JEFF PREVATT

Deputy Director, Pima County RWRD

PROFILE

25 years of experience implementing research, innovation and process design improvements for improving wastewater treatment and utility operations.

Extensive background in operations and maintenance with exceptional analytical problem solving skills.

Primary investigator on multiple research projects including WRF, NSF, ACOE and DOE projects.

Chairperson for Water Environment Federation's RNG Task Force

CONTACT

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RECENT ACCOMPLISHMENTS

- 1st Owner Operated RNG Facility in
- AZ 1st NuReSys installation in America
- 1st DPR pilot project in AZ
- Creator of the UofA's WEST Center for utility collaborated research & innovation

EDUCATION

University of Arizona
B.S. Microbiology & Immunology, 1991
M.S. Analytical Chemistry, 2000
Ph.D. Analytical Chemistry, 2002

WORK EXPERIENCE

Pima County RWRD – Deputy Director Treatment, Research & Innovation
2018–Present
Responsible for oversight of Treatment Division consisting of seven wastewater reclamation facilities including operations, maintenance, SCADA, purchasing and warehousing. Leads all research related activities for the department.

Pima County RWRD – Compliance, Research & Innovation Manager
2010–2018
Leads all research and compliance related activities for the department including permitting, laboratories, pretreatment and biosolids.
Piloting & implementation of new technologies for process improvement & liaison for university research collaborations.
Creator of the highly acclaimed UofA WEST Center.

S.I. Photonics, Inc. – Owner
2003–Present
Technical engineering & project management of the manufacture of high-performance spectroscopy equipment.

RESEARCH & INNOVATION PROJECTS

- Disinfection Byproduct Abatement Struvite mitigation
- Emerging contaminants Direct potable reuse
- Anammox pilot demonstration of MBBR and Hybrid IFAS Anitamox
- Microplastics analytical method development and transport throughout the wastewater treatment process
- PFAS in biosolids and land application sites
- Solar drying of biosolids
- Biogas to RNG upgrading

EDUCATION
Doctor of Philosophy, Civil & Environmental Engineering, University of California Davis, 2009

Master of Science, Environmental Engineering, University of Massachusetts, 2002

Bachelor of Science, Civil Engineering, Virginia Polytechnic Institute and State University, 1999

REGISTRATION
Professional Engineer, Civil, California No. C-77787, 2011

CERTIFICATIONS
Institute for Sustainable Infrastructure (ISI) Envision Sustainability Professional

HDR TENURE
13 Years

INDUSTRY TENURE
13 Years

Michael W. Falk, Jr., PhD, PE (CA)

Process

Mike has more than 13 years of water and wastewater engineering experience, with specialized expertise in nutrient removal process design, nutrient regulations, and energy optimization at wastewater treatment facilities. His experience is exceptionally broad with background on master planning, nutrient regulations, process design, energy audits and optimization, plant wide modeling, emerging technologies evaluation, and developing strategies for meeting low level nutrient discharge permits.

SELECT RELEVANT EXPERIENCE

Dublin San Ramon Services District, Alum Addition, *Dublin, California*
Mike is Principal-in-Charge during preliminary design, final design, bidding, and construction phase services for the addition of alum to the facultative sludge lagoon supernatant return flow, which was known to have high phosphate concentration. This improvement will allow the wastewater treatment plant secondary process to operate in anaerobic selector mode and improved the capacity of the secondary clarification process.

Dublin San Ramon Services District, Succession Planning, *Dublin, California*
Mike is shadowing the District plant superintendent (Levi Fuller) to develop unit process fact sheet for junior District staff.

Program Management

Advanced Wastewater Treatment Program Management Services | Regional San, Elk Grove, California
Provided program management services to assist the district with compliance of their new waste discharge requirements for the 181 mgd Sacramento Regional Wastewater Treatment Plant by December 2020. Provided sidestream evaluation, bench-scale testing, and basis of design report. Led the preparation of the facility plan for the entire program, which include purpose and objectives of facilities plan, regulatory/permit requirements, flows and loads for design, description of existing facilities, overview of the advanced wastewater treatment plant (description, process flow diagram, and site layouts), liquid stream treatment process sizing and descriptions, solid stream treatment process descriptions and modifications required, odor control and air emissions, traffic and circulation, schedule, estimated construction cost, and implementation plan. The $2 billion program includes road improvements, building location, site preparation, main switchgear expansion, landfill clean closure, biological nutrient removal, carbonaceous oxidation tank conversion, flow equalization basin, filter influent pumping station, filtration complex, disinfection system, return activated sludge pumping, primary effluent pumping station, sidestream treatment, and facility decommissioning. Prepared the mass balance for the entire plant. Provided pilot testing support and special technical studies. Pilot support included performing technical review of the experimental design for filter loading and chemical dosing optimization. Special technical studies included chemical optimization for phosphorus removal on jar test studies upstream of solids separation.

San Luis Obispo Program Management for Water Reclamation Facility Upgrade | City of San Luis Obispo, California
Provided program management services for upgrades to the city's 5.1 mgd dry weather (22 mgd wet weather) water reclamation facility. Upgrades are needed to meet discharge limits, replace aged facilities, and meet General Plan buildout. The revised discharge limits require the city to remove nutrients and disinfection by-products before discharging water to San Luis Obispo Creek. Responsible for preparing a waste characterization study, performing a regulatory compliance study, performing a capacity consideration study, providing infrastructure planning, preparing a master plan, and (providing support for review of the system-wide conceptual alternatives study, site planning study, and energy efficiency and renewable generation study. Support during the review and negotiation of the city’s draft NPDES permit was provided, which included providing written comments for the city’s use during negotiation, providing recommendations regarding permit strategies (e.g., effluent averaging periods) and assumptions for potential future changes (e.g., blending), and identifying other limits (e.g., micro constituents, N-nitrosodimethylamine [NDMA], pyrethroid, etc.) that may be important for consideration. NPDES permit requirements and other applicable permit requirements (air emissions, etc.) were summarized in a technical memorandum. The capacity consideration study identified the water reclamation facility capacity requirements, and included an analysis of future recycled water demands and reclamation capacity needs, as well as flow equalization capacity needs. Capacity considerations included flow management and equalization considerations (dry weather and peak wet weather) for treatment management and energy demand optimization, liquid treatment to meet the regulatory requirements and resource recovery goals, and solids handling and resource recovery options. Infrastructure planning included development of an onsite stormwater management plan that allows site drainage and landscape to follow the principles of low-impact development features while providing flood protection. Low-impact development techniques that were applied included vegetated swales, buffers, and strips, permeable pavers, rooftop gardens, rain gardens, and/or bio-retention. A hydrologic analysis was performed to evaluate drainage area, impervious area, soil conditions, precipitation, land use, and headworks to develop peak discharges. Developed a calibrated mass balance model (Envision) of the wastewater treatment plant, created a hydraulic model using Visual Hydraulics to estimate the plant hydraulic profile and energy grade line for the liquid stream, and evaluated treatment process alternatives to optimize life-cycle cost and supporting features of the new treatment facilities to achieve the city’s objectives. Process alternatives were developed and evaluated for primary, secondary, and tertiary treatment. The process alternatives included preliminary treatment, primary treatment, secondary treatment, filtration, disinfection, solids thickening, solids dewatering, gas management, and odor control systems. Served as the

technical lead that resulted in a >$100 million plant upgrade/expansion to a membrane bioreactor (MBR) and ultraviolet (UV) disinfection technologies for meeting NPDES requirements (nitrification/denitrification and THM limits) and to satisfy long-term growth projections. As the technical lead, led multiple client workshops that focused on technology alternatives evaluations, prioritizing and weighting parameters for triple bottom line analysis, and quantified facilities needs and the corresponding costs. Towards the end of planning, served as the project manager on a two-month long pilot that evaluated the viability of a high rate BOD removal process (High Rate A/B) as a means to reduce the downstream biological nutrient removal process. The piloting effort was necessary to inform the recommended technology in the facility plan. Beyond guiding the city through technology alternatives, served as a technical advisor for permitting support, operations support, and a reviewer on the designer's sampling plan and BioWin modeling calibration and analysis. Evaluated five different recycled water options for San Luis Obispo treated water: (1) Title 22 for Cal Poly; (2) Title 22 for wineries in the Edna Valley; (3) Indirect Potable Reuse (seasonal groundwater augmentation); (4) Indirect Potable Reuse (surface water augmentation); and (5) Direct Potable Reuse (provide source water to the drinking water plant). The overall project goals were to identify the best use of this valuable resource both daily and seasonally. The analysis considered water demands (both daily and seasonally), treatment technology trains, and cost.

Wastewater Treatment Plant Master Plan Program Management Services (CIP 3001) | Napa Sanitation District, Napa, California
Provided program management assistance to assist the district with the management and execution of the Wastewater Treatment Plant Master Plan prepared by others for the Soscol Water Recycling Facility, as well as the development of an affordable, cost-effective capital improvement program (CIP) that maximizes the use of existing facilities. Served as an extension of district staff throughout the duration of the project. Helped directed and managed project activities and the work being executed by the district's master plan consultants. Assisted the district in presenting findings and recommendations, as well as obtaining feedback/direction from the district's board of directors. Provided technical review and guide for stress testing of filters. This plant has ponds upstream of the filters.

Wastewater Treatment Plant Master Plan Program Management | Napa Sanitation District, Napa, California
Provided program management assistance by serving as an extension of district staff during preparation of the wastewater treatment plant master plan, which included commenting and finalizing the optimization and stress testing scope of work developed by the district's consultants.

Wastewater Program Management | City and County of Honolulu, Honolulu, Hawaii
Provided as-needed wastewater program management for the City and County of Honolulu's $6 billion court-ordered compliance program, which required Honolulu to eliminate sanitary sewer overflows and upgrade wastewater facilities to full secondary treatment standards. Honolulu handles over 100 mgd of wastewater through a network of 2,100 miles of pipelines (forcemains and gravity sewer system), 70 pumping stations, and nine wastewater treatment plants. Assisted with capacity analysis and stress testing of the secondary clarifiers and filters for the Kihei Wastewater Reclamation Facility in Maui, Hawaii. Provided technical review and guide for unit capacity analysis of secondary clarifiers and filters. Provided technical review for stress testing of secondary clarifiers and filters.

Energy/Sustainability

AB 32 Compliance and Energy Issues | Central Contra Costa Sanitary District, Martinez, California
Assisted the district with AB 32 compliance by providing energy optimization suggestions for current wastewater treatment plant operations. Prepared a summary table that listed: (1) potential energy efficiency or greenhouse gas (GHG) measures that the district could implement; (2) a simple rating of the district's relative energy and GHG savings (high, medium, and low); (3) relative implementation cost (high, medium, and low); (4) relative simple payback (high, medium, and low); and (5) impact on operation (high, medium, or low).

Renewable Energy Using Chicken Waste | OHR Biostar, LLC, Sonoma County, California
Designed a renewable energy project that converts poultry waste from multiple egg production operations in Sonoma County. Anaerobic digestion technology is used to convert a combined 53,000 tons/year of manure and mortality to natural gas energy equivalent of 250,000 million cubic feet/year and 16,000 tons/year of dry granulated sludge. Process components included feedstock receiving and treatment, anaerobic digesters, digester gas scrubbing using either a 300 kW fuel cell or discharge into Pacific Gas & Electric (PG&E) natural gas pipeline, centrifuge dewatering, and biosolids drying and bagging. Odor control scrubbers and emergency flare system were also designed. Dried product will be marketed as a commercial fertilizer. Process liquid will be either further treated to reduce ammonia or discharged to a municipal wastewater system. This project is part of a sustainability program for the Sonoma County Water Agency to make the agency energy neutral.

Fuel Cell Study | Turlock Irrigation District, Turlock, California
The district owns a 1.2 MW fuel cell located at the City of Turlock's wastewater treatment plant that operates on digester gas. This fuel cell unit has not worked well, and components have been sent back to FuelCell Energy in Connecticut several times. Conducted a study to evaluate digester gas production issues at the city's wastewater treatment plant, and assisted the district with troubleshooting the fuel cell design and operation.

Easterly Wastewater Treatment Plant Greenhouse Gas (GHG) Inventory | City of Vacaville, California
Prepared an analysis on the GHG inventory for the Easterly Wastewater Treatment Plant, which involved calculating GHG emissions using the Climate Registry's General Reporting Protocol, and preparation of a report that discussed the requirements of the State Revolving Fund (SRF) application process and estimate GHG production for flows of 9 mgd (current flow) and 15 mgd (design flow), based on the nitrification-denitrification facilities being on line. The information developed was used for the environmental impact report (EIR) and general plan.

Frankfort Wastewater Treatment Plant Pumping Station Energy Audit | City of Frankfort, Kentucky
Conducted an energy audit of the pumping station at the wastewater treatment plant.

Wastewater Treatment Plant Planning

Wastewater Master Plan Update | Camarillo Sanitary District, Camarillo, California
Assisted with preparation of the wastewater system master plan update, which was needed to address future population and flow projections, evaluate the treatment processes from an efficiency and regulatory compliance standpoint, determine required infrastructure improvements, evaluate the biosolids handling process, and incorporate an update to the 2009 System Evaluation. Capacity and Assurance Plan (SECAP) collection system evaluation. Prepared a high-level general summary of relevant regulations that could impact the agency's current biosolids management strategy, such as: (1) an evolving political and regulatory environment driven by Senate Bill (SB) 1838 and associated with multiple industries (e.g., organics diversion from landfill; (2) competition with biosolids for disposal capacity; (3) opportunities for collaboration and regionalization); (4) carbon footprint and green energy demand (increased value of and market for biogas or renewable natural gas); and (5) per- and polyfluoroalkyl substances (PFAS) and other emerging contaminants (looming restrictions on land application as a beneficial reuse/disposal option). Provided preliminary wastewater characterization. Prepared a plant-wide steady-state mass balance to size facilities based on projected flows and loads. Evaluated treatment plant alternatives, including liquid stream and sidestreams. Treatment plant alternatives that were evaluated included: (1) rehabilitate and expand Plant 3; (2) rehabilitate Plant 1 and Plant 3; (3) new treatment process at existing site, and (4) new treatment process near Lift Station 3. HDR's DecisionSPACE tool was used to facilitate initial treatment alternatives decision-making process. Evaluated current solids handling protocols, capacity, and facilities. Conducted biosolids alternative analyses for optimizing the system, including upgrading or introducing new technology(ies) to address system deficiencies identified, meet future demand, and enable the treatment plant to meet changing regulatory requirements with planned upgrades to address a projected regulatory timeline. Scenarios that were evaluated included digesting biosolids to Class A,

food grease receiving, cogeneration and energy production, as solids dewatering. Prepared a graphical representation of a biosolids management roadmap that layout the relevant recommended capital improvement program (CIP) projects against a regulatory and construction timeline, as well as illustrated the preferred strategy for managing its biosolids outside of the treatment plant's fence line. Assisted with preparing a 10-year CIP of treatment plant project using pairwise analysis, costs, budgets, and risk reduction considerations

Treatment Plant of the Future Conceptual Plan | Central Contra Costa Sanitary District, Martinez, California
Assisted with development of conceptual plans of future treatment plant process based on current or impending technologies, sustainable practices, and several regulatory scenarios that would minimize the carbon footprint of the wastewater treatment plant, and will result in a future treatment plant that is energy neutral or energy positive, to the greatest extent possible, as well as produce recycled water that meets California Title 22 requirements for unrestricted reuse for industrial and landscape irrigation users. The conceptual planning effort considered all current treatment processes, including preliminary treatment, primary treatment, secondary treatment, tertiary or advanced treatment processes, disinfection, effluent disposal, sidestream treatment processes, odor control, and solids handling and disposal/reuse. In addition, the integration of the solids handling process with the secondary process through the use of steam generated by waste heat to power the aeration blower was considered. In particular, if the plant transitions to anaerobic digestion, then the impact of steam production and the existing aeration system was addressed. Additional treatment requirements were also considered, such as for specific contaminants of emerging concern.

Wastewater Treatment Plant Capacity Assessment Update | Delta Diablo, Antioch, California
Updated the capacity assessment of the wastewater treatment plant based on the improvements to the secondary clarifiers performed by HDR in 2006 and aeration basins also performed by HDR in 2009. The updated capacity assessment report was successfully applied for a higher capacity with the San Francisco Bay Regional Water Quality Control Board (RWQCB).

Wastewater Treatment Plant Master Plan Update | Delta Diablo, Antioch, California
Assisted with preparation of an update to the 2004 wastewater treatment plant master plan to identify a phased and cost-effective capital improvement program (CIP) to accommodate planned growth within the district's service area, upgrades to meet regulatory changes, replacement of aging equipment within the wastewater treatment plant to improve reliability, and maximize plant flexibility to accommodate the district's future vision. The project included: (1) update and review of changes in flow and load projections; (2) update of the historical water reuse and projected water reuse demands and its impact on wastewater treatment plant conveyance and outfall capacity requirements, as well as development of projections for peak month and peak day recycled water demands based on historical recycled water flows and district information about future demands; (3) performance testing of secondary clarifiers, which included preparation of stress testing protocol, stress testing, computational fluid dynamics (CFD) model update and calibration, and secondary clarifier capacity report preparation; (4) need for modifications/additions to flow equalization and processes and liquid and solids stream processes, as well as its associated costs; (5) need for replacement/modifications/additions to existing utility systems (service water, drainage, potable water, plant air, etc.) and associated costs; (6) summary of capital improvements and related costs; (7) regulatory changes and costs associated with meeting any new or emerging regulations; (8) reliability and redundancy evaluation; (9) greenhouse gas (GHG) analysis, which included preparation of GHG inventory; and (10) review of both power supply to and power distribution within the 16.5 mgd wastewater treatment plant (including connected loads for the household hazardous waste facility, wastewater treatment plant process, and district office loads), as well as evaluation of additional power supply options (including additional high voltage Pacific Gas & Electric [PG&E] power drop).

Main Wastewater Treatment Plant Energy System Master Plan | East Bay Municipal Utility District, Oakland, California
Assisted the district with preparation of a master plan for improving the overall energy efficiency at the 415 mgd Main Wastewater Treatment Plant and key remote facilities by reducing on-site electrical and natural gas demands, utilizing available existing energy resources (including heat), evaluating additional equipment or operational changes to produce more renewable energy, exploring additional sources of energy, and obtaining the best value for electricity sales. Project included assisting with energy team formation, performing an electrical use audit of the plant that determined areas where electricity use can be reduced or shifted away from peak periods, reviewing natural gas use/trends/opportunities chapter developed by the district, identifying an operational control strategy to reduce electricity use and cost at Pump Station H, reviewing the draft implementation plan chapter prepared by the District, designing a training program/plan identified in the district's implementation plan, reviewing the monitoring and evaluation plan chapter provided by the district, evaluating the cost and benefits of alternative technologies or approaches to enhance solids capture in the primary sedimentation tank (included chemically-enhanced primary treatment), evaluating technologies available to pretreat sludge (especially waste activated sludge) to enhance digestibility, performing a high-level assessment of additional overlooked high-strength waste opportunities and recommendations for future study, evaluating opportunities for gas or liquid waste storage to maximize the value of energy produced by ramping up production during peak periods (i.e., 12:00 p.m. to 6:00 p.m.), identifying operational and capital improvements to better utilize existing heat resources around the power generation station and digesters, developing standard practices for reviewing energy use in the design process to ensure that the most energy efficient designs and operating strategies are developed, reviewing the district's approach to forecasting power purchases from Western Area Power Administration (WAPA), reviewing the district's approach to selling renewable energy, and exploring options for funding.

Biosolids/Energy Management Plan | Irvine Ranch Water District, Irvine, California
Assisted with preparation of a biosolids handling preliminary design report for the Michelson Water Reclamation Plant, as well as an energy efficiency master plan for Michelson Water Reclamation Plant and Los Alisos Water Reclamation Plant.

Secondary Treatment Facilities Conceptual Planning | City of San Mateo, California
Provided conceptual planning services for a new membrane bioreactor (MBR) system for the 15.7 mgd wastewater treatment plant.

Flamingo Water Resources Center Expansion Master Plan | Clark County Water Reclamation District, Las Vegas, Nevada
Assisted with preparation of a master plan for an expansion to 184 mgd and a 30% design for phase 1 expansion to 150 mgd. The master plan included evaluation of expansion on the West and East Campus sites, and preparation of 19 technical memorandums (TMs), including basis of planning, treatment capacity, preliminary treatment, primary treatment, primary effluent pumping station (PEPS), secondary treatment, tertiary treatment, solids handling, interconnection of facilities, side stream management, electrical and instrumentation & controls (I&C), site utilities, chemical feed system, sustainability, transportation corridors and plant access, project delivery methods, construction packaging and schedule, startup considerations, and opinion of probable construction cost. The predesign efforts included an evaluation of how the new facilities will connect to the required downstream tertiary treatment and solids dewatering facilities, and preliminary design of preliminary treatment, primary treatment, PEPS, secondary treatment, solids handling, side stream management, and interconnection of facilities. A secondary process model was developed. Responsible for reviewing the process engineering calculations to verify sizing and provide perspective on potential alternatives to improve the overall process solutions, and authored the sustainability chapter of the report. The sustainability chapter provides a roadmap to inform the designs decisions and solutions to manage the construction site during construction.

Wastewater Treatment Plant Master Plan | Douglas County Lake Tahoe Sewer Authority, Zephyr Cove, Nevada
Prepared a wastewater treatment plant master plan that identifies needed projects, their costs, and the date when they should be implemented. The master plan included a statistical analyses update based on historic influent flows and pollutant loads to reflect current condition, description of regulations and regulatory agencies that are involved with the wastewater treatment facilities and potential permit impacts and concerns, description of existing facilities and operations, description of the improvements required to provide the needed treatment capacity, and an implementation plan and capital improvement program (CIP) for the recommended improvements. Process areas that were evaluated included the aeration systems, influent flow equalization, headworks (including grit removal), chlorine (gas to hypochlorite), and thickener. Hydraulic modeling was performed to evaluate hydraulic loading for each unit process and identify hydraulic concerns (i.e., submerged weirs, submerged flumes, flooded basins, etc.).An ENVision mass balance model of the wastewater treatment plant was developed to reflect the plant's current configuration and operation.

Wastewater Treatment Plant Master Plan Update | Minden-Gardnerville Sanitation District, Minden, Nevada
Updated the 1994 wastewater treatment plant master plan to identify a phased and cost-effective capital improvement program (CIP) to accommodate planned growth within the district's service area, and replacement of aging equipment within the wastewater treatment plant to improve reliability and maximize plant flexibility. The master plan focused on the defining the ultimate service area, population, wastewater flows, and pollutant loads that were used to determine the buildout capacity requirements of the wastewater treatment facilities. Project also included hydraulic modeling using Visual Hydraulics to estimate the plant hydraulic profile and energy grade line for the liquid stream, and evaluate hydraulic loading for each unit process and identify hydraulic concerns (i.e., submerged weirs, submerged flumes, flooded basins, etc.).

Robert W. Hite Treatment Facility Plan | Metro Wastewater Reclamation District, Denver, Colorado
Process engineer for preparation of a district-wide planning document describing the necessary liquid stream and solids treatment process improvements needed to meet the planning and regulatory drivers from 2015 through 2035. The District was faced with meeting total inorganic nitrogen limit of 8 mg/L and total phosphorus limit of less than 0.1 mg/L.

Broken Arrow Wastewater Master Plan | Broken Arrow Municipal Authority, Broken Arrow, Oklahoma
Assisted with preparation of wastewater master plan, which included evaluation of the wastewater treatment capacity and future improvements, and a 5-year and 20-year capital improvements program.

Nutrient/Phosphorus/Ammonia Removal

Nutrient Removal Optimization and Upgrade Study | Bay Area Clean Water Agencies (BACWA), Oakland, California
Conducted a groundbreaking study that will shape the future of wastewater treatment for 37 publically owned treatment plants, with a combined permitted capacity of approximately 900 mgd, serving 6.5 million people, and to protect the health of the San Francisco Bay. Collaborated with BACWA and its member agencies to help shape the nutrient removal regulatory framework and strategy for all San Francisco Bay dischargers. Personally performed 17 site visits to make recommendations on optimization strategies and/or facility upgrades to meet potential future nutrient regulations, delivering to each agency a customized roadmap for future improvements that could easily total billions of dollars over the coming decade. Nutrient reduction study reports were prepared for: 1. City of American Canyon's 2.5 mgd (5 mgd peak) wastewater treatment facility 2. City of Benicia's 4.5 mgd (15 mgd peak) wastewater treatment plant 3. City of Burlingame's 5.5 mgd (15 mgd peak) wastewater treatment facility 4. Central Contra Costa Sanitary District's 53.8 mgd (250 mgd peak) wastewater treatment plant 5. Central Marin Sanitation Agency's 10 mgd wastewater treatment plan 6. Delta Diablo's 19.5 mgd wastewater treatment plant 7. Dublin San Ramon Services' District 17 mgd wastewater treatment plant 8. East

Bay Municipal Utility District's 120 mgd wastewater treatment plant 9. Fairfield-Suisun Sewer District's 23.7 mgd wastewater treatment plant 10. City of Hayward's 18.5 mgd (35 mgd peak) wastewater treatment plant 11. Las Gallinas Valley Sanitary District's 2.92 mgd sewage treatment plant 12. City of Livermore's 8.5 mgd water reclamation plant 13. City of Millbrae's 3 mgd water pollution control plant 14. Mt. View Sanitary District's 3.2 mgd (4.7 mgd peak) wastewater treatment plant 15. Napa Sanitation District's 15.4 mgd Soscol Water Recycling Facility 16. Novato Sanitary District's 7 mgd wastewater treatment plant 17. Oro Loma Sanitary District's 20 mgd Oro Loma/Castro Valley Wastewater Treatment Plant 18. City of Palo Alto's 39 mgd (80 mgd peak) Palo Alto Regional Water Quality Control Plant 19. City of Petaluma's 6.7 mgd Ellis Creek Water Recycling Facility 20. City of Pinole's 4.06 mgd (10.2 mgd peak) Pinole-Hercules Water Pollution Control Plant 21. Richmond Municipal Sewer District's 16 mgd water pollution control plant 22. Rodeo Sanitary District's 1.14 mgd water pollution control facility 23. City of San Jose's 167 mgd (261 mgd peak) San Jose/Santa Clara Regional Wastewater Facility 24. City of San Mateo's 15.7 mgd wastewater treatment plant 25. Sewerage Agency of Southern Marin's 3.6 mgd wastewater treatment plant 26. Sausalito-Marin City Sanitary District's 1.8 mgd wastewater treatment plant 27. San Francisco Public Utilities Commission's 85.4 mgd Southeast Water Pollution Control Plant 28. City and County of San Francisco's 2.2 mgd Mel Leong Treatment Plant located at the San Francisco International Airport 29. City of San Leandro's 7.6 mgd water pollution control plant 30. Sonoma Valley County Sanitation District's 3 mgd wastewater treatment plant 31. City of South San Francisco's 13 mdg San Bruno Water Quality Control Plant 32. City of Sunnyvale's 19.5 mgd water pollution control plant 33. Silicon Valley Clean Water's 29 mgd wastewater treatment plant 34. United States Navy's 2 mgd Treasure Island Wastewater Treatment Plant 35. Union Sanitary District's 33 mgd Raymond A. Boege Alvarado Wastewater Treatment Plant 36. Vallejo Sanitation and Flood Control District's 15.5 mgd wastewater treatment plant 37. West County Wastewater District's 12.5 mgd wastewater treatment plant.

Nutrient Strategy Assistance | Bay Area Clean Water Agencies (BACWA), Oakland, California
Assisted BACWA with understanding and responding to the rapidly-changing regulatory and scientific landscape related to nutrient enrichment of the San Francisco Bay. The scope of work included attendance at the Regional Monitoring Program Nutrient Workshop, executive board presentations, San Francisco Bay numerical nutrient endpoint stakeholders advisory group meetings, Suisun Bay Monitoring Plan Workgroup meetings, and Regional Monitoring Program Nutrient Workgroup meetings, as well as preparation of topic papers that included the following subjects: (1) numerical nutrient endpoint (NNE) literature review; (2) relevant hydrodynamic and nutrient models of the San Francisco Bay; (3) infrastructure implications of nutrient effluent limits; and (4) sustainability impacts of potential nutrient effluent limits.

Program Monitoring - Bay Area Clean Water Agencies (BACWA), Oakland, California
Provided as-needed engineering services to assist BACWA with active participation in the Numerical Nutrient Endpoint Stakeholders Advisory Group, Suisun Bay Monitoring Plan Workgroup, and Regional Monitoring Program Nutrient Workgroup. In addition, provided technical review of several key documents, including the Regional Water Quality Control Board's 13267 letter requiring publically-owned treatment works discharging to the San Francisco Bay to collect and submit historical nutrient related data, the draft Nutrient Strategy for the San Francisco Bay, and other institutional/inter-governmental agency agreements.

2010 Total Nitrification Study Update | Central Contra Costa Sanitary District, Martinez, California
Updated the 2010 total nitrification study to include results from recent studies, updated recommendations based on advancements in technology, and refined planning level capital and operations and maintenance (O&M) cost estimates to enable the district to plan appropriately for future capital upgrades.

As-Needed Technical Advisor Services for Plant Optimization for Ammonia Removal | Central Contra Costa Sanitary District, Martinez, California
Provided as-needed technical advisor services for the operations department, which included: (1) review of solids handling and cogeneration technical memorandums to determine if the analysis methodology is consistent with best practices, if the equipment proposed is state-of-the-art, and if the cost assumptions,

conclusions, and recommendations are reasonable; (2) technical review of facility plan element 1, plant optimization for ammonia removal, to provide input during workshops with other consultants and internal meetings on potential ammonia removal strategies; and (3) technical review and input of innovative (bleeding-edge) nutrient removal technologies that the district should consider in their research, which included providing input regarding nutrient removal pilot studies and treatment plant locations that the district should visit, and reviewing and providing comments on draft technical memorandums summarizing the district's research into bleeding-edge nutrient removal technologies.

Cyanide Inhibition Study | Central Contra Costa Sanitary District, Martinez, California
Conducted a cyanide inhibition study to evaluate the impact of incinerator scrubber water return stream on nitrifying bacteria growth rates. This study is unique to wastewater treatment plants with multiple hearth incinerators that are considering ammonia removal by nitrifying bacteria in the liquid stream process. Additionally, the experimental approach is designed to infer whether any nitrifying bacteria growth rate impairment from the incinerator scrubber water return stream is due to cyanide or other compound(s).

EPA Region IX Grant on Nutrient Reduction by Sidestream Treatment | East Bay Municipal Utility District, Oakland, California
Project manager for assisting the district with applying for the Environmental Protection Agency (EPA) Region IX Grant on Nutrient Reduction by Sidestream Treatment by conducting a comprehensive literature review of emerging and established viable sidestream treatment technologies, identifying knowledge/implementation gaps, developing technology selection criteria, selecting at least three viable technologies ((including deammonification) for bench and pilot testing, estimating and providing a report summarizing the nutrient load reductions to the San Francisco Bay from Bay Area Clean Water Agency (BACWA) member agencies implementing sidestream treatment (where applicable), and preparing a planning-level cost estimate of sidestream nitrogen removal technologies tested and mainstream nitrogen removal technologies.

Michelson Water Reclamation Plant Phase 2 Expansion | Irvine Ranch Water District, Irvine, California
Provided process design support for the $80 million Phase 2 expansion of the 18 mgd Michelson Water Reclamation Plant to meet projected capacity and effluent quality requirements. Improvements included a new 69 mgd headworks facility and vactor receiving station, four new rectangular primary sedimentation tanks (Nos. 6 through 9), expansion of two flow equalization basins from 4.7 to 6.4 million-gallon (MG), a new primary effluent pumping station, expansion of the biological treatment and filtration capacity using membrane bioreactors (MBRs), a new high-rate clarifier to provide pretreatment for the effluent filters and to recover spent backwash water, structural repairs to the effluent filtration system to address corrosion and spalling concrete, a new spent backwash equalization basin and pumping station, a new 1.9 MG chlorine contact chamber, a new magnesium hydroxide feed system for alkalinity and pH control in the biological processes, expansion of the reclaimed water pumping station, modifications to the existing methanol feed system to serve as a backup to the Unified Thickening and Fermentation (UFAT) process, and new UFAT facility. Two MBR trains were installed with a maximum-month capacity of 5.7 mgd (including recycle flows from the sludge fermentation process). Each MBR train consists of an aeration basin configured for nitrification/denitrification, a return activated sludge (RAS)/waste activated sludge (WAS)/scum pumping station, and four parallel membrane tanks. The new MBR facility also include fine screening, permeate pumps, membrane scour blowers, process air blowers, and chemical feed and storage facilities for membrane cleaning. The high-rate clarifier has a capacity of 22 mgd and consists of rapid mix, coagulation, flocculation, and sedimentation zones; a cyclone separator; and alum, polymer, and sand feed facilities. Disinfection is provided using gaseous chlorine. The new and existing chlorine contact chambers are equipped with baffles, fillets, and diffuser walls to reduce short-circuiting and increase disinfection efficiency. The chlorine feed capacity was expanded by installing new evaporators and an additional chlorinator. The capacity of the chlorine scrubber was expanded from 5 to 25 tons. During predesign, evaluated filtration alternatives, which included expanding the existing system with nine new filters, adding four new filters and two high rate clarifiers, adding two new high rate clarifiers and increasing the filter loading rate on existing filters, retrofitting the existing filters with immersed membranes, and adding new continuous backwash filters

and two high rate clarifiers. It was determined that the existing effluent filters will remain in operation without process modification; however, structural modifications will be made to address corrosion and spalling concrete. New facilities are expected to help the district meet trihalomenthane standards.

Phase 3 Mountain House Water Reclamation Facility Expansion Peer Review, Owner Representation, and Construction Phase Services | Mountain House Community Services District, Mountain House, California

Project manager for independent peer review of the design plans and specifications prepared by another consultant for the Phase 3 expansion of the Mountain House Water Reclamation Facility from 3 to 4 mgd. The project included: (1) new influent lift station pumps and new parallel sewer forcemains; (2) headworks facility in a building, with two stage screening and grit removal; (3) new sludge handling equipment, including transfer pumps, polymer addition, centrifuge dewatering equipment, and conveyors; (4) retrofit of the existing sequential batch reactor (SBR) to membrane bioreactor (MBR), which included 4 subdivision of the secondary process tanks into 4 tanks, conversion of the existing surge tank to post-anoxic treatment, retrofit the existing surge pumps to internal recycle systems, and new aeration blowers; (5) conversion of the existing digesters to anoxic basins; (6) new control programming and changes to the process; (7) new MBR membrane filtration tankage for 7.2 mgd; (8) MBR treatment equipment building with permeate pumping equipment, air scour blowers, instrumentation, chemical injection day tanks, return activated sludge (RAS) return pumps, and associated MBR mechanical and electrical components; (9) changes to existing electrical and new electrical systems, including additional backup diesel generator, automatic transfer switch, and control system, as well as required system power, lighting receps, bonding, and control electrical; (10) retrofit of the existing dissolved air floatation (DAF) clarifier systems to provide waste activated sludge (WAS) thickening prior to new aerated sludge storage; (11) new sludge storage systems under the combination headworks and sludge building, including digester blowers, aeration and mixing; (12) ultraviolet (UV) disinfection system; and (13) recycled water pumping and storage onsite. Also served as project manager for owner representation services and Principal-in-Charge for construction inspection and startup services.

Activated Sludge Rehabilitation for Plant No. 1 (Project P1-82) | Orange County Sanitation District, Fountain Valley, California

Provided process design support for upgrade of an existing 80 mgd activated sludge plant to allow either nitrification or carbonaceous BOD removal mode operations at flows up to 110 mgd. Improvements included oxidation basins, secondary clarifiers, membrane and coarse bubble air diffusers, and waste activated sludge (WAS) system, along with upgrade of the return activated sludge (RAS) pumping system to 110 mgd.

Nutrient Removal Study | Oro Loma Sanitary District, San Lorenzo, California

Summarized different potential ammonia and nutrient removal levels and applicable technologies for both sidestream and main liquid stream, including ammonia removal for sidestream, ammonia removal for main stream (nitrification only) with and without sidestream treatment, nitrification-denitrification for main stream with and without sidestream, and biological nutrients removal for effluent total nitrogen and effluent total phosphorus. Estimated annual average wastewater characteristics. Evaluated sidestream alternatives. Prepared conceptual design for the different nutrient removal levels, including the sidestream process. Built a mass balance model for the wastewater treatment plant to use as a design-aid tool for estimating the approximate sizing for different processes. Prepared planning-level estimate of construction and operations and maintenance (O&M) costs associated with the four levels of treatment. Prepared a summary report outlining the findings and recommendations.

Pinole-Hercules Water Pollution Control Facility Upgrade | City of Pinole, California

Prepared a predesign report that identified improvements needed for the 3 mgd (22 mgd peak) water pollution control facility to comply with the new NPDES permit. Identified wastewater characteristics (design flows and loads) to size the various processes, identified discharge requirements, prepared a mass balance model of the recommended treatment plant modifications, developed a biological process model (Biowin) of the plant that

represented the recommended modifications to the biological treatment process, and evaluated aeration basin modification alternatives (including alternatives for potential future nitrogen removal regulations). Project also included evaluation of construction phasing options available to the city to construct the needed improvements to minimize disruption to existing operations and reduce costs, alternatives to construct the influent pumping station capacity to achieve a capacity of about 20 mgd, alternatives for headworks facility screenings conveyance and handling to improve reliability, grit removal and handling system alternatives, alternative scenarios for flow diversions after headworks screening and pumping to determine the optimum size and operation of a potential flow equalization basin, and alternatives for a new return activated sludge (RAS)/waste activated sludge (WAS) pumping station, alternatives for the new solids handling facility, and pumping alternatives including pump type). Also provided process design support.

On-Call Technical Assistance for Advanced Treatment Alternatives at Sacramento Regional Wastewater Treatment Plant | Regional San, Elk Grove, California
Provided on-call technical assistance to assist the district with evaluating advanced treatment alternatives at Sacramento Regional Wastewater Treatment Plant. Task Order 1 included preparation of four compliance schedules to implement treatment improvements at the Sacramento Regional Wastewater Treatment Plant, which included: (1) achieving Title 22 effluent quality (no nutrient removal, but includes coagulation and filtration); (2) nutrient reduction (includes a high level of ammonia removal); (3) effluent cooling; and (4) nutrient removal, Title 22 effluent quality, ultraviolet (UV) disinfection, and effluent cooling.

Phase 2 Ammonia Study, Treatment Cost Evaluation | Regional San, Elk Grove, California
Evaluated the performance and cost of the ammonia reduction treatment technologies for the Sacramento Regional Wastewater Treatment Plant, which included: (1) nitrification in solids storage basin supernatant (SN) layer using sequestered fixed film media; (2) nitrifying sequencing batch reactor; (3) nitrification in constructed wetlands; (4) partial nitrification (nitritation), including: SHARONTM; (5) simultaneous nitrification/denitrification, including One Step Anammox, Sharon Anammox, CANON, and DEMONTM; (6) coupled nitrification/denitrification, including: ANAMMOXTM coupled with SHARONTM; (7) SN to irrigate and fertilize urban forest; (8) bioaugmentation - sidestream nitrification with sludge transfer to high purity oxygen activated sludge (HPOAS) to induce nitrification of main flow, including: BabeTM, InNitriTM, and AT-3TM; (9) bioaugmentation using a new nitrification main stream liquid treatment process and seeding the high purity oxygen basins; (10) integrated fixed-film activated sludge (IFAS); (11) tertiary biological aerated filters (BAFs); (12) tertiary nitrifying trickling filters (NTF); (13) tertiary fluidized bed reactor (FBR); (14) tertiary moving bed biofilm reactor (MBBR); (14) tertiary rotating biological contactors (RBCs); and (15) steam stripping. Ammonia control options were assessed to reduce ammonia by three ranges: 20 to 30 percent; 50 to 60 percent; and 80 to 95 percent. Identified and screened ammonia reduction technologies or approaches, provided a list of plants to visit that used the viable technologies, assessed the performance of the technologies, determined the life-cycle costs of the technologies, and recommended selected technologies for pilot testing and further evaluation.

Nutrient Management Evaluation | Sewerage Agency of Southern Marin, Mill Valley, California
Project manager for a study that evaluated and recommended nutrient management improvement options for ongoing trickling filter design and construction, operational optimization, and sidestream management. Evaluated and recommended technology alternatives for reducing total dissolved solids (TDS) while managing nutrients for recycled water. Evaluated funding options for recycled water improvements.

Russian River County Sanitation District Treatment Plant Biological Nutrient Removal (BNR) Facilities | Sonoma County Water Agency, Guerneville, California
Provided process predesign and design for a new BNR facility at the Russian River County Sanitation District Treatment Plant. During predesign, determined wastewater characteristics and wastewater discharge requirements, performed mass balance model calibration and modeling, evaluated BNR alternatives capable of meeting new effluent limits for nitrate and ammonia contained in the district's NPDES permit (included

evaluation of cyclic aeration [simultaneous nit/denite]), and arranged for and participated in tours of existing BNR treatment processes.

Nitrogen Removal Study and Nitrate Infeasibility Analysis | City of Stockton, California
Conducted a nitrogen removal study that evaluated nitrate removal alternatives at the Regional Wastewater Control Facility. The evaluation considered facility needs and the associated cost for each alternative (capital, energy, and chemicals).

Nitrate Infeasibility Study | City of Stockton, California
Prepared a compliance schedule for removing nitrate at the city's Regional Wastewater Control Facility. The compliance schedule table was incorporated into the Nitrate Infeasibility Analysis report that was prepared by another firm. The compliance schedules considered the milestones and schedule required to meet a potential nitrate limit. Additionally, on-call engineering services were provided related to advising or providing assistance related to the city's NPDES permit issuance and related matters.

Easterly Wastewater Treatment Plant Tertiary Project | City of Vacaville, California
Provided preliminary design services for tertiary upgrades to the 15 mgd Easterly Wastewater Treatment Plant to meet the requirements of the Regional Water Quality Control Board (RWQCB) permit. Regulatory requirements include compliance with numerical ammonia limits, nitrate limits, elimination of blending, and dry weather filtration/Title 22 reclamation. Predesign services included reviewing the facility planning work prepared by another consultant, preparing a mass balance model of the recommended treatment plant modifications, updating the Biowin model to represent the recommended modifications to the biological treatment processes, and evaluating construction phasing, headworks (including influent pumping station expansion to 55, screening, and grit handling), grit removal, primary clarification, flow equalization basin, aeration basin, blower, secondary clarification, return activated sludge/waste activated sludge (RAS/WAS) pumping station, effluent filtration, disinfection, line emergency storage pond, digested sludge storage lagoon, overall operational strategy, primary control strategies, electrical distribution system, plant utilities, demolition, site work, laboratory expansion, and site building alternatives. Responsible for performing filter pilot testing to demonstrate the reliability of various filtration technologies on meeting Title 22 and the revised National Pollutant Discharge Elimination System (NPDES) permit requirements. Six different tertiary filtration technologies comprised of five granular filters and one alternative cloth disk media filter were used in the pilot testing. Pilot testing was done in less than one month to determine filtration performance in terms of effluent turbidity, total suspended solids (TSS), particle size distribution and counts, and filter head loss development rate. Filter performance was evaluated under various influent solid loading rate, filter hydraulic loading rate, and chemical dosage testing conditions. Optimized media selection and loading rates. Performed stress testing using RAS. Based on the pilot testing efforts, a granular or sand material was recommended for the new filters. Assisted with optimizing primary clarifier hydraulics using the CFD model developed.

Contract 1, Denitrification Improvements for Easterly Wastewater Treatment Plant Tertiary Project | City of Vacaville, California
Provided process design for denitrification improvements to the Easterly Wastewater Treatment Plant Tertiary Project. At the headworks facility, the existing mechanical screens were replaced with 6 mm perforated plate screens, and a third perforated screen was installed. The screening conveyor was replaced with a hydraulic sluice. A second screenings washer compactor was also installed. The existing grit cyclones and classifiers were relocated to allow for direct discharge into storage bins. The grit slurry pipes were extended to the new location. The existing sludge strainers were removed. The aeration basins were expanded by adding two new basins to the west. The internal arrangements were changed to "coupled" basins to provide for denitrification. MLE flow is achieved using "through the wall" propeller pumps. The new facility included a flow split structure to divide flows between the three "coupled" basins, and the two future basins required for buildout capacity. A new 4-cell flow equalization basin (total storage capacity approximately 5.5 million gallons) was constructed in the west stormwater storage basin. This basin receives both primary and secondary effluent flows. An emergency

overflow to the existing North storage basin was also added. The existing biosolids storage lagoon was modified by reducing the size, and concrete lining was added for easier cleaning. The lagoon has floating aerator/mixers. A 70-foot-wide, 7,000 linear feet (LF) in length landscape buffer was constructed around the perimeter of the city's property. A second 2 MW generator was installed adjacent to the existing unit and is connected to the electrical system. A load bank was added to allow the generator to be exercised.

Wastewater Treatment and Gray Water Feasibility Study (Phase 1) for Point Molate Village Resort | Winehaven Partners LLC, Richmond, California
Evaluated various treatment technologies for water reuse opportunities at an eco-resort. The evaluation investigated conventional activated sludge, membrane bioreactors (MBRs), or constructed sub-surface wetlands for nitrification/denitrification. Although still in the conceptual phase, the project has selected sub-surface wetlands to remove nitrogen and reclaim a majority of the waste stream.

Aeration Basin Upgrades | Douglas County Lake Tahoe Sewer Authority, Minden, Nevada
Provided preliminary design, final design, and construction services for aeration system upgrades, which included: (1) replacing existing mechanical aerators with tube-type fine bubble diffusers; (2) rehabilitating, repairing, and coating concrete in the aeration basins to extend their service life; (3) rehabilitating/replacing walkways, guardrails, handrails, and other miscellaneous ferrous metal items in and above the aeration basins; (4) providing a biological nutrient removal (BNR) process, Modified Ludzack-Ettinger (MLE), reduces sludge hauling and increases operation flexibility; (5) extending the concrete influent channel to aeration zone 1 to increase operational flexibility; and (6) providing blowers sized to meet process demands with fine bubble tube-type diffusers. The project was delivered via Construction Manager at Risk (CMAR) method.

Water Pollution Control Facility Reduced Loading Operation Optimization | City of Las Vegas, Nevada
The operation of the City of North Las Vegas' new 21 mgd wastewater reclamation facility in 2011 resulted in an influent reduction to the City of Las Vegas' water pollution control facility. Conducted a study to identify improvements to remove and relocate all sidestream connections to Plants 1 and 2, bypass piping design from Plants 3 and 4 primary sedimentation basin effluent to nitrification influent pump station, conversion of the nitrification facilities to nitrification-denitrification facilities; removal soda ash storage and feeding system; modifying the operating strategy of all the existing thickeners, and modifying the nitrification influent pumping station and fixing the vibration problems of their existing pumps in the station.

Phase 5C Advanced Water Reclamation Facility Membrane Filtration and Nitrification Improvements | City of Coeur D'Alene, Idaho
Provided facility planning and predesign services for improvements to expand the aeration facilities and 1 mgd of membrane filtration that can be added incrementally as flows increase and more stringent ammonia, phosphorus, and carbonaceous biochemical oxygen demand (CBOD) permit limits go into effect. Phase 5C improvements included secondary effluent transfer pumping station, expanded solids contact tank transfer pumping, chemical mixing tank, membrane filtration equipment building, membrane operating system, Turbo blowers, return tertiary sludge pumping, waste sludge pumping, chemical feed systems, 3W pumping, primary clarification, secondary clarification, electrical supply, and instrumentation and control.

Pocatello Wastewater Treatment Plant Phase 1 Improvements | City of Pocatello, Idaho
Process design of Phase 1 upgrades to the 7 mgd wastewater treatment plant. Improvements were needed to met the new NPDES permit effluent limitations for total phosphorus (TP) that were derived from a Total Maximum Daily Loading (TMDL) for TP, and also included a new 28 mgd ultraviolet (UV) disinfection facility, dual media filtration, aeration basin upgrade to biological nutrient removal (BNR), and headworks screening with washer/compactor facilities

Low Phosphorus Demonstration Pilot Facility | City of Coeur D'Alene, Idaho
Assisted with a two-year demonstration pilot to help the city select the treatment technology or technologies for the wastewater treatment plant to meet lower effluent phosphorus limits under new NPDES permit limits. The three technologies that were demonstrated included membrane bioreactors, two-stage continuous upflow media filtration, and tertiary membrane filtration. Final selection of the process type and treatment plant arrangement was made based on the outcome of this pilot program and the wastewater facility planning.

Nitrogen Removal/Retrofit Study | Lemna International. Inc., St. Paul, Minnesota
Conducted a study that identified strategies for modifying existing Lemna Wastewater Treatment Plant to remove nitrogen. Identified a sustainable approach using existing Lemna technology for nutrient removal at the wastewater treatment facilities.

Carlsbad Wastewater Treatment Facility | City of Carlsbad, New Mexico
Prepared a preliminary engineering report and an environmental information document for the wastewater treatment facility, and assisted with design of improvements, which included: (1) rehabilitation of the entrance works, primary clarifiers, aeration basins, secondary clarifiers, and pumping station; (2) conversion to an MLE process; (3) replacement of the process air blowers and digester; (4) upgrade to ultraviolet (UV) disinfection; (5) upgrade to a SCADA system; (6) administration building renovation; and (7) a new laboratory.

Phase II-A Wastewater Treatment Facility Upgrade | City of Farmington, New Mexico
Process design of improvements to repackage a medium rate activated sludge (MRAS) basin.

Cloth Media Filter Full-Scale Testing | City of Santa Fe, New Mexico
Provided full-scale testing of the cloth media filters. Provided chemical dose optimization for day-to-day operation, as well as chemical dose optimization for phosphorus removal (if required in the future).

Wastewater Treatment Plant Nutrient Removal | City of Sioux City, South Dakota
Conducted a nutrient removal evaluation for the wastewater treatment plant.

Phosphorus Optimization Studies | City of Onondaga, New York
Performed phosphorus optimization studies on the filters. Provided technical support t on special study data analysis and experimental design (coagulation/flocculation studies).

Fort Bliss Replacement Hospital, Water Reclamation | U.S. Army Corps of Engineers, Fort Worth District, El Paso, Texas
Conducted a study to determine the viability of using a membrane bioreactor to treat and reclaim a hospital wastewater on-site at Fort Bliss Military Hospital located in El Paso, Texas.

WERF Nutrient Removal Challenge | Water Environmental Research Federation, Alexandria, Virginia
Investigator for a project involving cost-effective removal of nitrogen and phosphorus from wastewater that included national and international resources, modeling, treatment technology evaluations, and research studies. Developed a conceptual framework for a web-based information/technology transfer center to serve wastewater utilities and regulators across the country with accurate and up-to-date information nutrient removal technology, new and emerging technologies, and research on nutrient removal.

Village of Ruidoso Wastewater Treatment Plant Study | Village of Ruidoso, Ruidoso, New Mexico
Evaluated the flows/loads and modeled the biological process associated with the current wastewater treatment facility. Future upgrade alternatives were evaluated to meet extremely stringent total nitrogen effluent limitations on the order of 1 ppm as nitrogen.

Filtration

Tower Tricking Filters Evaluation and Cost Estimates | Delta Diablo, Antioch, California
Evaluated four options for the tower tricking filters (TTFs) and for biological treatment at Delta Diablo to identify the most cost-effective and treatment-effective method for its wastewater treatment plant. Project included flow and load analysis, and preparation of planning-level estimated be developed for the following options: Option 1 - TTF Rehabilitation: Rehabilitate the four existing TTFs for an additional 30 years of service life, assuming one TTF to be rehabilitated annually; Option 2 - TTF Removal: Demolish the four existing TTFs and move to a single-stage biological treatment process (increased aeration basin capacity) to meet treatment requirements and provide an additional 30 years of life; Option 3 - TTF Replacement with New TTFs: Demolish the four existing TTFs and replace them with new TTFs with reduced maintenance needs (i.e., concrete TTFs). New TTFs shall fit in the existing TTF footprint, or smaller; and Option 4 - TTF Replacement with New Process: Demolish the four existing TTFs and replace them with a new process/equipment system (i.e., membrane bioreactor). The new treatment process proposed is anticipated to meet future regulatory requirements.

Tertiary Plant Pilot and Technical Studies, and Predesign | City of Stockton, California
Provided technical studies and predesign services for the wastewater tertiary treatment improvements. Technical studies met the requirements of the city-issued Central Valley Regional Water Quality Control Board (RWQCB) Time Schedule Order No. R5-2013-0101 and included dissolved air flotation thickener (DAFT) optimization, tertiary filter evaluation, and disinfection optimization. An executive summary was prepared for submission to the RWQCB summarizing the bench-scale studies performed for the DAFT, tertiary filter, and disinfection systems. The executive summary included current performance data for the filters, polymer vendor results from DAFT testing, chlorine contact basin cover bench-scale demonstration results, chlorine contact basin cover recommendation, hypochlorite dose response study result, hypochlorite step feed dose response study result, PAA dose response study result, PAA/chlorine sequential dose response study results, ultraviolet transmittance (UVT) monitoring results, UV dose response study results, and mixing CFD modeling, including the base model and one alternative induction mechanism modeling result. A technical report was prepared summarizing the full-scale and pilot studies performed for the DAFT, tertiary filter, and disinfection systems. The technical report provided design direction and establish design basis for selected process and technology, and included evaluation of current performance of filters, filter structural evaluation results and column testing results, feasibility of sending filter backwash and DAFT return flows to the main plant, vendor polymer results and validation of polymer results, polymer activation and storage results, DAFT piloting results, DAFT condition assessment results, sequential chlorination full-scale study result, sequential PAA/chlorination full-scale study results, PAA/UV hybrid pilot study result, and SCADA integration recommendations for disinfection, DAFT, and filters. The predesign report detailed the proposed design for the tertiary plant facilities project. Responsible for DAFT and filter components of the project.

Filtration Improvements (Contract 3) for Easterly Wastewater Treatment Plant Tertiary Project | City of Vacaville, California
Designed filtration improvements for the Easterly Wastewater Treatment Plant, which included: (1) expansion of the influent pumping station to 52.5 mgd; (2) retrofit of the primary clarifiers; (3) addition of a third secondary clarifier; (4) expansion of the return activated sludge (RAS)/waste activated sludge (WAS) pumping station; (5) a new 27 mgd filter influent pumping station with vertical turbine pumps; (6) a new 27 mgd effluent filter facility; (7) a new chemical storage and feed complex ; (8) a concrete-lined earthen basin; (9) new effluent monitoring and process control buildings; (10) expansion of five chlorine contact tanks; (11) disinfection system upgrade; (12) anaerobic digester facility upgrades; and (13) electrical distribution system upgrade at the North Plant. The filter complex has six pairs of filter cells of 784 square feet each. Because regulations may change in the future, the physical dimensions of the filter tanks were selected to allow retrofitting the tanks with membranes in the future.

Third Party Operations and Maintenance (O&M) Review at the Truckee Meadows Water Reclamation Facility | City of Sparks, Nevada
Conducted a third party operations and maintenance (O&M) review of the 28 mgd (44 mgd) Truckee Meadows Water Reclamation Facility, which included: (1) evaluating O&M practices and procedures of the plant: and (2) identifying opportunities for improvement and process changes that would result in savings in energy, chemicals, and/or labor or other O&M costs. Provided tertiary treatment capacity analysis that included denitrifying filters.

Wastewater Treatment Plants

Aeration System Upgrade | Delta Diablo, Antioch, California
Provided hydraulic and process engineering support for the aeration system upgrades, CEPT, and tower bypass improvements at the 16.5 mgd (since increased) wastewater treatment plant.

Steam and Aeration Blower Systems Renovations - Evaluation and Predesign | Central Contra Costa Sanitary District, Martinez, California
Performed a condition assessment of the aeration systems at the 55 mgd wastewater treatment plant to determine the remaining useful life, evaluated aeration system replacement alternatives that address both current and future needs, and prepared 10 percent predesign documents. The project included testing and sampling of steam system and secondary treatment facilities, computational fluid dynamic (CFD) modeling, future nutrient removal impacts evaluation, and development of design criteria and feasible alternatives for use in business case evaluations and predesign development. Secondary treatment facilities testing and sampling included optimization of anaerobic selector, wastewater characterization, micro-organisms growth rate, and field oxygen transfer efficiency testing and sampling.

Hemet/San Jacinto Wastewater Treatment Facility | Eastern Municipal Water District, Perris, California
Provided support in assessing the current capacity of the existing wastewater reclamation facility. The evaluation comprised of modeling the biological process and supplying the municipality with a list of alternatives to promote meeting the permit requirements until the anticipated plant upgrade in 2014.

Fort Bragg Wastewater Treatment Plant Upgrade | City of Fort Bragg, California
Provided process design support for improvements to upgrade 1 mgd wastewater treatment plant. Reviewed the Predesign Summary Report, prepared by another consultant, for opportunities to improve design, decrease construction cost, decrease operation cost, improve efficiencies, and reduce power requirements. Predesign efforts included updating the stormwater handling analysis to address the grading that was completed for the perimeter of the existing wastewater treatment plant site to eliminate run-on water from adjacent lands, analyzing the feasibility of what may be necessary (e.g. extra treatment) to reach a Class A biosolids standards for the sludge, evaluating options for providing sufficient dewatering of solids (included centrifuge, screw press, and belt filter press alternatives), and analyzing alternative methods for generating energy at the plant (including wind power or solar on site). The feasibility of a fat, oil, and grease (FOG) receiving station at the treatment plant were investigated. Prepared a design confirmation memorandum, which included and evaluation of the proposed activated sludge system. The analysis included identifying the constraints created by other elements of the treatment process elements affecting the expansion of the activated sludge system, reviewing the hydraulic profile and identifying improvements, determining if lowering the grade(s) of activated sludge units could potentially eliminate pumping as well as cost, analyzing the feasibility of achieving Title 22 water recycling status, and evaluating the control systems for the new improvements to the wastewater treatment plant for ease of incorporation into a future Supervisory Control and Data Acquisition System (SCADA). Prepared plans, specifications, and cost estimates were prepared for the recommended project, which included replacement of the existing trickling filters and clarifiers with an Aero-Mod SEQUOX activated sludge system, repurposing the clarifiers into emergency/flow equalization and/or storm run-off storage, treatment of on-site stormwater, solids handling, and power requirements.

JB Latham Treatment Plant Aeration System | South Orange County Wastewater Authority, Dana Point, California
Assisted with design of a new aeration system to replace the 20-year-old diffuser system.

Easterly Wastewater Treatment Plant Solids Handling and Gas Utilization Analysis | City of Vacaville, California
Conducted an analysis of the anaerobic digestion system, gas utilization, and cogeneration systems at Easterly Wastewater Treatment Plant. Alternatives that were evaluated included: (1) refurbishing the gas handling system and placing the cogeneration engine in service; (2) anaerobic digestion heating system; (3) digester gas storage and cover replacement; (4) extending the heat loop to the administration building for heating; (5) installing an adsorption chiller at the administration building for cooling; (6) enhancing the digester gas production through the addition of FOG (fats, oil, and grease) system; and (7) alternative gas utilization systems, such as using the existing cogeneration engine, new cogeneration engine, fuel cell, and mini turbine. An opinion of the project cost for the most viable alternatives were developed and discussed in a workshop format to enable to city to select which alternative to implement.

Kihei Wastewater Reclamation Facility Process Evaluation and Assessment Study | County of Maui, Wastewater Reclamation Division Department of Environmental Management, Maui, Hawaii
The purpose of this project was to assess and evaluate the Kihei Wastewater Reclamation Facility to determine the current “true” capacity of the facility. Conducted a plant-wide optimization study of the Kihei Wastewater Reclamation Facility, which is an activated sludge treatment facility that currently has a peak dry weather capacity of 8 mgd and includes flocculation and chemical feed units, effluent filtration, ultraviolet (UV) disinfection, and an operations building. Tasks included recommending cost-effective short- and long-term capital improvement projects and associated budgetary costs to accommodate future increases in wastewater flow and recycled water demand. The project included detailed characterization of existing flows and loadings based on available historical data; full-scale stress testing of the secondary clarifiers by progressively taking clarifiers off-line and observing the performance under varying loads; dispersed and flocculated suspended solids tests to evaluate the flocculating characteristics of the mixed liquor and assess the hydrodynamic characteristics of the clarifiers; biological process and mass balance modeling to simulate future operating conditions to identify potential capacity and performance issues; and hydraulic modeling to verify the capability of handling future peak wet weather flows. Cost-effective recommendations to accommodate the higher projected future loadings included installation of a wet-weather partial flow diversion line from the headworks to the mixed liquor channel, and modifications to the aeration basin outlet structure to increase the basin operating depth.

Coeur d'Alene Phase 5B Improvements | City of Coeur D'Alene, Idaho
Provided process design support for Phase 5B improvements, which included a new anaerobic digester, digester control building, biogas control building, utility corridor, administration/ laboratory, and collections maintenance garage.

Derek R. Guthrie Water Quality Treatment Center Expansion | Kentucky Metropolitan Sewer District, Louisville & Jefferson County, Kentucky
Provided process engineering support for USEPA Consent Decree expansion and upgrade of an existing 30 mgd secondary wastewater treatment plant using contact stabilization to provide wet weather treatment capacity for up to 200 mgd of wet weather flow using a modified contact stabilization process. Project included upgraded facilities for grit removal, aeration, final clarification, disinfection, odor control, and associated support facilities.

Floyds Fork Water Quality Treatment Center Phase 2 Expansion | Louisville and Jefferson County Metropolitan Sewer District, Louisville, Kentucky
Provided process design support for Phase 2 expansion of the Floyds Fork Water Quality Treatment Center to 6.5 mgd, with accommodation for a Phase 3 expansion to 9.75 mgd. Design was developed based upon 6.0

MG/L for CBOD, 30 MG/L for TSS and 0.5 MG/L for total phosphorus limits. Improvements included influent pumping station rehabilitation, mechanical bar screens, girt collection system, orbal oxidation ditch modifications for increasing biological treatment capacity to 6.5 mgd, splitter box, two new secondary clarifiers, return activated sludge (RAS) pumping, 18-inch-diameter waste activated sludge (WAS) pipe, sludge holding system, two additional tertiary filters increasing the total extended peak capacity to 12.72 mgd, ultraviolet (UV) disinfection, and chemical feed modifications. The existing influent pumps were replaced with new units that double the capacity for a peak hourly flow capacity of 20.8 mgd and included a 24-inch-diameter force main, variable frequency drives (VFDs), and odor control facility. Tertiary filter improvements included replacement of the existing filter media and the refurbishing of the existing equipment. The existing Trojan 4000 UV system was replaced with the Trojan 3000Plus system.

Wastewater Treatment Facility Improvements Preliminary Engineering Report | City of Santa Rosa, New Mexico
Provided engineering design services, included an evaluation of the existing wastewater treatment facility and preparation of a predesign report that identifies improvements to meet the National Pollutant Discharge Elimination System (NPDES) requirements, provide beneficial use of reclaimed wastewater, provide for future expansion, and meet anticipated limits for land application of solids. Evaluated five treatment options, which included sequencing batch reactor (SBR), Medium Rate Activated Sludge (MRAS), STM aerator, Biolac, and oxidation ditch processes. Based upon a matrix rating system, the Medium Rate Activated Sludge (MRAS) process was selected as the best treatment alternative by the plant's operators, city administrators, and construction programs bureau

Sante Fe Wastewater Treatment Plant Expansion and Composting Facility | City of Santa Fe, New Mexico
Provided process design services for improvements to the existing wastewater treatment facility, which include upgrade the hydraulic rating of the plant to an average daily wastewater flow of 12 mgd.

Additional Pilot Testing

Sacramento Regional Wastewater Treatment Plant Pilot Testing Technology Selection | Sacramento Regional County Sanitation District, Sacramento, California
Assisted the district with selecting viable candidate treatment processes to pilot test at the Sacramento Regional Wastewater Treatment Plant for compliance with the new NPDES permit. Three workshops were conducted with District staff and other experts, and a summary report was prepared documenting the findings of the workshops.

Spokane Regional Wastewater Treatment Plant | Spokane County, Spokane, Washington
Assisted the county with a programmatic approach to their wastewater treatment, including a facility plan and TMDL negotiations with Washington State Department of Ecology. Assisted with preparation of a facility plan for the county, recommending that a new treatment plant be constructed with a discharge to the Spokane River. Also provided process design of a new 8 mgd, expandable to 24 mgd, regional water reclamation facility, which employs advanced tertiary treatment processes to produce Class A reclaimed water with very low phosphorus concentrations.

Wastewater Studies

Assist with the Second Regional Watershed Permit | Bay Area Clean Water Agencies, Oakland, California
Assisted with writing a portion of the scoping and evaluation plan as described under the Second Regional Watershed Permit. Provided information on developing planning-level facility needs on water conveyance from

water resource recovery facilities to potential natural treatment process sites, reviewing of natural treatment facilities developed by San Francisco Estuary Institute, and cost estimating for facility needs generated under the natural treatment processes component of the permit.

Solids Flux Tool | Central Contra Costa Sanitary District, Martinez, California
Project manager for development of a plan for creating a solids flux tool specific for the wastewater treatment plant.

Regulatory Assistance | Central Contra Costa Sanitary District, Martinez, California
Provided as-needed engineering services to assist the district's plant operations department with regulatory assistance. Provided review and development of comments regarding the district's draft NPDES permit, including development of comments in response to those submitted by the water contractors.

Blower System Reliability and Capacity Evaluation | Central Contra Costa Sanitary District, Martinez, California
Conducted a study to determine the most cost-effective approach for providing a reliable activated sludge blower system that meets current and future standby capacity.

Assist with Data Assessment and Process Troubleshooting | Delta Diablo, Antioch, California
Diagnosed recent elevated biochemical oxygen demand (BOD) and total suspended solids (TSS) discharge levels. Compiled data provided by the district, performed trending analysis on this data, met with district staff to review possible reasons for the elevated levels, and summarized the findings in a brief memorandum.

Preliminary Assessment of Waste Stream Disposal Impacts | K2 Pure Solutions, Antioch, California
Evaluated the impacts that backwash, blowdown, waste reject, and brine streams would have on Delta Diablo Sanitation District's treated effluent and recycled water quality. Also evaluate site bleach production versus hauling bleach.

Wastewater Impact Analysis for the Proposed Marsh Landing Generation Station | Mirant Services, LLC, Antioch, California
Evaluated waste stream, activated sludge total dissolved solids (TDS), and collection system impacts on the proposed 930 megawatt (MW) natural gas-fired combined cycle power plant (Marsh Landing Generating Station). Water supply for this power generation facility was originally going to be provided by the Delta Diablo Sanitation District's water recycled facility (satellite facility) located at the Bridgehead Lift Station site. Due to California's recessed economic situation, the costs associated with the satellite treatment and discharge facilities, and other considerations, Mirant wanted to obtain water from two supply wells as opposed to recycled water. Also prepared an estimated connection fee based on the projected discharge flows and the district's current connect fee schedule.

Sewer Model Update for Flow Equalization & East Bay Dischargers Authority (EBDA) Diversion Scenarios | Oro Loma Sanitary District, San Lorenzo, California
Assisted with update of the sewer hydraulic model to determine the amount of discharge capacity the District would need from the East Bay Dischargers Authority (EBDA), if the District had a permit to divert up to 100 million gallons (MG) per year through the existing emergency discharge structure.

Outfall Replacement Feasibility Analysis for the Oro Loma Wastewater Treatment Plant | Oro Loma Sanitary District, San Lorenzo, California
Assessed the feasibility and costs to replace the existing shallow water outfall for the 20 mgd wastewater treatment plant. The outfall would be dedicated for discharge of the district's treated effluent only. Work included: (1) determining regulatory requirements, permits necessary, and feasibility to replace the existing shallow water outfall into the San Francisco Bay; (2) determining conceptual upgrades necessary at the wastewater treatment plant to support replacement of the existing shallow water outfall; (3) preparing a

conceptual design for the outfall replacement; and (4) preparing a cost estimate for the plant upgrades and outfall replacement.

Mainstream Deammonifcation | City of San Luis Obispo, California
Evaluated mainstream deammonification for the water resource and recovery facility and prepared a study report that investigated modifying the membrane bioreactor (MBR) to a mainstream deammonification configuration (if deemed viable in the future). The potential energy savings for mainstream deammonification was calculated. Identified key operational features associated with mainstream deammonification, and provided a list of potential design elements to include for the current MBR design in the case that mainstream deammonification is viable in the future.

Review of Cutler Middle Bear River and Cutler Reservoir TMDLs | City of Logan, Utah
Reviewed and evaluated the TMDL and commentary included in the December 2008 Middle Bear River and Cutler Reservoir TMDLs-Public Draft to determine if there are possible shortcomings or flaws. Comments were forwarded to the Department of Environmental Quality.

Treatment Technology Review and Assessment | Association of Washington Business, Olympia, Washington
Evaluated the proposed technologies that claim to achieve the extremely low levels of metals and other toxic constituents of concern, despite not being properly evaluated by the Washington State Department of Ecology. Also developed an opinion of probable costs for implementing and operating these technologies for the Association of Washington Business members that have National Pollutant Discharge Elimination System (NPDES) permits.

Recycled Water

Regional Evaluation of Potential Nutrient Discharge Reduction by Water Recycling | Bay Area Clean Water Agencies, Oakland, California
Provided a planning level study related to nutrient discharge reduction by water recycling for BACWA member agencies with design wastewater flows greater than or equal to 1 mgd. The project involved collecting and compiling information from member agencies on recycled water projects being considered through existing planning efforts, calculating nutrient load reductions associated with these already planned projects, and evaluating their feasibility and cost-effectiveness. Information from agencies that have no recycling plans and/or determine that recycling is not feasible for them to pursue were assembled.

Refinery Recycled Water Project Evaluation Report Update | Central Contra Costa Sanitary District, Martinez, California
Updated the 2009 refinery recycled water project evaluation report for industrial use to include refining facility sizing to current standards, as well as capital and operations and maintenance (O&M) cost estimates for the preferred alternative. Energy demand in the form of kWh per million gallon treated was included. In addition, a new dentrification alternative to the recycled water treatment process was developed and evaluated.

Recycled Water Feasibility Study | Central Contra Costa Sanitary District, Martinez, California
Provided process design services for three separate engineering projects that included recycled water study, nitrification, and biological nutrient removal. The recycled water study report evaluated a module approach to take secondary treated wastewater and apply biological treatment to nitrify ammonia by way of a moving bed biofilm reactor (MBBR), followed by reverse osmosis to remove TDS. As for the nitrification and biological nutrient removal reports, the studies considered re-configuration and basin expansion required at the existing BOD removal facility to achieve a wide range of treatment objectives The biological configurations considered included A2O, 4-stage and 5-stage Bardenpho, integrated fixed-film attached sludge (IFAS), MBBR, and biologically active filter (BAF).

Conaway Ranch Recycled Water Project | Conaway Ranch Headquarters, Woodland, California
Conaway Preservation Group (CPG) was interested in using treated effluent from the City of Davis' wastewater treatment plant on a portion of the Conaway Ranch for agricultural irrigation, habitat, and other beneficial uses. Provided permitting, negotiation, and engineering support related to development of this recycled water project and related strategic initiatives, which included: (1) active technical committee participation, collaboration, and meeting attendance; and (2) reviewing and commenting on reports, permit, and other technical documents prepared by others.

Wastewater Treatment and Biosolids Facilities Master Plan | Dublin San Ramon Services District, Dublin, California
Provided input to the regulatory requirements technical memorandum (TM) to include Bay Area Clean Water Agencies (BACWA) activities and potential future nutrient requirements as well as risk factors and probabilities associated with each future nutrient requirement identified, assisted with emergency analysis of the energy and cogeneration systems as well as possible energy generation expansion alternatives, participated in a review panel (visioning panel workshop) to evaluate new developments and technologies in wastewater resource recovery facilities and recommend which of these technologies should be considered for the district future, identified and evaluated nutrient removal alternatives to achieve nutrient reduction goals consistent with the nutrient control study being completed for BACWA, provided assistance in identifying and evaluating biosolids management alternatives, provided assistance in assessing recycled water treatment alternatives, assisted with performing a control room spacing ad staffing study, and provided quality assurance/quality control review of the existing facilities and capacity technical memorandum (TM), regulatory requirements. Resource recovery technologies that were evaluated for the visioning panel workshop included nutrient recovery, biosolids recovery, and beneficial usage, and water recovery for reuse, including indirect and direct potable reuse applications.

Recycled Water Feasibility Study | Oro Loma Sanitary District, San Lorenzo, California
Assisted with conducting a feasibility study which was needed to comply with State Water Resources Control Board's Water Recycling Program Funding criteria. Evaluated effluent water quality, identified data gaps necessary to complete the evaluation, and identified and evaluated tertiary treatment technology and plant alternatives. Full advanced treatment for potable reuse alternative and nutrient removal alternatives were evaluated since nutrients in discharge was anticipated to be a concern in the future.

Recycled Water Rate Study | City of San Luis Obispo, California
Reviewed and developed cost-based recycled water rates, construction water rates, and surplus recycled water rates.

Water/Wastewater Infrastructure

Raw Water Storage Tank Conversion and Distribution Flow Meter - Construction Inspection and Startup/Commissioning Support | Mountain House Community Services District, Mountain House, California
Principal-in-Charge during construction inspection and startup/commissioning services for both the raw water storage tank conversion and distribution flow meter projects. The raw water storage tank conversion included conversion of the existing raw water storage tank to a treated water storage tank and new interconnecting pipework. The distribution flow meter project included removing buried 36-inch-diameter pipe (between existing isolation valves) and installing new pipework, flowmeter, and flowmeter vault. Both projects are located at the Mountain House Water Treatment Plant.

Dry Creek Bypass Pipeline Feasibility Study | Sonoma County Water Agency, Santa Rosa, California
Conducted a feasibility study for a new raw water pipeline that would improve flow of water for the agency's water contractors and provide more suitable conditions for juvenile salmon. As part of the feasibility study,

provided: (1) public outreach support; (2) agency coordination; (3) Phase 1 environmental investigation; (4) screening criteria for selection of preferred alternatives and alignment; (5) evaluating and ranking of alternatives and alignments relative to the screening criteria; (6) conceptual design of the inlet and outlet structures, raw water pipeline facilities (up to 60 inches in diameter) to divert a portion of the flow to a groundwater banking system in the Santa Rosa Plain, and hydroelectric generation facilities; (7) permitting assistance; (8) alignment routing study for the pipeline; (9) project cost evaluation of the alignment and alternatives; (10) hydraulic and water quality modeling; and (11) project engineering report.

Water/Wastewater Infrastructure for New California Correctional Health Care Facilities | California Prison Health Care Receivership Corporation, Sacramento, California
Provided preliminary design and planning support for the infrastructure serving new clinical healthcare facilities at various state prison locations throughout California, which include water, wastewater, storm drainage, electrical service, and communication system.

Publications

Falk, M.W.; Seshan, H.; Dosoretz, C.; Wuertz, S. (2013) Partial bioaugmentation to remove 3-chloroaniline slows bacterial species turnover rate in bioreactors. Water Research 47(19):7109-7119.

Falk, M.W.; Reardon, D.J.; Neethling, J.B.; Clark, D.L.; Pramanik, A. (2013) Striking the Balance between Nutrient Removal, Greenhouse Gas Emissions, Receiving Water Quality, and Costs. Water Environment Research 85(12): 2307-2316.

Falk, M.W. & Wuertz, S. (Submitted) Microbial Community Dynamics in Membrane Bioreactors are Unrelated to Effects of Toxin, 3-Chloroaniline, on Process Performance. *Wat. Res.*

Falk, M.W., Dinsmore, C., Kennedy, K., and Kirksey, W. (2009) Walking the Talk: Water Recycling & Energy Efficiency Intertwined at an Eco-Tourism Resort. Conference Proceedings for the Annual WateReuse Symposium, Seattle, WA.

Falk, M.W., Song, K.G., Matiasek, M.G., Wuertz, S. (2009). Microbial community dynamics in replicate membrane bioreactors – Natural reproducible fluctuations. Wat. Res., 43(3):842-852.

Goffredo, V., Falk, M.W., Schroder, E.D., Irvine, R.L., Ranieri, E. (2009) Biostorage polymers phenomena in cheese wastewater treatment by a sequencing batch reactor. J. Environ. Engr.-ASCE, 135(2):101-104.

Falk, M.W. & Wuertz (2007). Influence of 3-Chloroaniline on Population Dynamics in Membrane Bioreactors. Conference Proceedings for the 9th Annual Bacterial Genetics and Ecology (BAGECO) Symposium, Wernigerode, Germany.

Falk, M.W. & Wuertz, S. Diversity of Biofilms and their Formation Processes (2006). In: Biodiversity in Agricultural Production Systems, Ed. G. Benckiser & S. Schnell. Dekker, NY.

Gilmour, I.A., Falk, M.W., Chang, D.P. (2006). Renewable Energy Options for Canterbury Region and New Zealand. Renewable Energy CHCH Proceedings.

Falk, M.W. & Sarina J. Ergas (2002). Hydrogenotrophic denitrification for drinking water using a hollow fiber membrane bioreactor. Conference Proceedings for the Annual American Water Works Association Conference. New Orleans, Louisiana.

Falk, M.W. & Sarina J. Ergas (2001). Hydrogenotrophic denitrification for drinking water using a dead-end hollow fiber membrane bioreactor. Poster for the Annual New England Water & Environment Association Conference.

Presentations

Falk, M.W.; Shamblin-Gray, S.; Balendhran, C.; Neethling, J.B.; Toland, S.; Malloy, S. (2013) Lessons Learned from IRWD - Setting Boundary Conditions at Their WWTP when Estimating GHG Emissions for Their Sustainability Evaluation. Water Environment Federation Annual Conference, Chicago, IL.

Seshan, H.; Goyal, M.K.; Falk, M.W.; Wuertz, S. (2013) Diversity Indices and Predictive Modeling in Bioreactors. Annual International Water Associated Water Research Conference, Singapore Expo, Singapore. (Presentation and Conference Proceedings; NON-HDR SPONSORED; PhD RESEARCH)

Falk, M.W.; Kennedy, H.; Clark, D. (2013) What is the NNE Process and how it Might Impact My Next PermitAnnual Conference of the California Water Environment Association, Palm Springs, CA. (Abstract accepted)

Falk, M.W. and Reardon, D.J. (2012) Getting to Zero. California Association and Sanitation Agencies Tri-Annual Conference, Dessert Springs, CA.

Falk, M.W.; Liu, H.-Y.; Ernst, M.; Wydra, E. (2012) Changing Accepted/Old Habits to Improve Discharge Quality Water. Annual Conference of the California Water Environment Association, Sacramento, CA.

Falk, M.W.; Liu, H.-Y.; Hauser, D.W.; Neethling, J.B. (2012) Achieving Less than 0.050 mg P/L Reliably with Active Chemical Sludge. Annual Water Environment Federation Conference, New Orleans, LA. (Presentation and Conference Proceedings)

Falk, M.W.; Neethling, J.B.; Reardon, D.J. (2011) Is There a Happy Medium for Nutrient Removal and Sustainability? Annual Conference of the Central States Water Environment Association, Minneapolis, MN.

Falk, M.; Natoli, R.; Kennedy, K. (2011) Bleach: An Alternative to Chlorine Gas – The 2nd Largest Threat to Homeland Security. Annual Conference of the California Water Environment Association, Ontario, CA.

Falk, M.W. (2011) So You Want to Sustainably Reclaim Water using a Wetland? Annual Conference of the California Water Environment Association, Ontario, CA.

Falk, M.W.; Neethling, J.B.; Reardon, D.J. (2011) Striking the Balance between Nutrient Removal and Sustainability: Is There a Tipping Point? California Water Environment Association, CWEA Energy Efficiency Seminar, Berkeley, CA.

Perinpanayagam, M.; Balendhran, C.; Dale, A.; Falk, M.; Reardon, D. (2011) Pioneering Energy Resource Recovery on Food Waste at Gills Onions. Annual Water Environment Federation Energy and Water Conference, Chicago, IL. (Presentation and Conference Proceedings)

Falk, M.W.; Neethling, J.B.; Reardon, D.J.; Pramanik, A. (2011) Striking the Balance between Nutrient Removal and Sustainability. Annual Water Environment Federation Nutrient Conference, Miami, FL. (Presentation and Conference Proceedings)

Falk, M.W.; Neethling, J.B.; Reardon, D.J.; Pramanik, A. (2011) Wastewater Treatment Nutrient Removal and Energy/GHG Nexus. Annual Water Environment Federation Energy and Water Conference, Chicago, IL. (Presentation and Conference Proceedings)

Falk, M.W.; deBarbadillo, C.; Liu, H.-Y.; Neethling, J.B.; Pramanik, A. (2011) Development of a WERF Compendium on Design, Operations, and Research Needs for Tertiary Denitrification Processes to Meet Low N & P Limits. Annual Water Environment Federation Conference, Los Angeles, CA.

Falk, M.W.; Neethling, J.B.; Reardon, D.J.; Clark, D.L.; Pramanik, A. WERF Nutrient Challenge – Nutrient Regulations, Treatment Performance, and Sustainability Collide. Annual Water Environment Federation Conference, Los Angeles, CA. (Presentation and Conference Proceedings)

Falk, M.W.; Neethling, J.B.; Reardon, D.J. (2011) Striking the Balance between Nutrient Removal in Wastewater Treatment and Sustainability. Water Environment Research Foundation, NUTR106n. (Soft-

Falk, M.W. and Wuertz, S. (2010) Effects of the toxin 3-chloroaniline at low concentrations on microbial community dynamics and membrane bioreactor performance. Wat. Res., 44:5109-5115. (Peer-Reviewed Journal Publication; NON-HDR SPONSORED; PhD RESEARCH)

Falk, M.W. and Wuertz, S. (2010) Partial bioaugmentation and effect of 3-Chloroaniline on microbial community dynamics in membrane bioreactors. International Water Association Water Research Conference, Lisbon, Portugal. (NON-HDR SPONSORED; PhD RESEARCH)

Reardon, D. and Falk, M. (2010) Incorporating the Three Pillars of Sustainable Design into the Sugar Creek WWTP Expansion Project. Annual Conference of the California Water Environment Association, Sacramento, CA.

Liu, H.-Y.; Peterson, S.; Falk, M. (2010) Tertiary Filtration: Looking Beyond the Title 22 Requirements. Annual Conference of the California Water Environment Association, Sacramento, CA.

Falk, M. (2010) Walking the Talk: Water Recycling & Energy Efficiency Intertwined at an Eco-Tourism Resort. California Water Environment Association Annual Northern Regional Training Conference, Modesto, CA.

Falk, M.; Dinsmore, C.; Kennedy, K.; Kirksey, W. (2010) Walking the Talk: Water Recycling & Energy Efficiency Intertwined at an Eco-Tourism Resort. Annual Water Environment Federation Conference, New Orleans, LA. (Presentation and Conference Proceedings)

Falk, M.; Kinnear, D.; Reardon, D.; Jarell, J.; Knosby, M.; Mosteller, K. (2010) Greenhouse gas emissions analysis: making alpha work for you. Annual Water Environment Federation Conference, New Orleans, LA. (Poster and Conference Proceedings)

Reardon, D.J. and Falk, M.W. (2010) Getting to zero: sustainability best practices to significantly reduce greenhouse gas and energy at your wastewater facility. Annual Water Environment Federation Conference, New Orleans, LA. (Presentation and Conference Proceedings)

Falk, M.W. (2009) Influence of Toxins on Replicate MBRs Microbial Community Dynamics. Annual Conference of the California Water Environment Association, Palm Springs, CA.

Falk, M.; Dinsmore, C.; Kennedy, K.; Kirksey, W.; Levine, J.; Derry, M. (2009) Walking the Talk: Water Recycling & Energy Efficiency Intertwined at an Eco-Tourism Resort. WateReuse Annual Conference, Seattle, WA. (Presentation and Conference Proceedings)

Falk, M.W.; Song, K.-G.; Matiasek, M.G.; Wuertz, S. (2009) Microbial community dynamics in replicate membrane bioreactors – Natural reproducible fluctuations. Wat. Res., 43:842-852. (Peer-Reviewed Journal Publication; NON-HDR SPONSORED; PhD RESEARCH)

Awards and Honors

United States Environmental Protection Agency (USEPA) Science to Achieve Results (STAR) Fellow, September 2005 – August 2007

University of California Toxic Substances Research and Teaching Program Fellow, July ‘03 – June ’05

Carollo Scholarship for Outstanding Academic Achievement, 2004

National Science Foundation (NSF) Asia Summer Research Fellowship Recipient, 2002

Fundamentals of Engineering (EIT) Certification, April 1999

Virginia Tech Men’s Lacrosse Team Captain, 1997-1999

Boy Scouts of America Eagle Scout, September 1993

PROFESSIONAL ENDEAVORS

HDR Engineering, Inc.,
2008 to Present

Professional Affiliations

American Society of Civil Engineers (ASCE)

American Water Works Association (AWWA)

International Water Association (IWA)

Chi Epsilon (CE) Professional Civil Engineering Fraternity, 1999

Caroline Nguyen, Ph.D., P.E.

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SUMMARY OF QUALIFICATIONS

- B.S., M.S., and Ph.D. in Civil and Environmental Engineering
- Licensed Professional Engineer in Maryland (0402049292) and Virginia (41791)
- Accomplished Principal Scientist and Engineer specializing in resource recovery and water treatment, recognized for pioneering strategies, securing substantial grants, and publishing peer-reviewed research. Expert in resource recovery, water treatment, water quality, and sustainable infrastructure, demonstrating adept leadership in optimizing treatment facilities and fostering collaborations with top research institutions and industry leaders.

EDUCATION

Doctor of Philosophy, Civil Engineering, December 2010
Virginia Polytechnic Institute & State University (Virginia Tech), Blacksburg, VA

Master of Science, Environmental Engineering, August 2005
Virginia Polytechnic Institute & State University (Virginia Tech), Blacksburg, VA

Bachelor of Science, Environmental Engineering, May 2003
North Carolina State University (NCSU), Raleigh, NC

North Carolina School of Science and Mathematics, Durham, NC, May 1999

RELEVANT EXPERIENCE

Principal Scientist, Washington Suburban Sanitary Commission (WSSC Water), Laurel, MD, October 2016 – Present

- Established pioneering university partnerships, fostering an innovative treatment plant culture at WSSC Water.
- Implemented forward-looking strategies, optimizing WSSC Water treatment plants to boost resource recovery, reduce costs, and tackle critical challenges.
- Led the development, evaluation, and implementation of an advanced carbon-efficient nutrient removal system at the 26 MGD Seneca WRRF. Leveraged innovative sensor technology and strategic controls, significantly cutting operational costs and greenhouse gas emissions. Secured funding from the Water Research Foundation and earned an esteemed WEF Project Excellence Award.
- Secured a $2.5M Department of Energy grant, spearheading impactful collaborations with prestigious institutions—University of Maryland, Johns Hopkins University, Argonne National Laboratory, and Brown and Caldwell—to drive groundbreaking WRRF decarbonization research.
- Directed an industry-leading pilot at the 7.5 MGD Parkway WRRF, revolutionizing phosphorus removal techniques and achieving a 45% reduction in aluminum chemical use, boosting operational efficiency.

Principal Environmental Engineer, WSSC Water, Laurel, MD, May 2011 – October 2016

- Provided technical oversight for complex regulatory monitoring at Piscataway WRRF, specifically targeting identification and monitoring of polychlorinated biphenyl (PCB) sources.
- Led bench-scale tests evaluating the efficacy of powdered activated carbon and permanganate in removing petroleum compounds from Potomac River oil spills.
- Managed corrosion research on simulated home plumbing at Potomac Water Filtration Plant, predicting lead and copper rule compliance post-treatment changes.
- Conducted a pilot study comparing ferric chloride and polyaluminum chloride coagulants' impact on disinfection byproducts, plumbing corrosion, and residual solids.
- Reviewed technical documents and contributed insights during feasibility and design phases for the centralized Bioenergy/Anaerobic Digestion facility at the Piscataway WRRF.
- Developed calibrated biological process models for WSSC Water's major WRRFs, guiding operational recommendations and producing comprehensive reports to enhance plant performance.
- Actively engaged within the Contamination Rapid Response Team, strengthening readiness against water supply contamination risks for WSSC Water.

Research Assistant, Virginia Tech, Blacksburg, VA, June 2007 – May 2011

- Successfully managed EPA/Water Research Foundation Project #4088 ($625K), culminating in the publication of its impactful final report.
- Led investigations into the effects of coagulants, disinfectants, corrosion inhibitors, and other treatment changes on lead release from plumbing materials across ten U.S. utilities, influencing critical water quality strategies.
- Fostered collaborations with universities and utilities, devising strategic treatment approaches, setting key milestones, and consistently providing quarterly progress updates.
- Conducted pivotal research on chloramine decay and microbial regrowth in new building water conservation designs, shaping industry practices.
- Instructed the course "Introduction to Environmental Engineering" (Fall 2009), sharing expertise with future professionals in the field.

Engineer III, GHD (formerly Stearns & Wheler), Roanoke, VA, June 2005 – June 2007

- Played an integral role in developing comprehensive Basis of Design and Preliminary Engineering Reports for Enhanced Nutrient Removal (ENR) upgrades for seven Virginia Water Resource Recovery Facilities (WRRFs), ensuring compliance with stringent state regulations for effluent nitrogen and phosphorus as part of the Chesapeake Bay Program.
- Applied BioWin process modeling to forecast treatment efficiency, optimizing decision-making for facility upgrades and process enhancements.
- Produced detailed AutoCAD drawings for preliminary site plans, providing clear project visualization and strategic planning.
- Developed comprehensive cost estimates, ensuring accurate budgeting and resource allocation for project execution.

Research Assistant, Virginia Tech, Blacksburg, VA, Aug. 2003 – July 2005

- Explored factors (velocity, pH, chlorides, NOM, phosphate) influencing copper corrosion.
- Discovered rapid chloramine disinfectant decay in copper pipe contacting water as well as copper's role in free chlorine destruction.
- Developed predictive methods for copper pitting, advancing corrosion forecasting in water systems.

Engineering Intern, Hazen and Sawyer, Raleigh, NC**,** May 2001 – Aug. 2003

- Evaluated the performance of secondary clarifiers at a WRRF in Greensboro, NC, following the protocol recommended by the Water Environment Research Foundation (WERF) and the Clarifier Research Technical Committee (CRTC).
- Developed a standardized Microsoft Excel workbook for hydraulic evaluations for use throughout the company.

National Science Foundation (NSF) Green Processing Researcher, Department of Chemical Engineering and Department of Civil Engineering, NCSU, Raleigh, NC, Summer 2002

- Developed a STOAT biological process model to simulate the Raleigh Neuse River WRRF.

PEER-REVIEWED PUBLICATIONS

1) Morales, W.; To, P.; Taylor, M.; **Nguyen C.**; Fahrenfeld, N. 2023. Acclimation, manganese removal, and backwash impact on full-scale drinking water biofilter microbiome. AWWA Water Science. DOI: 10.1002/aws2.1334.
2) Pusker, R; Johnson, M.; Nguyen, C; Wells, G; Al-Omari, A. 2023. Demonstration of Progressive Carbon Efficient Nitrogen with Biological Phosphorous Removal in a Conventional BNR Facility. Final Report. Water Research Foundation, Denver, CO.
3) Luo H., Sun Y., Taylor M., **Nguyen C.**, Strawn M., Broderick T., Wang Z.W. 2021. Impacts of aluminum- and iron-based coagulants on municipal sludge anaerobic digestibility, dewaterability, and odor emission. Water Environment Research, 94(1), e1684 DOI: https://doi.org/10.1002/wer.1684 (Editor's Selection).
4) Luo H., Zhang D., Taylor M., **Nguyen C.**, Wang Z.W. (2021) Aeration in sludge holding tanks as an economical means for biosolids odor control – A case study. Water Environment Research, 2021;00:1–11, DOI: https://doi.org/10.1002/wer.1582.
5) Knowles, A.; **Nguyen, C.**; Edwards, M.; Stoddard, A; McIlwain, B.; Gagnon, G. 2015. Role of iron and aluminum coagulant metal residuals in lead release from drinking water pipe materials. Journal of Environmental Science and Health, Part A. Toxic/Hazardous Substance

& Environmental Engineering, 50(4):414-23. DOI: https://doi.org/10.1080/10934529.2015.987550
6) Triantafyllidou, S.; **Nguyen, C.**; Zhang, Y.; Edwards, M. 2013. Lead (Pb) Quantification in Potable Water Samples: Implications for Regulatory Compliance and Assessment of Human Exposure. Environmental Monitoring and Assessment, 185(2):1355-1365. DOI: http://dx.doi.org/10.1007/s10661-012-2637-6.
7) Hu, J.; Triantafyllidou, S.; **Nguyen, C.**; Edwards, M. 2012. Copper-Induced Metal Release from Lead Pipe into Drinking Water. Corrosion, 68(11):1037-1048.
8) **Nguyen, C.**; Elfland, C.; Edwards, M. 2012. Impact of Advanced Water Conservation Features and New Copper Pipe on Rapid Chloramine Decay and Microbial Regrowth. Water Research, 46(3):611-621, DOI: https://doi.org/10.1016/j.watres.2011.11.006.
9) **Nguyen, C.**; Powers, K.; Raetz, M.; Parks, J.; Edwards, M. 2011. Rapid Free Chlorine Decay in the Presence of $Cu(OH)_2$: Chemistry and Practical Implications. Water Research, 45(16): 5302-5312. DOI: https://doi.org/10.1016/j.watres.2011.07.039
10) **Nguyen, C.**; Clark, B.; Stone, K.; Edwards, M. 2011. Role of Chloride, Sulfate, and Alkalinity on Galvanic Lead Corrosion. Corrosion, 67(6): 065005-1-065005-9. DOI: https://doi.org/10.5006/1.3600449
11) **Nguyen, C.**; Clark, B.; Stone, K.; Edwards, M. 2011. Acceleration of Galvanic Lead Solder Corrosion due to Phosphate. Corrosion Science, 53(4):1515-1521. DOI: https://doi.org/10.1016/j.corsci.2011.01.016
12) Sarver, E.; Dodson, K.; Scardina, P.; Lattyak-Slabaugh, R.; **Nguyen, C.**; Edwards, M. 2011. Copper Pitting in Chlorinated, High pH Potable Waters. Journal American Water Works Association, 103(3):86-98.
13) **Nguyen, C.**; Stone, K., Edwards, M. 2011. Nitrate Accelerated Corrosion of Lead Solder in Potable Water Systems. Corrosion Science, 53(3):1044-1049. DOI: https://doi.org/10.1016/j.corsci.2010.11.039
14) **Nguyen, C.**; Stone, K.; Edwards, M. 2011. Chloride-to-Sulfate Mass Ratio: Practical Studies in Lead Solder Galvanic Corrosion. Journal American Water Works Association. 103(1):81. DOI: https://doi.org/10.1002/j.1551-8833.2011.tb11384.x
15) **Nguyen, C.**; Stone, K., Dudi, A.; Edwards, M. 2010. Corrosive Microenvironments at Lead Surfaces Arising from Galvanic Corrosion with Copper Pipe. Environmental Science & Technology, 44(18):7076-7081. DOI: https://doi.org/10.1021/es1015185
16) **Nguyen, C.**; Stone, K.; Clark, B.; Gagnon, G.; Knowles, A.; Edwards, M. 2010. Impact of Chloride:Sulfate Mass Ratio (CSMR) Changes on Lead Leaching in Potable Water. Final Report, Water Research Foundation, Denver, CO.

SELECTION OF PRESENTATIONS

1) **Nguyen, C**.; Johnson, M.; Regmi, P.; Al-Omari, A.; Wells, G.; Yeakle, B. Beating Best Practice: Development in Carbon Efficient Nitrogen Removal at the Seneca WRRF. WEF Intensification of Resource Recovery Forum. March 2023.
2) Regmi, P.; Johnson, M.; **Nguyen, C**.; Al-Omari, A.; Wells, G.; Yeakle, B. Demonstration of SND, A Full-Scale Demonstration of SND, Post-Denitrification With Internally Stored Carbon and Anammox Potential For Energy and Carbon-Efficient BNR. WEFTEC. October 2022.
3) Saavedra, Y.; Johnson, G.; **Nguyen, C**.; Hunter, G.; Hanna, M.; McPherson, A. Demonstration of Sidestream Enhanced Biological Phosphorus Removal at WSSC Water. WaterJAM Conference. September 2021.
4) Saavedra, Y.; **Nguyen, C**.; Taylor, M.; Jacangelo, J.; Maloney, B.; Krallinger, R.; Moody, C. Evaluation of Peracetic Acid for Disinfection of Filtered Secondary Effluent at Washington Suburban Sanitary Commission. WEFTEC 2019. September 2019.
5) **Nguyen, C.**; Johnson, M.; Amad, S.; Hanna, M. Inline Enhanced Biological Phosphorus Removal at WSSC. WaterJAM Conference. September 2019.
6) **Nguyen, C**.; Selock, K. Expanding Resource Recovery at WSSC. Chesapeake Tri-Association Conference. Ocean City, MD. August 2018.
7) **Nguyen, C**.; Triantafyllidou, S.; Edwards, M. Chloride to Sulfate Mass Ratio and Galvanic Connection Changes - Impact on Lead Leaching. Water Research Foundation Webcast, March 16, 2010.

8) **Nguyen, C.**; Triantafyllidou, S.; Hu, J.; Edwards, M. The Effect of Partial Lead Service Line Replacements on Lead Leaching. 2009 AWWA Annual Conference. San Diego, CA. Presentation TUE30-3:00. June 2009.
9) **Nguyen, C.**; Edwards, M.; DiGiano, F.; Elfland, C. Case Study of Microbial Growth in New Buildings with Water Conservation Features. 2008 AWWA Water Quality Technology Conference. Cincinnati, OH. November 2008.
10) **Nguyen, C.**; Edwards, M.; Stone, K.; Clark, B. Mechanistic Effects of Chloride-to-Sulfate Ratio on Lead Corrosion. 2008 AWWA Annual Conference. Atlanta, GA. Presentation TUE16. June 2008.
11) **Nguyen, C.**; Edwards, M. A Novel Method to Predict Copper Pitting. 2006 Annual AWWA Conference. San Antonio, TX. June 2006.
12) **Nguyen, C.**; Edwards, M. Chemistry of Rapid Chloramine Decay in Water Contacting Copper and Lead Plumbing. 2005 AWWA Water Quality Technology Conference. Quebec City, Quebec. Presentation MON13. November 2005.

ACTIVITIES/HONORS/CERTIFICATIONS

WEF Project Excellence Award 2022. Invited member of the **WEFTEC** Municipal Wastewater Treatment Design Program Community. **Licensed Professional Engineer** in Maryland (0402049292) and Virginia (41791). **National Science Foundation Graduate Fellowship** (2003-2005, 2007-2008), Via Civil and Environmental Engineering Departmental Fellowship (2003-2005, 2007-2010); Future Professoriate Graduate Certificate (Virginia Tech, 2010); Dean's List (1999-2003); W.C. Billy Creel Memorial Scholarship (2002-2003), Progress Energy Scholarship (2001-2002), CP&L Scholarship (2000-2001); Member of WEF, AWWA, WRF, and Chi Epsilon.

EDUCATION

MBA, Management/Finance,
Wayne State University

BS, Civil Engineering,
Michigan State University

REGISTRATIONS

Professional Engineer: FL
Professional Engineer: MI

QUALIFICATIONS

- Experienced in providing leadership on various sized water, wastewater and utility engineering projects throughout the southeast and midwest
- More than 1 million LF of pipeline design
- Well-versed in a magnitude of project types and understands what it takes to deliver projects successfullyUnderstands the importance of face-to-face meetings to obtain public support

As Wade Trim's Chief Business Development Officer, Tom Brzezinski, works closely with Wade Trim's clients and project managers to understand issues facing them, and how he can best assist them in achieving their objectives. With nearly 70% of Wade Trim's business focused on Water (water, wastewater, storm water and water reuse), Tom is aware of the issues impacting the water market sector and the application of emerging strategies and technologies to address those issues. He has spent his career in the Water sector starting in the field as a construction engineer before evolving into design and project management roles. With projects throughout the Midwest and southeast, he understands the challenges in a variety of geographies.

REPRESENTATIVE PROJECT EXPERIENCE

SEPTIC-TO-SEWER WASTEWATER PROGRAM MANAGER, ISLAMORADA, VILLAGE OF ISLANDS, ISLAMORADA, FL. | Program Manager for the $130-million centralized wastewater collection and treatment system program that included the plan, design, and construction to meet a five-year state-mandated deadline. The program replaced septic tanks with more than 80 miles of varying diameter vacuum sanitary sewer/force main systems, four requisite vacuum pump stations, transmission force mains, and transfer pump facilities. Improvements included 40 miles of roadway and 8 miles of water main and residential service line connections. Blanket easements were used to expedite the resident connection process on private property and minimize surveying and title work. A design-build-operate

(DBO) delivery model assisted the community in future operations. Led development of master schedule, project definition, and procurement support services, including RFQ process to shortlist firms and RFP process to select a firm. Oversaw development of process and SCADA equipment standards and installation procedures. Managed pilot program to establish design standards and provide a shovel-ready design. Oversaw design reviews and value engineering processes that identified $380,000 in cost-saving alternatives. Oversaw construction management, inspection, project controls, and project start-up and supported coordination with four regulatory agencies and community outreach meetings with residents.

SOIRL SEPTIC-TO-SEWER CONVERSION PROGRAM, BREVARD COUNTY UTILITIES DEPARTMENT, MELBOURNE, FL | Project Manager leading the design and construction services replacing septic tanks in three areas of Brevard County with vacuum sewer technology, totaling 2,881 parcels. The project is part of Brevard County's SOIRL initiative.

DESIGN CRITERIA PACKAGE AND OWNER'S REPRESENTATIVE SEPTIC TO SEWER PROGRAM, ISLAMORADA, VILLAGE OF ISLANDS, FL | Program Manager for the planning, design, and construction of a $130M centralized wastewater collection and treatment system to meet a state-mandated deadline over a five-year period. Replaced septic tanks with more than 80 miles of varying diameter vacuum sanitary sewer/force main systems, four requisite vacuum pump stations, transmission force mains, and transfer pump facilities. Improvements included 40 miles of roadway and eight miles of water main and residential service line connections. Oversaw design reviews and value engineering processes that identified $380,000 in cost-saving alternatives. Supported coordination with four regulatory agencies and assisted with community outreach meetings with residents.

KAREGNONDI WATER AUTHORITY (KWA) WATER SUPPLY SYSTEM, GENESEE COUNTY DRAIN COMMISSIONER, FLINT, MI. | Provided guidance and direction for design and construction of a $300 million water supply project to provide an independent water source and raw water transmission to service a 2,400-square-mile area delivered through a program management approach. The project was divided into seven contracts and included a new 80-MGD intake, 50 miles of 60-inch and 66-inch welded steel raw water main, two pump stations with two new electric substations, and 89,760 LF of 36-inch ductile iron finished water main.

CS-1158 LONG-TERM CSO CONTROL PLAN DEVELOPMENT, DETROIT WATER AND SEWERAGE DEPARTMENT, DETROIT, MI. | Provided engineering and structural support design for three CSO retention treatment basins with treatment capacities of 2,078, 548, and 425 MGD. The project included the design of screening, disinfection and odor control facilities. Innovative features included first flush capture tanks, shunt channels, tipping buckets and spray header flushing nozzles. The Hubbell-Southfield Basin received two design awards.

Val S. Frenkel, PhD, PE, DWRE

Vice President Process Engineering

YEARS OF EXPERIENCE

45

EDUCATION

Ph.D. Water and Ecology Science, Lviv Polytechnic University, 1983

M.Sc. Civil Engineering, Water and Wastewater, Lviv Polytechnic University, 1978

PROFESSIONAL REGISTRATIONS

- Professional Engineer: California, Michigan, New York and Texas
- Professional Engineer (P.Eng.): Ontario, Canada
- Diplomate, Water Resource Engineering (D.WRE)
- Fellow WEF
- Fellow IWA
- Fellow ASCE/EWRI
- IDA Outstanding Professional in Water Reuse 2018

PROFESSIONAL SOCIETIES

- Water Environment Federation (WEF)
- American Water Works Association (AWWA)
- Fellow International Water Association (IWA)
- Fellow American Society Civil Engineers (ASCE)
- International Desalination Association (IDA)
- American Membrane Technologies Association (AMTA)
- European Desalination Society (EDS)
- Professional Engineers Ontario (PEO)
- WateReuse Association
- American Academy of Water Resources Engineers (AAWRE)

PROFESSIONAL EXPERIENCE

Dr. Val Frenkel is a well-recognized expert with 45 years of experience and a proven record of building from the ground up for various markets including water, wastewater, water reuse, salinity management, desalination, and membrane technologies. Dr. Frenkel has a successful record of applying technological approaches to provide project cost savings, often via development of new technologies and applications used worldwide for treating water and wastewater. He also serves as overall project manager responsible for the delivery of complete treatment systems including coordination of permitting and ancillary design disciplines. Dr. Frenkel's expertise includes all aspects of water/wastewater business including, but not limited to: business development, program and project management, process design based on conventional and advanced technologies; membrane-based processes including MF, UF, NF, RO, ED, EDR, EDI, and MBR; potable water and wastewater treatment; water reuse; desalination; and salt management for industrial and municipal applications, food, power, semiconductor, oil and gas industries. His experience in detailed process and mechanical design encompasses key equipment design and calculations; equipment, controls, and instrumentation selection; and system specification, costing, and procurement.

RELEVANT PROJECT EXPERIENCE

Water

Project Manager and Lead Process Engineer for the Advanced Water Treatment System Evaluation for the Largest Single Cheese Production Plant in the World for the Hilmar Cheese Company, CA.
The Plant includes treatment of high biological strength wastewater with complex management of the produced sludge, including high-rate treatment, dewatering and disposal. The project included a detailed process and technological design selection of equipment, dewatering and sludge management equipment and development of design documents.

Project Manager and Lead Process Engineer for the Design of a Well Water Treatment Plant for the City of East Palo Alto, CA.
Designed well water treatment plant to treat Iron and Manganese to allow conformance with California drinking water secondary maximum contaminant levels (MCLs).

Program Manager for the Design of a Submerged Membrane Bioreactor for the City of Lathrop, CA.
Design of submerged membrane bioreactor up to capacity 2.5 MGD and expansion up to 9.0 MGD. Process design, BNR and MBR design, and equipment selection.

Project Manager for the Sand City Desalination Plant Evaluation Project for California American Water, CA.
The goal of this project is to optimize the Sand City Coastal Desalination Plant so it can reach its design capacity of 300 acre-feet (last year, approximately 160 acre-feet was achieved).

Project Manager for the Advanced Water Treatment System Evaluation for a Major National Dairy Processing Plant, CA.
The proposed advanced water treatment system is based on the previous recommendations to condition source well water supplied to the plant, which is rich with calcium, chloride bicarbonate and silica. The tasks include detailed process and technological design; selection of equipment, pumps, and energy recovery devices; development of reverse osmosis specifications; and development of design documents.

Technical and Process Advisor for the Development of Phosphorus Removal Feasibility Studies for the Calumet Water Reclamation Plants for the Metropolitan Water Reclamation District of Greater Chicago, IL.
The feasibility studies included two parts: to evaluate and optimize the existing operation so that to achieve as much phosphorus removal as possible with the least capital investment and to evaluate treatment technologies for the WRPs to meet 0.5 mg/L, 0.3 mg/L, and 0.1 mg/L effluent TP limits and the life cycle costs associated with the modifications. Consideration included struvite buildup potential and biosolids dewaterability impacts due to EBPR implementations.

Project Manager for the Development of a Desalination Feasibility Study for Santa Catalina Island, CA.
The project included understanding the existing desalination facility, researching pertinent regulatory requirements, understanding the various alternatives and respective design considerations associated with Santa Catalina Island, and providing a technical feasibility evaluation. Responsibilities included being knowledgeable of the local geography and geology, groundwater basins, land use, and prospective population growth. Dr. Frenkel identified and evaluated water supply characteristics and facilities ranging from technology to water use trends. The project included the understanding and evaluation of these various parameters and the creation of a feasibility study that summarizes the outcomes of the evaluation.

Project Manager for the Development and Validation of Water Pollution Control Plant Process Model for the Carmel Area Wastewater District, CA.
The Carmel Area Wastewater District (CAWD) Water Pollution Control Plant (WPCP) is a 3.0 million gallons per day (MGD) average annual permitted discharge flow facility that uses activated sludge for secondary treatment. Greeley and Hansen will utilize the CAWD WPCP's data for model development. Existing Monthly Operating Report (MOR) data (or similar) for the WPCP and as-built information will be the basis for the preliminary data analysis. WPCP data of interest includes influent flows and loads, as well as operating data such as mixed liquor suspended solids (MLSS) concentration, return activated sludge (RAS) concentration and flow rate, and other parameters as requested. It is anticipated that three years of MOR data would be sufficient for modeling purposes. The data collected from the MORs will be plotted, categorized into dry weather and wet weather data, and subsequently analyzed. A process model (BioWin) was used to model the WPCP and run seasonal simulations (four simulations total) of the WPCP. Analyses may include, but are not limited to oxygen uptake rates, growth rates, and decay rates. The data collected from a sampling program will allow the model to be refined, calibrated, and validated based on the actual plant specific parameters.

Project Manager and Process Engineer for Water Softening Evaluation and Sizing for the San Jose Water Company, CA.
Greeley and Hansen provided a third-party review of the water quality section within an in-development report which included the evaluation of the assumptions, calculations, findings, and recommendations described in the report. Greeley and Hansen also provided additional guidance and recommendations to better define the water softening Proof-of-Performance pilot testing scope of work that is recommended in the report and will be presented to the Public Utilities Commission in a future rate case. Greeley and Hansen subsequently prepared a preliminary PFD, sizing, and layout of a Reverse Osmosis (RO) or Nano- Filtration (NF) membrane treatment plant at Willow Glen Way Station that will address the known PFAS and hardness issues with the water. Dr. Frenkel's tasks included review and comment of the in-development report, comments on technical and construction considerations, creation of preliminary design criteria for a RO system at Willow Glen Way Station, development of a process flow diagram (PFD), development of a system layout with changes to existing major components, development of an annual operational expenses, and determination of capital cost estimates for major RO/NF line items.

Technical Advisor for the Morris Forman Water Quality Treatment Center Primary Sedimentation Basin Technology Evaluation and Design for Louisville and Jefferson County Metropolitan Sewer District, KY.
The Morris Forman Water Quality Treatment Center (MFWQTC) Primary Sedimentation Basins (primary clarifiers) were constructed in 1958 and were rehabilitated in the 1970s when secondary treatment was added to the facility. The equipment in the clarifiers has exceeded the anticipated service life and performance is unreliable. The peak wet weather capacity of MFWQCT is 350 MGD. The 2012 Integrated Overflow and Abatement Plan (IOAP) increased retention of wet weather flows in the collection system which will result in longer sustained peak flows to the clarifiers. The IOAP was developed utilizing a sustained peak capacity of 330 MGD through the clarifiers. The MFWQTC Primary Sedimentation Basin Rehabilitation Project includes the design of the following components influent aerated channel, new bypass channel and blower room; primary sedimentation basins; north and south pump station equipment; chemically enhanced primary clarification (CEPT); and odor controls. Dr. Frenkel served as technical advisor and supported the design of the CEPT system (including creating jar testing protocol) and optimization of the existing biological odor control units for the purposes of treating air from the primary sedimentation basins and other nearby odorous areas.

Process Engineer for the Jackson County Water Treatment Plant, MS.
Process Engineer for designing surface water treatment plant based on UF and RO technologies of 3.0 MGD capacity to allow conformance with strict standards for Trihalomethanes formation.

Desalination Program Technical Advisor for the Desalination Program for the City of Santa Cruz/Soquel Water District, CA.
Pilot study of open intake seawater desalination program based on Sea Water Reverse Osmosis, evaluating conventional pre-treatment and low-pressure membrane, Microfiltration (MF) and Ultrafiltration (UF) pre-treatment. The objectives of the pilot study were to establish design criteria and verify costs for a proposed 2.5 MGD (expandable to 5.0 MGD) open intake SWRO facility. The study produced desalinated water quality, SWRO technological parameters, and provided information for public relations and outreach.

Pilot Program Technical Director and Desalination Process Engineer for the Marin Municipal Water District Desalination Pilot Plant Study of San Francisco Bay Water, CA.
Pilot Program Technical Director and Desalination Process Engineer for an open intake seawater desalination program based on Sea Water Reverse Osmosis (SWRO), evaluating conventional pre-treatment and low-pressure

membrane, Microfiltration (MF) and Ultrafiltration (UF) pre-treatment. Program goals were to establish design criteria and define costs for this proposed 15 MGD open intake SWRO for the District. The study evaluated the quality of the produced, desalinated water, refined SWRO technological parameters, and supported the District's public outreach program.

Program Leader and Desalination Process Engineer for the Desalination Program Development for Pajaro/Sunny Mesa Community Services District, CA.
Program Leader and Desalination Process Engineer for a Desalination Program based on open intake seawater desalination program. The program objectives were to develop a cost-effective Sea Water Desalination project for the District and Monterey Peninsula, with the pilot study establishing design criteria and verifying costs for a proposed 20 MGD open intake SWRO. The study produced desalinated water quality, SWRO technological parameters, brine discharge criteria, and supported the public outreach program.

Design Lead and Process Engineer for the Membrane Bioreactor Design for the City of Santa Paula Ventura County, CA.
Design Lead and Process Engineer for the design of a 4.2 MGD submerged membrane bioreactor recycled water treatment and distribution system. Process design, BNR and MBR design, and equipment selection.

Process Engineer for the Membrane Bioreactor Design for the City of Fillmore, CA.
Process Engineer for the design of a submerged MBR based on GE Water - ZENON hollow-fiber membranes, plus recycled water treatment and distribution systems. Process design, BNR and MBR design, equipment selection, start-up, and commissioning.

Process Engineer for the Crescent City Membrane Bioreactor Design, CA.
Process Engineer for the design of submerged MBR based on SIEMENS hollow-fiber membranes, plus recycled water treatment and distribution systems. Start-up and commissioning.

Process Engineer for the Membrane Bioreactor Design for the City of Lake of the Pines, CA.
Process Engineer for the design of submerged MBR based on KUBOTA flat-plate membranes, including recycled water treatment and distribution systems. Process design, BNR and MBR design, and equipment selection, start-up and commissioning.

Process Engineer for the Membrane Bioreactor Design for the City of Coburg, OR.
Process Engineer for the design of submerged MBR based on SIEMENS hollow-fiber membranes, along with recycled water treatment and distribution systems. Process design, BNR and MBR design, and equipment selection.

Process Engineer for the Membrane Bioreactor Design for the City of La Center, WA.
Process Engineer for the design of submerged membrane bioreactor and recycled water treatment and distribution systems. Process design, BNR and MBR design, and equipment selection.

Program Manager and Project Engineer for the Ocean View Plaza Seawater Desalination Preliminary Design for Cannery Row Market Place LLC, CA.
Program Manager and Project Engineer for the preliminary design of SWRO system for a proposed development in Monterey, a water-short area. Prepared design criteria and concepts to facilitate permitting of the project with the Department of Public Health, Regional Water Quality Control Board and the California Coastal Commission. The project is currently receiving final permits.

Process Engineer for the Dissolved Air Flotation (DAF) and Membrane Bioreactor Pilot Study and Conceptual Project Design for a Confidential Food Processor Client, Canada.
Process Engineer for the pilot study and conceptual design of a 0.2 MGD capacity DAF and MBR systems to treat lemon production industrial effluent for recycling and reuse. Proposed to use DAF up-front of the MBR process, which allowed significantly reduce BOD load to MBR from 1,600 mg/l down to 400 mg/l, which resulted in the significant reduction of the aerobic process size and energy saving. Developed pilot study protocol, evaluated and established design parameters for the DAF and MBR systems.

Process/Project Engineer for the Membrane Bioreactor and Reverse Osmosis Pilot Study and Conceptual Project Design for a Confidential Food Processor Client, CA.
Dr. Frenkel served as the Process/Project Engineer for the pilot study and conceptual design of a 0.2 MGD capacity MBR and RO systems to treat olive production waste streams, creating an effluent suitable for recycling and reuse. He developed a flexible model to optimize and reduce the size of the treatment system and evaluated and established design parameters for the MBR and RO systems.

Desalination Process Engineer for the Oxnard Desalter Project Design for the City of Oxnard, CA.
Dr. Frenkel served as the Desalination Process Engineer for the design of a 7.5 MGD capacity (expandable to 15 MGD) brackish water RO plant. The innovative plant design will use the well field pumps to provide the feed pressure for the RO system to conserve space and reduce noise in the process building. The RO system will also incorporate inter-stage boost energy recovery to enhance system performance and reduce operating costs.

Project and Process Engineer for the Canyon Water Treatment Plant Membrane Pilot Study Azusa Light and Water Department, CA.
Dr. Frenkel served as the Project and Process Engineer for pilot study of pressure and submerged MF and UF membrane treatment. The objective of the pilot study was to establish design criteria and verify costs for a proposed 16 MGD expansion of the Canyon WTP. Three different MF and UF systems were piloted on surface water from the San Gabriel Reservoir and San Gabriel River. The study evaluated water quality, organics removal, and membrane operation parameters to demonstrate the efficacy of membrane filtration on these surface waters.

Process Engineer for the Ventura Avenue Water Treatment Plant/Foster Park Facilities Improvement Project for the City of San Buenaventura, CA.
Dr. Frenkel served as the Process Engineer for the preliminary and final design of improvements to the City of Ventura's Avenue WTP and their water supply facilities at Foster Park. The Avenue WTP was over 70 years old and required improvements to expand the facility and to meet new and upcoming water quality regulations. Improvements include a new 10 MGD submerged MF membrane filtration system (expandable to 15 MGD), new wash water recovery system, new water supply wells and piping, and rehabilitation of the City's historic administration building. The existing Avenue WTP will be maintained in operation during the construction of the new facilities. The project included pre-purchase of the membrane filtration equipment.

Process and Project Engineer for the Presidio Trust Recycled Water System Phase 1, CA.
Dr. Frenkel served as the Process and Project Engineer for the design of a 200,000 gpd submerged membrane bioreactor recycled water treatment and distribution system. He assisted with permitting and assisted with evaluation of construction techniques.

Project Engineer for the Municipal Water District Local Resources Program Funding Proposal for the City of Camarillo, CA.
Dr. Frenkel served as the Project Engineer for the preparation of a proposal for the City of Camarillo seeking funding for a 4 MGD membrane treatment facility for groundwater, under MWD's Local Resources Program.

Process Engineer for the Membrane Bio-reactor Design for the City of Arlington, WA.
Dr. Frenkel served as the Process Engineer for the design of submerged MBR based on KUBOTA flat-plate membranes, plus recycled water treatment and distribution systems. Process design, BNR and MBR design, equipment selection, and start-up and commissioning.

Wastewater

Lead Process Engineer for the Canoas Wastewater Treatment Plant Secondary Treatment Detailed Design Project for the Empresa de Acueducto, Alcantarillado y Aseo de Bogotá (EAAB), Colombia.
The Canoas WWTP is anticipated to be implemented through a public-private partnership (PPP) to design, finance, build, operate, and transfer (DFBOT) the Phase I (primary treatment) and Phase II (secondary treatment) of the plant. Greeley and Hansen, in a consortium relationship with the Colombian firm Integral, is providing professional engineering services to develop the detailed design and construction procurement documents for Phase II (secondary treatment) and update the conceptual design for Phase III (tertiary treatment – nutrient removal) of the Canoas WWTP. Project tasks included assisting EAAB with developing detailed design documents for the secondary treatment portion of the plant to complement the detailed design documents that already exist for the primary treatment, defining a strategy for minimization and beneficial utilization of the plant biosolids, which is of particular importance for EAAB to be able to clearly establish responsibilities of the DFBOT Contractor as it relates to the biosolids management component of plant operations, and developing a detailed and well supported construction cost estimate for use by EAAB in the preparation of the procurement and contract documents for the DFBOT project.

Principal Project Manager and Technology and Process Lead Engineer for Ashghal IDRIS Terminal Pumping Station and Sewage Treatment Works for the City of Doha, Qatar.
The advanced membrane technologies had a capacity of 130 MGD and an expansion of up to 260 MGD. Responsibilities included program management, project management and process design.

Project Manager and Lead Process Engineer for the System Evaluation for a Major Multinational Soft Drink Company.
The project involved water footprint reduction, evaluating performance of a closed-circuit desalination technology as a brine concentrator and as a primary RO process; evaluate performance of the Water Conservation Technology International technology as a part of water room design; evaluate the design effects and implications of combining CCRO and WCTI; suggest alternatives for improved efficiency and performance; and provide design services for water room and/or unit process improvements. Tasks included evaluating the technical and economic impacts of the various alternatives.

Technical Advisor and Technology and Process Lead Engineer for the Sewage Treatment Works Expansion for the City of Sharjah, United Arab Emirates.
Phase 4 and 5 based on Moving Bed Bioreactor (MBBR) technology included liquid and solids trains treatment, sludge thickening, dewatering and thermal treatment.

Process Lead Engineer for Evaluation for the Evaluation and Alternatives Analysis of the Cryogenic Oxygen Production Facility for the Passaic Valley Sewerage Commission, NJ.

PVSC owns and operates a 330 MGD wastewater treatment plant serving approximately 1.5 million people, 200 significant users, and 5,000 commercial users. PVSC's cryogenic oxygen generation system provides high purity gaseous oxygen to the treatment plant's biological secondary treatment process in the aeration tanks. The project involves evaluating the current cryogenic oxygen generation system at the treatment plant and providing an alternatives analysis for oxygen supply to the plant for the future.

Treatment and Technology Leader for an Optimized Treatment Concept for Industrial Wastewater Reuse for a Private Industrial Client, CA.
Treatment and technology leader developing optimized treatment concept for industrial wastewater reuse of 2.5 MGD capacity applying high and low load biological treatment, multi-stage double pass RO and deep well injection to achieve ZLD concept.

Technology Leader and Process and Design Engineer for the City of Muscat Wastewater Treatment Plant, HAYA Water for Sultanate of Oman.
Dr. Frenkel served as the Technology Leader and Process and Design Engineer developing conceptual approaches and technology for wastewater treatment for the newly designed treatment plant for tanker discharge water; capacity is 35 MLD (9.0 MGD).

Technology Leader and Process and Design Engineer for the Tanajib Wastewater Treatment Plant for Saudi Aramco, Kingdom of Saudi Arabia.
Dr. Frenkel served as the Technology Leader and Process and Design Engineer developing the wastewater treatment process and technological approach for a new wastewater reuse program.

Project/Process Engineer and Project Lead for the Delta Diablo Sanitation District, CA.
Dr. Frenkel served as the Project/Process Engineer and Project Lead for salinity management program on wastewater effluent reuse by municipal and industrial clients, with a WWTP capacity of 14.0 MGD.

Project/Process Engineer and Project Lead for San Elijo Joint Powers Authority for San Diego County, CA.
Dr. Frenkel served as the Project/Process Engineer and Project Lead for Advanced WWTP design and procurement for production of low-salinity reuse water.

Other

Professional Consulting Services as an Expert Witness for a Major Utility Company, NJ.
The scope includes support of the legal team addressing all technical inquiries.

Lead Engineer in a Litigation Process for the Bello Wastewater Treatment Plant, Colombia.
Dr. Frenkel served as the Lead Engineer in a litigation process in a group action filed before the Civil Court. A legal claim was filed against the companies designed and constructed Bello Wastewater Treatment Plant in Colombia.

ADDITIONAL SELECTED PROJECTS

Desalination/Reverse Osmosis/SWRO/BWRO/UPW

- Minera Escondida Drinking Water Treatment Plant, Chile. 0.5 MGD facility
- GE Power Plant, New York. 1.5 MGD facility
- APEX Silver Mines Drinking Water Treatment Plant, Denver, Colorado. 0.7 MGD facility
- Industrial DI Water Treatment Plant, Canada. 2 MGD facility
- DI Makeup Water Treatment Plant, Cooling Tower Blow Down Recycling Plant, Ireland. 3 MGD facility.

- DI Water Makeup System, Ireland. 0.5 MGD facility
- Desalination Plant, City of Eilat, Israel. 12 MGD facility
- Desalination Plant, City of Deir-El-Ballah, Gaza Strip, Palestine. 0.5 MGD facility
- Desalination Plant, Ma'agan Michael, City of Haifa, Israel, 0.5 MGD facility
- Sea Water Reverse Osmosis Desalination Plant, City of Sharm-El-Sheikh, Sinai, Egypt. 2 MGD facility

Media Filtration
- Water Makeup System, Ireland. 0.5 MGD facility
- Media Filters Redesign, City of Moscow, Russia. 660 MGD facility
- Water Treatment Plant, City of Volgograd, Russia. 40 MGD facility
- Iron and Manganese Removal Plant, City of Kovel, Ukraine. 13 MGD facility
- Industrial Oil Removal Plant, City of Lvov, Ukraine. Dissolved Air Filtration (DAF), 2.6 MGD facility
- Water Treatment Plant. City of Tiberia, Israel. 13 MGD facility
- Water Treatment Plant, Dead Sea, Israel. 2 MGD facility

Microfiltration
- Water Treatment Microfiltration Plant, City of Collingwood, Canada
- Shoal Lake Microfiltration Water Treatment Plant, First Nations, Manitoba, Canada

Activated Sludge
- Wastewater Treatment Plant, City of Lvov, Ukraine. Activated Sludge – Full Biological Treatment, 80 MGD facility
- Wastewater Treatment Plant, City of Ivano-Frankovsk, Ukraine. Full Biological Treatment, Activated Sludge, 2 MGD facility
- Wastewater Treatment Plant, City of Korolevo, Ukraine. Biological Aerated Filters, Biological Treatment, 1 MGD facility

Sequential Batch Reactor
- Wastewater Treatment Plant, City of Ra'anana, Israel, 5.3 MGD facility

Membrane Bioreactor
- Membrane Bio-Reactor (MBR), City of Milton, Ontario, Canada. 2.5 MGD facility

Electro Deionization
- DI Makeup Water Treatment Plant, Cooling Tower Blow Down Recycling Plant, Ireland. 3 MGD facility

AWARDS

American Academy of Water Resources Engineers (AAWRE) 2023 Outstanding Practitioner in Water Resources Engineering Award.
Award given for his outstanding contributions to the water industry in development and use of water and wastewater treatment processes, desalination, and membrane technologies; and innovations in use of membrane technologies and intermittent aeration concept.

PAPERS / PRESENTATIONS

Patents
Frenkel, V., Benedek, A., Husain H., Singh, M., Process for Purifying Water. Patent # 1998/046533, Application # 9846533. Applicant ZENON Environmental, Inc.

Frenkel, V., Benedek, A., Husain H., Behmann, M., Coagulation-Microfiltration Process for Water Treatment. Patent # 1998/046808, Applicant ZENON Environmental, Inc.

Frenkel, V., Method and Tools to Back-Wash Granular Media Filters. Patent # 1636012, Applicant Lvov Railway Corporation

Frenkel, V., Method to Determine Free Space in the Granular Media Filters. Patent # 1631366, Applicant Lvov Railway Corporation.

Frenkel, V., Ishalov, V., Method and Tool for Preparation Liquid Salt Solution. Patent # 2441142, Applicants Frenkel, V., Ishalov, V.

Frenkel, V., Ishalov, V., Tool for Preparation Liquid Salt Solution and Liquid Salt Solution for Repairing Oil Wells. Patent # 111188, Applicants Frenkel, V., Ishalov, V.

Books

Frenkel, V., Mercer, K., 2021. Concentrate Management in Desalination, 2nd Edition. Chapter 1: Overview of Desalination Processes. Case Studies published by American Society of Civil Engineers, ASCE and EWRI, July 2021, Reston, Virginia

Frenkel, V. at all, 2021. Industrial Water Reclamation and Reuse to Minimize Liquid

DISCHARGE, Chapter 3. Fundamentals, WEF Special Publication, Water Environmental Federation, Alexandria, Virginia, USA

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Frenkel, V., Vasilyev, V. 1986. The Coal Slag of the Power Electric Stations – The Effective Filtering Material for Water Treatment. Report of State Symposium “Rational Utilization of Recycled Resources.” Donetsk Polytechnic Institute, Donetzk.

ADDITIONAL INFORMATION

Languages
Fluent in 7 languages.

Specialized Coursework/Areas of Study
Lecturer at Stanford University, Palo Alto, California. Desalination, water reuse, membrane technologies.

Testimonials
Indicate if you have any client testimonials (quote, reference letter, etc.) that may be able to be used for marketing purposes.

Yes ☒ No ☐

https://www.linkedin.com/in/val-s-frenkel-a9b7746?trk=nav_responsive_tab_profile

Dr. Robert Bornhofen

Email: rjb@cornell.edu | https://www.linkedin.com/in/bornhofen/

VALUE PROPOSITION

- As a dynamic ***Innovation Leader***, I bring *hands-on experience* in developing and implementing comprehensive innovation strategies. For IBM, a global strategy. Oversaw efforts that ranged from problem formulation, ideation, partnering, incubating, and development / launch of new products. **Led crowdsourcing campaigns** that led to hundreds of ideas from a diverse set of creative employees & business partners. Managed budgets. **Promoted innovation across the enterprise**, engaged senior leaders, involved employees & SMEs. Led innovation programs for **DC Water, IBM, Citibank, and Delta Air Lines**.
- As an ***Educator and Coach*** in **Global Education** with over seven years of teaching experience:
  - As an Adjunct Course Facilitator at **Cornell University**, I taught 500+ executives and mid-level managers across multiple industries on what it takes to innovate. Knowledgeable in the full spectrum of **Innovation Strategy**
  - As an Adjunct Associate Professor for the **University of Maryland Global Campus**, I teach the MBA capstone course. Recognized with the distinction of being named "**Outstanding Adjunct Faculty**" achievement (2021-2023).
  - As Head Facilitator, I help deliver a certification program at the **Kellogg School** of Management, Northwestern University. Curriculum includes applying digital technology to **Operations Management** in creating competitive value.
- As a ***Strategic Business Partner*** with 12+ years of experience, most recently at for IBM (Enterprise Services Division), I owned the process for developing the **annual strategic plan**. Partnered with Senior Leadership stakeholders across three business units. Reviewed various options and adopted specific tactics that aligned to IBM's strategic goals. Identified **key long- and short-term strategic opportunities**. Similar strategy experience at Citibank & Delta Air Lines. As an Adjunct Professor, I **teach business strategy to MBA candidates** at the University of Maryland.

Recognition:

- Recognized for **leading a global innovation program** across Asia Pacific, EMEA, & the Americas that led to 12 successful **prototype solutions** involving **advanced technologies** (IBM)
- **Outstanding Adjunct Faculty** achievement, University of Maryland (2021-2024)
- Recipient of the *Quality Excellence Award* for **Outstanding Leadership** (Citibank)
- Recipient of a **certificate in *International Business*** from the Thunderbird School of Global Management in recognition of leadership contributions (Delta Air Lines)
- Holder of two *U.S. Patents* for **novel invention**

As an experienced **Innovation Leader for DC Water**. Oversee innovation across the organization to develop and grow DC Water's innovation program in creating value for customers in the District of Columbia and suburban Maryland & Virginia. Responsible for **program and strategy development**, oversight of research and idea capture, **key stakeholder engagement**, community of practice, partnering, value creation, delivery, communication and staff workforce engagement, & innovation sustainability. Sponsored several **sustainability projects** involving renewable biogas, bioproducts, and solar energy. Developed an **ecosystem** of business partners, academia, and associations to enable change.

As an experienced **Academic** (Adjunct Professor**)** who loves to teach, I offer a mix of teaching knowledge. I offer over seven years of demonstrated teaching excellence at the graduate & undergraduate levels in delivering courses in both **online & classroom** settings. Familiar with learning management systems (Canvas) and **multimedia technologies** for video, audio, & immersive learning.

As a ***Researcher*** who specializes in Human-Centric discovery, I led efforts at IBM involving **Design Thinking** on multiple projects to capture **customer frustration & unmet needs**. Taught Design Thinking principles to students (Cornell & University of Georgia). Proficient at rapidly adapting and responding to what is learned and needs to be applied & accomplished.

EDUCATION

- **Doctorate Degree** in Management, University of Maryland, Global Campus
- **Master's Degree** in Information Systems, Colorado State University
- **Bachelor's Degree** in Business Administration, University of Minnesota
- **Executive Certificate** in International Business, Thunderbird School of Global Management

ACADEMIC EXPERIENCE

Adjunct Professor (*Global Strategy*) | University of Maryland, Global College | 2017 – *current*

Course Title: Global Marketplace Strategy. I teach the **MBA capstone course**. Over 125 MBA students have learned to research, formulate, and implement strategy. This encompasses **gaming simulation and decision making** over a broad range of **business disciplines**.

Adjunct Professor (*Innovation Strategy*) | Cornell University | 2019 – *current*

Program Title: Innovation Strategy. I taught over 200 executives & mid-level managers a **five-segment curriculum on Innovation Strategy**. Curriculum includes various ways to innovate, competencies, tools, implementation methods, and means to launch new products to market.

Head Facilitator (Digital Operations Strategy) | Northwestern University | 2021 – 2023

Program Title: Operations Management: Digital Strategy. I moderate discussions and advance learning in this topic area. Most of the students were international. Curriculum includes operations management, digital strategy, & quality assurance.

Instructor (*Design Thinking*) | University of Georgia | 2014 – 2015

Taught several course segments on ***Design Thinking*** and ***Innovation Management*** to undergraduate & MBA students (part-time, 2014-2015).

Taught Digital Strategy & Innovation Management to 20+ visiting managers from China as part of the *Norinco Program Exchange*.

Adjunct Professor | CEDIM – Master of Business Innovation | 2015 Monterrey, Mexico

Developed and taught curriculum on "***New Product Innovation***" to 20+ graduate students as part of a Master of Business Innovation (MBI) Program.

SCHOLAR-PRACTITIONER

Educator, Coach, Mentor

· *As a Scholar*: Apply relevant theory, research, and discussion from which to inspire students to learn about innovation strategy and entrepreneurship

· *As a Practitioner*: Interject 20 years of practical experience in Innovation Leadership & Strategy to extend competency-based learning

· *As a Scholar-Practitioner*: Synthesize academic and practical knowledge into a comprehensive body of knowledge to stimulate student learning to provide a rich and deep learning experience.

What **differentiates my credentials** is the ability to ***impact*** what can get accomplished by engaging faculty, leadership, and external parties to solve key organizational challenges. Specifically, through creative ideas that lead to **new and improved uses technology** for teaching, learning, and research.

As a **Public Speaker and Presenter**, I have spoken at various international and national conferences. I am a recognized SME in the field of innovation strategy. Highly effective at communicating to large, **multicultural audiences** as well as smaller settings among internal leaders.

RESEARCH / PRESENTATIONS / PAPERS

Research Studies & Conferences

- Presented topics on Innovation Strategy at various water industry conferences (2021-2024) (e.g., Singapore International Water Conference, London World Water Summit, Silicon Valley Plug and Play Water Summit)
- Academy of Management (2020 submission): *Gamifying Innovation Challenges*
- Scholarly Presentation: Inventive Problem Solving—Gamifying Innovation Challenges, Emerging Innovation Summit, Royal Melbourne Institute of Technology, Melbourne, Australia
- Scholarly Paper/Presentation: *Diversity in Openness, Creativity in Thought*, 17th annual TQM Conference, Riyadh, Saudi Arabia
- Scholarly Paper: Stoking the Innovation Engine: Gamifying Innovation Challenges, Innovation Arabia International Conference, Dubai, UAE. Paper accepted.
- Scholarly Presentation: *Stoking the Innovation Flame*, 16th International Open and User Innovation Conference, Stern School of Business, New York City

PROFESSIONAL WORK EXPERIENCE

Innovation Director | DC Water | 2021 – current

Oversee innovation across the organization to develop and grow DC Water's innovation program in creating value for customers in the District of Columbia and suburban Maryland & Virginia.

Responsible for program and strategy development, oversight of research and idea capture, key stakeholder engagement, partnering, value creation, delivery, communication and staff workforce engagement, & innovation sustainability.

Strategy & Innovation Leader | IBM | 2017 – 2019
Led efforts to formulate and develop strategy for IBM Enterprise Services.

- Researched, formulated strategy, & driving key programs that align to corporate objectives
- Organized & directed worldwide innovation efforts to generate business value while focusing on organizational enablement & engagement
- Championed hackathons and innovation challenges (vis-à-vis crowdsourcing) that generated 200+ ideas from a diverse set of employees & business partners
- Managed an annual budget of US$900,000 to fund, on average, 10 prototype projects leading to a minimum viable product for handoff to the business partner for deployment.

Recognition. Led global crowdsourcing & crowdfunding campaigns that led to 12 successful prototypes involving emerging technologies in AI, blockchain, & chatbot with natural language processing capabilities

Innovation Leader | Southwest Airlines | 2016 – 2017
Led a Lean Start-up program to incubate business concepts / ideas through rapid prototype discovery and learning

- Incubated business concepts through rapid prototype methods to assess results and validate assumptions
- Led a lean team of developers to apply new technologies & capabilities to creative ideas, including biometrics, NLP (w/Amazon Alexa), and IoT sensors & push notification

Recognition. Led team and delivered multiple rapid prototype efforts involving new, innovative technologies tied to business strategy. Queued prototypes up for future development & launch

Program Director |Avaya | 2008 – 2014

- Strategy & Innovation. Developed, implemented, & delivered growth strategies that involved new verticals in the public sector. Positioned solutions to disrupt conventional products
- Rapid Prototyping & Development. Led effort to develop and launch a new iPhone app through the Apple Store that involved geolocation and maps associated with farmer markets
- Business Development. Drove the marketing of product innovations that leveraged Avaya's market strength.

Recognition. Accelerated growth through new wins that involved product offerings.

Program Manager | U.S. Public Sector | 2004 – 2008

- Managed & marketed large programs within the U.S. Public Sector for Perot, QSS, & CHM

Director | Delta Air Lines | 2000 – 2003

- Strategy Formulation: co-led the transformation of a core business unit as part of a strategic modernization initiative. Supported business case development to depict the ROI and TCO performance objectives.
- Innovation Strategy: Helped shape vision, strategy, objectives, & future business models to modernize operations. Transformed operations through new technologies & improved processes

Recognition. Executive Development Program in recognition of leadership contributions

Vice President | Citibank (4 years)

- Strategy & Product Management. Managed six products split between Europe and North America. Transformed ideas and business insights into product enhancements and new features
- Innovation Strategy. Generated new account growth through innovative system features. Championed Executed strategy with Business Units to drive product development
- Commercially launched a new B2C eCommerce product.to capture and approve new customers

Recognition. Recipient of the *Quality Excellence Award* for Outstanding Leadership

Manager | Deloitte Consulting (8 years)

· Problem solved among various commercial & public-sector clients and industries. **Formulated strategy** to help clients secure their environment. Supported two Wall Street firms and Ryland Acceptance Corporation on the issuance of mortgage-backed obligations to public investors.

Recognition: Four highly profitable bond offerings to public investors through Wall Street firms for my client, Ryland Acceptance Corporation.

Curriculum Vitae

Glen T. Daigger, PhD, PE, BCEE, DMASCE, Distinguished Fellow IWA, Fellow WEF NAE, CAE

EDUCATION

PhD, Environmental Engineering, Purdue University, 1979

MSCE, Environmental Engineering, Purdue University, 1975

BSCE, Purdue University, 1973

PROFESSIONAL REGISTRATION

Registered Professional Engineer: State of Indiana, Number 870309; State of Arizona, Number 47312

Board Certified Environmental Engineer, American Academy of Environmental Engineers

PROFESSIONAL EXPERIENCE

University of Michigan: 2015-Present

Dr. Daigger is currently Professor of Engineering Practice in the Department of Civil and Environmental Engineering at the University of Michigan. In this role he identifies and develops significant initiatives within the Department, the College of Engineering, and across campus for increased contribution to solving regional, national, and global water issues. He also interacts broadly across campus with faculty and students to help bring "real world" experience into the classroom and the research program.

One Water Solutions LLC: 2014-Present

Dr. Daigger is currently President and Founder of One Water Solutions, a water management professional services company. One Water Solutions provides water management consulting services to a wide range of utilities, consulting firms, and technology providers. Specializing in innovative solutions, coupled with fundamental and practical knowledge of existing and emerging water management and treatment technologies and practices, One Water Solutions offers superior water management solutions to its clients. Dr. Daigger is responsible for all aspects of the firm's operations and is the principal consultant employed by the firm.

CH2M HILL: 1996–2014

Dr. Daigger served as a senior vice president with CH2M HILL, an international consulting engineering firm. He served as chief wastewater process engineer and was responsible for wastewater process engineering on both municipal and industrial wastewater treatment projects on a firm-wide basis. He is the first Technical Fellow for the firm, an honor which recognizes the leadership that he provides for CH2M HILL and for the profession in the development and implementation of new wastewater treatment technology. He also served as the chief technology officer for the firm's Water Business Group. From 1997 to 2006 he served as technology director of the firm's Water Business Group.

Clemson University: 1994–1996

From August 1994 to July 1996, Dr. Daigger served as professor and chair of the Department of Environmental Systems Engineering (ESE) at Clemson University. In that position he was responsible for leadership and administration of the activities of the department, including its continuing development as an academic department. He also taught graduate and undergraduate courses in environmental engineering and water and wastewater process engineering. ESE is a mature academic department (nearly 30 years old) and is widely recognized as one of the premiere environmental engineering graduate schools in the nation. It offers a broad curriculum that covers the topics of environmental science and engineering. Seven areas of specialization are offered, consisting of process engineering, hazardous and radioactive waste treatment, contaminant characterization, contaminant fate and transport, analysis of natural systems, environmental restoration, and risk assessment and waste management. The student body averages approximately 100 graduate students pursuing masters or PhD degrees. During the 1995–1996 academic year, he also served as the director of the newly organized School of the Environment, which included the ESE Department and the Departments of Environmental Toxicology and Geological Sciences. In that position he was responsible for establishing the overall direction and program for the school.

CH2M HILL: 1979–1994

Between 1979 and 1994, Dr. Daigger was employed by CH2M HILL, an international consulting engineering firm, where he served as a senior vice president. CH2M HILL is the largest consulting engineering firm in the United States, and it also maintains the largest wastewater treatment practice of all firms within the United States. Dr. Daigger served as process engineer, project engineer, process consultant, and senior consultant on a wide variety of municipal and industrial wastewater treatment and reclamation projects. Between 1982 and 1991 he served as assistant director of CH2M HILL's Wastewater Reclamation Discipline Group, with firm-wide responsibility for wastewater process engineering. In this position he was responsible for establishing standards and overseeing the process engineering work on all of the firm's municipal wastewater treatment projects. He also served as acting director for the group during periods when the director was not available. Between 1991 and 1994, Dr. Daigger served as director of the Wastewater Reclamation Discipline Group and then as director, wastewater reclamation. In these positions he was responsible for technology and quality for all of the firm's municipal wastewater treatment projects. This practice area represented in excess of $100 million in professional fees for the firm on an annual basis.

Between 1990 and 1992, Dr. Daigger also served as CH2M HILL's first director of the Office of Innovation. The Office of Innovation was organized to recognize and champion the innovation process within all of the firm's activities. As the first director of this activity, Dr. Daigger was responsible for taking the objectives formulated by the firm's Board of Directors and developing and implementing an integrated program to meet those objectives. The program was not to stand alone, but was to be integrated into the firm's existing activities. This objective was realized, and the program was successfully transitioned to the next director (note: by charter the term of the director is limited to 2 years).

Purdue University: 1975–1979

During his career at Purdue University, Dr. Daigger served as a University Fellow, David Ross Research Fellow, and as a graduate teaching assistant.

Project Experience

Dr. Daigger has also been a practicing environmental engineer. He has been involved in the planning, development, design, construction, startup, and operation of wastewater treatment facilities for municipalities and industries. Included in these activities have been many process studies and bench-scale and pilot-scale evaluations of wastewater treatment alternatives. He has been involved in facilities ranging in size from the smallest to the largest. Appendix A lists the facilities he has been involved with.

Dr. Daigger has also been involved with a number of industrial wastewater treatment facilities. Examples include the Burley, Idaho; Ontario, Oregon; and Plover, Wisconsin facilities for Ore-Ida foods; the Marcus Hook Refinery in Philadelphia, Wisconsin; the Kwinana Refinery in Perth, western Australia; the Bahrain Petroleum Company Refinery; two wet corn milling plants in Lafayette, Indiana, for the Staley Corporation; the Hubinger wet corn milling plant in Keokuk, Iowa; Columbia Nitrogen in Augusta, Georgia; Pendleton Woolen Mills, Pendelton, Oregon; ARCO; EXXON; and numerous pulp and paper facilities such as the Proctor and Gamble facility in Mahopany, Pennsylvania; and the Georgia Pacific facilities in Pensacola and Jacksonville, Florida.

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

American Academy of Environmental Engineers and Scientists

American Society of Civil Engineers

American Water Works Association

Association of Environmental Engineering and Science Professors

Chi Epsilon

International Water Association (IWA)

National Academy of Engineering

Sigma Xi

Tau Beta Pi

Water Environment Federation

PROFESSIONAL ACTIVITIES

External Committee Member for Ph.D. Dissertation by Seyed Abrahim Nazlabadi Entitled "Integrated Management of Urban Water and Wastewater Towards sustainable Development Using Multi Attribute Decision Making Techniques (the case of Iran)", Amirkabir University of Technology (Tehran Polytechnic), Department of Civil and Environmental Engineering, 2023.

Plenary Presentation 20th IWA International Conference on Diffuse Pollution & Eutrophication, IWA DIPCON 2023, Daegu, South Korea, December 7, 2023.

Presentation, Webinar Organized by the IWA Biofilms Specialty Group Entitled Biological & Physical Selectors for Wastewater Treatment Process Intensification, November 15, 2023.

Keynote Presentation at 1st IACRR/IWA International Conference on Coastal Reservoirs and Sustainable Water Management, Changzhou, China, November 6, 2023.

Keynote Presentation at 2023 IWA Resource Recovery Conference, Shenzhen, China, November 1, 2023.

Keynote Presentation at 2023 7th International Conference on Integrated and Innovative Solutions for Circular Economy, National Taiwan University, October 18, 2023.

Member of the National Academy of Engineering Cultural, Ethical, Social, and Environmental Responsibility in Engineering (CESER) Advisory Committee, 2023 to Present.

Review Coordinator for National Academies of Science, Engineering, and Medicine Report *Health Risks of Indoor Exposure to Fine Particulate Matter and Practical Mitigation Solutions*, 2023.

Member of Management Committee for IWA Specialist Group on Sustainable Coastal and Estuarine Development, 2023 to Present.

Honorary Chair for Joint WEF and IWA Innovations in Process Engineering Conference, 2023

Member Scientific Committee for the 5th International Conference on the Evolution of China Urban Water Environment and Ecology, 2023.

Reviewer, Innovative Technologies in *Global Trends & Challenges in Water Science, Research and Management*, International Water Association, 2022.

Review monitor for National Academies of Science, Engineering, and Medicine report *Review of Inland Estimated Recovery System (ERSP) Prototype Calculator*, 2022.

External Examiner for Ph.D. Dissertation by Ahmed AlSayed Entitled “Going Beyond COD Redirection – Developing an Integrative Operational Strategy Using the Alternating Activated Adsorption (AAA) Technology as a Novel A-Stage Variant”, York University, 2022.

Member of International Water Association Strategic Council, 2022 - Present

Member, Advisory Board for the Journal *Resources, Conservation & Recycling*, 2022 – Present.

Member, Advisory Committee for National dialogue on Water in Thailand, Ministry of the environment of the Republic of Korea Organization for Economic Co-operation and Development and Asia Water Council, 2022-Present.

Member, Joint Science and Technology Committee of IFWS and Yellow River EIC, 2022 - Present

Keynote, Sub-Forum on Green and Sustainable Development of the Greater Bay Area Science Forum, Guangzhou, China, December 6-7, 2021.

Review Panel for the Centre for Water Technology and Policy, The University of Hong Kong, 2021.

Keynote, 2021 Eckenfelder Lecture Series, Water Environment Association of Texas (Virtual).

Keynote, 5th International Conference on Integrated and Innovative Solutions for Circular Economy", October 5, 2021, Tainan, Taiwan.

Keynote, IWA Water in Industry Conference, Nanjing, China, August, 2021.

Chair, National Water Research Institute Independent Advisory Panel to support City of Tampa PURE Project, 2021.

Member of the Water Management 2040 Future Scenarios Advisory Group, 2021.

Member of The Water Tower Institute Board of Directors, 2020 - Present

Member of the Economist Intelligence Unit City Water Optimization Index Independent Expert Panel, 2020 – Present.

Vice President International Association for Coastal Reservoir Research, 2020 - 2023

Member National Alliance for Water Innovation (NAWI) Municipal Roadmaping Broader Team, 2020 – 2021.

Review of the Chinese Academy of Sciences (CAS) Center for Excellence in Eco-environmental Sciences (CEEES), 2020.

Review of the Chinese Academy of Sciences (CAS) Research Center for Eco-Environment Sciences (RCEES), 2020.

Member Advisory Board of the journal *Frontiers of Environmental Science & Engineering (FESE)*, 2019 – Present.

Member National High-Level Foreign Experts for the Ministry of Science and Technology, People's Republic of China, 2019 – Present.

Member Editorial Board of the Journal *Water Environment Research*, 2019 – Present.

Advisory Board Member of the Journal *Environmental Science & Ecotechnology*, 2019 – Present.

Review Coordinator of Consensus Study Report: *Management of Legionella in Water Systems*, National academy of Engineering, National Academy Press, Washington, DC, 2019.

Reviewer of Consensus Study Report: *Independent Assessment of Science and Technology for the Department of Energy's Defense Environmental Cleanup Program*, National Academy of Engineering, National Academy Press, Washington, DC, 2019.

Reviewer of *Metrics for Successful Supercritical Water Oxidation System Operation a the Blue Grass Chemical Agent Destruction Plant*, National Academy of Engineering, 2019.

Member of the National Academy of Engineering Center for Engineering Ethics & Society (CEES) Advisory Group, 2019 – 2020.

Member of the National Academy of Engineering Online Ethics Center (OEC) Advisory Group, 2019 – 2020.

Member of the Chinese Research Academy of Environmental Sciences (CRAES) International Scientific Advisory Committee (ISAC), 2018 - Present

Member of The Water Research Foundation (TWRF) Board of Directors (2018 – 2020)

Chair of the National Water Research Institute (NWRI) Panel on Hampton Roads Sanitation District (HRSD) Sustainable Water Infrastructure for the Future (SWIFT) Program, 2016-Present

Member of the Water Environment & Reuse Foundation (WE&RF) Board of Directors (2016-2017), Co-Vice Chair (2016-2017)

Member of the BlueTech Technical Advisory Group, 2015-Present.

Chair of the International Advisory Committee (IAC) of the International Science & Technology Cooperation Center for Urban Alternative Water Resources Development (Int'l AWR Center), Xi'an, PRC, 2015-Present

Member, Expert Panel for the Integrated Validation and Demonstration Plan, Singapore PUB, 2015-2018.

Member of the Asian Development Bank Water Advisory Group, 2014-2017.

Member of the National Academy of Engineering Nominating Committee, 2014.

Member of ISME/IWA Biocluster Award Committee, 2014-Present,

International Co-Chair of the Science and Technology Commission for the 7th World Water Forum, 2013-2015.

Member of National Academy Committee on the On-Site Reuse of Graywater and Stormwater: An Assessment of Risks, Costs, and Benefits, 2013-2015.

Member of National Academy Committee on Science and Technology Capabilities at the Department of State, 2013-2015.

Member of the Water Environment Research Foundation (WERF) Board of Directors, 2013-Present (Vice Chair 2015-2016).

Member of Paul L. Busch Award Steering and Selection Committee, 2014-Present

Member of The Water Council Board of Directors, 2013-2019.

Member of National Academy of Engineering Committee on Membership, 2012-2013.

Member of National Academy Panel Regional Approaches to Urban Sustainability: A Focus on Portland – A Workshop, 2012-2-13.

Member of National Academy Panel on the Review of the Draft 2013 National Climate Assessment (NCA) Report, 2012-2013.

Member of the National Academy of Engineering Center for Engineering, Ethics and Society Advisory Group, 2012-2018.

Member of the National Academy Committee on Sustainability Linkages in the Federal Government, 2011 – 2013.

Member of the National Academy Committee on Economic Analysis of Final Water Quality Standards for Nutrients for Lakes and Flowing Waters in Florida, 2011-2012.

Member of the National Academy Committee on Regional Approaches to Urban Sustainability: A Focus on Metropolitan Houston, 2011-2012.

Member of the National Academy of Engineering Ethics Center Advisory Committee, 2011-2012.

Member of National Academy of Engineering Section 4 (Civil Engineering) Peer Committee, 2010-2013. Chair 2012-2013 and Vice Chair 2011-2012.

President, International Water Association (IWA), 2010–2014.

Member of the Board of Directors for the Environmental Engineering Foundation (Currently Vice-Chair and Previously Treasurer), 2009-2018.

Member of the National Academy Committee on Transitioning to Sustainability: The Challenge of Developing Sustainable Urban Systems. The National Academies Second Sustainability R&D Forum, 2009-2010.

Member of National Academy Roundtable on Science and Technology for Sustainability, 2007–2013.

Member of National Academy Committee on the Review of Water and Environmental Research Systems Network, 2007-2010

Senior Vice President, IWA, 2006–2010.

Member of the Environment and Water Industry Development Council (EWI), Singapore, International Advisory Panel, 2006-2009.

Member of National Academy of Engineering Committee on Engineering Education, 2005-2008.

Member of National Academy Committee on Energy Futures and air Pollution in Urban China and the United States, 2005-2007.

Member of the Water Environment Research Foundation (WERF) Research Council (2002–2008) and Chair (2004–2006).

Member of the Water Environment Research Foundation (WERF) Board of Directors, 2004-2006.

Chair of the Committee Leadership Council of the Water Environment Federation (WEF), 2004–2007.

Member (at-Large) of the WEF House of Delegates, 2004–2007.

Member of the WEF Board of Trustees, 2004–2006.

American Academy of Environmental Engineers (AAEE) trustee, 1998–2002.

Member of AAEE Long Range Planning Committee, 2002–2008.

Member of the USA National Committee (USANC) to IWA, 1996–2008.

Former Chair of the Water Environment Research Board of Editorial Review.

Former Chair of the WEF Technical Practice Committee.

Former Chair of WEF Manual of Practice No. 8 Task Force.

Member of the Scientific Committee for the IWA Leading Edge Drinking Water and Wastewater Treatment Technology Conferences in the Netherlands, Prague, Sapporo, Singapore (2), and Zurich, 2003–2009.

Member of the Organizing Committee for the 1994 ASCE Environmental Engineering Conference in Boulder, Colorado.

Member of the Panel on Source Control and POTW Technologies, Committee on Wastewater Management for Coastal Urban Areas, National Research Council, Water Science and Technology Board, 1990-1993.

Member of the Civil Engineering Research Foundation Implementation Task Force.

Member of WEF Committee on Manual of Practice (MOP) for Wastewater Treatment Plant Design (MOP 8). Contributing author to chapter 8, Activated Sludge, and Reviewer for chapter 11, Fixed Film Systems.

Member of WEF Committee on Clarifier Design. Co-author of Manual of Practice on Clarifier Design.

Member of the WEF Committee on Fixed Growth Reactors. Reviewer of Fixed Growth Reactor MOP.

Member of WEF Committee on Nutrient Control. Reviewer of Nutrient Control MOP.

Former member of WEF Awards Committee, and former chairman of the Gascoigne Medal Subcommittee.

Member of WEF Committee on Aeration.

Member of IWA Technical Group on the Design and Operation of Large Wastewater Treatment Plants.

Member of the IWA Technical Group on Biological Nutrient Removal.

Member of the IWA Technical Group on Population Dynamics.

Member of the IWA Technical Group on Biofilms.

Technical reviewer of papers submitted for publication in numerous professional Journals, such as *Water Environment Research, Water Science and Technology*, *Water Research,* and *Journal Environmental Engineering Division, American Society of Civil Engineers.* Also a frequent reviewer of manuals and reports. Examples include:

U.S. EPA, *Design Manual for Phosphorus Removal*, EPA/625/1-87/001, Water Engineering Research Laboratory (September, 1987).

U.S. EPA, *Handbook, Retrofitting POTWs*, EPA/625/6-89/020, Center for Environmental Research Information (July 1989).

WEF Manual of Practice, *Aerobic Fixed Film Reactors*, 2001

HONORS AND AWARDS

2023 Distinguished EP Seminar, Cornell University, November 16, 2023.

2022 ACS ES&T Engineering Best Paper Award for "Emerging Trends and Prospects for Municipal Wastewater Management in China", November, 2023.

2023 Water Distinguished Lecture at Lehigh University.

Eddy Wastewater Principles/Processes Medal, Water Environment Federation, 2023.

H. Scott Fogler Award for Professional Leadership and Service, University of Michigan College of Engineering, 2022-23.

Glen T. Daigger Symposium on Sustainable Water Resource Recovery at the Joint WEF/IWA Innovations in Process Engineering Conference, 2023.

Gordon Maskew Fair Award, American Academy of Environmental Engineers and Scientists, 2022.

Excellence in Service Award, Michigan Water Environment Association, 2021.

With Sybil Sharvelle, Nancy G. Love, and Mazdak Arabi, Wesley W. Horner Award, American Society of Civil Engineers, 2021.

Elected to the Chinese Academy of Engineers, 2020.

With Avery Carlson, Martha Hahn Memorial Award, WEFTEC, for Highest-Rated Abstract in the Municipal Symposium, 2019.

Presented the Mathes Distinguished Lecture 2018 at Missouri S&T, October 19, 2018.

Received the Gascoigne WWTP Operational Improvement Medal, Water Environment Federation, 2018.

Keynote Address at the 2018 International Conference on Resource Sustainability, Beijing, Republic of China, June 29, 2018.

Singapore Water Academy Fellow, 2017.

Presented the John McClanahan Henske Distinguished Lecture in Chemical and Environmental Engineering, Yale University, New Haven, CT, December 7, 2016.

Received Frederick George Pohland Medal, Association of Environmental Engineering and Science Professors, 2016.

Life Member, American Society of Civil Engineers, 2016.

Named Most Influential Individual in Water for 2015 by Water and Wastewater International.

Keynote Lecture at the Joint Chemical & Environmental Engineering Seminar Sponsored by the Chancellor's Distinguished Visitors Program and the Frank H. Schulte, Jr. Endowment for Chemical Engineering in Honor of Dean Henry E. Bent, Rice University, 2015.

Named Distinguished Fellow, International Water Association, 2014

Richart Lecture, University of Michigan, 2013.

McCarty Lecture, Stanford University, 2013.

Elected Distinguished Member of the American Society of Civil Engineering, 2012.

Named Water Environment Federation Fellow, 2012.

Named Distinguished Engineering Alumni, Purdue University, 2012.

Presented the Tsuan Hua Feng Distinguished Lecture at the University of Massachusetts at Amherst, October, 2011.

Received Purdue University Civil Engineering Alumni Achievement Award, 2010.

Named Fellow of the American Society of Civil Engineers, 2009.

Presented the 2008 Association of Environmental Engineering and Science Professors Lecture at the Research Symposium for the Water Environment Federation Technical Exhibition and Conference.

Received the 2008 Harrison Prescott Eddy Award from the Water Environment Federation.

Presented the 2006 Simon W. Freese Award & Lecture from ASCE.

With M. G. Noesen, D. Laffitte, T. Mc Allister, S. Clark, and B. Sprick, recognized by the Water Environment Federation for the best poster at the 2005 WEFTEC Conference, entitled "Peak Flow Treatment Alternatives Evaluated for the Eugene-Springfield Water Pollutions Control Facility, Oregon".

Elected to the National Academy of Engineers, 2003.

Received the 2002 Harrison Prescott Eddy Award from the Water Environment Federation.

Received the 2001 Harrison Prescott Eddy Award from the Water Environment Federation.

Presented the American Academy of Environmental Engineers (AAEE) Kappe Lecturer, 2001

Received the 1996 Phillip F. Morgan Award from the Water Environment Federation.

Named first Technical Fellow by CH2M HILL, 1996.

Presented the third annual James JC. Brown Design Lecture at the University of North Carolina at Chapel Hill, 1993.

Recognized by CH2M HILL for Outstanding Contribution to Innovation by the Firm. Recognized specifically for development of the WQIG and for the development of phosphorus removal technology at the Rock Creek Advanced Wastewater Treatment Plant, 1992.

Recognized by the American Consulting Engineering Council with a Grand Award for contribution to the development of the VIP plant project, 1992.

Recognized by Engineering News Record (ENR) for Outstanding Contribution to the Construction Industry, February 17, 1988.

Received the 1987 Radebaugh Award from the Central States Water Pollution Control Association for Noteworthy Advancement of Knowledge.

Outstanding Paper Presented at the 1985 Annual Conference of the Illinois Water Pollution Control Association Meeting.

Received the 1982 Gascoigne Award from the Water Pollution Control Federation for Significant Contribution to Operations.

Named a David Ross Fellow, 1975–1977.

Named a Purdue University Fellow, 1973–1975.

Named Outstanding Civil Engineering Senior by Indiana Section of ASCE.

Named Outstanding Junior by Purdue Student Chapter of Chi Epsilon.

Honorary Professorships

Zhejiang University Guest Professor, 2018.

Xi'an University of Architecture and Technology, 2016.

Tongji University, Advisory Professor, 2012.

Nanjing Institute of Environmental Sciences, Ministry of Environmental Protection, Honorary Professor, 2012.

Beijing University of Civil Engineering and Architecture, Visiting Professor, 2009.

PUBLICATIONS

Books, Monographs, and Book Chapters

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Houweling, D. and G. T. Daigger, *Intensifying Activated Sludge Using Media-Supported Biofilms*, IWA Press, London, 2019.

Sabba, F., J. Calhoun, B.R. Johnson, G.T. Daigger, R. Kovács, I. Takács, and J. Boltz, "Applications of Mobile Carrier Biofilm Modelling for Wastewater Treatment Processes,", In *Frontiers in Wastewater Treatment and Modelling*, Mannina, G. Ed., FICWTM 2017, Springer International Publishing AG, Cham, Switzerland, 2017.

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Grady, C. P. L., Jr., G. T. Daigger, and H. C. Lim, *Biological Wastewater Treatment*, Second Edition, Marcel Dekker, New York, New York (1999).

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Jenkins, D., M. G. Richard, and G. T. Daigger, *Manual on the Causes and Control of Activated Sludge Bulking, Foaming, and Other Solids Separation Problems*, 3rd Edition, Lewis Publishers, Boca Raton, FL, 2004.

Jenkins, D., M.G. Richard, and G.T. Daigger, *Manual on the Causes and Control of Activated Sludge Bulking and* Foaming, 2nd Edition, Lewis Publishers, Ann Arbor, MI, 1993.

Jenkins, D., M. G. Richard, and G. T. Daigger, *Manual on the Causes and Control of Activated Sludge Bulking and Foaming*, 1st Edition, Water Research Commission, Republic of South Africa (December, 1984).

Nutrient Removal

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Daigger, G. T. and T. W. Sigmund, "Design and Operation of Chemical Phosphorus removal Facilities," In *Principles and Practice of Phosphorus and Nitrogen Removal from Municipal Wastewater*, 2nd Ed., Sedlak, R. K., Ed. Lewis Publishers, Ann Arbor, MI (1992).

Daigger, G. T. and S. R. Polson, "Design and Operation of Biological Phosphorus Removal Facilities," In *Principles and Practice of Phosphorus and Nitrogen Removal from Municipal Wastewater*, 2nd Ed., Sedlak, R. K., Ed. Lewis Publishers, Ann Arbor, MI (1992).

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Daigger, G. ., "One Water and Resource Recovery: Emerging Water and Sanitation Paradigms," in *The Future of Water: A Collection of Essays on "Disruptive" Technologies That May Transform the Water Sector in the Next 10 Years*,, Machado, F. and L. M Mimmi Ed., Discussion Paper No. IDB-DP-657, Inter-American Development Bank, April, 2019.

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Daigger, G., "Integrating Water and Resource Management for Improved Sustainability," In *Water Infrastructure for Sustainable Communities: China and the* World, Hao, X., Novotny, V., and Nelson, V. Ed., IWA Publishing, London, 2010, 11-21.

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Review of the Waters Network Science Plan, The National Academies Press, Washington D.C., 2010. Task Force Member

Aerobic Fixed-Growth Reactors, A Special Publication, Water Environment Federation, Alexandria, VA, 2000. Major Contributor

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Managing Wastewater in Coastal Urban Areas, National Research Council Press, Washington, D.C., 1993. Major Contributor

Design Manual for Fine Pore Aeration Systems, United States Environmental Protection Agency, EPA/625/1-89/023, Risk Reduction Engineering Laboratory (September 1989). Major Contributor

Summary Report: Fine Pore (Fine Bubble) Aeration Systems, United States Environmental Protection Agency, EPA/625/8-85/010., Water Engineering Research Laboratory, October, 1985. Major Contributor

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Review of the EPA's Economic Analysis of Final Water Quality Standards for Nutrients for Lakes and Flowing Waters in Florida, The National Academies Press, Washington D.C., 2012. Committee Chair

Water Environment Research Foundation, *Characterizing Mechanisms of Simultaneous Biological Nutrient Removal During Wastewater Treatment*, Project 00-CTS-17UR, 2004. Major Contributor

Nitrogen Control Manual, United States Environmental Protection Agency, EPA/625/R-93/010, 1993. Major Contributor

Membrane Bioreactor

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Membrane Technology: Feasibility of Solids/Liquids Separation in Wastewater Treatment, Water Environment Research Foundation, Alexandria, VA, Website and CD-ROM, 2001. Principal Investigator

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Ge, J, Liu, J., Zhu, T., and Daigger, G. T., Feasibility Analysis of Possible Revised Effluent Phosphorus Discharge Standard – January 2013 to December 2022, Prepared for the Great Lakes Water Authority, March 14, 2024.

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Daigger, G. T., Miller, C. J., and Rose, J., *Report to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on Water Infrastructure Regional Planning RFP No. 2200000002167*, November 30, 2022.

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Jun, C. and G. Daigger, *Suggested Revision to Operating Protocols and impacts of Facility Modifications on GLWA WRRF Phosphorus Removal Performance*, Memorandum to John Norton, Great Lakes Water Authority, October 5, 2020.

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Liu, Y., R. Vander Meulen, and G. T. Daigger, *Further Characterization of Biological Phosphorus Removal Performance at the Great Lakes Water Authority Water Resource Recovery Facility: Final Report*, Prepared for the Great Lakes Water Authority, Detroit, MI, April 3, 2019.

Yu,, T., R. Vander Meulen, and G. T. Daigger, *Further Evaluation of Primary Treatment chemical Phosphorus Removal at the Detroit, MI, Water Resource Recovery Facility: Final Report*, Prepared for the Great Lakes Water Authority, Detroit, MI, April 3, 2019.

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Zhang, Z., U Sato, J. Dai, H. K. Chui, G. Daigger, M. C. M. van Loosdrecht, G. Chen, "Flushing Toilets and Cooling Spaces with Seawater Improve Water-Energy Securities and achieve Carbon Mitigation in Coastal Cities, *Environ. Sci. Technol.* 2023, **57**(12), 5068–5078

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Cheng, Y., E. Belia, and G. T. Daigger, "Automating Process Design by Coupling Genetic Algorithms with Commercial simulators: A Case Study for Hybrid MABR Processes," *Wat. Sci. & Tech.,* **86**(4), 2022, 672-689. https://doi-org.proxy.lib.umich.edu/10.2166/wst.2022.234

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Qu, J., X. Dai, H-Y Hu, X. Huang, Z Chen, T. Li, Y. Cao, and Glen T. Daigger, "Emerging Trends and Prospects for Municipal Wastewater Management in China," *ACS EST Engg.* **2**, 323-336, 2022, doi.org/10.1021/acsestengg.1c00345.

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APPENDIX A: WASTEWATER TREATMENT PLANT EXPERIENCE

Plant	Capacity (m^3/day)
14 WWTP's with total of 1,200 mgd of capacity for New York City, NY	4,500,000
Changi Water Reclamation Plant, Republic of Singapore	2,400,000
Detroit Water Resource Recovery Facility, Detroit, MI	2,400,000
Hyperion WWTP, Los Angeles, CA;	1,500,000
Passaic Valley WWTP, Newark, NJ	1,500,000
Blue Plains WWTP, Washington, DC	1,440,300
Robert W. Hite Treatment Facility, Denver, CO	830,000
Tuas Water Reclamation Plant, Republic of Singapore	650,000 Domestic/150,000 Industrial
Duffin Creek Water Pollution Control Plant, Toronto, Ontario	640,000
Belmont WWTP, Indianapolis, IN	450,000
Southport WWTP, Indianapolis, IN	450,200
Central WWTP, Denver, CO	454,200
San Jose/Santa Clara Water Pollution Control Plant, CA	630,000
West Point WWTP, Seattle, WA	600,000
Central WWTP, Dallas, TX	570,000
North WWTP, Memphis, TN	510,000
Jones Island Wastewater Treatment Plant (WWTP), Milwaukee, WI	470,000
Hamilton, Ontario, Canada WWTP	450,000
EBMUD WWTP, Oakland, CA	450,000
Manakau WWTP, Auckland, NZ	450,000
Iona Island WWTP, Vancouver, BC	450,000
Bonnybrook WWTP, Calgary, AB	396,000
South Shore WWTP, Milwaukee, WI	380.000
Morris Foreman WWTP, Louisville, KY	380,000
Columbia Boulevard WWTP, Portland, OR	380,000
Western Treatment Plant, Melbourne, Australia	350,000
Southside WWTP, Dallas, TX	340,000
Eastern Treatment Plant, Melbourne, Australia	330,000
Southeast Water Pollution Control Plant, San Francisco, CA	320,000
South Valley WRF, Utah	300,000
Orange County Sanitation District, HPO Plant, CA	300,000
Lou Romano WWTP, Windsor, ON	273,000
Alexandria, VA, WWTP	265,000
Akron, OH, WWTP	265,000
F. Wayne Hill Water Resources Center, Gwinnett County, GA	260,000
McAlpine Creek WWTP, Charlotte, NC	240,000

Highland Creek Water Pollution Control Plant, Toronto, ON, Canada	217,000
Salt Lake City, UT Water Reclamation Plant	212,000
Fields Point WWTP, Narragansett Bay Commission, Providence, RI	208,000
Upper Occoquan Sewage Authority WWTP, Centerville, VA	204,000
South WRF, Orange County, FL	200,000
Green Bay, WI, WWTP	197,000
Rock Creek WWTP, Hillsboro, OR	191,000
Wyoming Valley WWTP, Wilkes-Barre, PA	189,000
Little Blue Valley WWTP, Independence, MO	189,000
Ina Road WRF, Pima County, AZ	189,000
Four plants, Jacksonville, FL, Electric Authority	189,000
Northside WWTP, Tulsa, OK	160,000
Riverside Park Water Reclamation Facility, Spokane, WA	150,000
VIP WWTP, Norfolk, VA	150,000
Duck Creek WWTP, Garland, TX	150,000
Pt. Woronzof WWTP Anchorage, AK	150,000
New Haven, CT, WWTP	150,000
Durham WWTP, Tigard, OR	150,000
South River WWTP, Atlanta, GA	150,000
R. L. Sutton WWTP, Cobb County, GA	150,000
Cedar Rapids WWTP, IA	150,000
Adams Field WWTP, Little Rock, AR	150,000
Riverside WRF, Spokane, WA.	150,000
Stockton, CA WWTP	150,000
Skyway WWTP, Region of Halton, ON	140,000
Brightwater Treatment Plant, King County, WA	136,000
Leon Creek WWTP, San Antonio, TX	132,000
Salado Creek WWTP, San Antonio, TX	132,000
Licunhe WPT, Qingdao, PRC	132,000
Kitchner WWTP, ON	120,000
Agua Nueva Water Reclamation Plant, Tucson, AZ	120,000
Allentown, PA WWTP	120,000
Fayetteville, NC WWTP	114,000
Lubbock, TX, WWTP	114,000
Missouri WWTP, Omaha, NB;	114,000
Bustamante WWTP, El Paso, TX	114,000
East WRF, Orange County, FL	114,000
North Las Vegas WWTP, NV	114,000
Pine Creek WWTP, Calgary, AB	100,000
Crooked Creek Water Reclamation Facility, Gwinnett County, GA	98,000
South Bay International WWTP, San Diego, CA	95,000
Lions Gate WWTP, Vancouver, BC	95,000

Monterey Water Reclamation Plant, CA	95,000
H. L. Mooney Water Reclamation Facility, VA	91,000
Rowlett Creek WWTP, Garland, TX	90,000
Regional Plant No. 4, Chino Basin Municipal Utility District, CA	90,000
Hoboken, NJ, WWTP	90,000
Cross Creek WWTP, Fayetteville, NC	90,000
Bellingham, WA, WWTP	90,000
Yellow River Water Reclamation Facility, Gwinnett County, GA	83,000
Carbon Canyon WWTP, Chino Basin Municipal Utility District, CA	80,000
Govalle WWTP Austin, TX	75,000
LOTT WWTP, Olympia, WA	75,000
Oceanside WWTP, San Francisco, CA	75,000
Terminal Island WWTP, Los Angeles, CA	75,000
Palo Alto, CA, WWTP	75,000
Stamford, CT, WWTP	75,000
Merramec WWTP, St. Louis, MO	75,000
Lulu Island WWTP, Vancouver, BC	75,000
Lethbridge, Alberta, WWTP	49,000
Beloit, WI, WWTP	68,000
Sunnyvale, CA WWTP	68,000
Paul R. Noland WWTP, Fayetteville, AR	64,000
Ballenger-McKinney Wastewater Treatment Plant, Frederick County, MD	57,000
Cox Creek Water Reclamation Facility, Anne Arundel County, MD	57,000
West County WWTP, Louisville, KY	57,000
Seven Mile Beach WWTP for Cape May County Municipal Utilities Authority, NJ	57,000
Laguna WWTP, Santa Rosa, CA	57,000
Abiliene, TX, WWTP	57,000
Kanapaha WWTP, Gainesville, Fl;	57,000
Jordan Basin WRF, Utah	57,000
Caspar, WY, WWTP	53,000
North WRF, Orange County, FL	51,000
Loveland WWTP, CO	45,000
Visalia, CA, WWTP	45,000
Broad Run WWTP, Loudoun County, VA	45,000
Flat Creek WRF, Gainesville, GA	45,000
Tahoe-Truckee Sanitary Authority, Truckee, CA;	38,000
Tracy, CA, WWTP	38,000
Roseburg, OR, WWTP	38,000
Econchate WWTP, Montgomery, AL	38,000
Key West, FL, WWTP	38,000
Manhattan WWTP, KS	38,000

Grand Island WWTP, NB	38,000
Clear Creek WWTP, Redding, CA	38,000
West Camden, New South Wales, AU	36,000
Landis Sewage Authority WWTP, Landis, NJ;	32,000
Gippsland Water Factory, Tralagon, VIC, Australia	32,000
Tri-City WWTP, Oregon City, OR	31,000
Spokane County Regional Water Reclamation Facility, WA	30,000
Traverse City, MI WWTP	30,000
Southwest Water Reclamation Facility, Henderson, NV	30,000
Muskogee, OK, WWTP	28,000
Twin Falls, ID, WWTP	28,000
Parkway WWTP, Laurel, MD	28,000
Marcy Gulch WWTP, Highlands Ranch, CO	26,000
Chickasaw WWTP, Bartlesville, OK;	26,000
Grand Strand, SC, WWTP;	25,000
Morristown, NJ, WWTP	23,000
Wilsonville, OR, WWTP	20,000
Northern WWTP, Cairns, Northern Territories, AU	19,400
Southern WWTP, Cairns, Northern Territories, AU	19,400
Okmulgee WWTP, OK	19,000
Bonita Springs WWTP, FL	19,000
Leesburg, VA, WWTP	19,000
Stillwater WWTP, Redding, CA	19,000
Eagle River WWTP, Anchorage, AK	19,000
Laei WWTP, HI	19,000
Kearney WWTP, NB	19,000
Olivehurst, CA, WWTP	19,000
Linwood WRF, Gainesville, GA	19,000
Norwest Langley WWTP, Vancouver, BC	15,000
Port Townsend, WA, WWTP	17,000
Lower Township, NJ, WWTP	15,000
North Funen, DK, WRRF	11,500
Clovis Sewage Treatment/Water Reuse Facility, Clovis, CA	11,000
Benicia, CA, WWTP	11,000
Port Charlotte, FL, WWTP	11,000
Anacortes, WA, WWTP	11,000
Woodburn, OR, WWTP	9,500
Hillsboro, OR, WWTP	7,600
Mainside WWTP, Quantico Marine Base, VA	7,600
Harriman, TN, WWTP	7,600
West Jefferson WWTP, Evergreen Metro District, CO	3,800
Girdwood, AK, WWTP	2,800

Experience
31 years

Education
PhD, Environmental Engineering/Wastewater, Northwestern University

Master of Engineering, Sanitary Engineering/Water, Muroran Institute of Technology, Japan

MS, Civil Engineering, Lvov Polytechnic Institute, Ukraine

BS, Civil Engineering, Lvov Polytechnic Institute, Ukraine

Registration
Professional Engineer, Florida #58590

Board Certified Environmental Engineer, Certified Environmental Engineer, # 03-10010

Professional Committees
Vice Chair, PFAS Task Force. Water Environment Federation (WEF)

Member, PFAS Technical Advisory Group. American Water Works Association (AWWA)

Member, Industry-Government Engagement Program. Society of American Military Engineers (SAME)

Former Vice Director, Landfill Management Division of Solids Water Association of North America (SWANA)

Technical Advisor, Landfill Leachate and PFAS Evaluation and Removal Research projects, Florida and North Carolina universities (four)

**Experience prior to FNI*

Viraj deSilva, PhD, PE, BCEE | Polyfluoroalkyl Substances (PFAS) Global Expert

Dr. Viraj deSilva is a Senior Treatment Process Leader with more than 30 years of progressive experience in water and wastewater engineering, including landfill leachate and PFAS management, from concept through construction and start-up. ***His national and international experience includes specific expertise in PFAS regulation/treatment.*** Viraj provides consultation to municipal clients on upcoming regulations, such as PFAS, and how to upgrade existing treatment processes to comply with new regulations.

Viraj has been published in or presented at more than 290 industry journals and conferences - 151 of them are PFAS related; authored EPA, WEF, ASCE, and AWWA manuals of practice; and his recent PFAS work is cited in AWWA and EPA publications. ***His AWWA's "Managing and Treating PFAS in Membrane Concentrates" paper was selected for the 2021 AWWA Membrane Treatment Best Paper Award.*** He currently serves on the Technical Advisory Group at five universities conducting PFAS Research including USF, UM, UF, FIU, and GCU.

Relevant PFAS Project Experience:

PFAS Long-Term Management | City of Austin, TX | Technical Advisor | Viraj reviews existing PFAS sampling data and works with contractors who are building a new terminal at the Austin-Bergstrom International Airport. Soil and groundwater cleanup systems are required during excavation activities to prevent potential PFAS release.

PFAS Treatment Pilot Study | Columbus, GA | Technical Advisor | Viraj reviews water quality to be treated for PFAS removal at Fort Hood Army base in GA. Design Pilot skids and selected GAC and IX media to be tested. In addition, RO skids and Cerafiltec skids to be tested for their removal efficiencies. Discussions with GAEPD to get test protocol approved. PFAS sampling plan and EBCT and other parameters were selected to make the 6months pilot to be successfully completed.

PFAS Treatment GAC Filter Study | DeKalb County, GA | Technical Advisor | Viraj reviews water quality to be treated for PFAS removal at Scott Chandlier Water Treatment Plant in GA. Evaluation of current GAC/Sand/Gravel filters for their removal efficiencies and breakthrough times are included in this study. Disposal of spent media and filter backwash cycles are adjusted for most efficient way and selection of best GAC media was part of this study.

PFAS Long-Term Management | City of Austin, TX | Technical Advisor | Viraj reviews existing PFAS sampling data and works with contractors who are building a new terminal at the Austin-Bergstrom International Airport. Soil and groundwater cleanup systems are required during excavation activities to prevent potential PFAS release.

PFAS Analysis | JEA, FL | Project Engineer | Viraj assisted in developing PFAS upgrade costs for JEA's wastewater treatment plants and biosolids management programs. Viraj also conducted PFAS workshops for JEA staff related to PFAS regulations, pre-treatment programs and cost related to PFAS management.

Cross-State Landfill PFAS Investigation* | Solid Waste Authority, Palm Beach, FL | Project Manager | Viraj provided oversight and quality assurance during the sampling of soil, groundwater, and surface water for analysis of PFAS. He also developed work plans for client approval prior to field investigation which required DPT drilling to collect soil and surficial groundwater samples and he reviewed lab analysis results.

Perdido Landfill Leachate Treatment Study* | Escambia County, FL | Project Manager | Viraj conducted a feasibility study of the landfill leachate collection and management system. He proposed several pre-treatment options for total nitrogen and PFAS

reduction in leachate effluent. Viraj also led the investigation team that included sampling for PFAS and reviewing plant water quality data for several years.

RO Concentrate (PFAS Waste) Injection Study and Design* | New Hanover Landfill, Wilmington, NC | Project Manager | Viraj conducted a pilot study to evaluate the feasibility of injection RO concentrate via a vertical well in the landfill. He implemented the installation of two 6-inch diameter injection wells 80- to 100-feet deep and conducted a study injecting reverse osmosis concentrate into the wells in closed landfill Cells 3B and 4A at the landfill.

Selected PFAS Presentations/Publications (Total over 141)

- DPR Systems to meet proposed PFAS Limits. 2024 ACE (AWWA Annual Conf), Anaheim, CA
- Drinking Water Treatment Plants meeting PFAS Compliance around US. 2024 PFAS Training. Tulsa, OK
- From Sea to Shining Sea: Determining the Most Suitable PFAS Removal Technology across the United States. 2024 Texas Water, Fort Worth, TX.
- Navigating Florida's Surface Water Discharge Elimination Plans-SB64 Challenges. 2024 FWRC Conference. Kissimmee, FL
- Lessons Learned for Four PFAS Pilot Tests in the US. 2024 FWRC Conference. Kissimmee, FL
- DPR Systems Coast to Coast to meet proposed PFAS Limits, 2024 FWRC Conference. Kissimmee, FL
- Eliminating PFAS Sources to Water Reclamation Facilities. OK Industrial Pretreatment Association Workshop. Tulsa, OK
- Turning Challenge into Opportunity: PFAS and Potable Reuse Systems. 2023 FSAWWA Fall Conference. Champions Gate, FL
- Piloting Granular Activated Carbon to Remove PFAS. 2023 FSAWWA Fall Conference. Champions gate, FL
- How Water Utilities are influenced by EPA's new PFAS rule. 2023 FWEA Process Seminar. Jacksonville, FL
- Stopping at the Source. Controlling PFAS through Industrial Pre-Treatment Programs. NC OneWater 2023, Raleigh, NC
- Solutions for PFAS Management – Treatment. WEFTEC 2023. Chicago, IL
- Successful PFAS Destruction Research in the US. WEFTEC 2023, Chicago, IL
- Stopping at the Source – Pretreatment Strategies to Eliminate PFAS. FL Industrial Pretreatment Association Workshop. Sarasota, FL
- How New PFAS Regulations will impact Water and Wastewater Utilities. National Society of Professional Engineers. Webinar
- Mission Impossible: Removing the "Forever Chemical" (PFAS) from Drinking Water. 2023 Rocky Mountain Water Conference. Denver, CO
- The Challenges of Removing PFAS from Water and Wastewater. 2023 Southwest FL Water & Wastewater Exposition. Punta Gorda, FL
- Stopping PFAS at the Source. 2023 GA Industrial Pretreatment Association Workshop. Atlanta, GA
- How Rural Water Communities in the US are Planning for Upcoming PFAS Rules. 2023 FL Rural Water Association Conference. Westley Chappel, FL
- New Developments in Water Quality Permitting. 2023 Environmental Permitting School. Marco Island, FL
- Implementation of Senate Bill 64 – Examples of Surface Water Discharge Elimination. 2023 FWRC Conference. Orlando, FL
- Current PFAS Water Treatment Practices in the US. 2023 PFAS Forum III. Orlando, FL
- Addressing the Impacts of PFAS in Water/Wastewater. 2023 Coastal Bend WEAT/TAWWA Seminar. Corpus Cristy, TX
- Addressing the Impacts of PFAS in Biosolids. 2023 WEAT & TX AWWA Joint Seminar. Austin, TX
- PFAS Management in Potable Reuse Projects. 2023 Texas Water. Houston, TX
- Updates to PFAS Regulations and Current PFAS Treatment Practices. 2023 ASCE FL Section + Engineer Without Borders. Webinar
- PFAS – Latest Regulatory Landscape and Treatment Approaches. 2023 Spring FWEA Process Seminar. Pompano Beach, FL
- PFAS – New Incentive for Potable Reuse. Journal FWRJ. April 2023
- What Every Operator Should Know About PFAS. WE&T - Operator Essential. November 2022
- Water Reuse and PFAS (2022 AWWA Best Paper Award). Journal AWWA. December 2022
- What Every Operator Should Know About PFAS. WE&T - Operator Essential. November 2022
- Development of PFAS Pretreatment Programs - Challenges faced by landfills and industrial customers in the US. 2022 WEFTEC, New Orleans, LA
- Managing the Regulatory & Transactional Risks of Emerging Contaminants such as PFAS. Env. Permitting School, 2021, Marco Island.
- Most Significant Issues and Concerns Related to PFAS that a Public Works Director Should Know and Plan For. 2021 WEFTEC, Chicago, IL. Invited Speaker
- Latest PFAS Regs in the US and Site Investigation Update and Cleanup Efforts in Florida. 2021 FSAWWA Fall Conference, Orlando, FL.

Jennifer D Baldwin, Ph.D., PE

Digital OneWater Strategic Growth Lead

Summary Biography

Dr. Jennifer Baldwin (she/her) is an expert technologist specializing in assembling and leading large program teams and planning and implementing comprehensive rehabilitation and improvement programs. S

As Jacobs' Digital OneWater Strategic Growth Lead, Jennifer is responsible for looking at the array of digital tools available to our water sector clients and bringing them under a OneWater umbrella. By creating an integrated ecosystem of data-enabled solutions, we can more effectively and efficiently assist our clients with their most complex water challenges, from water scarcity and flood control to overstretched budgets and staffing shortages.

Dr. Baldwin served as quality assurance manager/technical assistance for a $1.6 billion sewer program with 110 projects and as technical manager for conveyance for a $5 billion wastewater treatment and conveyance program. She provides process mechanical expertise on a variety of infrastructure development projects, specializing in wastewater conveyance facilities, such as pump stations and storage facilities. Dr. Baldwin serves in a senior advisory capacity on large and complex water and wastewater infrastructure improvement programs, specializing in pump station hydraulics and design quality assurance. Active in professional organizations, including Water Environment Federation (WEF) and American Society of Civil Engineers (ASCE).

Key Skills/Areas of Expertise

- Wet weather flow management, including pumping and storage
- Wet weather planning
- Water infrastructure planning and design

Education and Qualifications

- Ph.D., Civil (Environmental) Engineering, Purdue University, 2001
- B.S., Chemical Engineering, Purdue University, 1995

Registrations and Certifications

- Professional Engineer, Florida, 2019, 87246, Expiration Date: February 2023
- Professional Engineer, Texas, 2016, 124377, Expiration Date: September 2021
- Professional Engineer, Tennessee, 2006, 00110990, Expiration Date: October 2022
- Professional Engineer, Indiana, 2004, PE10404080, Expiration Date: July 2022

Memberships and Affiliations

- Member, American Society of Civil Engineers, 2019, Active Status
- Member, Water Environment Federation, 2003, Active Status
- Member, American Water Works Association, 2002, Inactive Status

Achievements/Awards

- Golden Spigot Award, 2012, American Water Works Association
- Mentor of the Year Award, 2009, CH2M Hill

Languages

- English (mother tongue)

Employment History

- July 2006 to Present, Jacobs, Principal Technologist
- November 2001 to June 2006, HNTB, Inc., Water Engineer
- August 1995 to November 2001, Purdue University, Graduate Assistant

Project Experience

Capital Project Delivery, CSO Monitoring Expansion Project, Wilmington, DE, City of Wilmington, Project Manager, July 2021 to Present

Jacobs is providing operations and maintenance services for the City of Wilmington as well as delivering capital projects to improve operational efficiency of the wastewater collection and treatment system. The CSO monitoring expansion includes adding level sensors at the 35 unmonitored CSO sites as well as flow meters in select interceptors. The meters will be used to optimize operation and maintenance of the collection system to limit CSOs. Jennifer's role as project manager was to develop a schedule and budget for the project scope. She led the technical team, which developed the design and then implemented deployment of the meters in the system. In addition to project management, Jennifer coordinated with the AquaDNA development team to use Jacobs AquaDNA tool to monitor the level and flow data, provide alerts to maintenance staff, and predict when CSOs may be activated.

State Road 207 Water Reclamation Facility (SR 207 WRF), St. Augustine, FL, St. John's County Utility District (SJCUD), September 2022 to Present

SJCUD is carrying out a wastewater master plan related to population growth and conveyance and treatment capacity. The SR 207 WRF project is a progressive design-build project that includes a new 3.25 mgd, expandable to 6.5 mgd average daily flow WRF, over 15 miles of new force main and reclaimed water transmission mains, a wastewater master pump station, and two reclaimed water booster pump stations. The budget for the project is $145 million. Jennifer's role on the project is the resource manager for the Pipelines team, which includes pipeline and trenchless designers and engineers as well as the hydraulic modeling lead for the wastewater master pump station and reclaimed water booster pump station that is located at the WRF.

One Water Program: South County Potable Water Transmission Main, Hillsborough County, FL, Senior Technical Consultant and QA/QC reviewer, September 2021-Present

Jacobs, as a sub-consultant to McKim and Creed, is working under Westra, the design builder for the South County Potable Water Transmission Main. The project includes design and construction of 42-inch and 48-inch potable water transmission main that will expand service to the South County area. Jennifer's role on the project is to QA/QC the hydraulic modeling report and work with the design leads to ensure that quality reviews have been performed on the deliverables.

Water/Wastewater System Resiliency Program, Jacksonville, FL, JEA, Lead Engineer, November 2018 to December 2020

The wastewater/water system resiliency program is identifying areas that have current capacity and/or resiliency issues within JEA's system as well as into the future. Jennifer assisted with the task orders related to conveyance system capacity and flood resiliency. Jennifer was also the technical lead for assessments of the effluent pumping/outfall systems at two of JEA's Water Reclamation Facilities. The assessment of the Buckman WRF included a condition assessment of the 78-inch outfall pipe.

Rilling Road Flow Management Facility, San Antonio, TX, San Antonio Water System (SAWS), Storage and Mechanical Lead, January 2021 to July 2022

SAWS is carrying out improvements in their wastewater collection system to address the requirements of a Consent Decree. This project includes detailed design and engineering services during construction for the Rilling Road Flow Management Facility. The project includes validation of the 30 percent design for the Rilling Road Flow Management Facility that was developed as part of the Central Basin Planning Consultant project completed in 2018. Jennifer's role on the project is to lead the process/mechanical team for design of the storage facility, including cleaning elements and weirs/gates, and the return pump station.

Central Basin Planning Consultant, San Antonio, TX, San Antonio Water System (SAWS), Storage Lead, July 2016 to October 2018

SAWS is planning improvements in their wastewater collection system to address the requirements of a Consent Decree. Jennifer was the storage lead for the Central Basin Planning Consultant team, determining storage solutions for the sanitary sewer overflow improvements. As storage lead, Jennifer led the feasibility analysis for several storage options within the Central Basin Planning study area. From the feasibility analysis, the alternative that was chosen included a new 15 MG storage facility (expandable to 30 MG) that will be located at the former Rilling Road Wastewater Treatment Plant site and a 30 MGD lift station to return flow into the system, for which Jennifer led the process mechanical for the 30% design.

Great Lakes Water Authority 96-inch Water Transmission Main Relocation, Detroit, MI, Great Lakes Water Authority (GLWA), Abandonment and Flushing/Disinfection/Service Restoration Lead, October 2020 to Present

GLWA intends to relocate a portion of their 96-inch diameter water transmission main (WTM) around the closed G&H Industrial Landfill. The relocated portion of the WTM will be approximately 2.5 miles long, and approximately 2.5 miles of existing WTM will be abandoned. Jennifer's role as the abandonment lead includes determining the abandonment alternatives, preparing a technical memorandum describing those alternatives, and leading the design of the abandonment of approximately 2.5 miles of 96-inch water transmission main, including the appurtenances along the portion of main to be abandoned. Jennifer's role as flushing/disinfection/service restoration lead includes writing a technical memorandum outlining the steps for flushing, disinfection, and service restoration of the new and existing 96-inch main, isolation valves, existing and new appurtenances, and metered connections at several points during the construction of the project.

Force Main Condition Assessment Plan, Phase 1, and Phase 2, Fort Lauderdale, FL, City of Fort Lauderdale, Technical Lead, November 2019 to March 2020

The City of Fort Lauderdale has entered into a Consent Order with the State of Florida and is planning projects related to the Consent Order. Jennifer's role as the technical lead was to work with the team to evaluate the information received, determine the immediate action projects for force mains whose likelihood of failure is so great that condition assessment is not needed, and development of the force main condition assessment plan for the remaining force mains, prioritizing based on likelihood of failure. Jennifer also led the development of the order-of-magnitude costs and schedule in Phase 1 for the condition assessment that took place in Phase 2. Jennifer also led the team of corrosion engineers who performed the Phase 2 assessment.

Ocean Outfall Legislation (OOL) Program, Miami, FL, Miami Dade WASD, Conveyance Technical Team Lead, November 2014 to July 2018 (project ongoing)

The Miami Dade WASD is undergoing a program to reduce outfalls to the Atlantic Ocean. Jennifer's initial role was to perform the validation of the force main projects and assist with validation of the pump station projects that were included in the 2013 OOL Compliance Plan. Following validation, Jennifer's role was to lead the planning of conveyance improvements needed to meet the OOL. Jennifer also performed an analysis of existing pump stations in the conveyance system that could become under capacity following implementation of the OOL. Jennifer provided reviews of the conveyance-related conceptual design reports. She was also the equalization lead for new equalization tanks at the Water and Sewer Department's South District WWTP and developed the project delivery approach and schedule for the South District, Central District, and West District WWTP conceptual design reports. Jennifer also led a task that revised the flood modelling to take into account different hurricane pathways and wave heights.

Baton Rouge Sanitary Sewer Overflow (SSO) Abatement Program, Baton Rouge, LA, City of Baton Rouge/East Baton Rouge Parish, Quality Assurance Manager and Chief Engineer, September 2007 to December 2014 (program is ongoing)

The City of Baton Rouge/East Baton Rouge Parish is rehabilitating the existing sewer system, upsizing sewer and forcemain pipes to increase the capacity for wet-weather flows, and increasing the capacity of approximately 150 pump stations as part of their Program to eliminate SSOs. Jennifer was responsible for

assisting Program staff in resolving technical issues, reviewing storage and pump station design project submittals and calculations, scheduling and planning level cost estimating for the projects, and developing design guidelines for design consultants. Jennifer also produced the Program Delivery Plan, including the cost loaded schedule for the delivery of the Program, on an annual basis from January 2008 through December 2013. Jennifer also assisted with the process training at the South Wastewater Treatment Plant for the operators when the wet weather treatment project at that plant was nearing completion, including operation of the 66 MG of storage. Jennifer continues to provide assistance on an as-needed basis.

Lenoir City Utilities Board Wastewater Treatment Plant Expansion, Lenoir City, TN, Lenoir City Utilities Board (LCUB), Process/Mechanical Engineer and Project Manager, August 2006 to December 2009

The project involved updating an existing trickling filter plant to allow the plant to meet their NPDES effluent limits. The expanded plant (from 2 MGD to 3 MGD maximum month flow) utilizes the trickling filter as a roughing filter and add an oxidation ditch for activated sludge treatment. Construction of the treatment plant expansion was completed in December 2009. Jennifer's role as Process/Mechanical Engineer involved design of treatment processes, including four pumping stations, as well as engineering services during construction, including answering requests for information (RFIs) and reviewing submittals with respect to process/mechanical equipment. Jennifer's role as Project Manager during design involved coordinating with the project team and client as well as managing the schedule and budget and during construction involved coordinating submittal reviews and RFIs between disciplines as well as attending construction progress meetings.

Published Papers

- Baldwin, J., Francois, D., Griffin, J., and Praturi, P., 2021, "Risk Based Condition Assessment of Force Mains Using External Corrosion Surveys", Proc. American Society of Civil Engineers (ASCE) Pipelines Conference, Paper and Presentation.
- Baldwin, J. Francois, D., Griffin, J., Praturi, P., and Heyerdahl, L., 2021, "Risk-Based Condition Assessment of Force Mains using External Corrosion Survey Methodologies", Proc. North American Society for Trenchless Technology (NASTT) No-Dig Show, Paper and Presentation.
- Sealey, K., Daugherty, D., Cunningham, B, Simms, P., Baldwin, J.D., and Dykes, D., 2019, "Programmatic Approach to I&I Removal", Proc. WEFTEC, Paper and Presentation.
- Griffin, J., Baldwin, J.D., Buonadonna, D., Fernandez, R., Schwarz, W., Leighton, B., 2019, "South Florida Aging Infrastructure: Force Main Condition Assessment and Renewal", Proc. American Society of Civil Engineers (ASCE) Pipelines Conference, Paper and Presentation.
- Baldwin, J.D., Smith, A., and Laryrisson, H.S., 2015, "Value Engineering of Conveyance System Projects on a Large Wet Weather Program", Proc. American Society of Civil Engineers (ASCE) Pipelines Conference, Paper and Presentation.
- Baldwin, J.D. and LeBlanc, M.L., 2014, "Financing of a $1.6 Billion Sanitary Sewer Overflow (SSO) Program in Louisiana", Proc. WEFTEC, Paper and Presentation.
- Baldwin, J.D., Schulze, A.E., and Smith, H.L., 2014, "Construction and Commissioning of a Complex Wet Weather Storage System in Baton Rouge", Proc. American Society of Civil Engineers (ASCE) Pipelines Conference, Paper and Presentation.
- Baldwin, J.D., Schulze, A.E., and Smith, H.L., 2013, "Project Implementation and Construction Sequencing with 93 Projects: The Baton Rouge SSO Program", Proc. American Society of Civil Engineers (ASCE) Pipelines Conference, Paper and Presentation.
- Baldwin, J.D. and Schulze, A. E., 2012, "Planning and Modeling Solutions for a Complex Collection System: The Baton Rouge SSO Control and Wastewater Facilities Program", Proc. American Society of Civil Engineers (ASCE) Pipelines Conference, Paper and Presentation.
- Baldwin, J.D., and Hua, I., 2004, "Alachlor Oxidation by Sonication and Ozonation", Proc. Water Quality and Technology Conference, San Antonio, TX, American Water Works Association, November 2004.
- Schramm, J. D., and Hua, I., 2001, "Ultrasonic Irradiation of Dichlorvos: Decomposition Mechanism", Water Research, 35(3): 665-674.
- Beckett, M., Schramm, J. D., Zhang, G., and Hua, I. 2001, "Electrohydraulic Cavitation and Sonolysis" in Hazardous and Radioactive Waste Treatment Technologies Handbook. Chang H. Oh, Ed., CRC Press LLC (Boca Raton, Fl).

CAROL ANN HEE
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EDUCATION

MBA—Kenan-Flagler Business School, University of North Carolina at Chapel Hill 2008
- *Beta Gamma Sigma* Honors Society

PhD—Marine Sciences Department, University of North Carolina at Chapel Hill 2002
- UNC Chapel Hill Graduate School Competitive Fellowship
- U.S. Environmental Protection Agency Science-to-Achieve-Results (STAR) Fellowship
- Tanner Award for Undergraduate Teaching

BS—University of Scranton 1995
- *Magna Cum Laude;* Biology with Biochemistry and Philosophy Minors. *Alpha Sigma Nu* (Jesuit), *Beta Beta Beta* (Biology)*, Gamma Sigma Epsilon* (Chemistry) & *Phi Sigma Tau* (Philosophy) Honors Societies
- Undergraduate Research Honors Program. Thesis: "Quantification of denitrification potential in a salt marsh affected by a nitrogen-rich ground water plume from a wastewater treatment plant."
- Special Jesuit Liberal Arts Honors Program

FULL-TIME INDUSTRY EXPERIENCE

Principal consultant, Life cycle assessment
Anthesis Group 2023-Present

TEACHING EXPERIENCE

Associate Adjunct Professor, Duke University's Nicholas School of the Environment 2019-Present
Teaching Professor, Environment, Energy, and Ecology Program, UNC-Chapel Hill 2019-2023
Associate Professor of Strategy and Entrepreneurship, UNC Kenan-Flagler Business School 2013-2019
Assistant Professor of Strategy and Entrepreneurship, UNC Kenan-Flagler Business School 2008-2013
Instructor, Organic Chemistry, Durham Technical Community College 2003-2004
Science Writer, Editor, Systems Analyst, Team Lead, US Environmental Protection Agency 2001-2008
Graduate Research and Teaching Assistant, UNC Marine Sciences Department 1995-2002

TEACHING AWARDS AND GRANTS

- Johnston Teaching Excellence Award (2022)
- Weatherspoon Award for Excellence in Undergraduate Teaching (2019)
- Page Prize for Excellence in Sustainable Business Education (2018)
- Obama-Singh 21st Century Knowledge Initiative Award (2013-2017)
- Provost Junior Faculty Development Award (2013)
- MBA Teaching All Star (2013)
- Center for European Studies Curriculum Development Award (2013)
- European Union Center of Excellence Case Study Development Grant (2012-2014)
- Center for Global Studies Curriculum Development Award (2012)
- Center for International Business Education and Research Mini-Grant (2011)
- Page Prize for Curriculum Development in Environmental Strategy (2010)
- Tanner Award for Excellence in Undergraduate Teaching (2000)

COURSES TAUGHT

Undergraduate Education

- Renewable Energy Project Financing, ENEC 698
- Carolina Sustainability Consulting, BUSI 590 and ENEC 698
- Sustainable Enterprise and Social Entrepreneurship, BUSI 507H
- Finance and Management Fundamentals for Change Makers, ENEC 473
- Green Business Strategies, ENEC 463/BUSI 463
- Managing Global Sustainability Challenges, BUSI 490
- Introduction to Environmental Problem Solving, ENEC 203
- Honors Theses, Internships, and Independent Studies, including ENEC 393: Undergraduate Internship in Environmental Science and ENEC 395: Undergraduate Research in Environmental Science ENEC 396

Graduate Education

- Business and the Environment, MEM 811
- Life Cycle Assessment, MEM 638
- Corporate Environmental Strategy, MBA 869
- Global Business Consulting Projects (ON-LINE), MBA 890
- Strategies in Sustainable Enterprise, MBA 815
- Sustainable Enterprise in Global Contexts, MBA 815B
- Masters Theses, Internships, and Independent Studies

Executive Education

- Corporate Social Responsibility: Calculating Social Impact and Return on Investment. North Carolina Network for Grant Makers. Raleigh, NC. 2012.
- Trends in Sustainability Reporting. Foundation for the Carolinas. Charlotte, NC. 2011.
- Strategic Corporate Philanthropy. North Carolina Network for Grant Makers. Raleigh, NC. 2011.
- Going Green. UNC Kenan-Flagler Business School Executive Education. Chapel Hill, NC. 2009.

International Teaching Experience

- Strategies in Global Sustainable Enterprise. International Summer School, University of Economics; Vienna, Austria. Summer, 2013.
- Embedding Corporate Social Responsibility in Vietnam through Research, Training, and Curriculum Development. Developed three sustainability courses as part of grant from UN Global Compact Network's University Partnership for CSR Curriculum Development. Summer, 2010.

SUSTAINABILITY CONSULTING ENGAGEMENTS ADVISED

For each of these projects, I recruited the client, scoped the work, set and enforced deadlines, facilitated client-student communications, provided subject matter expertise, ensured on-time delivery of high-quality results.

- 2022-23
  - Life cycle assessment for an upscale furniture company
  - Life cycle assessment for an alternative protein company
  - Environmental Life Cycle Assessment for two lighting devices commercialized by Energizer Inc.
  - Advancing North Carolina's clean energy transition by empowering government leaders with data
  - Data-Driven Recommendations for Marketing, Communications, and Strategic Campaigns for the North Carolina Sustainable Energy Association

- 2021
  - Sustainability strategy and carbon footprinting for Duke University Health Care System.
  - Quantify potential environmental and economic benefits of anaerobically digesting restaurant-generated FOG (fat, oil, grease) waste using municipal infrastructure
  - Reducing the environmental impacts from packaging, transportation, and waste for a food company
  - Creating partnerships and a sustainable business model to support circularity in the textiles industry

- Designing a plastic credit / plastic offset program for a Haitian social business
- Quantifying the reach of EV charger deployment in the mid-Atlantic using GIS
- Developing an economically sustainable plastic recycling ecosystem in the Ohio River Valley
- Improving the ability of small-scale drinking water utilities to access government funding
- Assessing the effectiveness of various financial instruments to promote the development of renewable energy in India and Indonesia
- Design a social marketing strategy to increase utilization of educational materials about climate change created by the Yale Project on Climate Change Communications

- 2020
  - Developing a comprehensive sustainability strategy and communications plan for a IT company
  - Assessing the life cycle impacts of a running shoe for an MNC
  - Assessing the life cycle impacts of a tent for an NC-based manufacturer
  - Assessing the life cycle impacts of an automatic hand sanitizer dispenser for a start-up
  - Reducing the environmental impacts from packaging for a global skin care company
  - Reducing the environmental impacts from packaging for a premium coffee company
  - Promoting water conservation through the design of utilities' billing statements
  - Improving the accuracy of predicting building energy demand through modeling
  - Understanding barriers to teaching climate change faced by high-school teachers in the rural South
  - Quantifying the co-benefits of clean cooking innovations for an Austrian NGO
  - Quantifying the life cycle impacts of a tent for a family-owned business
  - Advancing environmental sustainability in the food storage industry for an MNC
- 2019
  - Making the business and environmental case for replacing fleet vehicles with EVs
  - Developing a zero-waste eco-community in western NC
  - Sustainable packing and retail strategy for a triple-bottom-line food startup
  - Marketing and social marketing strategy and pilot project for UNC's surplus store
- 2018
  - Identifying potential supporters of environmentally sustainability philanthropy
  - Improving compositing operations in a university cafeteria
  - Building a market for nutrient credits
  - Reducing energy consumption by university athletics
- 2017
  - Promoting sustainable operations in a student-run coffee shop
  - Launching a composting program in a university cafeteria
  - Nourishing low-income workers with boxes of local produce from a CSA
  - Reducing contamination of recycling at football tailgate parties

MASTERS THESES ADVISED

- Jaein Yoon (2022) "TickTok Made Me Buy It: Can Purchases Made on TikTok Lead to Cognitive Dissonance? Examining Gen Z's Purchase Decisions through the Lens of Today's Sustainability Dilemma" [Master's Thesis Committee Member, School of Journalism and Mass Communication]
- Jennifer Craft, Natalia Jaffee, Megan Lundequam, and Rebecca Sauer (2022) "Sustainability Strategy and Carbon Footprinting for Duke University Health Care System." [Masters Project Advisor, Nicholas School of the Environment, Duke University]
- Shepard Barnes (2021) "Understanding Consumer Perceptions of Retail Sustainability Campaigns: Content Analysis of Patagonia Social Media Marketing" [Master's Thesis Committee Member, School of Journalism and Mass Communication]
- Sara Barr (2021) "Assessment of Framing and Ideology in Environmental Children's Literature and Application to Environmental Problem-Solving." [Master's Thesis Committee Member, School of Journalism and Mass Communication]

- Stephane Monomie (2021) "Walking the talk: Authenticity as a sustainable brand differentiation strategy in green marketing" [Master's Thesis Committee Member, School of Journalism and Mass Communication]
- Mohamed Abdullah, Garrett Blake, Zhenchen Li, and Ayse Trail (2021) "Creating a sustainability strategic plan for a Fortune 500 technology company" [Master's Thesis Advisor, Nicholas School of the Environment, Duke University]
- Alexandra Grant (2019) "A historical content analysis of Twitter users' responses to Nike's corporate social responsibility" [Master's Thesis Committee Member, School of Journalism and Mass Communication]
- Madeline Omeltchenko (2019) "Relationship building and branding on Instagram: How green brands leverage social media to reach mass audiences" [Master's Thesis Committee Member, School of Journalism and Mass Communication]
- Rachel McMahan (2017) "Tarheels are literate, but are they energy literate? Assessing Energy literacy at the University of North Carolina at Chapel Hill and engaging university stakeholders in the airport solar and energy storage demonstration project." [Master's Thesis Committee Member, School of Journalism and Mass Communication]

UNDERGRADUATE HONORS THESES ADVISED

- Matthew Bravante (2019) "How much would it cost to power North Carolina exclusively with renewable energy?" [Honors Thesis Advisor] *Highest Honors*
- Lily Schwartz (2019) "Recycling mandates for multifamily housing units: An assessment of convenience, capacity, and compliance agent stipulations" [Committee Member, Department of Political Science] *Highest Honors*
- Nicolas Byron (2018) "Using community-based social marketing to develop strategies for reducing paper cup waste at cafes on UNC-CH's campus." [Honors Thesis Advisor]
- Christina Farrell (2017) "Innovation's changing landscape: Comparing sustainability innovation in B Corps with the world's most innovative companies." [Honors Thesis Advisor]
- Payal Nanavati (2013) "The role of demographic factors in contributing to the success of collaborative consumption enterprises." [Honors Thesis Advisor]
- Tia Davis (2013) "Wall Street citizenship or a PR stunt? An assessment of Goldman Sachs' social impact bond issuance as a corporate social responsibility initiative." [Honors Thesis Committee Member, School of Journalism and Mass Communication]
- Ashley Pileika (2012) "Are B Corps socially, environmentally, and financially effective enterprises?" [Honors Thesis Advisor] *Highest Honors*
- Shiwani Kumar (2012) "The effects of internal and external factors on microfinance institutions' success in South Asia." [Honors Thesis Committee Member]
- Mandi van Aswegen (2012) "The potential for social entrepreneurship in the townships of South Africa: Understanding concept and applying to directly assessed needs." [Honors Thesis Committee Member]
- Victoria Ma (2011) "Microfinance institutions in times of crisis: A regional study of microfinance institutions during the financial crisis of 2008-2010." [Honors Thesis Advisor] *Highest Honors*
- Ricardo Hurtado (2011) "Microfranchising in the *favelas* of Rio De Jaeiro, Brazil: Business suppressors, business enablers, and opportunities." [Honors Thesis Committee Member]
- David Blumberg (2011) "LEED for existing buildings: Certification and its effects on the U.S. office market" [Honors Thesis Committee Member]
- Jamie Yang (2010) "Denmark's wind energy policies as a case study for China." [Honors Thesis Committee Member]
- Jordan Scarboro (2009) "A triple bottom-line approach to sustainable community development." [Honors Thesis Advisor]

INDEPENDENT STUDIES ADVISED

- "Life cycle assessment of lab-produced breast milk." Lillian Wheery. MEM Duke University, Summer Internship. Summer, 2020.
- "The role of stock exchanges in ESG intervention" Carly Eve Edwards. ENEC 393, Independent Study. Summer, 2020.
- "Sustainability strategy within the beauty industry." Elizabeth Russler. ENEC 393, Undergraduate Internship, Spring 2019.
- "Business considerations for carbon capture and utilization technologies." Edward Hirsch. MBA Independent Study, Fall 2018.
- "Developing a sustainable composting program at middle and elementary schools: An internship with the non-profit Every Tray Counts." Jennifer Craft. ENEC 393, Independent Study, Spring 2018.
- "Creating a sustainable food culture: A study on UNC Panhellenic Association sorority meal plans." Lily Marie Schwartz. ENEC 395, Undergraduate Independent Study, Fall 2017.
- "Promoting pro-environmental behavior in UNC Greek houses." James Dockery, Robert Richey, Lily Marie Schwartz, Elizabeth Vilmar, ENEC 395: Undergraduate Research, Spring 2017.
- "Greek Recycling Internship." Blake Marin, James Dockery, Robert Richey, Lily Marie Schwartz, Elizabeth Vilmar, ENEC 393: Undergraduate Internship, Fall 2016.
- "Entry strategy for Research Triangle Institute's expansion into water advisory services in China." James MacDonnell (Project Leader; MBA@UNC), David Ayento (MBA@UNC), Donald Dong Jian; (Lingnan University, Hong Kong), Monica Louie (MBA@UNC), Austin Jackson (BSBA), Shihui Shao (UNC-CH). Global Business Consulting Project, Spring 2015. (ON-LINE)
- "Options for socially responsible investing by the University of North Carolina at Chapel Hill." Julie Sandler and Walter Shiftlett. MBA Independent Study, Fall 2014.
- "Social Start-Up Consultants: MBA student support for UNC social entrepreneurs." Matt Cook, David Opoku, and Brian Faulk. MBA Independent Study, Spring 2014.
- "A marketing and communication strategy to reduce AGCO's scope 3 greenhouse gas emissions" Shreya Chatterjee (Project Leader, MBA), Yulia Dubovicheva (MBA), Grant Heskamp (BSBA), Steven Patton (BSBA), Chetan Thapar (MBA), Ethan Trifari (BSBA). Consulting Project, Spring 2013.
- "Best practices for e-waste management—Recommendations for Bank of America" Graham Carroll and Macon Carroll. MBA Consulting Project, Spring 2013.
- "Applying sustainability tools to market benefits of Novozymes offerings to the cereal foods industry." Ravi Ayer. MBA Independent Study, Spring 2010.
- "Business model development for Sareelution, A Social Venture in Pune, India." Darshan Mundada. Masters Independent Study, Spring 2010.
- "Feasibility analysis of rice straw as a biomass feedstock." Rhiannon Bock. MBA Independent Study, Fall 2009.
- "Commercializing environmental sourcing and supply chain information: A business plan feasibility study for The Green Standard." Ben Hill *et al.* MBA Independent Study, Spring 2009.
- "An exploration of an American icon: General Motors and its past, present, and future." Deborah Zimmerman. Undergraduate Independent Study, Spring 2009.
- "Wetland mitigation banking opportunities for credit default insurance." Brad Hunter. MBA Independent Study, Spring 2009.

- "Advancing the triple bottom line with UNC's Dining Services." Diana Selezeanu *et al.* Sustainability Practicum, 2008-2009.

SCHOOL, UNIVERSITY, AND PROFESSIONAL SERVICE

- Director of Kenan-Flagler Center for Sustainable Enterprise (2010-2015)
  - Obtained grants and donations totaling over $1.75M
  - Achieved 3 top-10 global rankings
  - Planned and hosted 14 conferences and dozens of events for students and community members, including co-founding the UNC Clean Tech Summit with the Institute for the Environment
  - Built robust cross-campus collaborations including with the Global Business Center, Institute for the Environment, Sustainability Office, School of Law, School of Government, Hussman School of Journalism and Mass Communications, the Campus Y, Innovate Carolina, the Curriculum for the Environment, Center for African Studies, Center for Asian Studies, Center for Eastern European and Slavic Studies, and Center for Western European Studies
- Consultant to UNC Student Social Ventures:
  - Just Cup It, Carolina Thrift, PhytaHarvest, MeanTime Coffee, Seal the Seasons, Native South Creamery, Sanitation Creations, Healthy Girls Save the World, Musical Empowerment, Sareelution
- Faculty Advisor for UNC Student Organizations:
  - Habitat Solar (2021-2022)
  - Carolina Impact Investing Club (2018-2022)
  - Kay Blada Recycling (2017-2022)
  - Carolina Thrift (2018-2022)
  - Carolina Conservation Technology (2017-2019)
  - UNC Greek Sustainability Council (2016-2019)
  - Design for America (2013-2019)
  - Phi Gamma Delta Fraternity (2012-2019)
  - MBA Energy Club (2011-2015)
  - UNC Men's Crew Club (2012-2014)
  - MBA & Undergraduate Net Impact Clubs (2008-2018)
- UNC Institute for the Environment, Faculty Advisory Board (2008-2019)
- UNC Parr Center for Ethics, Faculty Fellow (2011-2019)
- UNC Vice Chancellor's Sustainability Advisory Committee, Faculty Chair (2013-2019)
- Editorial Committee of the *Journal for Corporate Responsibility and Leadership* (2014-Present)
- UNC Sustainability Strategic Plan, Steering Committee Co-Chair (Jan 2015-2017)
- Provost's Taskforce for the Environment, Impact & Outreach Subcommittee Co-Chair (2015-2016)
- Kenan-Flagler Center for Sustainable Enterprise, Director (2010-2015)
- Textbook reviewer, *Foundations of Sustainability*, for Wiley (2013)
- Kenan-Flagler Global Business Center (GBC), Operations Committee (2010-2016)
- Kenan-Flagler Sustainable Venture Capital Investment Competition, Internal Judge (2012-2015)
- Fulbright Review Committee (2012-2013)
- Center for Global Initiatives Faculty Development Grant Review Committee (2012-2013)
- Pan-University Water Theme, Steering Committee Member (2011-2015)
- MBA Integrative Case Competition Judge (2011)
- International Sustainability Symposium Planning Committee Member (2010-2014)
- Carolina Challenge Judge – Social Track and Finals (2010, 2014)
- Student Honor Court University Faculty Hearings Board (2010-2012)

- Kenan-Flagler Undergraduate Business Degree Admissions Interviews (2010)PUBLICATIONS

PUBLICATIONS

"Embedding Sustainability into the DNA of the Campus: Strategic Sustainability Plan at UNC-Chapel Hill" (2017) in *Handbook of Theory and Practice of Sustainable Development in Higher Education*. Volume 4. Link.

"Beyond Corporate Sustainability in the Anthropocene" (2016) in Emmett, Robert, and Thomas Lekan, (eds.) "Whose Anthropocene? Revisiting Dipesh Chakrabarty's 'Four Theses,'" *RCC Perspectives: Transformations in Environment and Society,* no. 2. doi.org/10.5282/rcc/7421. (Book Chapter). Link.

"PUMA: Leading the Pack with an Environmental Profit and Loss Statement" (2014) with Nikita Uday Godbole. UNC Kenan-Flagler's Center for Sustainable Enterprise.

"A Bottle-full of Precaution: Sigg and the BPA-Triggered Recall" (2014) UNC Kenan-Flagler Business School. UNC Kenan-Flagler Center for Sustainable Enterprise.

"World Vision Water – Scaling to Reach Every Single Child" (2014) with Bridget Brennan and Lisa Jones Christensen. UNC Kenan-Flagler Center for Sustainable Enterprise.

"Motivations and Behaviors of Solar PV and Geothermal System Owners in North Carolina" (2013) with Christopher Wedding. North Carolina Sustainable Energy Association. Link

"Procter & Gamble's PUR Purifier of Water: How Global Corporate Philanthropy Builds Shareholder Value" (2012) with Lisa Jones Christiansen. University of Michigan's William Davidson Institute. Link

"Case Study: Procter &Gamble's PUR" with Lisa Jones. *Financial Times of London*. March 2, 2011. Link

"Sustainability Policy and Practice in the German Context" (2010) UNC Center for Sustainable Enterprise.

"TNT: Sustainable Enterprise for the 21st Century?" (2009) with Peter Brews. UNC Center for Sustainable Enterprise.

"Structure and Composition of a Northern Hardwood Forest Suffering from Regeneration Failure." (2002) with Daniel Townsend, Jennifer Seva, and Greg Mayers. *Bartonia*. 61: 1-13.

"The Dynamics of Dissolved Organic Carbon Production and Consumption in Anoxic Marine Sediments: An Assessment Using Carbon Isotopes and Ultrafiltration." (2002) Carol Ann Hee. Ph.D. University of North Carolina at Chapel Hill.

"Dissolved Organic Carbon Production and Consumption in Anoxic Marine Sediment: A Pulsed-Tracer Experiment" (2001) with Tamara Pease, Marc Alperin, and Christopher Martens. *Limnology and Oceanography*. 46(8) 1908–1920.

CONFERENCES PLANNED AND HOSTED

For these events, I exercised co- or primary responsibility for its origin, determining themes and topics, inviting speakers, creating partnerships, and obtaining sponsorships.

- "North Carolina Clean Tech Summit." (Co-Founder, with Greg Gangi) 2014 and 2015.
- "Advancing Sustainability Education and Research in India." Obama-Singh 21st Century Knowledge Initiative Partnership with Indian Institute of Management-Bangalore. 2015.
- UNC Global Sustainability Symposia:
    - "The Story of Cities: Global and Local Perspectives on the Quest for Thriving and Sustainable Communities." 2014.
    - "Water & Energy in the Crosshairs." 2013.
    - "Shared Tables: Local and Global Sustainable Food Systems." 2012.
    - "International Job Creation: Can We (Micro) Franchise Our Way Out of Poverty?" 2011.
- "Sustainability Research and Practice." UNC Kenan-Flagler Center for Sustainable Enterprise

- "To Sell or Donate? The Provision of Clean Drinking Water and the Quest for a Sustained Product Use at the Base of the Pyramid" featuring Sridhar Balasubramanian (UNC Kenan-Flagler Associate Dean) and Greg Allgood (UNC Alumnus and Vice President, World Vision Water). Spring 2015.
- "Five Reasons MBAs Should Study Poverty" featuring Lisa Jones Christensen (UNC Kenan-Flagler Assistant Professor of Strategy) and Napoleon Wallace (MBA Alumnus 2010 and Executive at Self-Help Credit Union and the Center for Responsible Lending). Late Fall 2015.
- "Is Servicization a Win-Win Strategy? Profitability and Environmental Implications of Servicization" featuring Vinayak Deshpande ((UNC Kenan-Flagler Associate Professor of Operations) and Lindsay James (MBA Alumna 2003 and Vice President of Restorative Enterprise at Interface). Early Fall 2014.
- Global Entrepreneurship Week at UNC Kenan-Flagler Business School
  - "Saving the Planet through Entrepreneurial Approaches" (2015)
    - Jason Aramburu (Keynote) Founder of re:char; Daniel Blake, Founder, EcoScraps; and Andy Zeman, Founder, Benjamin Vineyards and Winery
  - "People. Planet. Profits. Saving the World One Step at a Time"(2014)
    - Markus Wilhelm (Keynote), CEO and Founder, Strata Solar; Ginger Dosier, Founder, BioMason; Rachael Cook, Founder, Seeds; Jennifer Curtis, CEO and Founder, Firsthand Foods
  - "How Entrepreneurship Can Save the Planet" (2013)
    - Tom Szaky (Keynote), Founder, TerraCycle; Daniel Whittaker, Founder, Green Planet Catering; Sam Imende, Founder and Managing Partner, ENZI Footwear; Luke Fishback, CEO and Founder, PlotWatt
- "Innovations in Energy Conference." UNC Kenan-Flagler Center for Sustainable Enterprise (2010). Two-day conference to celebrate 10th anniversary of CSE.

INVITED PROFESSIONAL TALKS

- "The Future of Work: Good Jobs and Jobs with Purpose." UNC World View Global Education Leaders Program. (2018) *Keynote*
- "Corporate Innovation to Address Climate Change and Global Sustainability Challenges." UNC Marine Sciences Seminar. (2018)
- "Sustainability Strategy Case Study." UNC Kenan-Flagler Global Business Conference. (2017, 2018)
- "Careers in Sustainability." UNC Kenan-Flagler Net Impact. (Annually 2011-2018)
- "Sustainability Education and Impact Assessment." Association to Advance Collegiate Schools of Business (AACSB), Assessment and Impact Conference. (2017)
- "Achieving Social Impact through Collaborations." Association to Advance Collegiate Schools of Business (AACSB) International Conference and Annual Meeting. (2015)
- "Global Sustainability Challenges of the Anthropocene." UNC World View Global Education Leaders Program. (2015) *Keynote*
- "Politics and Capitalism in the Anthropocene." History Center/Provost Institute for Visiting Scholars. University of South Carolina. (2015)
- "Collaborating with Business Schools to Achieve Social and Environmental Impact" Sustainable Brands Conference, San Diego. (2015)
- "Sustainability-Driven Trends in the Global Economy." UNC World View Community College Symposium. (2014) *Keynote*
- "Fostering the Social Impact of B-Schools." Association to Advance Collegiate Schools of Business (AACSB) Sustainability Conference. (2014) *Conference Co-Chair and Invited Speaker*

- "Integrating Sustainability into Core Business School Courses." Poole College of Management at North Carolina State University. (2014)
- "American and European Approaches to Teaching Social Entrepreneurship." Indian Institute Management Bangalore, Bangalore, India. (2013)
- "Water in Our World." University Day at UNC-Chapel Hill. Academic Panel Discussion. (Fall 2013)
- "Forging a More Sustainable Future Starts with Education: Efforts at the University of North Carolina." London Symposium on Globalization, the Environment, and Sustainability, London, England. (2013)
- "How to Teach Sustainability if You Don't Consider Yourself a Sustainability Expert." Association to Advance Collegiate Schools of Business (AACSB) Sustainability Conference. (2013)
- "Integrating Sustainability into Any Career." UNC Kenan-Flagler Women in Business Conference. (2012)
- "Sustainability Career Resources." MBA Career Services for Working Professionals Alliance. (2012)
- "Teaching Sustainability to Business Students." Lumbar School of Business at the University of Wisconsin. (2011)
- "Page Prize Recipients – Best Classes in Environmental Strategy" Association to Advance Collegiate Schools of Business (AACSB) Sustainability Conference. (2011) *Keynote*
- "Best Practices in Sustainable Enterprises." Kenan-Flagler Executive MBA Alumni Weekend. 2010.
- "Germany as a Model for 21st Century Sustainability." German Language Teacher's Conference hosted by UNC Center for International Business Education and Research. (2010) *Keynote*
- "Social Entrepreneurship – Teaching Students to Change the World." Association to Advance Collegiate Schools of Business (AACSB) Sustainability Conference. (2009) *Keynote*
- "Greening the Supply Chain." Research Triangle Quality Assurance Association. (2009)