

EDUCATION

M.S. Geological Engineering. (Hydrogeology), 2001.

Colorado School of Mines, Golden, Colorado

Thesis: Coupling Site-Scale Fate and Transport with Watershed-Scale Modeling of Nutrients from Onsite Wastewater Treatment Systems

B.S. Geological Engineering, 1999, Summa Cum Laude.

Missouri University of Science and Technology (formerly University of Missouri-Rolla), Rolla, Missouri

Other Training

OSHA Hazardous Waste Site Operations (“HAZWOPER”) 40-hr training

OSHA HAZWOPER 8-hr refreshers & Site Manager Training

American Red Cross CPR/AED and First Aid Certified

PROFESSIONAL REGISTRATION

Registered Geologist, State of Missouri Registration No. 2004005425

Registered Water Tracer, State of Missouri Registration No. 500

PROFESSIONAL SOCIETY MEMBERSHIPS

National Ground Water Association

Soil and Water Conservation Society

EMPLOYMENT HISTORY

Senior Hydrogeologist – Ozark Underground Laboratory - 2008 to present. Protem, Missouri. Project manager and field team leader for contract studies in hydrogeology, karst-related issues, and natural resource management of karst regions, as well as assessment of hydrological impacts of rock quarrying and coal mining. Development and implementation of karst educational programs.

Senior Associate – The Forrester Group - 2001 to 2007. Springfield, Missouri. Experience included environmental investigations, engineering design of remedial systems, construction oversight, project management, agency negotiation, client communication, and work plan and report writing, environmental compliance and due diligence, and litigation support.

Graduate Research and Teaching Assistant – Colorado School of Mines - 1999 to 2001. Golden, Colorado. Independent researcher and research team member on the site-scale and watershed-scale impacts of onsite wastewater systems. Teaching duties included preparation for and leading laboratory exercises and field trips in Geomorphology.

Associate Geologist – The Forrester Group - 2000-2001. Arvada, Colorado. Assisted with office startup, including set up of communications systems, filing systems, and employee orientation. Duties also included geological data interpretation, and work plan and report writing.

SUMMARY OF EXPERIENCE

Over 13 years of professional experience in ground water and surface water hydrology, hazardous waste site investigation and remediation, environmental compliance and litigation support.

Hydrogeological Investigations

Project manager or field team leader for various hydrogeological investigations, including the following:

- Ground water tracing in soluble rock landscapes and delineation of recharge areas for cave, spring, and fen hydrogeologic systems. Work conducted in Missouri and Arkansas.
- Ground water tracing design and implementation at hazardous waste sites for the evaluation of contaminate transport and pre-remedial design parameters. Work conducted across the United States.
- Hydrogeologic hazard area mapping and vulnerability area assessments for the management and protection of rare, threatened and endangered animal species' habitats in caves and groundwater systems. Studies in Missouri and Arkansas.
- Design and implementation of over 300 tracer tests using fluorescent tracer dyes in soluble rock terrain and porous media.
- Subsurface dye tracing following a jet fuel spill at a national airport in Missouri with an extended monitoring program in cooperation with USEPA, U.S. Fish and Wildlife Service, Missouri Department of Natural Resources.
- Assessment of the hydrologic impacts of rock quarries and coal mines at multiple sites in Alabama and Missouri.
- Aquifer pumping test in an unconsolidated alluvial aquifer in order to determine the design parameters for the remedial design of a hydraulic containment system of a 2-mile TCE plume.
- Investigated contaminated groundwater plumes at over 50 sites, including development of conceptual fate and transport models for site characterization.

Project Management

- Manager of multiple projects involving both federal and state oversight with budgets ranging from \$1,500 to over \$1.5 million.
- Management of project staff including task delegation, work load leveling, and junior staff training and mentoring
- Budget preparation, tracking, management, and invoicing

- Client communications
- Agency communications and negotiations with USEPA Region 7; Missouri Department of Natural Resources; Arkansas Department of Environmental Quality; and Kansas Department of Health and Environment under state-led superfund sites, voluntary cleanup programs, and other programs
- Contractor selection, management, and coordination
- Field team leader for environmental investigations including assembling and overseeing field team members including contractors, work scheduling, budget management, and management of scope change due to unexpected field conditions
- Preparation of work plans, reports, proposals, schedules, and budgets

Engineering Design

- Design of hazardous waste site remedial systems for contaminated soil and groundwater, including a pesticide-impacted soil remedy in Arkansas, a source area remedy for a 2-mile volatile organic compound (VOC) groundwater plume in Kansas, and a site with lead and asbestos in shallow soils in Missouri. Also experienced with non-hazardous waste site remedy designs as the design team leader for a zero-discharge storm water collection and disposal system at a large livestock auction facility under state and federal confined animal feeding operations (CAFO) regulations.
- Preparation of conceptual designs, work plans, and bid specifications
- Agency negotiation of engineering design plans
- Management of bidder selection and contracting including bid walks, review of bid packages and providing recommendations for bidder selection
- Construction oversight, including management of contractors, schedule, and change management during construction
- Preparation of Construction Completion As-built reports

Environmental Compliance and Due Diligence

- Experienced with compliance under Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Clean Water Act (CWA), Emergency Planning and Community Right-to-Know (EPCRA), Toxic Substance Control Act (TSCA), and Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Occupational Safety and Health Administration (OSHA)
- Performed numerous Phase 1 Environmental Assessments and Transaction Screen Assessments in support of property transactions on industrial, commercial and vacant properties including manufacturing facilities, gasoline service stations, newspaper and printing, food service processors, warehousing operations, grain mills, farms, and vacant lots and abandoned industrial properties.
- Team member for environmental compliance audit of large roofing manufacturing facility
- Led field effort of campus-wide chemical inventory for EPCRA/Hazard Communication management and reporting system development at a small college

- Prepared numerous Spill Prevention Control, and Countermeasures (SPCC) Plans and Storm Water Pollution Prevention Plans (SWPPP) for manufacturing facilities, airports, electric utilities, a small college, and an amusement park
- Assisted clients with NPDES permitting under Missouri storm water regulations, CAFO regulations, and point source discharge regulations for both general and site-specific permits

Environmental Data Collection

- Hydrogeologic (groundwater tracing) studies in karst environments, fractured rock, and unconsolidated alluvial aquifers
- Field leader on numerous projects for collecting samples of surface and subsurface soil, groundwater, storm water, and surface water; indoor air; and solid and hazard waste

Litigation Support

- Litigation support team member for numerous environmental litigation projects with duties including cost allocation, auditing of environmental sampling procedures, and expert report preparation.

PUBLICATIONS AND PRESENTATIONS

Beeman, Shiloh L., Thomas J. Aley, and Michael Slay. 2013. The Need for Presumptive Habitat Considerations in Working with Subterranean Aquatic Species of Concern: Three Ozark Region Case Histories U.S.A., 13th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, Carlsbad, NM, May 6-10, 2013.

Aley, Thomas and Shiloh L. Kirkland. 2012. Down but not straight down: significance of lateral flow in the vadose zone of karst terrains. Proceedings of Environmental Impacts of Karst Symposium, St. Louis, MO 2011. Carbonates and Evaporates Vol. 97:2, pp. 193-198. Springer publications. DOI: 10.1007/s13146-012-0106-5.

Curtis, Randy M; Tom Aley; R. Keith Barnhill; and Shiloh L. Kirkland. 2012. An investigation of monitorability issues for groundwater in the Zachs Knob syncline area, Northeast Tennessee, USA. Proceedings of Environmental Impacts of Karst Symposium, St. Louis, MO 2012. Carbonates and Evaporates Vol. 97:2, Springer publications. DOI: 10.1007/s13146-013-0152-7.

Kirkland, Shiloh and Thomas Aley, 2012. Lessons from 45 years of habitat Restoration and Rehabilitation at Tumbling Creek Cave and Its Recharge Area. Presentation at Ozarks Summit 2012: Restoration in the 21st Century. Missouri State University, Springfield, Missouri. June 12-14, 2012.

Kirkland, S.L. and T. Aley, 2011. Down but Not Straight Down: Significance of Lateral Flow in the Vadose Zone of Karst Terrains. Presentation at 12th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, St. Louis, MO, January 10-14, 2011.

Kirkland, S.L. and T. Aley, 2010. Groundwater Tracing: Innovative Uses for Environmental Site Characterization, 2010 North American Environmental Field Conference, Tampa, Florida.

McCray, J.E., S.L. Kirkland, R.L. Siegrist, and G.D. Thyne, 2005. Model Parameters for Simulation Fate and Transport of On-Site Wastewater Nutrients, *Ground Water*, 43(4), July-August 2005, p. 628-639.

Kirkland, S.L., 2001. Coupling Site-Scale Fate and Transport with Watershed-Scale Modeling to Assess the Cumulative Effects of Nutrients from Decentralized Wastewater Treatment Systems, M.S. Thesis, Department of Geology and Geological Engineering, Colorado School of Mines, Golden, Colorado.

Kirkland, S.L., and J.K. Cassil. 2001. Sources of Phosphorus in Surface Waters, Poster Presentation, Upper White River Basin Conference, November 4-5, Springfield, Missouri.

Kirkland, S.L., J.E. McCray, R.L. Siegrist, C.W. Chen, L.H.Z. Weintraub, and R. Goldstein, 2001. Assessing cumulative effects of nutrients from decentralized wastewater treatment systems, *Geol. Society of America Abstracts with Programs*, 33(5), April 30-May 2, Albuquerque, New Mexico.

Kirkland, S.L., R.L. Siegrist, J.E. McCray, C.W. Chen, L.H.Z. Weintraub, and R. Goldstein, 2001. Determining watershed-scale inputs of nutrients from decentralized wastewater treatment systems, presentation at American Geophysical Union Hydrology Days, April 2-5, Fort Collins, Colorado.

Kirkland, S.L., J.E. McCray, and R.L. Siegrist, 2001. Watershed-Scale Cumulative Effects of Nutrients from Soil-Based Wastewater Treatment Systems, for presentation at the 2001 American Geophysical Union Annual Meeting, May 29-June 2, Boston, Massachusetts.

Kirkland, S.L., J.E. McCray, R.L. Siegrist, 2001. Modeling Onsite Wastewater System Cumulative Effects of Nutrients, presentation at the American Water Resources Association-Colorado Section meeting, May 29, Denver, Colorado.

Kirkland, S.L., P.J. Mudd, S. van Cuyk, R.L. Siegrist, and J.E. McCray, 2001. Incorporating Onsite Wastewater Systems into Watershed-Scale Water-Quality Models, WEF Specialty Conference WATERSHEDS 2002, February 23-27, Ft. Lauderdale, Florida.

McCray, J.E., S.L. Kirkland, R.L. Siegrist, and D.N. Huntzinger, 2001. Use of modeling to understand and predict pollutant treatment and transport processes for wastewater soil absorption systems from bench to field scales, Third NSF International Symposium on Small Drinking Water and Wastewater Systems Proceedings, April 22-25, Washington D.C., USA.

McCray, J.E., S. Kirkland, R. Siegrist, S. van Cuyk, P.J. Mudd, 2001. Cumulative effects of wastewater pollutants at the watershed scale, presentation at Colorado Environmental Health Association (CEHA) ISDS Workshop, April 10, Glenwood Springs, Colorado.