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Tarek Saba, Ph.D.
Senior Managing Scientist

Professional Profile

Dr. Tarek Saba is a Senior Managing Scientist in Exponent's Environmental Sciences practice. Dr. Saba has 11 years of consulting experience in combining chemical forensic methods with hydrogeologic and numerical analyses tools to apportion contamination to sources in order to allocate liabilities. His experience includes reconstructing the history of releases of petroleum hydrocarbons (LNAPL), tar (DNAPL), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), dioxins and furans (D/F), chlorinated solvents (PCE, TCE and their degradation products), and metals, among other chemicals.

Dr. Saba has provided consulting and expert support in cases involving petroleum refineries, natural gas storage fields, hydraulic fracturing, manufactured gas plants (MGP), pulp and paper mills, and landfills, among other industrial setups. His scientific focus has been on the environmental contamination of groundwater, soils, and sediments. Dr. Saba has been involved in complex environmental liability and litigation matters, insurance remedial cost recovery claims, Superfund (CERCLA) liability, applicability of CERCLA's petroleum exclusion to Superfund Sites, and natural gas migration cases. In addition, Dr. Saba's expertise includes conducting detailed technical reviews of expert reports and assisting attorneys in preparation for depositions and trials.

Academic Credentials and Professional Honors

Ph.D., Environmental Engineering, University of Colorado at Boulder, 1999
M.S., Water Resources, Cairo University, 1994
B.S., Civil Engineering, Cairo University, 1992

Publications

Saba T. Boehm PD. Congener-based analysis of the weathering of PCB Aroclor 1242 in paper mill sludge. Chemosphere, 2011; 82(2011)1321–1328.

Saba T Boehm PD. Quantitative Polychlorinated Biphenyl (PCB) congener and homologue profile comparisons. Environmental Forensics 2011; 12(2):134–142.

Saba T, Boehm PD. CERCLA's petroleum exclusion and the use of chemical forensic methods. ABA Superfund and NRD Litigation Committee Newsletter 2011; 6(2).

Saenton S, Illangasekare TH, Soga K, Saba T. Effects of source zone heterogeneity on surfactant enhanced NAPL dissolution and resulting remediation end-points. Journal of Contaminant Hydrology 2002; 59(1–2):27–44.

Saba T, Illangasekare TH, Ewing J. Effect of flow dimensionality on mass transfer rate coefficient estimations under enhanced conditions. Journal of Contaminant Hydrology 2001; 51(1–2):63–82.

Saba T, Illangasekare TH. Effect of groundwater flow dimensionality on mass transfer from entrapped nonaqueous phase liquid contaminants. Water Resources Research 2000; 36(4):971–979.

Conference Proceedings and Presentations

Saba T, Hall K, WC Kimbrill. Hydraulic fracturing—The next wave of groundwater toxic tort litigation. Presented as part of the DRI's Toxic Tort and Environmental Law Committee CLE credit program, July 7, 2011.

Saba T, Boehm PD. Quantitative PCB Congener and homologue profile comparisons. Presented at the 6th International Conference on Remediation of Contaminated Sediments. New Orleans, LA, February 7–11, 2011.

Menzie C, Kierski M, Saba T, Meyer S, Kovatch E, Kahler J, Fox R, Kern J. Multisite ambient investigation for MGPs on the Chicago River. Presented at the 6th International Conference on Remediation of Contaminated Sediments, New Orleans, LA, February 7–11, 2011.

Saba T, Boehm PD. Congener-based analysis of the weathering of PCBs in paper mill sludge. Presented at the 2010 Dioxin Conference, San Antonio, TX, 2010.

Saba T, Boehm PD. Historical reconstruction of contamination using environmental forensic methods. Boston Bar Association Seminar, Boston, MA, February 11, 2010.

Boehm P, Brown J, Saba T, O'Reilly K. The three-part approach to PAH source identification and apportionment in sediments as applied to petroleum, coal tars, and combustion sources. SETAC North America 30th Annual Meeting, New Orleans, LA, November 19–23, 2009.

Saba T. Environmental weathering of PCBs in sediments. The 26th Annual International Conference on Soils, Sediments, and Water, University of Massachusetts at Amherst, MA, October 18–21, 2009.

Boehm PD, Shields W, Fairbrother A, Saba T. Determination of the chemical background for sediment—Approaches and conundrums. SMWG meeting in Sarasota Springs, NY. September 29, 2009.

Boehm PD, Saba T. Using chemical forensics and other lines of evidence to distinguish PAH contributions from different pyrogenic sources to the sediments of the Hylebos Waterway Superfund Site—A CERCLA and MTCA cost recovery case. SMWG Spring Sponsor Forum, Kalamazoo, MI, April 29–30, 2008.

Boehm P, Saba T, Benton L. Identification of natural gas sources using geochemical forensic tools. The 23ed Annual International Conference on Soils, Sediments, and Water, University of Massachusetts at Amherst, October 15–18, 2007.

Butler E, Saba T. Use of PCB congener and homolog analysis in source apportionment at a rail yard Superfund site. The Annual International Conference on Soils, Sediments, and Water, University of Massachusetts at Amherst, October 16–19, 2006.

Biemer T, Brown M, Butler E, Saba T. Better litigation through chemistry. Presentation to the Boston Bar Association, October 6, 2005.

Saxe JK, Saba T, Wannamaker EJ. Do arsenic-containing products influence arsenic concentrations in subsurface drinking water supplies? Society of Environmental Toxicology and Chemistry 24th Annual Meeting, Austin, TX, November 9–13, 2003.

Sharma M, Saba T, Bittner A. Optimization of groundwater pump and treat systems using numerical modeling and the Monte Carlo approach. 2003 NGWA Midsouth Focus Conference, Philadelphia, PA, 2003.

Sharma M, Saba T, Bittner A. Optimization of groundwater pump and treat systems using numerical modeling and the Monte Carlo Approach. Presented at the National Ground Water Association Mid-South Focus Conference, Nashville, TN, September 19, 2003.

Illangasekare TH, Saenton S, Saba T, Wilson CS. Up-scaling of NAPL dissolution from entrapped sources: Implications on end-points for risk assessment. Proceedings, Contaminated Site Remediation Conference, Melbourne, Australia, December 4–-8, 2000.

Illangasekare TH, Dai D, Saba T, Barranco Jr FT. The influence of heterogeneity on NAPL zone detection with subsurface multiple tracers: Column and intermediate scale laboratory results. Proceedings, Groundwater 2000 International Conference on Groundwater Research, Copenhagen, Denmark, 2000.

Illangasekare TH, Saba T. Upscaling of contaminant transport in heterogeneous aquifers: Dissolution of entrapped separate phase organic chemicals. Proceedings, Engineering Jubilee Congress, Engineering of Peradeniya; (2):127–132, 2000.

Illangasekare TH, Saba T. Intermediate scale physical model testing to investigate upscaling of dissolution of non-aqueous phase liquids in aquifers. Proceedings, Physical Modeling and Testing Environmental Geotechnics, Network of European Centrifuges for Environmental Geotechnic Research (NECER). Garnier J, Thorel E, and Haze E (eds), pp. 285–292, La Baule, France, May 15–17, 2000.

Saba T, Illangasekare TH. Surfactant-enhanced dissolution of non-aqueous phase waste chemicals: Effect of flow dimensionality. Conference of Hazardous Waste Research, St. Louis, MO, April 1999.

Saba T, Illangasekare TH. Effects of aquifer heterogeneity and groundwater flow dimensionality on upscaling of natural and surfactant enhanced dissolution of non-aqueous phase liquid waste chemicals. Conference on Hazardous Water Research, Snowbird, UT, 1998.

Saba T, Illangasekare TH. Effect of aqueous phase flow dimensionality on surfactant enhanced dissolution from entrapped non-aqueous phase liquid contaminants at the spill-site scale. American Geophysical Union, San Francisco, CA, December 6, 1998.

Illangasekare TH, Saba T. Upscaling of mass transfer from zones with entrapped nonaqueous phase chemicals. American Geophysical Union, San Francisco, CA, December 6, 1998.

Vestal EW, Illangasekare TH, Ramaswami A, Bielefeldt A, Riffel AM, Saba T. Modeling of net interphase mass exchange in NAPL-water systems undergoing biodegradation at the spill-site scale. American Geophysical Union, San Francisco, CA, December 6, 1998.

Saba T, Illangasekare TH. Natural dissolution of organic chemicals entrapped in a two-dimensional groundwater systems. AGU 18th Annual Hydrology Days, Colorado State University, Fort Collins, CO, 1998.

Project Experience

Dr. Saba has been involved in complex environmental liability and litigation matters, insurance remedial cost recovery claims, Superfund (CERCLA) liability, petroleum exclusion, and natural gas migration cases.

Select Current and Recent Cases

- Industrial Waterway (Washington). Testifying expert for defense on PCB fingerprinting and source determination.
- Kalamazoo River Superfund Site (Michigan). Expert on PCB evaluation matters.
- Bayway and Bayonne Refineries (New Jersey). Project manager for defense on historical reconstruction of contamination from refinery contamination in soils, sediments, and groundwater.
- Hylebos Waterway Superfund Site (Tacoma, Washington). Project manager on PAH forensics and allocation of contamination.
- Major waterway (Houston, Texas). Expert on PCB matters.
- Natural Gas Storage Field Geochemical Fingerprinting (Cunningham Field, Kansas). Project manager and expert on geochemical fingerprinting of natural gas.
- Superfund Site (Massachusetts). Expert on divisibility of mercury contamination and remediation costs.
- Manufactured Gas Plant (MGP, Rhode Island). Project manager for plaintiffs to identify PAH sources allegedly originated from disposal of wastes from a manufactured gas plant.
- Multiple Superfund Sites (Oklahoma). Project manager for defense to determine applicability of petroleum exclusion to the Sites.
- Natural gas migration (Tioga Field, Pennsylvania). Natural Gas fingerprinting expert to determine sources of natural gas in drinking water wells.
- Natural gas (Elk Basin, Wyoming). Expert of natural gas geochemistry to evaluate migration.
- Chlorinated solvents (Springfield, Illinois). Expert on chemical fingerprinting and fate and transport of chlorinated solvents (PCE, TCE and their degradation products) at an industrial site.
- Major Bay (East Coast). Expert in PCB fingerprinting to determine sources to the bay.
- Manufactured Gas Plants (Massachusetts and New York). Project manager evaluating activities that resulted in MGP contamination as part of insurance claim cases.
- Hydraulic fracturing. Role of different chemical additives in the hydraulic fracturing process, and their fate and transport processes.

Polychlorinated biphenyls (PCBs)

For a confidential client on the west coast, investigated historical and current PCB sources to a major waterway. Designed and oversaw a field sampling program to collect source samples and sediment samples from the waterway. Conducted fingerprinting analysis on the congener and homologue data, and identified the source of contamination with high degree of certainty. Case settled.

For a confidential client in the Midwest, provided expert report on the historical uses of PCB-containing hydraulic fluids in the die casting industry.

For Southeastern Pennsylvania Transit Authority (SEPTA), identified PCB sources and approximate spill timing at the former Paoli rail yard Superfund site in support of a $60 million remedial cost allocation case. Work included historical review of PCB purchase records and handling practices, and chemical forensic analysis to identify PCB Aroclor and congener patterns. Co-authored expert report of findings. Case settled.

For a confidential client on the East Coast, analyzed homologue and congener patterns to identify PCB sources to a major bay sediment. Identified congeners associated with specific sources. Analysis included conducting PCA analysis, analysis of PCB profiles in sediment cores. Work is part of a remedial investigation report for the bay.

For a confidential client in the Midwest, conducted fingerprinting analysis to identify sources of PCB contamination to river sediments and banks abutting client's property. Directed the collection and laboratory congener analysis of sediment samples.

For an industrial client in the Midwest, reviewed and critiqued calculations of PCB contribution from a former paper mill to a river.

For a major manufacturer, assisted client in developing technical defense in response to plaintiff claims relating to PCB and dioxin contamination at an electrical transformer-manufacturing site in the Southeastern U.S. Work included documentation of PCB handling, and chemical fingerprinting analysis.

For a confidential client in Georgia, evaluated the feasibility of proposed remedial alternative at a PCB and VOC contaminated landfill. Recommendations included modifications to the proposed design to optimize the remediation process.

Petroleum Chemistry

For a confidential client in northeastern U.S., identified the sources of PAHs and metals at a petroleum refinery as part of a defense against a multi-billion dollar natural resource damage (NRDA) claim. Identified refinery areas impacted by PAHs and metals from urban background, offsite sources, and other historical activities.

For confidential clients in the Midwest, evaluated impacts of former refinery operations on soils and on LNAPL plumes underneath Superfund Sites. Discussed the applicability of CERCLA's "Petroleum Exclusion" to the Sites.

For confidential clients in southern US, conducted chemical fingerprinting analysis to age-date a petroleum plume underneath the Site to determine the responsible party.

Polycyclic Aromatic Hydrocarbons (PAHs)

For a client in northwestern U.S., evaluated PAH sources to the sediments of a major waterway as part of a dredging cost allocation case. Determined the relative importance of candidate sources (primarily creosoted pilings, aluminum smelter sludge and urban runoff) through chemical fingerprinting, sediment age dating, and PAH concentration gradients.

For residential owners in Rhode Island, reviewed expert reports on the sources of PAH contamination in the residents' yards. Identified deficiencies in the opposing experts' analysis methods to distinguish PAHs from a nearby former manufactured gas plant and natural background. Case settled.

At a steel manufacturing site, evaluated the connection between sediment PAH contamination and surface water sheens using chemical fingerprinting techniques. Found that sediment PAHs resulted in the sheens observed on the surface water and that impacts to both media were not related to the steel manufacturer activities.

Manufactured Gas Plants (MGPs)

For multiple energy companies in northeastern U.S., linked historical MGP operations and practices to present day contaminant distribution at over 20 former plants. Used forensic analysis to identify approximate time frame of historical leaks and spills. Analyzed tar, oil, and NAPL entrapment and migration patterns to identify contamination sources. Co-authored several expert reports as part of insurance remedial cost recovery cases.

Dioxins/Furans

For a confidential client in Louisiana, evaluated dioxin and furan fingerprint patterns in a bayou sediment to determine responsible parties. Combined dioxin/furan data with sediment age dating information, and determined with a high degree of certainty the likely source of contamination.

For a confidential client in Mississippi, evaluated dioxin and furan fingerprint patterns in dust and soil samples collected from residential areas around a transformer service facility to determine whether the dioxin/furans originated from the facility or from background sources.

Chlorinated Solvents

Evaluated sources of tetrachloroethene (PCE) at a former petroleum hydrocarbon distribution facility in the Western U.S. Used different evaporation models to estimate the approximate start date of PCE release(s) to the surface soil.

For a confidential client in Illinois, conducted fingerprinting and fate and transport analysis to age date multiple chlorinated solvent plumes. Used multiple lines of evidence including groundwater travel times, daughter/parent compound ratios, and historical construction of

contamination to determine the age of the different plumes. Presented findings to the Illinois EPA.

Reviewed cost recovery documents for municipal water treatment due to alleged contamination from dry cleaning activities. Found approximately $350,000 in overestimated treatment costs.

For a confidential client in MA, identified a client's share of chlorinated solvents plume impacting residential areas downgradient from several chlorinated solvent PRPs. Used multiple lines of evidence including PCE degradation pathways and groundwater modeling. Case settled.

For a dry cleaner in Canada, evaluated carbon isotope data for trichloroethene (TCE) in groundwater to identify different sources of chlorinated solvents contamination downgradient from the dry cleaner.

For a superfund site in New Hampshire, optimized injection and extraction well locations and flow rates for faster PCE recovery in a pump and treat system. Optimized system reduced total remediation time by 25%. Computer modeling work involved modifying MODFLOW and MT3D to fit the superfund site-specific characteristics, and linking the modified versions to a USGS optimization code. Reduced projected plume recovery time by 25%.

Natural Gas

For multiple gas companies, designed and implemented forensic field programs to differentiate native gas from storage gas using composition and isotope analysis. Co-authored reports to State's Conservation Commission. Presented findings to the Federal Energy Regulatory Commission (FERC).

For a confidential gas company, investigated sources of natural gas bubbling in residential water wells. Used chemical fingerprinting including gas composition and isotope analysis to determine the origin of the gas in the water wells. Co-authored expert report to the State’s department of Environmental Protection.

For a gas company in New York, investigated storage gas migration from a storage field and calculated the percent of storage gas and native gas in a set of gas wells located near the leaking field. The work was conducted as part of settlement negotiations between the owners of the storage field and the gas well owners.

For a developer in the southern U.S, designed and directed a field investigation to determine sources of methane in soil underneath newly constructed houses.

Metals

At a contaminated waterway in Louisiana, linked creek sediment metal contamination to multiple responsible parties in support of remedial cost allocation. Data evaluation included identification of marker metals and combination of metals used by different industries located on the creek.

For a confidential arsenical pesticide manufacturer, evaluated the fate and transport of the different arsenic species in soils and groundwater at Florida Sites. Authored reports to the Florida Department of Environmental Protection.

For a confidential client in the northeast, evaluated fate and transport of mercury in soil and groundwater in support of a several million dollars remedial cost allocation case at a Superfund Site.

For a major paint manufacturer, used statistical methods (variogram analysis) to show the sufficiency of a soil-sampling program in characterizing a lead contaminated site.

Hydrogeology/ Fate and Transport

For a confidential client in Argentina, designed and modeled a hydraulic barrier system to mitigate off-site contamination transport. Responsibilities included groundwater and solute transport modeling.

For a consulting company in Houston, Texas, developed a proprietary model for NAPL dissolution as part of a Department of Defense contract to develop a decision support system to evaluate effectiveness and cost of source zone treatment.

For the USEPA, served as technical reviewer for BIOCHLOR and provided technical assistance of select EPA groundwater models offered over the Internet.

For the Hazardous Substance Research Center, created a numerical code to simulate NAPL entrapment and dissolution in groundwater.

List of Expert Reports and sworn depositions available upon request.