PROFESSIONAL PROFILE

CONTACT INFORMATION

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EDUCATION

Petroleum Geochemistry and Environmental Forensics graduate classes, Montclair State University
PhD, Biology, Dartmouth College
MS, Biology, University of Mississippi
BS, Natural Resources, Cornell University

Deborah A. Chiavelli, PhD

Technical Director

EXPERIENCE SUMMARY

Over eighteen years of consulting experience in contaminated site investigation and forensic assessment, apportionment, and allocation at contaminated sites.

- Roux, 2023-present
- Anchor QEA, 2006-2023
- Post-doctoral Research, Dartmouth Medical School, 2003-2006
- Research Assistant/Teaching Assistant, Dartmouth College and University of Mississippi

TECHNICAL SPECIALTIES

Dr. Chiavelli has extensive experience in investigation of large-scale, complex contaminated sediment sites including nature and extent, fate and transport, ecological and human health risk, feasibility studies, natural resource damages, forensic source investigation, cleanup liability apportionment, and liability litigation.

Dr. Chiavelli is an expert in environmental forensics, having led forensic source evaluations of chemical contamination at sediment, groundwater, soil, and vapor contaminated sites throughout the United States and Canada. Her forensic source investigations have supported remedial investigations, remedial footprint negotiations, natural resource damage (NRD) assessments, source apportionment, cost allocation and cost recovery negotiation, mediation, and litigation. She has taught continuing education environmental forensics courses for the Environmental Professionals of Connecticut (EPOC) and the Massachusetts Licensed Site Professionals (MA LSP) programs, with qualifying credit for Massachusetts, Connecticut, and New York.

REPRESENTATIVE PROJECTS

- **Strategic and Technical Support, Industrial Client, Sediment CERCLA Site, New York.** Leads an interdisciplinary team providing technical and strategic support to limit the client's long-term liability at a major Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, aka Superfund) Sediment Site. Responsibilities include strategic and technical review of work plans, reports, and agency communications; attendance of potentially responsible party (PRP)/regulatory agency meetings; participation in technical work groups; oversight of remedial cost allocation modeling and nexus report development; and tracking and advising on the interaction of PRPs, citizen groups, and regulatory agencies.
- **RI/FS Strategic and Technical Support, Utility Client, MGP Sediment Site, New York.** Project manager and a technical lead for a supplemental remedial investigation and feasibility study in a lake sediment operable unit for a former manufactured gas plant (MGP) site in upstate New York. A lead for client and regulatory agency meetings, communications, and negotiations. Developed and managed a sediment quality triad benthic risk assessment, including work plan development, field work management, and benthic risk analysis. Managed remedial investigation (RI) report and feasibility study (FS) report development.
- **Source Allocation Expert Witness, Utility Client, Sediment CERCLA Site, Oregon.** Lead expert witness for environmental forensic analysis and cleanup liability allocation at a large urban river CERCLA site. Lead author of 13 expert, rebuttal, and surrebuttal reports submitted to the independent allocation team. Oversaw and developed the technical approach for forensic analysis of thousands of environmental samples with source evaluation for PAHs, PCBs, dioxins/furans, pesticides, and metals. Linked sample-specific forensic results with three-dimensional contamination delineation and EPA-approved remedial technology

selection decision tree to apportion sediment cleanup liability at a site with dozens of PRPs. Developed and applied site-specific fingerprinting tools, including site-specific diagnostic ratios, mixing models, and factor analysis. Conducted forensic sampling events. Collaborated with engineering teams to ensure upland and sediment sampling programs were consistent with forensic source apportionment and allocation data quality objectives.

- **Residual Oil Quantification, Urban River Crude Oil Spill, Energy Client, Michigan.** Project manager and technical lead in a chemical forensic quantification of residual crude oil in a 40-mile stretch of river sediments several years after a large pipeline spill became entrained in the river. Oversaw forensic analysis of PAHs and petroleum biomarkers in thousands of sediment samples. Developed a multi-ratio concentration-based mixing model that accounted for varying background concentrations and heterogeneous legacy contamination while distinguishing and quantifying weathered residual spill oil mass in sediments. Statistically aggregated residual spill oil mass results for distinct geomorphological river regions to quantify whole river residual oil mass. In response to this work, the Environmental Protection Agency (EPA) released a revised residual oil estimate 50% lower than their initial estimate.
- **Allocation Support, CERCLA Sediment Site, Energy Client, Massachusetts.** Dioxin/furan and PAH forensic analysis and cleanup cost allocation analysis; provided support to reduce the client's buyout offer by approximately 70% for future remedial costs at a CERCLA sediment site.
- **Floodplain Soil Forensic Analysis, Urban River Crude Oil Spill, Energy Client, Michigan.** Project manager and technical lead in chemical forensic quantification of residual crude oil in a 40-mile stretch of river floodplain soils several years after a large pipeline spill became entrained in the river. Developed a site-specific mixing model to quantify benzo(a)pyrene (BAP, a PAH) attributable to severely weathered spilled crude oil versus other PAH sources, and coauthored a white paper on local PAH background contamination. The work demonstrated that most floodplain BAP exceedances of MI direct contact criteria were forensic matches to non-pipeline PAH sources and consequently supported a "No Further Action" designation.
- **Natural Resource Damages Negotiation Support, Sediment CERCLA Site, Utility Client, West Coast, USA.** Project manager and technical lead to contest overallocation of NRD in an urban river superfund site to operations at the client's site. Coordinated with legal counsel and was the technical lead in multiple communications and meetings with NRD Trustees. A robust technical forensic analysis combined with a demonstration of flaws in the allocation method employed by the NRD Trustees' consultant resulted in approximately a multi-million-dollar reduction (~ 25%) in damages allocation to the client.
- **Groundwater Gasoline Contamination Litigation Support, Energy Client, New York.** For a groundwater contamination litigation case, conducted chemical forensic analysis on gasoline constituents in soil and groundwater to support expert report opinions regarding comingling of contamination from adjacent gas stations and the presence of non-gasoline hydrocarbon sources to the Site.
- **Sheen Fingerprinting, MGP Sediment Site, Utility Client, East Coast, USA.** Dr. Chiavelli directed the investigation of water surface sheens at an East Coast MGP site as part of an operations and maintenance sheen monitoring program. Forensic analysis determined that the observed sheens originated from non-MGP sources, typically boat motor oil, in most cases, supporting the position that sheens should not be attributed to the Site unless verified with fingerprinting.
- **PAH and PCB Source Investigation, Urban River Sediment Site, Municipal Client, Wisconsin.** Directed chemical forensic analysis of sediment and storm drain samples, and evaluated potential historical and ongoing releases following identification of PAH and PCB concentrations above prior remedial thresholds in a previously remediated portion of an urban river. Identified parking lot coal tar-based sealcoat as the likely source of the newly elevated PAHs. Two distinct PCB fingerprints were identified but not linked to specific releases.
- **Contaminated Groundwater Investigation, Gasoline Pipeline Spill, Insurance Litigation, Confidential Site.** Evaluated historical monitoring well hydrocarbon data to provide support for the expert report opinion that the pipeline release occurred outside the insurance-covered time period.
- **PAH and PCB Source Investigation, Estuarine Harbor, Canadian Government, BC, Canada.** Directed forensic analysis of soil and sediment to identify sources of PAH exceedances in the vicinity of several commercial docks. Ruled out previously suspected onshore PAH sources, instead identifying the docks as the source of PAHs from creosoted wood and fuel releases. PCB congener fingerprint analysis of sediment, water, crab, and fish tissue determined that PCB source signatures varied over a harbor-wide spatial scale, and that variation in tissue and environmental signatures spatially covaried.
- **Cleanup Liability Support, Contaminated Soil Site, Industrial Client, Washington.** Supported a cleanup liability mediation at an industrial facility by providing a forensically-supported demonstration that PAH contamination originated from off-site sources and was not attributable to the client's operations.

- **Fuel Source Investigation, Contaminated Groundwater and Soil Site, Small Business Client, New York.** Performed chemical fingerprinting and geological forensic analysis to demonstrate that a small business site was impacted by two distinct petroleum fuel sources. Determined one of the fuel sources was consistent with a recent fuel spill record adjacent to the Site, and was therefore not attributable to the client's property operations.
- **Forensic Reduction of Remedial Footprint, Former MGP Sediment Site, Utility Client, New York.** Conducted forensic PAH source analysis in sediments in the vicinity of a former MGP site. Developed an innovative diagnostic ratio identification model to effectively utilize non-forensic quality PAH data. The model provided a tool to distinguish between upstream background and downstream facility PAHs versus MGP-derived PAHs. Results provided support for a 30% reduction of the MGP remedial footprint.
- **Indoor Air Fingerprinting, Residential Site, Utility Client, New York.** Provided forensic analysis for an indoor air monitoring program to evaluate volatile organic hydrocarbons detected in residential buildings situated over legacy subterranean MGP-sourced contamination. Diagnostic ratios specifically developed for the Site demonstrated that the indoor air composition was inconsistent with vapor origination from MGP hydrocarbons.
- **PCB Source Investigation, Industrial Port Sediment Site, Industrial Client, California.** Directed PCB congener fingerprinting and source assessment in stormwater solids and sediments at a major urban shipyard. The work determined that sediment exceedances were distinct from and not attributable to a previously remediated PCB source and were likely associated with recent stormwater inputs.
- **Upland and Sediment Forensic Investigation, CERCLA Site, Industrial Client, District of Columbia.** Forensic investigation of an industrial site and adjacent multi-PRP urban river CERCLA site. Chemical fingerprinting and fate and transport analysis determined that PAHs and PCBs found in upland light non-aqueous phase liquid (LNAPL), soil, and tributary sediments had either de minimis (PAHs) or no (PCB) contribution to contaminated river sediments.
- **Former MGP Remedial Investigation Support, River Sediment Site, Utility Client, Midwest.** Conducted a forensic source analysis of PAH, lead, and arsenic contamination sources in soils and sediments associated with a former MGP site. The analysis established that elevated lead and arsenic originated from background sources. A proprietary diagnostic ratio model provided the tools to distinguish between PAHs from weathered MGP tar and urban background PAHs and to delineate the proposed site footprint for remediation.
- **Groundwater Investigation, MGP Site, Utility Client, Midwest.** Evaluated comingling of an off-site light petroleum fuel plume with on-site MGP constituents in monitoring wells at a former MGP site. Groundwater and LNAPL fingerprinting and other lines of evidence successfully distinguished an off-site plume from site MGP residuals.
- **Dioxin/Furan Source Evaluation, Port of Olympia, Olympia, Washington.** Assisted with a forensic analysis of dioxins/furans to offshore sediments. The analysis focused on development and application of robust fingerprinting tools, including factor analysis, for source identification and attribution of contamination to multiple legacy sources.
- **Conceptual Site Model Support, Former Creosote Facility, Industrial Client, Virginia.** Provided forensic PAH source analysis for a sediment site investigation adjacent to a former creosote manufacturing facility. The analysis delineated impacts of creosote dense non-aqueous phase liquid (DNAPL), urban runoff, and dissolved creosote constituents to sediments, providing creosote fate and transport information for the conceptual site model.
- **PCB Contamination Litigation, Urban Waterway, Industrial Client, Massachusetts.** Conducted PCB congener fingerprinting analysis in support of remediation cost recovery litigation. Used innovative forensic diagnostic indicators to separate multiple weathered forms of the client's released PCBs from numerous other sources to the waterway. Assisted with expert and rebuttal report writing for the expert witness. Assisted with preparation for deposition of experts, and development of demonstratives for trial. The work was instrumental in support of a Daubert motion, preventing the defendant's expert witness from testifying about forensic source analysis. The jury decision reduced the client's liability by 15%.
- **Dioxin and Furan Source Investigation, CERCLA Site, PRP Client Group, New Jersey.** Part of a technical team that conducted forensic analysis of dioxin and furan contamination in an urban river sediment CERCLA site. The team combined multiple lines of chemical forensic analysis and fate and transport modeling to demonstrate the spatial influence of a dioxin/furan point source and background sources in the river.
- **Oil Spill Contamination Litigation, Sediment Site, Energy Client, Michigan.** Served as a supporting consultant for the expert witness. Used prior forensic analysis of sediments and soil as the basis for litigation support of the client, who was a defendant against a property damage claim from an oil spill. The plaintiff was seeking $6 million in damages, but the jury found that the spill did not cause damage to the plaintiff's property, awarding only $155,100 for lost profits.

- **Cleanup Cost-Sharing Investigation, Former MGP Site Utility Client, Marine Bay, East Coast, United States.** Conducted PAH fingerprinting on sheens and bay sediments adjacent to a former MGP site. The work demonstrated and delineated several distinct contamination sources, providing support for the client's position on cleanup cost-sharing.
- **Mercury Contamination Litigation, River Site, Industrial Client, Maine.** Project manager for general litigation support and field sampling for a mercury contamination civil litigation case. Tasks included assisting with expert, rebuttal, and surrebuttal report preparation and deposition for three technical experts; review of discovery materials; trial strategy development; design and management of field work; and data analysis, research, and database management.
- **PCB Contamination Binding Arbitration, Small River Site, Industrial Client, Indiana.** Provided scientific support in a legal dispute over PCB contamination of a small waterway in Indiana. Tasks included forensic data analysis of PCBs, assistance with expert and rebuttal report preparation for an expert witness, expert witness deposition support, and binding arbitration support. The work resulted in reduced cleanup cost responsibility for the client.
- **Poultry Contamination Litigation, Agricultural Watershed, Industrial Client, Oklahoma.** Provided support for litigation regarding watershed contamination from industrial poultry farming. Prepared expert report sections on alleged violation of bacteria and nutrient water quality standards; helped develop direct and cross-examination approaches, courtroom demonstratives, and courtroom teaching exhibits; and provided courtroom assistance during the trial.
- **Groundwater Risk Assessment, MGP Site, Utility Client, Oregon.** Directed statistical groundwater contaminant trend analysis and exposure point concentration analysis in support of the Human and Ecological Risk Assessment at a former MGP facility.
- **Metals Source Evaluation, Litigation Support, Washington.** Conducted multivariate statistical analysis to assist the testifying expert for the plaintiffs to determine liability for transboundary contamination of a major river system by metals originating from a smelter in Canada. Spatial distribution of metals signatures identified in the multivariate analysis were one line of evidence establishing contamination originated from the smelter.
- **Oyster Population Modeling, Lower Colorado River Authority, Matagorda Bay, Texas**. Project manager and technical lead for statistical modeling relating salinity and freshwater inflow to oyster reef health. Key tasks included presentations to Texas state agencies, sampling program development and management, research, statistical and uncertainty analysis, report preparation, and project management.
- **DDT Trends in Fish, Shellfish and Sediments, Flow Science, Incorporated, Newport Bay, California.** Conducted statistical analysis of temporal trends in DDT levels in mussels, fish, and sediments to compare long-term and recent DDT contamination trends. The work provided the client with supporting information for development of a Total Maximum Daily Load organochlorine model for Newport Bay.
- **Lake Food Web Model, Onondaga County Department of Environment Protection, Syracuse, New York.** Assisted in developing the planktonic food web component of an Onondaga Lake Phosphorus Total Maximum Daily Load model. Tasks included research support to develop a mechanistic model including feeding behavior, bioenergetics, and stoichiometry; model calibration; results analysis; and reporting.
- **PCB Bioaccumulation Model, Hudson River CERCLA Site, General Electric, New York.** Assisted in the development of a PCB bioaccumulation model for the Hudson River food web. Tasks included general research, parameterization, sensitivity analysis, model calibration, and report preparation.
- **Cholera Epidemiology, Dartmouth Medical School, Hanover, New Hampshire and Dhaka, Bangladesh.** Lead grant writer and co-principal investigator for a $1.25 million National Science Foundation grant to Dartmouth Medical School. The grant funded post-doctoral research that used genomic, molecular genetics, and ecological approaches to study the environmental dynamics of the bacterium *Vibrio cholerae*, the causative agent of cholera.

PROFESSIONAL AFFILIATIONS

Society for Ecological Toxicology and Chemistry

International Society of Environmental Forensics

PUBLICATIONS

Quadrini, J. D., W. Ku, J. P. Connolly, D. A. Chiavelli, and P. H. Israelsson, 2015. "Fingerprinting 2,3,7,8-Tetrachlorodibenzodioxin Contamination Within the Lower Passaic River." Environmental Toxicology and Chemistry 34(7): 1485–1498.

Byard, J. L., S. C. Paulsen, R. S. Tjeerdema, and D. Chiavelli, 2014. "DDT, Chlordane, Toxaphene and PCB Residues in Newport Bay and Watershed: Assessment of Hazard to Wildlife and Human Health." Reviews of Environmental Contamination and Toxicology 235: 49–168.

CIESM 2004. "Executive Summary." In Novel Chemical Contaminants and Pathogens in Coastal Waters. Editor, N.S. Fisher; Chiavelli one of 13 authors. CIESM Workshop Monograph No. 26, 2004.

Chiavelli, D. A., K. L. Cottingham, and R. K. Taylor, 2004. "Linking the Ecology, Epidemiology and Pathogenicity of Vibrio cholerae: A Molecular Genetic Approach." Novel Chemical Contaminants and Pathogens in Coastal Waters. Editor, N.S. Fisher. CIESM Workshop Monograph No. 26.

Cottingham, K. L., D. A. Chiavelli, and R. K. Taylor, 2003. "Environmental Microbe and Human Pathogen: The Ecology and Microbiology of Vibrio cholerae." Frontiers in Ecology and the Environment 1(2): 80–86.

Chiavelli, D. A., J. W. Marsh, and R. K. Taylor, 2001. "The Mannose-Sensitive Hemagglutinin of Vibrio cholerae Promotes Adherence to Zooplankton." Applied and Environmental Microbiology 67(7): 3220–3225.

Threlkeld, S. T, D. A. Chiavelli, and R. L. Willey, 1993. "The Organization of Zooplankton Epibiont Communities." Trends in Ecology and Evolution 8(9): 317–321.

Chiavelli, D. A., E. L. Mills, and S. T. Threlkeld, 1993. "Host Preference, Seasonality, and Community Interactions of Zooplankton Epibionts." Limnology and Oceanography 38(3): 574–583.

PRESENTATIONS

Chiavelli, D. A., M. Matthew, B. Covert, M. Rury. 2023. New Approaches in the Application of PAH Source Diagnostic Ratios. 39th Annual International Conference on Soils, Sediments, Water, and Energy (Amherst, Massachusetts).

Chiavelli, D. A. Environmental Forensics. 2022. Air and Waste Management Association, Florida Chapter Regulatory Conference. (Pensacola, Florida).

Chiavelli, D. A. Environmental Forensics. 2022. Air and Waste Management Association, Georgia Chapter Regulatory Conference. (Atlanta, Georgia).

Chiavelli, D. A., P. Kwon, M. Rury, and G. Dang, 2019. Application of a Diagnostic Ratio Evaluation Model to Distinguish MGP-Derived PAHs from Urban Background. MGP Conference (Philadelphia, Pennsylvania).

Simon, P. M., D. A. Chiavelli, P.B. Simon, and M. Rury, 2019. Tracking a Petrogenic Source: Forensics Characterization Identification, and Quantification of Spilled Crude Oil. Battelle 10th International Conference of Remediation on Contaminated Sediments (New Orleans, Louisiana).

Chiavelli, D. A., P. M. Simon, M. Rury, and P.B. Simon, 2018. PAH Apportionment at a Site with Severely Weathered Crude Oil. International Network of Environmental Forensics (Salt Lake City, Utah).

Chiavelli, D. A., P. M. Simon, P. B. Simon, and M. Rury, 2017. Tracking a Petrogenic Source with Pyrogenic Compounds: PAH Apportionment for Severely Weathered Crude Oil. 33rd Annual International Conference on Soils, Sediments, Water, and Energy (Amherst, Massachusetts).

Chiavelli, D. A., P. M. Simon, P. B. Simon, and S. Schroeder, 2014 and 2015. Using Sheens to Quantify in Situ Weathering of Spilled Crude Oil in River Sediments. 30th Annual International Conference on Soils, Sediments, Water, and Energy (Amherst, Massachusetts); October 2014; and Battelle Eighth International Conference of Remediation on Contaminated Sediments (New Orleans, Louisiana).

Chiavelli, D. A., P. M. Simon, P. B. Simon, M. Rury, and E. Pendleton, 2014 and 2015. Use of a Concentration Based Mixing Model to Quantify Spilled Crude Oil in River Sediments. 30th Annual International Conference on Soils, Sediments, Water, and Energy (Amherst, Massachusetts); October 2014; and Battelle Eighth International Conference of Remediation on Contaminated Sediments (New Orleans, Louisiana).

Simon, P. M., D. A. Chiavelli, P. B. Simon, D. Glaser, and M. Rury, 2014 and 2015. Multiple Lines of Evidence Approach: Oil Spill Identification and Differentiation. 30th Annual International Conference on Soils, Sediments, Water, and Energy (Amherst, Massachusetts); October 2014; and Battelle Eighth International Conference of Remediation on Contaminated Sediments (New Orleans, Louisiana).

Lamoureux, B., J. Connolly, and D. Chiavelli, 2011. Do Hudson River Benthic Microorganisms Have a Water Column Dominated Diet: Evidence from PCB Data. Society of Environmental Toxicology and Chemistry (Boston, Massachusetts).

Chiavelli, D. A., K. L. Cottingham, and R. K. Taylor, 2004. Links Between the Ecology, Epidemiology and Pathogenicity of Vibrio cholerae: A Molecular Genetic Approach. CIESM Workshop for Novel Contaminants and Pathogens in Coastal Waters (Neuchatel, Switzerland) and EAWAG, Department of Limnology (Dubendorf, Switzerland).

Chiavelli, D. A., 2003. Genomic Response of Vibrio cholerae to Changes in the Aquatic Environment. International Centre for Diarrhoeal Disease Research (Dhaka, Bangladesh).

Chiavelli, D. A., K. L. Cottingham, and R. K. Taylor, 2003. Linking the Ecology, Epidemiology and Pathogenicity of Vibrio cholerae: A Genomic Approach. Marine Sciences Research Center, Stony Brook University, Stony Brook, New York.

Chiavelli, D. A, and R. K. Taylor, 2001. A Surface Pilus Promotes Adherence to Zooplankton by Vibrio cholerae, Providing a Potential Contribution to Environmental Persistence. Ecological Society of America Annual Meeting (Madison, Wisconsin).