

λχ Lithochimeia, Inc.

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Education

Ph.D., Earth Sciences, Case Western Reserve University, 1979
M.S., Earth Sciences, Case Western Reserve University, 1976
B.S., Geology & Geophysics, Yale University, 1973

Certifications

Certified Professional Geologist	American Institute of Professional Geologists, Certificate No.10078
State of Mississippi	Registered Professional Geologist, Registration No. 0301
State of Texas	Registered Professional Geoscientist, Registration No. 0201

Employment History

2004 to Present	President, Lithochimeia, Inc., Tulsa, OK
2000 to 2004	Principal, Exponent Environmental Group, Tulsa, OK
1995 to 2000	Geologist/Geochemist, Gardere & Wynne, L.L.P., Tulsa, OK
1994 to 1995	Staff Research Scientist, Technology Application and Development, Environmental Technology, Amoco Shared Services, Tulsa, OK
1990 to 1994	Staff Research Scientist, Environmental Research Group, Amoco Production Company, Tulsa, OK (acting supervisor of group 4/94 to 8/94)
1981 to 1990	Staff Research Scientist, Lithochemistry/Petrology Research Group, Amoco Production Company, Tulsa, OK
1981	Visiting Assistant Professor, Earth Sciences, Case Western Reserve University, Cleveland, OH
1980	Assistant Research Professor, University of California, Santa Barbara, CA
1978 to 1980	Research Associate, Earth Sciences, Case Western Reserve University, Cleveland, OH
1974 to 1978	Graduate Research Assistant, Earth Sciences, Case Western Reserve University, Cleveland, OH
1973 to 1974	Assistant Geologist/Biologist, Normandeau Associates, Inc., Manchester, NH

Academic Experience

2010 to present	Adjunct Professor of Geology, University of Tulsa, Tulsa, OK
2004 to 2007	Assistant Professor of Geosciences, University of Tulsa, Tulsa, OK
1995	Adjunct Professor of Chemical Engineering, University of Tulsa, Tulsa, OK
1991 to 1995	Adjunct Professor of Environmental Engineering, Oklahoma State University, Stillwater, OK
1994	Adjunct Professor of Chemical Engineering, University of Tulsa, Tulsa, OK
1991	Adjunct Professor of Geology, University of Tulsa, Tulsa, OK
1981 to 1995	Adjunct Professor of Geology, Tulsa Junior College, Tulsa, OK

Courses Taught

Physical Geology	University of Tulsa; Tulsa Community College
Petroleum Geology	University of Tulsa
Environmental Geochemistry	University of Tulsa
Geochemistry	University of Tulsa
Environmental Engineering	University of Tulsa
Introduction to Statistics	Tulsa Community College
Introductory Chemistry	Tulsa Community College
Historical Geology	Case Western Reserve University; Tulsa Community College
Benthic Ecology	Case Western Reserve University
Invertebrate Zoology	Case Western Reserve University

Service

Chair, Board of Industrial Advisors, Integrated Petroleum Environmental Consortium (IPEC). The Integrated Petroleum Environmental Consortium (IPEC) is a consortium of the University of Tulsa, the University of Oklahoma, Oklahoma State University and the University of Arkansas at Fayetteville. IPEC is funded by the U. S. Environmental Protection Agency Office of Research and Development. The mission of IPEC is to increase the competitiveness of the domestic petroleum industry through a reduction in the costs of compliance with U.S. environmental regulations. Specifically, IPEC is: (1) Developing cost effective technologies to meet the challenges of environmental regulations to the competitiveness of the domestic petroleum industry, (2) Training environmental professionals as an investment in technology and policy development., and (3) Disseminating information regarding technology development and legal and regulatory issues which can impact the competitiveness of the domestic petroleum industry.

Interviewer, Yale Alumni Schools Committee. Serve as an alumni interviewer for Yale applicants from northeast Oklahoma (1990 to present).

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Volunteer, Palmer Continuum of Care, Inc. Assist in organizing annual charity running event for Palmer Continuum of Care, an organization that helps adolescents and women with children who struggle with substance abuse and chemical dependency.

Relevant Experience

Petroleum Exploration, Production and Transportation

Worked with a municipality and a citizens group to develop data concerning contamination of groundwater and surface water by runoff and infiltration of contaminated water from a flyash disposal site in LeFlore County, OK where oil and gas produced water was disposed to support a permit protest before the Oklahoma Corporation Commission; provided expert testimony in the Oklahoma Corporation Commission protest hearing.

Worked with an investment group to identify possible areas for mineral acquisition in the northeastern United States using basic geologic data, topographic data, air photo data, pipeline data and records of well permitting and well drilling.

Worked with a private group interested in the quality of pipeline construction and pipeline safety to identify areas of poor construction practices and safety concerns using air photos, topographic data and on-ground visual and geophysical information.

Evaluated the nature and extent of salt contamination of soil and groundwater and evaluated production operations practices and access road maintenance and use over a 10,000 acre ranch with oil and gas production in Washington County, Oklahoma using records review, air photo interpretation, on-ground observation, soil and water sampling and surface geophysical survey (EM-31 terrain conductivity).

Evaluated the nature and extent of salt contamination of soil and groundwater at an oil and gas production site in central Osage County, Oklahoma using records review, air photo interpretation, on-ground observation, soil and water sampling and surface geophysical survey (EM-31 terrain conductivity).

Evaluated the nature and extent of salt contamination of soil and groundwater at an oil and gas production site in southern Pontotoc County, Oklahoma using records review, air photo interpretation, on-ground observation, soil and water sampling and surface geophysical survey (EM-31 terrain conductivity, resistivity profiling).

Evaluated the nature and extent of salt contamination of soil and groundwater on a 1,300 acre ranch with oil and gas production in Hutchinson County, Kansas using records review, air photo interpretation, on-ground observation, soil and water sampling and surface geophysical survey (EM-31 terrain conductivity).

Made a preliminary evaluation of the extent of soil salinization and made preliminary recommendations for remedial measures at a commercial landfarm site in southern Oklahoma. Work done at the request of the operator.

Evaluated nature and extent of salt contamination of soil and groundwater at a commercial saltwater disposal facility in Love County, Oklahoma using records review, air photo interpretation, on-ground observation, soil and water sampling and surface geophysical survey (EM-31 terrain conductivity).

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Evaluated nature and extent of contamination from oil and gas production operations on a 12,000 acre ranch in Osage County, Oklahoma using records review, air photo interpretation, on-ground observation, soil and water sampling and surface geophysical survey (EM-31 terrain conductivity).

Evaluated nature and extent of environmental damage from drilling operations at multiple sites in south-central Oklahoma on behalf of landowners.

Designated as an expert in produced water disposal, produced water disposal economics and environmental remediation of groundwater contaminated with saltwater and hydrocarbons in a matter in southern California. Prepared process and scope cost estimate for remediation of groundwater and offered opinions in deposition testimony.

Updated a laboratory for the chemical analysis of oilfield brines by adding ion chromatography and inductively coupled plasma spectroscopy and by automating titration of dissolved solids analysis capabilities, while at Amoco.

Served as Chairman of a board of industry specialists who advise the executive board of the Integrated Petroleum Environmental Consortium (IPEC) on environmental research needs in the domestic petroleum industry and review research proposals at a pre-proposal stage for relevancy to the mission of IPEC.

Assisted in defense of BP in a matter involving identification of the source of hydrocarbon and salt contamination at an historic oil field in southern California. Conducted historic reconstruction of relevant portion of oil field, analyzed existing sampling data and reports and suggested additional sampling and analysis efforts.

Assisted in plaintiff's matter concerning contamination of an aquaculture facility by sediment, acid rock drainage, and drilling fluids from a gas well drilling site. Designed and conducted field sampling effort of soil, sediments, water. Prepared expert report, and assisted counsel in reviewing defense expert reports.

Rationalized and reviewed database of complaints made to a state regulatory entity concerning environmental issues related to ongoing and historic oil and gas production.

Assisted petroleum producers in a matter related to saltwater contamination of land in southern Arkansas. Reconstructed oilfield history, evaluated historic environmental conditions from review of archive photographs, and assessed evidence of contamination in historic air photos.

Assisted Exxon in a matter related to saltwater contamination of soil and groundwater at a production facility in Oklahoma. Reviewed history of contamination investigation and expert reports prepared by all parties to the lawsuit.

Assisted in the defense of a groundwater contamination claim against ARCO arising from changeover from dry land to irrigated cotton farming. Identified and recruited experts in

environmental field work, soils, and precision cotton agriculture. Reviewed data generated by both plaintiff and defense experts.

Served as technical representative for plaintiffs in groundwater contamination case involving leakage of natural gas, gas condensate, and other produced fluids from improperly constructed or maintained gas well casing. Helped define plaintiffs' technical approach to the case, located and retained expert witnesses, provided liaison with technical experts, reviewed and analyzed defendants experts opinions and documents, prepared brief in support of motion in opposition to motion to strike an expert witness based on Daubert objection, prepared technical component for expert depositions by written questions, managed and directed field sampling efforts, managed and directed selected sample analyses, managed and directed data compilation of geologic and petroleum engineering data, and managed and directed production of geologic and petroleum engineering trial exhibits.

Worked on behalf of multiple corporate defendants in case involving the 208-square-mile East Texas oilfield. Plaintiffs allege widespread groundwater contamination by oilfield brine. Conducted historical research on the East Texas oilfield, managed and directed data compilation of geologic and petroleum engineering data, and managed and directed production of geologic and petroleum engineering visual displays.

Served as technical representative for Chevron in proposed class action in Houston, Texas, alleging contamination of indoor air and drinking water by various hydrocarbons coming from an abandoned oil storage pit. Evaluated technical merits of plaintiffs' case based on document review, interviews, and site inspection; prepared initial drafts of experts' affidavits; prepared video concerning the occurrence of methane in the environment; prepared video to provide a visual demonstration of plaintiffs' theories; and analyzed testimony presented at public hearing.

Assisted in the defense of ARCO in a case involving the contamination of groundwater by saltwater introduced through evaporation pits. Reviewed existing technical reports to assess technical issues in the case for the purpose of devising an effective technical defense.

Assisted in the defense of ARCO in a case involving a dispute over the value of a vertical severance. Reviewed primary documents related to the drilling, completion, and testing of wells; identified and interviewed experts; assisted in crafting the technical case in chief; reviewed co-defendant's technical case regarding stratigraphy; and worked with experts to develop and refine expert reports.

Assisted in the defense of Shell Western Exploration and Production in an oil field toxic tort action involving the general area of the Westgate Subdivision, Hobbs, NM. Worked with legal team to define to define the approach to technical defense of the case, located and retained expert witnesses, provided liaison with technical experts, reviewed and analyzed plaintiffs' experts' testimony during depositions and hearings, drafted expert witness affidavits, managed and directed field sampling efforts, and managed and directed compilation of geologic and petroleum engineering data.

Assisted in the defense of ARCO and Chevron in a proposed class action involving allegations of field-wide groundwater contamination in the Glenpool oilfield (23,000 potential class members; 55

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square miles in Tulsa and Creek Counties, Oklahoma). Defined the approach to technical defense of the case, located and retained expert witnesses, provided liaison with technical experts, reviewed and analyzed plaintiffs' experts' opinions and documents, provided real-time technical analysis of plaintiff's experts testimony during depositions and hearings, drafted expert witness affidavits, managed and directed field sampling efforts, and managed and directed data compilation.

Assisted in defense of Exxon in groundwater contamination case alleging groundwater contamination by oilfield brine. Plaintiffs also claimed contamination of groundwater by radium and other naturally occurring radionuclides associated with oilfield brine. Evaluated technical merits of plaintiffs' case based on document review, interviews, and site inspection and identified and retained expert in health physics.

Served as technical representative for Chevron in a case involving alleged surface damage and groundwater contamination due to spills of oilfield brine and crude oil. Evaluated technical merits of the case based on document review, interviews, and site inspection; planned and reviewed further site investigation; and managed and directed preparation of exhibit materials.

Served as technical representative for ARCO in a case involving alleged surface damage and groundwater contamination due to oilfield brine. Evaluated technical merits of the case based on document review and site inspection; planned and reviewed further site investigation; and managed and directed preparation of exhibit materials.

Served as technical representative for Union Pacific Resources in a case involving alleged groundwater contamination due to oilfield brine. Evaluated technical merits of case based on document review and site inspection; planned and reviewed further site investigation; and managed and directed preparation of exhibit materials.

Naturally Occurring Radioactive Materials (NORM)

Assisted in the defense of Cox Resources and Taylor Energy in an action involving allegations of NORM, hydrocarbon, hazardous substance and saltwater contamination of soil and groundwater at an historic production site in St. James Parish, Louisiana. Worked with legal team to define the approach to technical defense of the case; assisted in locating expert witnesses; reviewed and analyzed plaintiffs experts' opinions and documents; offered deposition testimony and live witness testimony.

Assisted in the defense of Chevron in an action involving allegations of NORM, hydrocarbon and hazardous substance contamination of soil and surface water at an historic production location in Adams County, Mississippi. Worked with legal team to define the approach to technical defense of the case; located and retained expert witnesses; provided liaison with technical experts; reviewed and analyzed plaintiffs, experts' opinions, and documents; and organized field sampling efforts.

Assisted in the defense of Chevron in a series of actions involving allegations of field-wide groundwater contamination and widespread surface contamination with NORM and non-hazardous oil field wastes in the Brookhaven oil field (~20 square miles in Lincoln County, Mississippi).

Worked with legal team to define the approach to technical defense of the case, located and retained expert witnesses, provided liaison with technical experts, reviewed and analyzed plaintiffs' and experts' opinions and documents, provided near-real-time technical analysis of plaintiffs' experts' testimony during depositions and hearings, drafted defense expert witness affidavits, managed and directed field sampling efforts, managed and directed data compilation of geologic and petroleum engineering data, drafted and presented mock trial testimony, and managed and directed production of geologic and petroleum engineering trial exhibits.

Assisted in the defense of Chevron in an action in the Baxterville oil field in Lamar County, Mississippi. The case involved allegations of field-wide groundwater contamination and widespread surface contamination with NORM and non-hazardous oil field wastes. Worked with legal team to define the approach to technical defense of the case, located and retained expert witnesses, provided liaison with technical experts, reviewed and analyzed plaintiffs' experts' opinions and documents, provided near-real-time technical analysis of plaintiffs' experts' testimony during depositions and hearing, managed and directed data compilation of geologic and petroleum engineering data, and managed and directed production of geologic and petroleum engineering exhibits.

Assisted in the defense of Travelers Insurance in an action regarding NORM contamination of a pipe yard and surrounding properties in Louisiana. Worked with legal team to define the approach to the technical defense of the case, reviewed and summarized a substantial volume of technical reports prepared by plaintiffs and co-defendants concerning the occurrence and distribution of NORM nuclides at the pipe yard and surrounding properties.

Assisted in zoning matter in Oklahoma on behalf of surrounding property owners involving environmental issues on property to be rezoned, including NORM contamination. Conducted preliminary NORM survey of site. Provided expert testimony concerning environmental circumstances on property of municipal zoning board.

Assisted PCC Flow technologies in a matter related to NORM contaminated pipe at a warehouse facility in Oklahoma. Conducted preliminary assessment of NORM nuclides in pipe. Organized and managed removal of pipe by a certified NORM disposer, and organized and managed radiation survey of warehouse facility.

Assisted manufacturer in assessment of NORM nuclides in refractory material lining scrap pipe. Sampled and analyzed refractory material and reviewed applicable regulations to make recommendation concerning appropriate disposal.

Established a laboratory for the analysis of NORM nuclides in gas, solids and liquids while at Amoco.

Groundwater Contamination

Worked with individual litigants to develop a geologic and hydrogeologic conceptual model to understand drainage from a flyash disposal site in Cherokee County, Oklahoma.

Assisted a group of landowners to evaluate residual contamination from a gasoline transportation

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accident in Jefferson County, OK.

Assisted The Pantry in insurance coverage litigation regarding the timing of gasoline releases from ten gasoline stations in Florida.

Assisted petroleum refiner in defense of a matter involving MTBE contamination of groundwater in southern California. Reviewed existing technical reports and advised in-house attorneys as to the validity of existing reports.

Assisted Peerless Insurance in a matter related to coverage of release of gasoline from an underground storage tank in Vermont. Designated as an expert in remediation and hydrogeology. Offered expert opinions in deposition.

Assisted plaintiffs in a matter related to a fatality gasoline explosion in Connecticut. Reviewed existing technical documents concerning underground storage tank release site, designated as an expert and offered deposition testimony.

Assisted in the defense of Oxy USA in a case involving historic soil and groundwater contamination by hydrocarbons at a former petroleum terminal site in McAllen, Texas. Reviewed technical site reports generated by plaintiffs' experts, formulated defensive technical sampling and analysis approach focused on geochronology, and assisted in pre-trial settlement discussions with other co-defendants.

Managed technical experts in chemical engineering, hydrogeology, and environmental engineering on behalf of CONOCO, Inc., in a case involving historic groundwater pollution by ethylene dichloride. Reviewed technical site reports generated by numerous experts both inside and outside of the litigation. Assisted in the development of extensive animated displays to illustrate CONOCO's theory of the case.

Served as technical representative for Occidental Chemical Corporation in alleged groundwater contamination pursuant to brine pipeline leaks. Evaluated technical merits of plaintiffs' case based on document review, interviews, and site inspection; prepared GIS coverage of litigation site; coordinated air photo shoot of site; assisted in planning of sampling work; and evaluated results of sampling work.

Natural Resource Damages

Assisted Koch Industries in evaluation of potential natural resource damage liabilities across all corporate facilities.

Served as technical representative for Quapaw Tribe of Oklahoma in a Natural Resource Damage Action against the United States Department of the Interior Bureau of Indian Affairs, the State of Oklahoma, and private potentially responsible parties for injury of and damage to ecological and cultural natural resources of the Tar Creek watershed as a consequence of lead and zinc mining.

Served as technical representative for Glenn Springs Holdings Company, Inc., and Occidental Chemical Corporation in Natural Resource Damage Action brought by the National Oceanic and Atmospheric Agency (NOAA) and the Louisiana Department of Environmental Quality which alleges injury of and damage to significant ecological assets of the Calcasieu Estuary (Calcasieu & Cameron Parishes, Louisiana). Participated in drafting and editing extensive technical response to preliminary damage assessment report draft issued by NOAA; identified and managed technical experts; reviewed technical documents; developed industrial history profiles; provided technical representation at meetings with other industry representatives and government officials; and designed and managed extensive databases concerning NPDES discharges and environmental chemistry.

Water Resources

Assisted Citizens to Protect the Arbuckle Simpson Aquifer in opposing an application for a temporary permit to withdraw groundwater from the Arbuckle Simpson aquifer in Oklahoma. Reviewed hydrogeologic and geologic reports concerning aquifer; made direct geologic field observations and geologic measurements; reviewed geotechnical boring logs and geotechnical core photographs, reviewed opposing expert deposition and hearing testimony.

Assisted Seminole Nation of Oklahoma in mapping properties with potential riparian rights.

Assisted Chickasaw Nation of Oklahoma in opposing an application for a temporary permit to withdraw groundwater from the Arbuckle Simpson aquifer in Oklahoma. Reviewed hydrogeologic reports concerning aquifer. Compiled environmental, water supply, geological and hydrogeologic data pertaining to the Arbuckle Simpson aquifer and incorporated these data in maps.

Assisted Wyandotte Nation of Oklahoma in conducting an inventory of water resources and potential sources of water contamination.

Superfund

Assisted joint defense group in a contribution action related to a Superfund site in Texas. Specific assignments included conducting an extensive review of produced documents and depositions, constructing the operational history of and developing waste profiles for three Houston-area petrochemical plants and comparing the historic waste profiles for these plants to the contaminants found at the Superfund site.

Assisted Glen Springs Holdings in reviewing report to be submitted to a state regulatory entity concerning status of soil and groundwater remedial efforts at a former fertilizer plant in Georgia.

Designated as an expert in environmental chemistry on behalf of Kerr McGee Chemical Company in a soil and groundwater contamination matter related to the operation of an historic wood-treating site in Illinois. Filed expert report and offered deposition testimony.

Assisted in defense of Champion Paper (International Paper) in matter related to Sikes Superfund site. Assisted legal team in developing specific technical issue focus; reviewed site investigation documents and deposition testimony; prepared expert opinion concerning historic wastes disposed

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by Champion.

Assisted in the defense of Aviall Services, Inc., in a case involving soil and groundwater contamination by hydrocarbons and chlorinated solvents at Love Field, Forest Park, and Carter Field. Assisted in development of lines of technical evidence used in defense of the case. Identified and interviewed experts; assisted in review of sites for the purpose of identifying sample collection points; assisted in developing sampling and analysis protocol; and worked with experts to draft expert opinions.

Served as technical representative for Glenn Springs Holdings in regulatory matter involving remediation of former mining site operated by Cities Service. Identified use of constructed wetlands for acid mine drainage mitigation at other metal sulfide mining sites, and compared conditions at those sites to those present at former Cities Service site. Compared conditions at the former Cities Service site to those at the Tar Creek (Ottawa County, OK) Superfund site.

Served as technical representative for Glenn Springs Holding Company in negotiating a cost allocation agreement among parties held responsible for the Jones Industrial Services Superfund Site. Reviewed technical documents pertaining to site, assisted in design of remedial investigation, and assisted in oversight of field investigation.

Agriculture/Water Quality

Assisted State of Oklahoma (Office of the Attorney General; Office of the Secretary of the Environment) in matters related to nutrient and toxicant contamination of surface water, ground water, soils and sediments as a consequence of the disposal of poultry production wastes by broadcast spreading within the Illinois River Watershed; provided deposition testimony and provided expert testimony at evidentiary hearing and trial in Federal Court.

Assisted City of Tulsa and the Tulsa Metropolitan Utility Authority in matters related to nutrient runoff from fields receiving poultry litter fertilizer. Reviewed status of phosphorous index calculation tools; provided critique of proposed phosphorous index computation tools; provided expert testimony in Federal Court; prepared expert report concerning implementation of settlement agreement.

Assisted in preparation of a report that reviewed existing data concerning water quality degradation in response to nutrient enrichment in a water supply reservoir in Oklahoma on behalf of the Trust for Public Lands, a non-party to a lawsuit brought against poultry interests and a municipality by a municipal water supply authority.

Served as technical representative for Tulsa Metropolitan Utilities Authority's interests in protecting water quality from poultry waste runoff. Conducted research on environmental impact of poultry wastes. Built a geographic information system (ArcView) to manage and display data pertaining to poultry waste management. Presented results of fact finding to Governor Keating's Task Force on Animal Waste and Water Quality and to Governor Keating's Legislative Task Force on Animal Waste and Water Quality. Helped draft revisions to emergency regulations for poultry operations on

behalf of Tulsa Metropolitan Utilities Authority.

Assisted confidential clients in a matter related nutrient runoff from fields receiving poultry litter fertilizer. Assembled and reviewed data package on poultry census and water quality information. Assisted in drafting report based on data package review.

Environmental Contamination, Toxic Tort and Transactional Matters

Assisted plaintiff in matter regarding environmental contamination by carbon black particles originating at a carbon black production facility.

Assisted AirGas in conducting and interpreting environmental sampling of property for potential acquisition with historic metal plating operation.

Assisted plaintiff in a matter concerning contamination of a private lake by soil and sediment eroded from an electric transmission line right-of-way in southern Oklahoma. Designed and conducted field sampling effort of soil, sediments, water. Prepared expert report, provided deposition testimony and assisted counsel in reviewing defense expert reports.

Assisted petroleum product manufacturer in a toxic tort matter involving possible occupational exposure of an asphalt plant worker to benzene. Conducted historic research to establish solvents used in quality control analysis of asphalt mixes.

Conducted historic research to close out Nuclear Regulatory Commission license issues at former Amoco Tulsa Research Center. Reviewed historic documents and court records; interviewed knowledgeable individuals.

Assisted in the defense of O'Melveny & Meyers in an action involving allegations of methane seepage from an historic oilfield into a recently constructed school building. Worked with legal team to define the approach to technical defense of the case; assisted in locating expert witnesses; reviewed and analyzed plaintiffs experts' opinions and documents; reviewed and analyzed third-party site investigation data.

Conducted environmental review of a manufacturing facility in Oklahoma on behalf of potential purchaser. Reviewed historic air photos, property data and public records. Conducted site visit to review environmental issues at facility.

Served as technical representative for Clear Lake Properties in a case involving an allegation of chlorinated solvent contamination of shallow groundwater. Evaluated technical merits of case based on document review; planned additional site investigation work; and managed and directed preparation of exhibit materials.

Served as technical representative for Schott Glass in a mass toxic tort case involving exposure to chemical weapons during the Persian Gulf War. Produced visual aids illustrating manufacturing and storage of chemical weapons, chemical agent releases, and locations of individuals claiming exposures. Developed profiles of chemical weapons used in Persian Gulf War; reviewed and

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documented reported instances of chemical weapons detection and chemical exposures to combatants; and developed GIS displays showing troop movements, military installations, chemical and biological weapons stores, and wind conditions.

Served as technical representative for Crow Holdings in regulatory clean-up of a former transformer repair facility. Reviewed and analyzed site investigation reports, and evaluated PCB profiles against known PCB profiles of transformer repair facilities. Prepared expert report and affidavit concerning findings of document review.

Served as technical representative for Oxy USA in regulatory clean-up of former phosphate fertilizer production site. Reviewed and analyzed technical reports, and organized sampling effort for the purpose of allocating liability by determining mixing of lead from this site and other nearby sites using lead isotope ratios and forensic geochemical review of existing metals data.

Assisted in environmental due diligence work on behalf of Protex in proposed purchase of historic fluorides manufacturing plant. Reviewed public record databases and company documents, assisted in drafting interrogatory regarding chemicals used at and manufactured on site, and prepared assessment of pollution issues and potential for future liability.

Served as technical representative for American Airlines in transferring current and future costs for environmental remediation at Miami International Airport to parties responsible for environmental contamination. Reviewed historical documents pertaining to development airport, reconstructed industrial activities performed by tenants of airport, designed field sampling program to document chemical stratigraphy of canal sediments, designed site-wide investigation program, reviewed and analyzed primary environmental sampling data and engineering reports derived there from to identify areas of contamination and associate those areas with specific entities, identified and managed technical experts engaged in document review and analysis, and managed technical data in a geographic information system (ArcView)

Served as technical representative for American Airlines in reducing current and future costs for environmental remediation at San Francisco International Airport through proving-up and negotiating a risk-based corrective action remedial solution. Reviewed documents pertaining to demonstration and documentation of intrinsic remediation of hydrocarbons in groundwater and soils at airport.

Reviewed environmental management system and compliance record of Lomack Petroleum on behalf of Texas Commerce Bank for the purpose of assessing Lomack's potential environmental liability in a \$400MM acquisition of hydrocarbon producing and processing properties. Reviewed documents pertaining to acquisition, interviewed Lomack Petroleum's corporate officers and environmental and line managers to assess environmental management systems, and drafted technical component of loan provision recommendations.

Prepared an environmental assessment for the Trust for Public Lands in support of the conversion of a 35-mile segment of railway to a bicycle and equestrian trail. Reviewed agency documents and databases, conducted historic document research and interviewed knowledgeable individuals.

Publications, Reports and Abstracts

Olsen, R. L., J. B. Fisher, F. M. Soster and M. Smith. 2011. Evaluations of the sources of contamination in sediment cores from Tenkiller Reservoir (Oklahoma, U.S.A.). 6th International Conference on Remediation of Contaminated Sediments, New Orleans, Feb. 7-10, 2011 (Abstract and Poster Presentation).

Fisher, J. B., R. L. Olsen and M. Smolen. 2010. Poultry Waste Marker Constituents in Edge of Field Runoff Samples from the Illinois River Watershed. Oklahoma Governor's Water Conference and Water Research Symposium, Norman, OK – October 26-27 (Abstract and Oral Presentation).

Fisher, J. B. and K. L. Sublette. 2010. Case Studies of Surface and Vadose Zone Migration of Oilfield Brine Contamination. 2010 17th Annual International Petroleum & Biofuels Environmental Conference San Antonio, TX - August 30 - September 2, 2010 (Abstract and Oral Presentation).

Fisher, J. B. 2009. Using Multiple Soil Salinity Assessment Methods in the Development of Geochemical and Geophysical Salt Contamination Maps for Use in Litigation. 2009 16th Annual International Petroleum & Biofuels Environmental Conference Houston, TX - November 3-5, 2009. (Abstract and Oral Presentation).

Fisher, J. B., R. L. Olsen, F. M. Soster, B. Engle and M. Smith. 2009. The history of poultry waste contamination in the Illinois River Watershed as determined from sediment cores collected from Tenkiller Ferry Reservoir (Oklahoma, United States) *In: Progress in Environmental Science and Technology, Volume II, Part B. Proceedings of the 2009 International Symposium on Environmental Science and Technology, Shanghai, China, June 2-5, 2009, Shengcai Li, Yajun Wang, Fengxia Cao, Ping Huang and Yao Zhang, eds. , Science Press, Beijing, P. R. China, pp 1222-1237.*

Fisher, J. B., R. L. Hight, R. van Waasbergen, B. Engle and M. Smith. 2009. Estimates of the mass generated, disposal timing and the spatial distribution of disposal sites within the Illinois River Watershed (Oklahoma and Arkansas, United States). *In: Progress in Environmental Science and Technology, Volume II, Part B. Proceedings of the 2009 International Symposium on Environmental Science and Technology, Shanghai, China, June 2-5, 2009, Shengcai Li, Yajun Wang, Fengxia Cao, Ping Huang and Yao Zhang, eds. , Science Press, Beijing, P. R. China, pp 1238-1247.*

Barton, M. N., J. B. Fisher, and J. B. Tapp. 2006. Persistence of Oil Waste Lands in Osage County, Oklahoma . 13th Annual International Petroleum Environmental Conference, San Antonio, TX, October 17-20. (Abstract, Poster and Oral Presentation)

Landrum, C. J., J. B. Fisher, E. Jennings, S. Munshi, D. Weber, K. Sublette, and B. Tapp. 2006. Advancing Research Towards Preventing the Vertical Migration of Salt from Brine Exposure. 13th Annual International Petroleum Environmental Conference, San Antonio, TX, October 17-20. (Abstract and Poster)

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Sublette, K. L. E. M. Jennings, J. B. Tapp, J. B. Fisher, K. Duncan, G. Thoma, J. Brokaw, T. Todd. 2006. Lessons Learned in Remediation and Restoration in the Oklahoma Prairie. 13th Annual International Petroleum Environmental Conference, San Antonio, TX, October 17-20. (Abstract and Oral Presentation)

Landrum, C. J., J. B. Fisher, E. Jennings, S. Munshi, K. Sublette, B. Tapp, and D. Weber. 2006. An Investigation into the Prevention of Vertical Capillary Transport of Brine Contamination. 13th Annual International Petroleum Environmental Conference, San Antonio, TX, October 17-20. (Abstract and Oral Presentation)

Munshi, S., C. J. Landrum, K. Sublette, E. Jennings, J. B. Fisher, and B. Tapp. 2006. Remediation and Restoration of an Historic Brine Scar - What Went Wrong? 13th Annual International Petroleum Environmental Conference, San Antonio, TX, October 17-20. (Abstract and Oral Presentation)

Sublette, K. L. E. Jennings, D. Weber, C. J. Landrum, S. Munshi, M. Barton, and J. B. Fisher, K. Duncan, G. Thoma, and T. Todd. 2006. Things I Wonder About in the Restoration of Oil and Brine-impacted Sites. 13th Annual International Petroleum Environmental Conference, San Antonio, TX, October 17-20. (Abstract and Oral Presentation)

Landrum, C., J. B. Fisher, E. Jennings, S. Munshi and K. L. Sublette. 2005. An investigation into the prevention of vertical capillary transport of salt from brine contamination. Geological Society of America South-Central Section Meeting, Norman, OK, 6-7 March, 2006 (Abstract and Poster).

Bridge, C. F., E. M. Garvin, C. Landrum, J. B. Fisher, K. L. Sublette, K. P. Roberts and H. Wells. 2005. Lichens as environmental monitors: Mapping of airborne transport of contaminants from land disposal of poultry wastes within the Illinois River Watershed. Geological Society of America South-Central Section Meeting, Norman, OK, 6-7 March, 2006 (Abstract).

Fisher, J. B. and Sublette, K. L. 2005. Environmental releases from exploration and production operations in Oklahoma: Type, volume, causes, and prevention. *Environmental Geosciences*, 12(2): 89-99.

Fisher, J. B. and A. Santamaria. 2003. Dissolved organic constituents in coal-associated waters and implications for human and ecosystem health, an update. In: The 10th International Petroleum Environmental Conference, Houston, TX.

Rice, C. A., Kharaka, Y. F., Orem, W. and Fisher, J. B. 2003. Limits on produced water management resulting from the composition of coalbed methane produced water: The Powder River Basin. In: The 10th International Petroleum Environmental Conference, Houston, TX.

Sublette, K. L., Fisher, J. B. and Schmidt, M. 2003. Oil and saltwater releases from E&P operations in Oklahoma, 1993–2002. In: The 10th International Petroleum Environmental Conference, Houston, TX.

Sublette, K. L. and Fisher, J. B. 2003. The Other and original produced water issue. In: The 10th International Petroleum Environmental Conference, Houston, TX.

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Testimony Provided

Oklahoma Corporation Commission CAUSE PD NO. 201000038; APPLICANT: LORI WROTENBERY, DIRECTOR OIL AND GAS CONSERVATION DIVISION OKLAHOMA CORPORATION COMMISSION/RELIEF SOUGHT: AMEND CLARIFY OR VACATE Order No. 549096 / LAND COVERED: W/2 of Section 16, and the E/2 of SECTION 17 and the NE/4 of the NE/4 of the NE/4 of SECTION 20, and the N/2 of the N/2 of NW/4 of Section 21 all in TOWNSHIP 8 NORTH, RANGE 24 EAST, LEFLORE COUNTY, OKLAHOMA. Designated and qualified as an expert on behalf of the Trustees of Bokoshe, Oklahoma and Herman Tolbert in the areas of geology, hydrogeology and geochemistry. Offered testimony regarding the geochemical evidence for the movement of pollutants from fly ash disposal site at which produced water from oil and gas operations was mixed with fly ash and the resulting slurry used to fill a former strip mine pit. Hearing concluded, awaiting decision.

W. A. Drew Edmondson, in his capacity as Attorney General of the State of Oklahoma and Oklahoma Secretary of the Environment, C. Miles Tolbert, in his capacity as the Trustee for Natural Resources for the State of Oklahoma v. Tyson Foods, Tyson Poultry, Inc, Tyson Chicken, Inc., Cobb-Vantress, Inc., Aviagen, Inc., Cal-Maine Foods, Inc., Cargill Turkey Products, LLC, Georges, Inc., George's Farms, Inc., Simmons Foods, Inc., and Willowbrook Foods, Inc. Case No. 05-CV-00329-TCK-SAJ United States District Court for the Northern District of Oklahoma. Designated and qualified as expert by Plaintiffs in environmental geology and fate and transport analysis; conducted field investigations of defendants' contract grower operations within the Illinois River Watershed and elsewhere, assisted in geological and geochemical field data collection efforts for soils, sediments, surface waters and ground waters within the Illinois River Watershed; obtained, radiometrically dated and chemically analyzed undisturbed cores of sediments from Lake Tenkiller; offered expert opinions in an affidavit, a deposition and bench trial testimony regarding movement of materials and bacteria over and through a mantled karst terrain and the history of accumulation of materials derived from poultry waste disposal in the sedimentary record of Lake Tenkiller as it relates to the history of animal agriculture within the Illinois River Watershed. Status: Trial concluded, awaiting decision; provided testimony in preliminary injunction hearing, 2008; provided 6.5 days of expert testimony at the trial on the merits in 2009.

The Ponca Tribe of Indians of Oklahoma, et al., Plaintiffs vs. Continental Carbon Company, CCC USA, Corp. Inc. and China Synthetic Rubber Corp., Defendants and CONOCO Phillips, a Corporation, Third Party Defendant. Case No. CIV-05-445-C in the United States District Court for the Western District of Oklahoma. Designated as a rebuttal expert by Plaintiffs in environmental chemistry; reviewed particle analysis reports produced by defense and plaintiff experts, prepared expert report rebutting work done by defendants' experts, provided deposition testimony regarding content of expert report. Status: Settled prior to trial.

Don Quarles, an Individual and Quarles Acres LLC vs. Little River Energy Co., Yarhola Prod. Co. and Spess Oil Co. Case No. 00-CV-00913-GKF-PJC United States District Court for the Northern District of Oklahoma. Designated and qualified as an expert by Plaintiffs in environmental geology and geochemistry. Conducted field investigations on plaintiffs property. Wrote expert reports based on outcomes of field investigations and extensive document review. Offered testimony at evidentiary hearing. Offered testimony at jury trial as to the source of

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hydrocarbon and salt contamination on Plaintiffs' property and costs to remediate hydrocarbon and salt contamination sites. Status: Trial court judgment entered for Plaintiff; money damages awarded to Plaintiff; punitive damages awarded to Plaintiff.

In the Matter of UMETCO Minerals Corp. D/B/A Wilson Mine, Docket No. 06-005-P, Arkansas Pollution Control & Ecology Commission. Designated as an expert on behalf of Billy Wilson, opponent to UMETCO NPDES Permit Application. Provided expert report, deposition testimony and administrative hearing testimony. Status: Adverse administrative ruling for Plaintiff.

Application of Meridian Aggregates Company, a Limited Partnership, for a Permit to use Groundwater in Johnson County, Oklahoma. Application No. 2002-602. Before the Oklahoma Water Resources Board, State of Oklahoma. Designated as an expert by Citizens to Protect the Arbuckle Simpson Aquifer in geology and hydrogeology. Provided expert report, deposition testimony and administrative hearing testimony. Status: Groundwater withdrawals restricted to levels below those requested OWRB .

Lloyd W. Thompson and Rickie J. Thompson, Husband and Wife v. Western Farmers Electric Cooperative, a cooperative corporation, Chapman Construction, L.P., Terry White. Case No. CIV-04-211-S United States District Court for the Eastern District of Oklahoma. Designated as an expert by Plaintiffs in geology and soil erosion. Offered expert opinions in an expert report and deposition and testimony. Status: Settled prior to trial.

The City of Tulsa and The Tulsa Metropolitan Utility Authority v Tyson Foods, Inc. Cobb-Vantress Foods, Inc., Peterson Farms, Inc., Simmons Foods, Inc., Cargill, Inc and Georges, Inc. and the City of Decatur Arkansas. Case No. 01 01 CV 0900EA(C), United States District Court for the Northern District of Oklahoma. Designated and qualified as an expert by Plaintiffs in geology and the geochemistry of soil and water and analytical chemistry. Offered expert opinions in evidentiary hearing testimony. Prepared expert report concerning the construction and implementation of a revised Phosphorus Index. Status: Ongoing, Settlement under Court supervision.

Starrh and Starrh Cotton Growers v. Aera Energy, LLC, et al. Case No. 24587 JMS, Superior Court for the State of California, Kern County. Designated and qualified as an expert by Plaintiffs in produced water disposal and environmental remediation of groundwater contaminated with saltwater and hydrocarbons in a groundwater contamination matter in southern California. Prepared process and scope cost estimate for remediation of groundwater and offered expert opinions in deposition testimony and in trial testimony. No expert report filed. Status: Trial court judgment entered for Plaintiffs; money damages awarded to Plaintiffs.

State of Vermont Agency of Natural Resources v Peerless Insurance Co., Docket No. 681-12-01 Wncv, Superior Court for the State of Vermont, Washington County. Designated as an expert in remediation and hydrogeology by Defendant in a matter related to an underground storage tank (UST) leak. Offered expert opinions in deposition testimony. Status: Settled prior to trial.

Wilma Snowberger, Administratrix of the Estate of Robert Snowberger vs Americo Henriques and Eulalia Henriques et al., Docket No. X06 CV 01-0167144S, Superior Court, Complex Litigation Docket at Waterbury. Designated and qualified as an expert by Plaintiffs in fate and transport of gasoline and statistical analysis of gasoline inventory day by plaintiffs in a fatality explosion matter related to a gasoline release from an underground storage tank in Connecticut. Offered expert opinions in deposition and in trial testimony. Survived Daubert Hearing. Status: Settled during trial.

United States of America, Plaintiff v Pharmacia Corporation, et al., Defendants. Pharmacia Corporation and Solutia Inc., Counterclaim Plaintiffs v United States of America, et al., Counterclaim Defendants, Case No. 99-63-DRH, United States District Court for the Southern District of Illinois. Designated as an expert in environmental chemistry by Kerr McGee Chemical Company (Defendant) in a soil and groundwater contamination matter related to the operation of an historic wood-treating site in Illinois. Filed expert report and offered expert opinions in deposition testimony. Settled prior to trial.

Dan M. Honnoll v. The GHK Company, Robert A. Hefner III, individually, Robert S. May, individually, Unit Drilling Company, and El Dorado Dozers Inc. Case No. CV-01-18, District Court of Pushmataha County, State of Oklahoma. Designated as an expert by Plaintiff in geology, geochemistry and benthic ecology by the plaintiff in a matter concerning contamination of an aquaculture facility by sediment, acid rock drainage and drilling fluids. Filed expert reports. No depositions given. Status: Settled prior to trial.