mechanical Engineer; Miter Bend and Heavy Wall Tee Replacement; TC Energy; Henrico County, VA.** The VM 107 natural gas pipeline is an NPS 18 line with a 639 psi MAOP. One miter bend and one heavy wall tee that caused overspeed were to be replaced with standard extruded fittings. Mr. Nachazel acted as the project engineer by coordinating work and documenting project status. He also performed duties of a mechanical engineer such as pipe wall thickness calculations, validating piping design, and flow calculations.

- **Mechanical Engineer; Mine Shaft Integrity Study; Rio Tinto Group; Salt Lake City, UT.** The Bingham Canyon Mine is an open-pit mining operation extracting a large porphyry copper deposit. Mr. Nachazel used Finite Element Analysis tools to study the effects of rock crusher induced ground vibrations on an existing mine shaft. He performed static and modal analyses to determine the deflection, stress, and natural frequencies of the shaft to verify its structural integrity.
- **Mechanical Engineer; Gas Line Replacement; TransCanada; Bemidji, Minnesota.** Due to new homes being built in Bemidji, Minnesota, over 5,000 feet of gas lines needed to be replaced with a higher class line to account for the added demand. Standard 36" carbon steel pipe was replaced with Schedule 30 carbon steel pipe in three locations. Mr. Nachazel reviewed engineering drawings for accuracy and compliance. The lines were to be designed to a design criterion of 973 psig, temperature range of 20 F – 120F, and a design factor of 0.50 per CFR 49, Part 192, Subpart C, Pipe Design and ASME B31.8 Gas Transmission and Distribution Systems.
- **Mechanical Engineer; Acid Mine Water Treatment Plants; Pennsylvania Department of Environmental Protection; Carbon and Indiana Counties, PA.** Mr. Nachazel was the mechanical engineer responsible for determining pumping requirements and specifying all pumps based on flow rate, pressure requirements, and water quality for the Blacklick (7.2 MGD) and the Quakake Tunnel (14.4 MGD) acid mine water treatment plants. He also calculated other process flow rates, tank size needs, and related equipment. He routinely reviewed Process Flow Diagrams (PFD) & Piping and Instrument Diagrams (P&ID) drawings for accuracy and viability. He developed and maintained equipment data sheets that correlated with the P&ID drawings, process calculations, and vendor proposals. He wrote specifications for equipment, materials, delivery, installation, tie-in, testing and commissioning of various processing equipment including pumps, reaction tanks, and sludge holding tanks. Specifications included information stemming from data sheets Mr. Nachazel created for equipment such as pumps, agitators, and reaction tanks.
- **Design Engineer; Hydraulic and Pneumatic Systems; Harrison Western; North Dakota.** The Long Base Neutrino Research Facility will be built in an old mine in North Dakota. Mr. Nachazel designed the hydraulic and pneumatic systems relating to the ore bin. This included sizing an air compressor, dryer, and accumulator tank based on air requirements. Air requirements included material agitation tools as well as other ancillary tools. He also designed hydraulically actuated gates for the ore bin openings.
- **Design Engineer; Dust Collection System; Harrison Western; North Dakota.** The Long Base Neutrino Research Facility will be built in an old mine in North Dakota. Part of the scope of the construction is excavating additional material out of the mine. This requires the use of the mine's dust collector that has not been used for over 15 years. Mr. Nachazel was responsible for designing new duct work for the system, evaluating the system's fan and filter, and sizing a new air compressor, dryer, and accumulation tank for cleaning the filter. Designing new ductwork required determining airflow requirements based on industry experience, technical references, geometric requirements of hoods and ductwork, and air velocity. Determining whether the fan would be adequate required plotting the new system curve on the old performance curve. Developing isometric, plan, and detailed drawings of new ductwork. Specifying aspects of duct fabrication and assembly such as flanges, supports, gaskets, and hoods.
- **Engineer, Technical Director; Nuclear Reactor Modifications; Westinghouse Electric Company; Nationwide.** As described in more detail below, nuclear reactor modifications require specialized tooling and training. Mr. Nachazel developed new and modified old tooling to apply towards modification jobs. He provided engineering support to project managers by doing dimensional studies to fit tooling in tight spaces, creating and verifying drawings, and innovating new tooling and processes.

Howard Velasquez

Sr. Civil / Structural Engineer

EXPERIENCE SUMMARY

Mr. Velasquez has 21+ years of broad experience in civil/structural engineering performing greenfield & brownfield Oil and gas, power generation, and mining projects. He also posses on-shore and off-shore engineering experience as well as comprehensive understanding of civil and structural work related to large industrial mining and oil and gas facilities.

Mr. Velasquez brings broad experience as a structural engineer in analysis and design process as well as for field construction supervision phase. He has overseas experience as an expatriate in major EPC projects including FEED and Detailed Engineering and PMC technical assistance contracts, including Quality Assurance and integrity structural inspections. He is bilingual in English and Spanish and is MSHA Surface Mining 5000-23 certified.

Mr. Velasquez has familiarity with applicable codes and standards (ACI, AISC, ASTM, ASME, ANSI, AWS, PIP, API, etc.) and the ability to make, read, and understand complex civil, structural, mechanical, and piping engineering 2D & 3D design plans. He possesses years of experience with SAP-2000, STAAD Pro, STAAD Foundations, RAM & RFEM. He has been AutoCAD designer since the 90s and adheres to QAQC/document control best practices philosophy.

RELEVANT EXPERIENCE

Tetra Tech; Senior Structural Civil Engineer; 2018 – Present
Heavy Mining / Industrial Brownfield Structural Integrity Inspections, repair engineering, and design of strengthening for existing steel members. +100 projects and Inspections executed 2018 – 2023.

Major Clients

- Rio Tinto Kennecott (RTKC), Salt Lake City, UT
- Nevada Gold Mine (NGM), Elko, NV
- Montana Resources (MR), Butte, MT
- Simplot, UT
- Genesis Alkali, WY

Major Recent Projects Executed for RTKC

- Concentrator Acid Alley Drop Box AsBuilt
- Concentrator Ball & Sag Mill Crane Platform Redesign
- Concentrator Flotation Rigging Platform Analysis
- Concentrator Flotation Roof fall Protection Engineering Design
- Concentrator Filter Feed Tanks (Moly Tanks) Mixer Platform Analysis.
- Concentrator Filter Feed Tanks (Moly Tanks) and Foundation.
- Concentrator Plant Structural Integrity Inspections

Education

B.S. Civil Engineering, Universidad de Oriente (Venezuela), 2002

Master's Degree in Quality Management, Universidad Camilo Jose Cela (Spain), 2013

Area of Expertise

Civil Engineering

Structural Engineering

Registrations/ Affiliations

Member of American Society of Civil Engineers (ASCE)

Member of Structural Engineering Institute (SEI)

Member of American Institute of Steel Construction (AISC)

Member of American Welding Society (AWS)

Training/Certifications

STAAD PRO (Bentley)

SAP-2000 (CSI)

SAFE (CSI)

RAM (Bentley)

AutoCAD 2D/3D

Inventor (for stress analysis)

RFEM

Navisworks

Office

Salt Lake City, UT

Years of Experience

21

Years within firm

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Contact

Howard.Velasquez@tetratech.com

- Concentrator Grind Bldg Basement Sump Engineering Design
- Smelter Material Handling & Feed Drying Engineering Design
- Smelter Refining Furnace Trunnion Replacement Engineering Design
- Smelter Anodes DC-250 Asbuilts
- Smelter Acid Plant HHEX Converter Foundation FS
- Smelter Granulation Chutes Engineering Design
- Smelter Acid Plant Lifting Points Evaluation
- Smelter Granulation Clarifier Shoring
- Smelter Structural Integrity Inspections
- Refinery Tank House Cooling Tower Replacement Engineering Design
- Refinery Fire Pump House Engineering Design
- Refinery MPC Monorail Stacker Engineering Design
- Refinery Shutdown Coordinator
- Refinery and Smelter Post-Earthquake Task Force Structural Inspections
- Refinery Precious Metal Plant, Structural Integrity Inspections
- Mine 5390 Pump Station & Pipeline Relocation, Bingham Copper Mine

Major Recent Projects Executed for NGM

- Cortez Mine Complex Structural Integrity Inspections
- Cortez Mine Complex Crusher Building Repair Engineering Design
- Cortez Mine Complex Area 30 Leaching Facility. Barren Solution Pond Structural Engineering Design
- Cortez Mine Complex. Underground (CHUG) Structural Integrity Inspections
- Goldstrike Mine Complex Structural Integrity Inspections
- Gold Quary Mine Complex Structural Integrity Inspections
- TS Power Plant Structural Integrity Inspections

GMS Engineering Consulting; Senior Structural Engineer and Designer; 2016 – 2018

Performed analyses and designs for Oil and gas facilities, including:

- Storm/sewage water effluent systems, retention basin (storage dikes)
- Site work, industrial road design, industrial building design
- Steel structures, Pipe racks, pipe bridges, pipe supports
- Concrete structures, footings, sleepers, pump bases
- Horizontal and vertical vessel bases, API-650 Tank Ring foundation, gas compressor foundations
- Delay Coke Unites Structure, FCC Unit Structure, Crude Oil refinery tower bases
- Catalyst Hoppers CIP/Micropyles, Reactor and Regenerator Massive Concrete Foundations

Worleyparsons; Senior Civil Structural Engineer; 2012 – 2016

Civil/Structural Department Leader for PMC overseas major projects, mainly performing analyses and designs for Oil and gas facilities, including the following projects:

- Bajo Alto LNG Plant and Offshore platform. Onshore LNG plant foundations remediation (geotechnical, hydrogeological, and seismic assessment). Responsible for the civil, geotechnical, and structural portion of the PMC contract on the Bajo Alto LNG plant foundations remediation brownfield project in southern Ecuador.
- Monteverde LPG marine dock and plant Turnover. Responsible for civil, geotechnical, and structural parts for PMC Technical Assistance contract Monteverde LPG plant and marine dock turnover.
- Esmeraldas Refinery - Revamp Project. Responsible for civil, geotechnical, and structural PMC (Construction Specialist and QA/QC) contract on the Esmeraldas 110.000 bpd refinery revamp. Reconstruction and upgrading of FCC, Merox-Amine, and Sour Water Stripping units brownfield project.

ProEnergy Services; Senior Civil Structural Engineer; 2010 – 2012

Civil Structural Department Leader for Thermoelectric Power Plants EPC Projects. Expertise as Field Engineer for Gas-Turbines Center Line and Balance of Plant for Rolls-Royce, Pratt & Whitney, and General Electric equipment. Proven proficiency in performing field fast-track designs as well as construction engineering for gas turbines and generators foundations and BOP facilities. Design of high voltage distribution yard frame structures.

Major Projects Executed

- 232MW (ISO) Thermoelectric Plant. Rolls-Royce Gas turbine generators
- 100MW (ISO) Thermoelectric Plant. Pratt & Whitney Gas turbine generators
- 140MW (ISO) Thermoelectric Plant. GE Gas turbine generators
- 181 MW (ISO) Thermoelectric Plant. GE Gas turbine generators
- 300 MW (ISO) Thermoelectric Plant. GE Gas turbine generators

Previous Engineering and Technical Experience

- DTCOM, Civil Structural Engineer, 2008 – 2010
- Jantesa, Civil Structural Engineer, 2005 – 2008
- Royal Modulars Canada, Civil Engineer, 2002 – 2005
- Inelectra, Structural Designer, 2001 – 2002
- Fundaudo, Civil Designer, 1998 – 2000

OTHER INFORMATION

- Environmental Audit Specialist - ISO 14001, Bureau Veritas. Spain (2013)
- QA/QC Engineering Audit Specialist – ISO 9001, Bureau Veritas. Spain (2013)
- S&H Audit Specialist – OHSAS 18001, Bureau Veritas. Spain (2013)
- University of Utah Zions Evening English Second Language (ESL) Program, Fortieth Cohort, Utah (2021)
- AISC Continuing Education Night School 19, 20 & 23, Utah (2016 – 2020)
- ASCE Continuing Education trainings and certifications, Utah (2016 – 2020)
- PLAXIS Standard Course on Computational Geotechnics, New York City (2017)
- WorleyParsons trainings and Certificates of Completion, Houston (2012 – 2016).
- Two scientific publications:
  - Los Escorpiones Sinkhole, Turimiquire Ridge, Sotillo County, State of Anzoategui, Venezuela. This paper describes a sinkhole within a cavern system characterized by vertical development. Horizontal development of 411 m, and a height difference of 261.15 m. (2007)
  - New Description and Topography of The Chimana Grande Cave, Mochima National Park, State of Anzoategui, Venezuela (2004).

TETRA TECH

Michael Schon

Senior Designer

EXPERIENCE SUMMARY

Mr. Schon is a Senior Designer with over 25 years of experience. He has previous experience in structural and civil design, calculations, preparation of construction documents (including roadway, pipeline, foundation plans, framing plans, details and specifications) and construction administration for buildings, civil and structural elements.

RELEVANT EXPERIENCE

Tetra Tech CEA, LLC

- Senior Designer
  - Responsible for coordinating all design items, and providing three-dimensional layout and design, piping, isometric, and P&ID's. Coordination with owner project team and review of the final project.
  - Performs 3D modeling of piping, civil, and structural for detailed design of gas processing plant additions, crude oil multi-well pad sites, and other industrial projects.
  - Structural design of foundations, piping racks and equipment platforms
  - Civil design of roadways, pipelines, storm water, storm water quality, erosion control, retaining structures, drainage studies, surveying and construction staking.
- Enerplus Resources, Fort Berthold, ND
  - 3D modeling and detailing of pipe racks and platforms
  - Structural design
- Gilt Edge Mine Superfund Reclaimation, Galena, SD
  - Gathering survey data utilizing drone and 3d processing software
  - Civil /surveying coordination and Final Documentation
- Anadarko Petroleum Corporation, Rock Springs, WY
  - 3D modeling and detailing of foundations and pipe rack
  - Civil design and Coordination of Truck traffic flow paths
- Denbury Resources, Big Piney, WY
  - 3D modeling and detailing of foundations and platforms
- Whiting Petroleum, Belfield, ND
  - Detailing of new mezzanine within existing facility

Hermanson Egge Engineering, Inc.

- Project Manager
  - Responsible for coordination between contractor, design team, and owners' representative.
  - Provided daily support to the contractor so project schedule was maintained, and contract documents were fulfilled.

Education

University of Colorado, 1993

Associate of Applied Science in Mechanical Drafting (AASMD), Denver Institute of Technology, 1993

Area of Expertise

Project Management

Civil Design

Structural Design

Piping Design

Automated Production of Shop Drawings/Fabrication Drawings

3D Modelling

Registrations/ Affiliations

Insert text

Training/Certifications

Insert text

Office

Rapid City, SD

Years of Experience

25

Years within firm

4

Contact

mike.schon@tetratech.com

  - Coordinated shop drawing submittals and reviews along with providing support to the contractor to expedite items that are long lead items.
  - Industrial design for large manufacturing plants.
  - Responsible for coordinating all design items, and providing three-dimensional layout and design, piping, isometric, and P&ID's. Coordination with owner project team and review of the final project.

- Structural/Industrial/Civil Designer
  - Structural design for building, industrial and site projects.
  - Responsible for structural design, calculations, preparation of construction documents (including foundation plans, framing plans, details and specifications) and construction administration for buildings, and structural elements.
  - Structures designed were constructed of concrete, structural steel, wood and masonry. During the design phase, I worked closely with clients including architects, general contractors and owners.
  - During construction phase, I reviewed shop drawings, answered contractor questions and performed construction observations for the purpose of verifying compliance with the contract documents and design intent.
  - Responsible for all infrastructure layout and design for construction documents (including roadways, drainage, water, sewer, traffic analysis, sedimentation and erosion control).
  - Provided designs for several 80 to 160 million gallons per year ethanol plants, 750-unit man-camp, and several large subdivisions.
- Sutherland Ethanol Plant, Sutherland, NE.
  - Ethanol plant located in Sutherland Nebraska was an 80 million gallon / per expansion to an existing 28 million gallon / year facility.
  - Expansion had several issues that needed to be addressed during the design phase. The first issue was the delivery of corn to the facility which entailed over 130 trucks per day unloading corn into the 12,000,000-bushel storage facility.
  - Entire site was only 40 acres and only had two entrances as onto the main highway.
  - Facility also used trains for delivery of corn to the facility, coupled with the delivery of corn that would be processed and ethanol facility also had to maintain traffic to the existing 28,000,000 gallons per year facility, wet distillers grains and ethanol were a byproduct of the manufacturing process.
  - Products required over 13 trucks and 28 railcars on the site as well.
  - Additional trucks were required to service the existing 28,000,000 gallon per year facility.
  - Responsible for civil design for the facility, including storm drainage grading roadways railroad and design plans.
  - Responsible for 3-D modeling, piping, structural design and layout of the new 80,000,000 gallon per year facility.
- Stark County Mancamp North, Dickinson, ND.
  - Man camp located approximately 10 miles north of Dickinson North Dakota and required an on-site sanitary sewage treatment facility.
  - Facility would house approximately 1000 individuals in the module-based system, and a large portion of the facility was trailer homes and mobile parking.
  - The design of this facility required coordination with US sanitary sewer treatment manufacturer and grading on a site that was relatively steep compared to the final design that was required.
  - This facility was also constructed within a four-month timeframe to beat winter conditions the tight timeline required that we provided this surveying and civil design and construction management for this project.
- Postville Ethanol Plant, Postville, IA.

  - 120,000,000 gallon per year facility located approximately 25 miles northeast of Postville Iowa.
  - Existing property where the facility was to be constructed had system 5% grade proceeded from the West side of the property to the East side of the property where storm water discharged onto existing registered wetlands.
- Bighorn Basin Alternative Fuels, Greybull, WY.
- North Country Ethanol, Rosholt, SD.
- Goodland Ethanol, Goodland, KS.
- Pete Lien & Sons, Rapid City, SD.
  - Facility located on the Northwest side of Rapid City.
  - Project entailed the design of a new batch plant located over an existing lime refuse site.
  - Facility required the design of not only the civil but a 3-D design was also provided to the owner for review with several owner groups that were involved in the decision-making process.
  - 3-D layout was instrumental in providing quick and accurate decisions by the owner groups prior to construction beginning on the project.
- BPM, Halliburton, Colony, WY.
  - Facility was a series of projects that were designed, constructed and estimated over a six-year period at the facility. Some of the projects that were worked on included the following:
  - New augers, weigh belt and aspirator system for an existing granular system. This system was located in an extremely and began approximately 35 feet above the existing facilities structure. It also included the design of a helical pier system to support the tower structure.
  - New warehouse, including programming layout and design of a new warehouse that would provide the facility with adequate space for the current and also future expansion that was required.
  - P&ID's of the existing system were created to provide the owner with a comprehensive layout of the existing facility. These would also provide the owner with not only a visual tool but also a series of documents that would allow them to identify issues within the existing facility.
  - A new maintenance facility was also laid out with a shop mezzanine to provide additional space for fabrication and repair of on-site facility equipment.
- BPM, Halliburton, Lovell, WY.
  - Facility was located at Lovell, Wyoming.
  - Issue was identified with the existing weigh belt loadout system to railcars. A lack of efficiency made loading railcars and extensive undertaking.
  - This project entailed not only the design of a new bin, but extensive testing and research into the issue.
  - When the project was completed the weigh belt was loading railcars at 65 tons per hour.
- Baroid Performance Products, Halliburton, Dunphy, NV.
  - Project was located approximately 35 miles to the east of Dunphy, Nevada.
  - Was an existing mining site that processed barite in its raw crushed form.
  - Civil design structural design 3-D layout and material handling design were provided for this project.
  - The 3-D layout allowed the owner and owner groups to make decisions based upon the expedited timeline the design fabrication and installation of this project required less than eight months from the beginning to the end.

Davis Engineering & Land Surveying, Inc.

- Project Manager
  - Coordination between contractor, design team, and owners representative.
  - Provided daily support to the contractor so project schedule was maintained and contract documents were fulfilled.

  - Coordinated shop drawing submittals and reviews along with providing support to the contractor to expedite items that are long lead items.
- Civil Designer
  - Civil design.
  - Responsible for all designs for infrastructure layout and design for construction documents including roadways, drainage, water, sewer, traffic analysis and erosion control.
  - Surveying Coordination.
  - Responsible for coordination of 10 survey crews.
  - Construction staking
- Scenic Valley Subdivision, Rapid City, SD.
- Piedmont Valley Golf Course and Subdivision, Piedmont, SD.
- Evans Heights Subdivision, Rockerville, SD.
- Strathavon Subdivision, Rockerville, SD.
- Blackhills National Forest, Blackhills, SD.
- Taco Bell Corporation, Rapid City, SD.
- Moyle Petroleum, Rapid City, SD.
- Zandstra Construction, Rapid City, SD.
- South Dakota Cement Plant, Rapid City, SD.
- Hills Materials and Pete Lien & Sons, Rapid City, SD.
- Ellsworth Air Force Base, Box Elder, SD
- Pineridge Indian Reservation, Pine Ridge, SD
- US Department of Agriculture, Rapid City, SD
- South Dakota Highway Department, Rapid City, SD

FORMS

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

Rangesh Srinivasan
(Name, Title)
Rangesh Srinivasan - Project Manager
(Printed Name and Title)
1500 CityWest Boulevard, Houston TX 77042
(Address)
(513) 496-6362
(Phone Number) / (Fax Number)
rangesh.srinivasan@tetratech.com
(Email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that: I have reviewed this Solicitation/Contract in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation/Contract for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration..

Tetra Tech
(Company)

(Authorized Signature) (Representative Name, Title)
Jacquelyn Brody - Operations Manager
(Printed Name and Title of Authorized Representative) (Date)
05/06/2024
(Date)
412-921-8640
(Phone Number) (Fax Number)
jacquie.brody@tetratech.com
(Email Address)

STATE OF WEST VIRGINIA

PURCHASING AFFIDAVIT

CONSTRUCTION CONTRACTS: Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

ALL CONTRACTS: Under W. Va. Code §15A-3-14, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code* §61-5-3) that: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Tetra Tech

Authorized Signature: _____ Date: 05/06/2024

State of Pennsylvania

County of Allegheny, ~~to-wit:~~

Taken, subscribed, and sworn to before me this 6 day of May, 2024.

My Commission expires February 15, 2028.

AFFIX SEAL HERE

NOTARY PUBLIC _____

Commonwealth of Pennsylvania - Notary Seal
Rachel Gerster, Notary Public
Allegheny County
My commission expires February 15, 2028
Commission number 1440930
Member, Pennsylvania Association of Notaries

WV-73
Approved / July 7, 2017

State of West Virginia
DRUG FREE WORKPLACE CONFORMANCE AFFIDAVIT
***West Virginia Code* §21-1D-5**

STATE OF ~~WEST VIRGINIA,~~ Pennsylvania

COUNTY OF Allegheny, **~~TO-WIT:~~**

I, Jacquelyn Brody, after being first duly sworn, depose and state as follows:

1. I am an employee of Tetra Tech; and,
(Company Name)

2. I do hereby attest that Tetra Tech
(Company Name)

maintains a written plan for a drug-free workplace policy and that such plan and policy are in compliance with ***West Virginia Code*** §21-1D.

The above statements are sworn to under the penalty of perjury.

Printed Name: Jacquelyn Brody

Signature: [signature]

Title: Operations Manager

Company Name: Tetra Tech

Date: 05/06/2024

Taken, subscribed and sworn to before me this 6 day of May, 2024.

By Commission expires February 15, 2028

(Seal)

[signature]
(Notary Public)

Commonwealth of Pennsylvania - Notary Seal
Rachel Gerster, Notary Public
Allegheny County
My commission expires February 15, 2028
Commission number 1440930
Member, Pennsylvania Association of Notaries

Rev. July 7, 2017

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.:

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

[x] Addendum No. 1	[ ] Addendum No. 6
[ ] Addendum No. 2	[ ] Addendum No. 7
[ ] Addendum No. 3	[ ] Addendum No. 8
[ ] Addendum No. 4	[ ] Addendum No. 9
[ ] Addendum No. 5	[ ] Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Tetra Tech, Inc

Company

Authorized Signature

05/08/2024

Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.