

Statement of Qualifications 2017

COMPANY BACKGROUND

Confluence Engineering Group, LLC (Confluence) was co-founded in 2008 by Melinda Friedman, P.E., and Michael Hallett to provide exceptional water quality engineering, planning, and applied research services for clients involved with management, operations, and regulation of drinking water systems. Located in Seattle, Washington, Confluence is a small and flexible woman-owned engineering firm that can efficiently and cost-effectively provide personalized services that are tailored specifically to our client's water quality needs. Confluence is nationally recognized for its expertise with regard to:

- Optimizing distribution system water quality,
- Regulatory impact analyses and simultaneous compliance,
- Assessment and implementation of distribution system best management practices,
- Secondary disinfection studies, breakpoint evaluations, and nitrification control,
- Blending studies,
- Corrosion control evaluations,
- Addressing aesthetic water quality issues, and
- Groundwater treatment and process selection

STAFF

Melinda Friedman, P.E. – President:

Prior to founding Confluence in 2008, Ms. Friedman spent 18 years as Water Quality Program Lead and Project Principal at HDR Engineering, Inc., and at Economic and Engineering Services, Inc., in Bellevue, Washington. In these roles she has provided services related to source water and distribution system water quality evaluation, regulatory compliance, comprehensive planning, and optimized treatment practices. As a recognized leader with respect to distribution system water quality, she has participated in numerous research efforts and has helped to prepare many prominent industry Guidance Manuals published by the American Water Works Association (AWWA) and the Water Research Foundation (WaterRF).

Michael Hallett – COO/Field Scientist:

Mr. Hallett manages the day to day business operations of the company, as well as acting as project administer/scientist for all field related work. Before cofounding Confluence in 2008 Mr. Hallett spent 20 years working in a wide variety of positions within the field of physical sciences with vast experience in the collection and analysis of air, water, and soil samples as well as field, laboratory, and small business operations and management.

Stephen Booth, Ph.D., P.Eng. – Sr. Project Manager:

Before joining Confluence in 2011, Mr. Booth worked as a research scientist and engineer for Kennedy/Jenks Consultants and Carollo Engineers. During his tenure with these firms Mr. Booth was the

project manager and lead engineer on numerous projects involving treatment plant optimization and design improvements. Mr. Booth has extensive experience with source water and distribution system taste and odor evaluations. He has worked with numerous research and municipal groups and served as the past chair for AWWA Water Quality and Taste and Odor committees.

Amie Hanson, P.E. – Project Engineer:

Amie specializes in assisting water systems with meeting drinking water requirements and their own internal standards for safe, aesthetically pleasing drinking water. Amie's projects have included development of water quality monitoring plans, assessing regulatory compliance status of utilities, impacts of source water changes on drinking water quality, and research on distribution system water quality issues.

Andrew Hill, P.E. – Sr. Project Manager:

Prior to joining Confluence 2009, Andrew served as Project Manager/Process Engineer for a collective 10 years with HDR Engineering, Inc., Kennedy/Jenks Consultants, and Economic and Engineering Services, Inc. As a chemical engineer, Andrew specializes in drinking water treatment processes, facility master planning, regulatory/simultaneous compliance, and source-to-tap water quality optimization. He has performed numerous treatment and water quality evaluations, including bench and pilot-scale studies, encompassing a variety of issues.

Alex Mofidi, P.E. – Sr. Project Manager:

Alex has over 25 years of experience evaluating and optimizing potable water treatment and reticulation systems, developing monitoring & improvement programs for source and finished water quality, developing design criteria for new applications of conventional & advanced treatment technologies, managing and training utility operations staff, and facilitating the evaluation and design of water quality and treatment solutions for clients in United States, Canada, Australia, New Zealand, China and Korea.

Virpi Salo-Zieman, P.E. – Project Engineer:

Virpi is a project engineer with Confluence. Before joining Confluence Virpi spent 11 years as a regional engineer with the Department of Health(DOH). Ms. Salo-Zieman's experience with the DOH includes: administering drinking water regulations, inspecting water systems, reviewing projects and plans for regulatory compliance related to federal and Washington state specific requirements, and evaluating performance of existing treatment plants. She has inspected approximately 150 water systems in western Washington. Ms. Salo-Zieman completed graduate school at the University of Washington and post-graduate school at Tampere University of Technology, Finland.

Danbi Won, E.I.T. – Engineer:

Danbi Won is an engineer at Confluence with specialization in data analysis, interpretation, management, modeling and visualization. Prior to joining Confluence, Danbi conducted two years of graduate research at the University of Washington related to the use of membrane distillation technology, and fate and transport of organic contaminants in water sources.

PROJECT EXPERIENCE

The table below provides an overview of the numerous clients and many complex projects that Confluence and its staff have managed or played an important role in. Detailed project descriptions for selected projects are provided in the following section.

Project Type/Client	Monitoring Plan Development and Evaluation	Regulatory Compliance Roadmap	Response or Prevention Plan	Bench, Pilot, or Field Testing
Unidirectional Flushing Pilot Studies: Cities of: Mercer Island, WA; Portland, OR; Seattle, WA; Park City, UT; Woodland/Davis, CA; Woodburn, OR; Tualatin, OR; Tigard, OR; Lacey, WA; Tumwater, WA; Water Districts/Boards: Woodinville, WA; Anchorage, AK; Woodland, CA; Tallahassee, FLA; Yakima, WA.	●	●		●
Ammonia and Nitrification Studies: Cities of: Woodburn, OR; Tualatin, OR; Lacey, WA; Water Districts/Boards: Asotin PUD, WA; Highline, WA; Contra Costa, CA.	●		●	●
Distribution System Optimization Studies: Cities of: Flint, MI; Mercer Island, WA; Woodland/Davis, CA; Cleveland, OH; Everett, WA; Bremerton, WA; Issaquah, WA; Bellevue, WA; Calgary, ONT; Water Districts/Boards: Eugene, OR; Covington, WA; Longview, WA; Mercer Island, WA; Tallahassee, FLA; Jordan Valley Water Conservation District.	●		●	
SDWA Compliance and Water System Plans: Cities of: Bremerton, WA; Marysville, WA; Tumwater, WA; Everett, WA; Bellevue, WA; Olympia, WA; Tukwila, WA; Redmond, WA; Water Districts/Boards: Sammamish Plateau, WA; Alderwood, WA; Covington, WA.	●	●		
IDSE/Stage 2 DBP Rule Compliance Plans: Cities of: Lacey, WA; Pullman, WA; Bremerton, WA; Edmonds, WA; Water Districts/Boards: Soos Creek, WA; Cedar River, WA; Skagit PUD, WA; Mercer Island, WA.	●	●		
Total Coliform Rule Compliance Studies: Cities of: Issaquah, WA; Bremerton, WA; Woodburn, OR; Lacey, WA; Tumwater, WA.	●	●	●	
Lead and Copper Rule Compliance Studies: Cities of: Portland, OR; Bremerton, WA; Everett, WA; Bellingham, WA; Kent, WA; Tacoma, WA; Auburn, WA; Tumwater, WA; Centralia, WA; Water Districts/Boards: Covington, WA; Rainbow, OR; Skagit PUD, WA; Springfield, OR; Bainbridge Island School District, WA; Clover Park School District, WA.	●	●	●	
Aeration Studies: Cities of Centralia, WA; Renton, WA; Tacoma, WA; Auburn, WA; Olympia, WA; Tumwater, WA; Concrete, WA; Springfield Utility Board, OR and United Water Idaho.	●	●		●
Aesthetic Water Quality Studies: Cities of: Lacey, WA; Renton, WA; Longview, WA; Woodburn, OR; Water Districts/Boards: Highline, WA; Asotin PUD, WA.	●			●
Fe/Mn Groundwater Treatment Studies: Cities of: Poulsbo, WA; Woodburn, OR; Tumwater, WA; Lacey, WA; Renton, WA; Auburn, WA; Hamilton, WA, Marysville, WA; Water Districts/Boards: Highline, WA; Covington, WA, Snohomish PUD, WA; Sunny Slope County, CA.	●		●	●

Project Type/Client	Monitoring Plan Development and Evaluation	Regulatory Compliance Roadmap	Response or Prevention Plan	Bench, Pilot, or Field Testing
Blending Studies: Cities of: Hillsboro, OR; Marysville, WA; Olympia, WA; Tacoma and Purveyors, WA; Veneta, OR; Water Districts/Boards: Cedar River Water and Sewer, WA; Sammamish Plateau, WA; Asotin PUD, WA; Highline, WA; Snohomish PUD, WA; Poulsbo, WA.	•		•	•
USEPA Regulatory Support: Total Coliform Rule Revisions, Distribution System Information Needs, Simultaneous Compliance Guidance Manual	•	•		
System-Wide Hospital and Healthcare Facility Legionella and Microbial Risk Management Plans	•	•	•	

SELECTED PROJECT DESCRIPTIONS

Corrosion Control Evaluations

Corrosion Control Pilot Study – Portland Water Bureau, Portland, OR. Prime Consultant 2017

Portland Water Bureau (PWB), with high-quality drinking water supply and strong stewardship in water quality, has consistently reduced exposure to lead through a variety of measures since the early 1990s. Despite proactive measures to remove leaded materials from the distribution system and to implement corrosion control treatment, LCR action level compliance has proven to be difficult for PWB as demonstrated by exceedances in the lead action, most recently in 2016. Confluence is leading a multi-year multi-disciplinary team through bench-scale and pilot-scale studies to determine optimal corrosion control treatment for PWB and its wholesale customers to further reduce lead exposure. This high-profile project is being closely monitored by US EPA. The selected treatment will impact approximately 1,000,000 people and industries across the region.

Tacoma Goosenecks and Corrosion Control Optimization Studies. Technical Advisor. On-Going.

Confluence served as a Technical Advisor to Tacoma Water to provide consultation and support to evaluate results from service area homes suspected to have lead goosenecks. Data collected by Tacoma water using a novel home profiling approach were reviewed, and recommended modifications were identified to avoid disruption of particulate lead during the sample collection process. Follow-up monitoring helped to verify that very little lead from lead goosenecks was reaching the customer's tap. As a subconsultant to HDR Engineering, the Confluence team is assisting with an LCR compliance evaluation consisting of review of available data, development of a summary report, review of pipe loop data, and development of Optimal Water Quality Parameter set-points. A key focus of the study is interaction between groundwater and surface water supplies, and impacts on lead scale stability.

Corrosion Control Optimization Study – Springfield Utility Board, OR. Prime Consultant. 2013.

Confluence is working with the Springfield Utility Board (SUB) to identify the Optimal Corrosion Control Treatment approach and appropriate treatment locations. SUB is considered a large system under the Lead and Copper Rule (LCR), and maintains a complex water system comprised of numerous well-fields, seasonal sources, a surface water source, and also serves a consecutive system. Historical data are being evaluated along with operational constraints to identify optimal treatment for this system.

Corrosion Control Needs and Strategies Survey of North American Utilities. AWWA. Project Manager. 2008.

Confluence, supported by HDR Engineering, Inc., was hired by American Water Works Association (AWWA) to conduct a Corrosion Needs and Strategies survey in North America. A web-based survey was developed and built using SurveyMonkey.com. The survey was sent to approximately 300 U.S. utilities and 100 Canadian utilities. The following items were assessed using the survey results:

- Survey Response Demographics and Characteristics
- Corrosion Control Objectives
- Corrosion Control Practices
- Corrosion Control Effectiveness and Needs
- Lead Service Line Replacement Program

The findings of this survey will be used by utilities, regulators, and other interested parties to gain a better understanding of industry needs, the effectiveness of the LCR, unintended consequences, and specific elements of effective corrosion control programs.

Distribution System Optimization

City of Flint, Michigan –Distribution System & Corrosion Control Optimization. Member of project team. On-going

The water quality issues experienced by the City of Flint over the past two years have been well-documented in the national media. Confluence is a member of the project team that was selected to provide the guidance, planning, and training needed to enable the City to provide high-quality drinking water to its customers. Confluence, in conjunction with Cornwell Engineering Group, is conducting the Distribution System Optimization Evaluation and the Corrosion Control Evaluation. Together they will be reviewing water quality data and assessing the current water quality monitoring programs to determine if corrosion, disinfection, and other water quality goals are being achieved. They will also be evaluating the City's current corrosion control treatment (CCT) practices and providing recommendations on modifications and identifying opportunities to optimize the current CCT approach. Pipe rigs supplied by USEPA Office of Research and Development and originally designed and constructed Confluence staff 2007 will be used to verify OCCT conditions. Additionally, our team will be evaluating the City's Standard Operating Procedures (SOPs) and staff training programs to identify non-capital improvements that will enhance the City's ability to deliver high quality drinking water.

City of Woodland, CA – Discolored Water Evaluation and Mitigation. Prime Consultant. 2016-Present.

The City started receiving water from a new regional surface water treatment plant in 2016, after 100+ years of being groundwater-fed. Within weeks of the source switchover, the City began to experience colored water complaints. As technical lead, Confluence organized a series of technical investigations that identified the cause of the problem – chemical destabilization of legacy Fe/Mn due to ORP and DIC changes – and allowed the City to pursue mitigation through a combination of main cleaning activities and polyphosphate use. Additionally, Confluence conducted controlled UDF trials in two problem areas to characterize the nature of mobile deposits on various pipe types and identify optimal velocities; provided a protocol for removal and analysis of legacy pipe deposits to assess composition (solids extraction) and surface properties (SEM/EDS); and developed a sentinel monitoring program to assess spatial and temporal distribution system trends in response to ongoing main cleaning efforts.

City of Tallahassee NW Water Supply and Distribution System Water Quality Remediation Evaluation. City Tallahassee, FLA. Prime Consultant. 2014 – 2016.

The City of Tallahassee, Fla. has been dealing with customer complaints in the northwest section of the distribution system. The customer complaints are typically due to water discoloration and odors, and staining of laundry and household fixtures. These complaints tend to increase when changes to the system hydraulics occur, fire hydrant flushing, changes in well operations, etc. To address this issue, the City has previously performed an extensive swabbing program (2003), installed a greensand filtration system on Well 26 (2006), and performed pilot tests for unidirectional flushing and ice pigging (2011). The swabbing effort seemed to minimize customer complaints for several years; however, reports of discolored water have reemerged. The City retained a consultant team including Confluence to review the adequacy of available data, note trends and likely contributing factors, and to identify data gaps. The second stage of this project involved filling in data gaps with hands-on field data collection, synthesis the results of these field efforts to determine the source of the water quality degradation, and recommendations for remediation efforts.

Microbial Occurrence Response and Distribution System Best Practices Evaluation. City of Mercer Island, WA. Prime Consultant. 2014 – On-going.

In September 2014, the City of Mercer Island (City) experienced multiple *E. coli* detections in various locations of its distribution system. With guidance and oversight from DOH, the City implemented a response action plan that included increased monitoring, inspection activities, booster chlorination, and flushing activities, with the goals being to try to identify potential causes, document existing conditions, and improve DS water quality to fully eradicate the problem. The City contracted with Confluence to conduct an "After Action" evaluation to: review system data and information to assess potential causative factors and identify data gaps; evaluate the City's current routine and response O&M activities relative to industry standards and DS best management practices; conduct additional investigations as needed to fill key data gaps; and develop recommendations for new and/or modified system practices to minimize the risk of future events.

Distribution System Water Quality Stabilization Evaluation – City of Longview, WA. Prime Consultant. On-going.

In January 2013 the City of Longview (City) started up the new Mint Farm Regional Water Treatment Plant (MFRWTP), which treats groundwater supplied by four production wells. The treated groundwater replaced the Cowlitz River supply, which was in use for 67 years. Approximately 30 days after the source changeover, the City began experiencing severe water quality problems receiving hundreds of taste, odor, and color complaints from residents in an area with old, unlined cast iron pipe with significant tuberculation. The City initiated a contract with Confluence to help identify the causes of the destabilization event and how to get it under control. A comprehensive surveillance monitoring program was developed and chemistry trends were identified. Confluence also oversaw the installation of a pipe rig assembly, consisting of four lengths of pipe removed from the distribution system to verify the controlling chemistry variables in order to hasten re-equilibration throughout the distribution system. The City has been able to significantly improve the chemical stability of their finished water and combined with water age management, maintain oxidizing conditions within the distribution system.

Water System Plan Updates

City of Olympia, WA, Water System Plan Update. Project Engineer. 2007.

As part of the City's Water System Plan update, an assessment was conducted to determine potential impacts associated with introducing water from the anticipated McAllister Wellfield on pipe scale stability, regulatory compliance, and aesthetic water quality conditions. Identified treatment processes needed for the McAllister Wellfield supply. Conducted a review of the Regulatory Compliance section of the Water System Plan update prepared by City staff.

City of Marysville, WA, City of Marysville Comprehensive Water System Plan Update. Project Manager. 2003 and 2009.

Managed the update of a Water System Plan that included demand forecasting, hydraulic modeling, review of related plans and policies, assessment of water quality issues, wellhead and service water protection, and development of a CIP. A critical element of the update included preparing a detailed description of existing, pending, and future Safe Drinking Water Act regulations that would impact the City's groundwater, unfiltered surface water, and purchased surface water supplies. Prior to leaving HDR, Melinda Friedman and her team were re-selected by the City to prepare the 2009 Water System Plan Update.

Regulatory Support and Guidance Manuals

Metals Accumulation and Release within the Distribution System: Evaluation of Mechanisms and Mitigation. (WaterRF #4509). Principal Investigator. 2016.

Confluence served as Principal Investigator for a tailored collaboration WaterRF project to address emerging industry research needs pertaining to trace metals accumulation and release in distribution systems. As the sponsoring utility, Park City, Utah experienced two notable metals release events within its distribution system. Park City operates a complex distribution system with multiple sources that blend dynamically within the system, providing an opportunity to assess chemical, physical, and microbial aspects of deposit stability. Key project components included a 12-month distribution system water quality monitoring program with a spatial/temporal analysis of releases and risk factors, examination of native pipe deposits, laboratory experiments to assess metals desorption and uptake in biofilm, and a field demonstration of main cleaning performance for UDF, ice pigging, and swabbing. The research identified: the significance of legacy manganese as a controlling substrate for lead co-occurrence; the need for a multi-faceted, integrated main cleaning approach; the significance of practicing controlled bending and maintaining water chemistry within certain conditions to ensure chemical stability of legacy deposits.

Criteria for Optimized Distribution Systems (AwwaRF #4109). Principal Investigator. 2010.

The main objective of this project was to develop a continuous improvement program based on optimization principals for water distribution systems. The project developed a self-assessment approach that defines critical components of optimized distribution systems and defines metrics to measure the degree of optimization. Approximately 50 utilities participated in the project to help identify and beta-test optimization metrics. The self-assessment program was built using Partnership for Safe Water principals and will be implemented nation-wide by the Partnership for Safe Water.

Assessment of Inorganics Accumulation in Scales and Sediments (AwwaRF #3118). Principal Investigator. 2010.

The purpose of this project was to investigate the accumulation of regulated inorganic contaminants and naturally occurring radionuclides in distribution system pipeline scales and sediments. The project investigated the mode of occurrence and possible correlation of inorganics/radionuclides accumulation with water qualities, pipe materials, and water sources, etc. Field studies were conducted to extract sediment and piping materials for detailed analyses using standard and novel analytical techniques. The project will help utilities predict those distribution systems particularly at risk from this type of contamination problem and determine potential public health implications and regulatory consequences.

Strategies to Manage Total Coliform and E. coli in Distribution Systems (#3116). Principal Investigator. 2009.

The objective of this project was to develop a practical guide to help utilities manage and develop response strategies to total coliform and *E. coli* occurrences in the distribution system. This guide will help utilities identify the cause(s), evaluate the significance of, and respond to positive coliform and *E. coli* events.

Groundwater - Iron and Manganese, Aesthetics, and Water Quality Studies

Manganese Removal Lincoln Well #2 – City of Poulsbo, WA. Prime Consultant. 2014

In 2014 the City contracted Confluence, as a subcontractor to Water Engineering Solutions LLC, to identify the appropriate treatment option in an effort to bring their Lincoln Road well #1 facility, which has elevated Manganese levels, on line. The City is also considering mixing the water from Lincoln well 1, which has Manganese levels at or slightly above the MCL, with the well 2. Confluence mobilized one of their field pilot skids and performed detailed comparative pilot treatment for manganese removal on well #2, using both Pyrolusite and greensand medias, while also conducting bench scale mixing studies on a blend of waters from wells 1&2. Confluence also conducted bench scale chlorine demand and decay studies to assess the disinfection byproduct formation and profile water aging, as well as backwash settling test to help identify the proper method of disposal.

Iron and Manganese Removal Sunnyside Wells – City of Marysville, WA. Prime Consultant. 2013-14

In 2013 the City contracted Confluence, as a subcontractor to Murray, Smith & Associates, to identify the appropriate treatment applications for two different wells sites within their system. Over the course of twelve months Confluence mobilized one of their field pilot skids and performed detailed pilot treatment for iron and manganese on the individual wells and blends of various waters. Concurrent with the pilot operations Confluence performed blend analyses to better understand how these treated waters would mix with water purchased from an adjacent PUD. Confluence also conducted bench scale chlorine demand and decay studies to assess the disinfection byproduct formation, and break point trials to accommodate naturally occurring ammonia.

References

Client	Contact Information
Yone Akagi, Water Quality Compliance Manager, Portland Water Bureau - Portland, Or.	(ph) (503) 823-7648 Yone.akagi@portlandoregon.gov
Kathleen Cahall, Water Resources Manager, City of Bremerton, Wa.	(ph) (360) 473-2315 kcahall@ci.bremerton.wa.us
Brad Zanhov, Water Quality Lead, City of Marysville, Wa	(ph) (360) 363-8164 bzahnow@marysvillewa.gov
Amy Blain, Civil Engineer, City of Longview, Wa.	(ph) (360)-442-5206 amy.blain@ci.longview.wa.us
Scott Jonas, Operations Manager, Sammamish Plateau Water & Sewer – Sammamish, Wa.	(ph) (425) 392-6256 scott.jonas@spwsd.org

Licenses

Engineers licensed as P.E.s in the states of Washington and California

Business registered with the States of Washington(business license # 602 809 606) and Oregon(business license #1634453-7)

Federal EIN # 26 – 2114192

Insurance:

Commercial General Liability –

- General - \$2,000,000
- Aggregate - \$2,000,000
- Personal Injury - \$2,000,000
- Each occurrence - \$2,000,000

Professional Liability –

- Aggregate limit - \$2,000,000
- Each Claim Limit - \$2,000,000

Auto – Liability/uninsured - \$1,000,000