

# Lisa Tolbert

## Senior Scientist/Engineer



### Education and Credentials

M.S., Environmental Health (Risk Assessment), University of Washington, Seattle, Washington, 2007

B.S., Chemical Engineering, Magna Cum Laude, University of Washington, Seattle, Washington, 2001

Engineer-in-Training, Washington (License No. 24849), 2002

### Continuing Education and Training

First Aid/CPR Certification (current)

Hazardous Waste Operations and Emergency Response 40-Hour Certification (most recent refresher certification received 2017)

Visualizing and Analyzing Environmental Data with R Course (2017)

Contaminant Vapor Migration and Intrusion Course (2014)

Globally Harmonized System of Classification and Labeling of Chemicals Course (2013)

Establishing Cleanup under the Model Toxics Control Act (MTCA) Course (2013)

Project Management Training (2008, 2011, 2015)

### Professional Profile

Ms. Lisa Tolbert is a consultant with more than 15 years of broad technical experience in the fields of environmental health science and toxicology, exposure and risk assessment, remedial site investigation and characterization, regulatory compliance, and engineering. As an environmental health scientist, she has executed human health risk assessments for cancer and noncancer health endpoints from exposures to numerous environmental chemicals in multiple media, and provided toxicological, regulatory, litigation, and data analysis support for private clients and public agencies for contaminated sites throughout the U.S. As a chemical/environmental engineer, she has provided engineering support during the research, development, design, implementation, closeout, and documentation stages of environmental remediation and construction projects. Ms. Tolbert has managed or contributed to a wide variety of projects, including those involving deterministic and probabilistic (i.e., Monte Carlo) human health and ecological risk assessment, development of screening and cleanup levels, and soil, sediment, and groundwater remediation. Other projects have involved excavation, dredging, vapor intrusion, post-application pesticide volatilization, leaking underground storage tanks (USTs), landfills, stormwater monitoring, the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), and sampling of ambient air, groundwater, soil, soil vapor, and sediment in support of site characterization activities. She has experience working on sites contaminated with petroleum hydrocarbons, chlorinated solvents, arsenic, lead, PCBs, pesticides, and dioxins and furans. In addition, Ms. Tolbert has experience evaluating sites with contaminants of emerging concern, such as per- and polyfluoroalkyl substances (PFAS).

### Relevant Experience

#### Product Stewardship

*Evaluation of Zinc Alloy Products for Proposition 65 Compliance, California*—Supported assessment of consumer exposures to various zinc alloy-based products containing cadmium and lead, both California Proposition 65-listed chemicals, for Proposition 65 compliance. Researched exposure models and parameter values for evaluation of child, adult, and worker contaminant intakes resulting



from oral mouthing, dermal absorption, hand-to-mouth transfer, and inhalation exposures.

***Evaluation of Cheerleading Products for Proposition 65 Compliance, Portland, Oregon***—Managed evaluation of cheerleading pom-poms for compliance with California’s Proposition 65. Compiled database of all chemicals within components of pom-pom products, calculated concentrations of Proposition 65 chemicals within pom-poms, and compared Proposition 65 chemical concentrations with available Safe Harbor Levels by developing exposure scenarios and calculating modeled exposure levels for multiple Proposition 65-listed constituents of colorants, including organic and metal pigments and volatile organic compounds (VOCs). Prepared report documenting the justification for why the pom-poms do not require labeling under Proposition 65.

## **Risk Assessment**

***Probabilistic Modeling of Risks Associated with Fish Consumption, Multiple Sites***—Performed probabilistic human health risk assessments associated with the fish ingestion exposure pathway for multiple confidential litigation projects across the U.S. Using data from site location-specific studies and Crystal Ball® software, developed probability density functions for key exposure input variables and modeled human health effects resulting from exposure to environmental PCB concentrations via consumption of seafood within site waterbodies. Evaluated site-specific fish consumption rates and finfish species group preferences, variations in PCB exposures within site waterbodies, and other potentially relevant exposure pathways to site-related PCB concentrations. Additionally supported deterministic human health risk assessments associated with direct contact exposure pathways for multiple residential and recreational receptors. Prepared related documentation in support of multiple expert reports. Project manager for five project sites.

***Human Health and Ecological Risk Assessment for PFAS, Confidential Location***—Completed both human health and ecological risk assessment activities for confidential site contaminated with PFAS. For the human health evaluation, compiled toxicity criteria and scenario-specific parameter assumptions for soil and tap water exposures, back-calculated site-specific screening levels, and screened maximum detected site soil and surface water PFAS concentrations. For the ecological evaluation, reviewed available ecological benchmark values for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) and compared site PFOA and PFOS data with the range of ecological benchmark values.

***Human Health Risk Assessment for Wild Game Hunters, Confidential Location***—Evaluated potential human health risks to members of the hunting community and their families associated with the consumption of recreationally hunted wild game meat from a confidential site contaminated with PFAS. Created model to estimate annualized wild game ingestion rates based on site-specific parameters and used PFOA and PFOS concentration data from deer and wild turkey harvested from the site to calculate risks to adult hunters and their children.

***Lead Risk Assessment at Former Printing Plant, Sacramento, California***—Estimated potential health risks from exposure to lead in soil during and following excavation activities associated with the closure, demolition, and redevelopment of a former printing plant. Evaluated planned excavation areas and lead data from soil to be excavated and from soil to be left in place, including



calculation of upper confidence limits using ProUCL software. Coordinated completion of technical memorandum that evaluated risks to construction/excavation workers and offsite residents and provided recommendations for soil management during redevelopment.

***Health and Safety Evaluations for Construction Workers, Newark, California***—Developed human health risk evaluation and health and safety guidance for workers performing activities associated with the installation and maintenance of underground utilities at a pipeline extension project site. Risk evaluation included a screening-level assessment of potential risks to trench workers, who were defined as future construction/utility workers who could be exposed to VOCs via inhalation while working in trenches. Used Virginia Department of Environmental Quality’s trench model to estimate concentrations of VOCs in air in trenches and excavations. Prepared guidance for incorporation into contractor health and safety work plans on potential exposures to VOCs in soil and groundwater during installation and maintenance of underground utilities.

***Human Health Risk Assessment for Tank Farm Facility, Cut Bank, Montana***—Contributed to human health risk assessment for tank farm facility under CERCLA. Evaluated risks to human health and ecological receptors from exposures to site-impacted soil, groundwater, surface water, and sediment from refinery-related activities. Following Montana guidance, evaluated multiple current and future receptor scenarios involving exposures to variety of crude oil-related, petroleum hydrocarbons.

***Screening-Level Risk Assessment for Proposed Residential Redevelopment, San Jose, California***—Completed unrestricted (residential) screening-level evaluation for the potential risks to future human receptors from direct contact exposures to a variety of existing contaminants in surface and subsurface soil and soil vapor. Contributed to site health and safety plan for the protection of workers engaging in field activities associated with site soil management during construction.

***Human Health Risk Assessment Strategizing for Floodplain Area, New York***—Completed probabilistic risk assessment modeling and calculations to help client decide whether to pursue probabilistic risk assessment for potential human exposures to PCBs in soil over extensive floodplain area. Compared default deterministic, site-specific deterministic, and site-specific probabilistic noncancer hazard and cancer risk results for multiple receptor scenarios, each incorporating multiple exposure pathways, to assist in decision-making.

***Human Health Risk Assessment for Former Industrial Complex, Henderson, Nevada***—Performed human health risk assessment-related tasks for former industrial complex to evaluate closure conditions within two areas of the site. Because of deed restrictions and institutional controls, potential receptor scenarios were limited to outdoor workers, trespassers, and offsite residents subject to soil and groundwater contaminant exposures via direct contact and inhalation pathways. Chemicals of potential concern included dioxins/furans, PCBs, pesticides, semivolatile organic compounds, and VOCs.

***Management of Pesticide-Impacted Soil, Hawaii***—Updated a plan for the identification and management of soils impacted by pesticides and pesticide residues for military housing



communities in Hawaii. Addressed regulatory agency comments on soil management plan and developed process for evaluating sites with potential pesticide-impacted soils.

***Human Health Risk Assessment for Former Pulp and Paper Mill, Montana***—Performed human health risk assessment-related tasks in support of technical and documentation requirements for the site’s remedial investigation and feasibility study. Prepared technical report for derivation of site-specific soil and sediment screening levels for dioxins and furans for multiple receptor scenarios, which included research of similar work done at other Montana Superfund sites and compilation of relevant exposure parameter assumptions.

***Human Health Risk Assessment for Steel Manufacturing Facility, Portland, Oregon***—Addressed regulatory agency comments on human health risk assessment document originally drafted by another consulting firm and assisted in production of an addendum to the risk assessment to finalize the draft document. Developed updated screening levels based on current and applicable state and federal screening levels and reevaluated selection of contaminants of potential concern. Evaluated changes to risk conclusions based on added chemicals of potential concern, recalculated exposure point concentrations, revised exposure parameter assumptions, and updated chemical-specific toxicity factors.

***Human Health Risk Assessment for Lead Exposures on a River, Missouri***—Planned and performed preparatory work towards completing a baseline human health risk assessment for recreational and occupational exposures to lead in river floodplain soils and sediments contaminated by historical mining activities. Began work in support of site remedial investigation and feasibility study activities. Modeled blood lead levels for child and adult receptors using EPA’s integrated exposure uptake biokinetic model and adult lead methodology, respectively. Evaluated receptors that frequent terrestrial and aquatic areas within a portion of the river floodplain that extends over 50 river miles.

***Human Health Risk Assessment for Former Sawmill, Montana***—Contributed to a large baseline risk assessment to address releases of pentachlorophenol (PCP), carcinogenic polycyclic aromatic hydrocarbons (cPAHs), petroleum hydrocarbons, and dioxins and furans during historical operations at a former wood treatment facility. Evaluated human health endpoints for exposure to impacted soils and groundwater related to residential, commercial, recreational, and agricultural land uses and summarized resulting cancer risks and noncancer hazards in EPA’s RAGS, Part D format.

***Human Health and Ecological Risk Assessment for San Jacinto River Waste Pits, Harris County, Texas***—Provided technical and quality assurance support for human and ecological risk assessments conducted for a Superfund site historically used for deposition of wastes generated by a bleached kraft pulp mill facility. Conducted both deterministic and probabilistic risk assessments for human and ecological receptors using a complex spreadsheet system and Crystal Ball® software for Monte Carlo modeling. Primary site contaminants include dioxins and furans. Environments potentially affected by wastes include an estuary, riparian areas, and adjacent uplands. Researched



standard exposure parameter values for various human receptor scenarios, including fishers, recreationists, trespassers, and workers in multiple areas within the site.

***Human Health Risk Assessment for Arsenic in a Community, New England***—Conducted deterministic and probabilistic human health risk assessments for arsenic in soil in a community surrounding a pesticide manufacturing facility undergoing RCRA corrective action. Study area-specific risk assessment was designed to compare risks associated with site (historical, current, and multiple hypothetical future scenarios) and background arsenic concentrations and to support selection of remedial alternatives for a corrective measures study. As an integral member of project team, composed a complete baseline human health risk assessment report evaluating several areas within the study area and multiple receptors for soil and house dust incidental ingestion and dermal contact pathways. Developed probability density functions for exposure input variables based on site-specific data and peer-reviewed literature research. Employed Crystal Ball® and ProUCL software to generate comparable background data sets, analyze community and background data sets, and perform Monte Carlo simulations for calculation of probabilistic incremental intake estimates. Led compilation, management, characterization, and evaluation of site-specific arsenic concentration database.

***Human Health Risk Assessment for Former Wood-Treating Facility, Minnesota***—Contributed to an extensive human health risk assessment for former wood-treating facility. Updated comprehensive spreadsheet system for calculating risks for six receptors, including those practicing subsistence tribal lifestyles; 12 exposure pathways; 10 exposure areas; and 85 individual exposure locations. Chemicals of potential concern included PCBs, cPAHs, PCP, and dioxins and furans. Evaluated model based upon methodology developed by Virginia Department of Environmental Quality for estimation of trench vapor concentrations for utility worker exposures. Developed site-specific preliminary remediation goals based on residential and industrial land use for cPAHs and dioxins and furans. In support of feasibility study, calculated and compared site-related contaminant intakes with background dietary contaminant intakes to illustrate importance of dietary exposures in relation to site-related exposures.

***Ecological Risk Assessment for Former Pesticide Manufacturing Facility, Oregon***—Provided support for an ecological risk assessment conducted for a former DDT manufacturing facility. Employed ProUCL software to evaluate distributions, central tendency estimates, and upper confidence limits for multiple data sets containing multiple site contaminants in upland soils, riverbank soils, and sediments. Drafted toxicological profiles for several site contaminants and documentation describing computational methodology, input, and output for risk assessment.

***Post-application Pesticide Volatilization in a Community, Wenatchee, Washington***—Planned, executed, and documented fieldwork for graduate-level research aimed at evaluating the impact of post-application pesticide volatilization on children living within an agricultural community, specifically by measuring ambient air concentrations of organophosphorus pesticides typically applied over a growing season and at two different sites within the community's airshed. Completed master's thesis documenting spatial and temporal variations in observed pesticide concentrations, as well as probabilistic risk assessment of measured levels compared with those



that may cause chronic, noncancer health endpoints in children following inhalation exposure. Fieldwork was subsequently used as a model in planning broader scale air monitoring in support of Washington State House Bill 1810.

## Engineering and Remediation

***Groundwater Contaminant Plume Evaluation, Long Island City, New York***—Coordinated groundwater well installation and monitoring for a former UST site contaminated by fuel oil constituents. Evaluated current and historical groundwater monitoring data for the suspected existence of an offsite source and to petition for site closure with the New York State Department of Environmental Conservation.

***Spill Plan Review for Fuel Storage and Handling Facilities, Seattle, Washington***—Served as project manager for multi-year reviews and updates of spill prevention, control, and countermeasure (SPCC) plan for fuel storage and handling facilities within a commercial office building complex. Reviewed current regulations for compliance. Updated SPCC plan to include changes in facility name, ownership, personnel, and operating procedures, and oversaw modification of fuel system diagrams.

***Injection Program Evaluation, Long Island City, New York***—Evaluated quarterly groundwater monitoring data following completion of an *in situ* chemical oxidation (ISCO) injection program for remediation of soil and groundwater contaminated by fuel oil from a former cluster of leaking USTs. Based on suspected existence of an offsite source, coordinated collection of additional groundwater monitoring data and evaluated data to assess the need for future ISCO treatment or to petition for site closure with the New York State Department of Environmental Conservation.

***Removal of Soil Associated with Leaking USTs, Seattle, Washington***—Project manager for an evaluation of the allocation of costs associated with removal of several leaking USTs and associated contaminated soil, completed as part of a larger site redevelopment. Managed observation and documentation of UST removal and soil excavation activities to evaluate MTCA compliance and support subsequent cost allocation negotiations among the client, landlord, and property redeveloper. Requested collection of a sample from a suspect lobe of the contaminated soil plume, which verified that the source of the contamination was being improperly attributed to the client's USTs and resulted in substantial cost savings to the client. Upon review of preliminary sample data and cost information collected by the property developer's consultant, successfully argued for a reduced cost allocation, saving the client nearly \$100,000. Maintained close contact with the property redeveloper's consultant and the Washington State Department of Ecology to ensure the documentation submittal process resulted in a determination of "no further action" and closure for the site.

***Facility Sub-slab Depressurization System Pilot Test and Installation, Lakewood, Washington***—Managed project involving a car rental facility experiencing vapor intrusion of contaminants from an offsite source. Facilitated team evaluation of site conditions and potential mitigation strategies. Developed scopes of work for subcontractors and oversaw testing and installation of a sub-slab depressurization system (SSDS). Coordinated monthly and annual monitoring of the SSDS to



verify that the system was operating within design parameters. Following a change in site subsurface conditions, coordinated collection of multiple rounds of sub-slab soil vapor samples for comparison with Washington State Department of Ecology screening levels to verify continued need for the SSDS.

***Design Support and Construction Quality Assurance for Georgetown Steam Plant, Seattle, Washington***—Completed engineering design and construction quality assurance activities for an interim action at a facility historically contaminated with PCBs, dioxins and furans, metals, petroleum, PAHs, and VOCs. Before construction commenced, analyzed soil borehole sample data from within soil removal boundaries to revise excavation prism and evaluate need for collection of additional pre-excavation performance monitoring soil samples. Developed a performance monitoring plan for incorporation in an interim action work plan. Performed quality assurance review of construction drawings, site drainage report, site health and safety plan, and backfill material performance criteria. Completed a SEPA environmental checklist in support of project permitting. During construction, maintained presence onsite to perform quality assurance checks of and document site activities. Collected pre-excavation and post-excavation performance monitoring soil samples. Following construction, periodically monitored site and local weather conditions to verify performance of stormwater management measures, including infiltration of rain into stormwater bioretention cells.

***Excavation and Dredging Design Quality Assurance for Terminal 117, Seattle, Washington***—Supported oversight and quality assurance review of design work completed for excavation and dredging activities planned within upland and in-water portions of Terminal 117, a site historically contaminated with PCBs and dioxins that is located within the Lower Duwamish Waterway Superfund site. Critically evaluated rationale for excavation/dredge prism set forth in engineering evaluation and cost analysis (EE/CA) to determine whether prism captured all exceedances of removal action levels and whether soil and sediment data set contained gaps that might impact excavation/dredge prism. To guide additional sampling activities and redesign of excavation/dredge prism, evaluated site characterization and excavation/dredge prism by compiling data for and analyzing a 3-dimensional model of soil and sediment PCB concentrations generated by Environmental Visualization System (EVS)-Pro software (modeling performed by another team member). Composed technical memorandum documenting EVS modeling work and provided recommendations to design consultants. Performed quality assurance reviews of design documents, including work plan for addressing data gaps and construction design work plan, prepared by design consultants. Compiled and analyzed tidal data over planned construction period. Calculated excavation volumes for planning excavation below groundwater and tidal levels. Analyzed local and regional catch basin PCB and dioxin data for contaminant source tracking.

***Stormwater Source Control Measures Monitoring for Former Pesticide Manufacturing Facility, Oregon***—Prepared performance monitoring plan and revised quality assurance project plan in support of stormwater source control measures design report for a former DDT manufacturing facility. Elements of performance monitoring plan included monthly collection of stormwater samples and flow rate data from influent and effluent of stormwater treatment system, to be



installed during implementation of stormwater source control measures, to assist in evaluation of treatment system performance. In the event that the treatment system would be unsuccessful in reducing DDT and other chemicals of potential concern in stormwater discharges, the performance monitoring plan also included an adaptive management approach for optimizing the stormwater treatment system. Evaluated stormwater monitoring guidance documents and site-specific monitoring requirements presented in permits, agreements, and other regulatory documents. Researched automated sampling devices capable of collecting composite stormwater samples and logging flow rate data.

***Radioactively Contaminated Site Excavation, San Francisco, California***—Produced work plans for characterization and excavation activities for three radioactively contaminated sites within a naval shipyard. Generated site-specific health and safety plans for all three sites and procured equipment and materials for implementation of remedial actions at two sites.

***Trichloroethylene-Contaminated Soil and Groundwater Remediation, Santa Clara County, California***—Project team member supporting planning and preparation of corrective action plan and associated work plan for remediation of trichloroethene (TCE)-contaminated soil and groundwater within a former naval air station via direct-push injection of an oxygen-releasing chemical agent. Composed site-specific health and safety plan, contractor quality control plan, waste management plan, and traffic control plan.

***Coating of Contaminant-Leaching Building Materials, Santa Clara County, California***—Prepared sizeable work plan in short time period to implement time-critical interim action for remediation of contaminants (PCBs, lead, asbestos, and zinc) leaching from hangar construction materials and into surrounding storm drain system within a former naval air station. Participated in meeting with client, regulatory agencies, and interested parties to discuss submission of work plan and execution of remedial action, resulting in preparation and approval of work plan in record time of 3 weeks. Procured equipment and materials for implementation of interim action, which finished ahead of schedule and with minimal field changes. Following completion of field activities, submitted project summary newsletter articles to two Navy publications and generated completion report, which received concurrence from EPA with no comments.

***Stormwater Dike Excavation, Santa Clara County, California***—Supported preparation of remedial design and implementation work plan for excavation of contaminated sediments from the Eastern Diked Marsh, a conduit for stormwater to flow from a settling basin to a retention basin, within a former naval air station. Prepared contractor quality control plan and stormwater pollution prevention plan, and contributed to construction specifications.

***Waterway Dredging, Tacoma, Washington***—Supported preparation of basis of design and design analysis report for dredging activities and placement of isolation cap at head of Thea Foss Waterway. Composed construction quality assurance plan, quality assurance project plan, and site health and safety plan, and assisted in assembly of engineering cost estimate. Provided and incorporated responses to client and regulatory agency comments.



***Petroleum-Contaminated Soil and Groundwater Remediation, Seattle, Washington***— Assisted in gathering field data during dual phase extraction pilot test, a step test performed to evaluate proposed extraction flow rates and wellhead vacuum pressures for remediation of petroleum-impacted soil and groundwater at a former fuel station. Following completion of pilot study, produced cleanup action plan and engineering design report to implement dual-phase extraction remediation system. System design features included multiple extraction wells, an extraction pump system, an oil and water separator, product storage, a water treatment system, a vapor treatment system, and associated instrumentation and controls. In preparation for implementation of remediation system, prepared documentation required for Puget Sound Clean Air Agency, Department of Planning and Development, and King County Wastewater Discharge permits.

***Contractor Quality Control, Santa Clara County, California***— Evaluated definable features of work and associated preparatory, initial, and follow-up activities for generation of contractor quality control plans for multiple remediation projects, including evaluation and optimization of two aquifer treatment systems, within a former naval air station.

***Squirrel Habitat Alteration, Santa Clara County, California***— Prepared habitat alteration work plan to implement effective long-term control of California ground squirrels posing potential threat to integrity of landfill cap within a former naval air station. Assisted in design of Phase II field activities to control squirrels, including population control (fumigation and/or trapping) and redesign of habitat (earthen and rock road berms, riprap shoreline protection, and two energy dissipaters).

***Harbor Dredging, New Bedford, Massachusetts***— Contributed to production of basis of design/design analysis report for dredging activities throughout New Bedford Harbor. Researched and assembled information required for dredging PCB-contaminated sediment.

***Modeling Water Quality Impacts, Portland, Oregon***— In support of NPDES permit application, performed modeling of effects of proposed waste stream discharge on temperatures of receiving waters within Columbia River using the EPA 2-dimensional model RBM10. Based on simulation results, demonstrated proposed discharge would have minimal heat load and that Columbia River temperatures would not be sensitive to new source. Prepared technical memorandum documenting results of RBM10 model application.

***Remediation of Trichloroethylene-Contaminated Groundwater, McChord Air Force Base, Washington***— Researched, screened, developed, and evaluated remedial alternatives in support of a feasibility study for cleanup of TCE dense nonaqueous phase liquid (DNAPL) contamination in groundwater within the air force base. Alternative technologies evaluated included pump-and-treat system, in-well air stripping, air sparging and soil vapor extraction, chemical oxidation, and permeable reactive barriers.

***Coal Bed Methane Exploration, Pierce County, Washington***— Prepared application and subsequent addendum to application required by Washington State Department of Ecology for land application of coal bed methane exploration process wastewater. Evaluated suitability of



wastewater retrieved from coal beds and of proposed area for land treatment in engineering report. Assisted in installation of groundwater monitoring wells and in sampling of groundwater from both monitoring and methane production wells. Following completion and acceptance of application, continued to prepare monthly reports detailing volumes of water discharged from project area and periodically performed sampling of groundwater and production water.

***Landfill Biotic Barrier Construction, Santa Clara County, California***—Collaborated with team to prepare and implement remedial design and implementation work plan for construction of landfill biotic barrier, required to prevent burrowing animals from bringing refuse to landfill surface, within a former naval air station. Wrote preconstruction work plan in preparation for remedial design activities and prepared presentation for client and regulatory agencies. Determined groundwater flow direction in vicinity of site via installation of and collection and analysis of data from pressure transducer equipment. Managed cost estimation and procurement of various services needed for construction and project completion, including tree well installation, golf course reconstruction, and community relations services. During execution of construction activities, assisted in construction quality control and supported field staff with surveying, field change requests, and documentation of field activities. Composed remedial action report to summarize all project activities and other closeout documentation following successful completion of biotic barrier construction. Elimination of anticipated draft-final and final iterations of remedial action report due to successful draft version of document resulted in a cost savings of approximately \$20,000.

## **Regulatory/Toxicology Support**

***Toxicity Reviews of Multiple Emerging Contaminants for Confidential Client***—In support of litigation for confidential client, performed comprehensive literature review of studies involving the associations between various PFAS (PFOA, PFOS, and perfluorononanoic acid [PFNA]) and various thyroid outcomes. Compiled and researched basis for all available federal and state water quality standards and toxicity factors for 1,1,1-trichloroethane.

***Feasibility Study and MTCA Regulatory Support for Landfill, Richland, Washington***—Project manager for MTCA regulatory compliance support associated with the feasibility study and cleanup action plan for a low-level radioactive waste site. Supported selection of indicator hazardous substances for soil, groundwater, and soil vapor and calculated cleanup levels for those substances. Performed modeling of contaminant vapors migrating from soil to groundwater to develop remediation levels for soil vapor. Reviewed portions of the feasibility study relevant to MTCA regulations and responded to related regulator's comments on the draft feasibility study.

***Determination of Cleanup Levels for Georgetown Steam Plant, Seattle, Washington***—Determined site-specific screening and cleanup levels for soil, groundwater, and surface water at a facility undergoing MTCA cleanup by evaluating MTCA, CERCLA, TSCA, and other potentially applicable or relevant and appropriate requirements. Compared site soil and groundwater data with developed screening levels to determine chemicals of potential concern, and with cleanup levels to determine whether site concentrations are in compliance. Evaluated leaching pathway from soil to groundwater. Analytes included PCBs, dioxins, metals, petroleum, PAHs, and VOCs. Summarized soil and groundwater screening activities in a site characterization report.



***Modification of Cleanup Levels for Terminal 117, Seattle, Washington***—Researched applicable regulatory cleanup levels and modified site-specific cleanup levels calculated for soil contaminants at a site located within the Lower Duwamish Waterway Superfund site. Performed quality assurance review of and revised MTCA/CERCLA risk values for an EE/CA.

### **Site Characterization**

***Cost Allocation Support for Port Angeles Harbor, Port Angeles, Washington***—Researched historical site files in support of allocation of costs associated with remediation of sediments contaminated with dioxins/furans, mercury, and PAHs. Documents, including those associated with stormwater/sewer conveyance systems and aquatic leases, were reviewed to better understand potential contaminant sources, the history of area pulp and paper facility wastes, and contaminant transport processes in the harbor.

***Characterization of Soil and Groundwater near Georgetown Steam Plant, Seattle, Washington***—Assisted in collection of soil and groundwater samples from facility historically contaminated with PCBs, dioxins, metals, petroleum, PAHs, and VOCs. Compiled, analyzed, and prepared summary tables of chemical data for development of site-specific screening and cleanup levels. Periodically collected groundwater level measurements from monitoring wells to support evaluation of groundwater flow and seasonal groundwater fluctuations.

***Characterization of Soil and Groundwater near Terminal 117, Seattle, Washington***—Assisted in installation of groundwater monitoring wells and collection of soil and groundwater samples from neighborhood properties and adjacent streets impacted by Terminal 117, a nearby site historically contaminated with PCBs and dioxins that is located within the Lower Duwamish Waterway Superfund site. Prepared summary report documenting groundwater monitoring well installation and associated soil boring and groundwater sampling results. Compiled, analyzed, and prepared summary tables of soil chemical data collected during more extensive soil sampling effort, conducted in support of an EE/CA. Researched potential causes of elevated dioxins near site (i.e., historical fire incidents). Immediately prior to and during implementation of cleanup activities, collected additional soil samples to confirm excavation depths. Prepared data report summarizing all dioxin and furan sampling results and a subset of PCB sampling results.

***Evaluation of Smelter Waste in a River, Washington***—Compiled, analyzed, and prepared summary tables of metals and organic chemicals data for sediments along river impacted by historical discharges of slag from an upstream smelter.

***Evaluation of Metals from an Operating Lead and Zinc Smelter, British Columbia***—Compiled and analyzed arsenic, cadmium, and other metals data for produce and soil in community with an operating lead and zinc smelter.

***Quarterly Water Quality Monitoring, Santa Clara County, California***—Led one of several teams in collection of groundwater and gaseous samples from wells on eastern portion of a former naval air station during quarterly sampling events. Gathered data pertinent for evaluation of effectiveness of existing aquifer treatment system.



*Annual Water Quality Monitoring, Santa Clara County, California*—Participated in collection of groundwater samples from 120 wells throughout a former naval air station during an annual sampling event. Gathered data pertinent for base-wide water quality monitoring.

*Waterbody Current and Tide Assessment, Thurston County, Washington*—Participated in deployment and retrieval of current meters and tide gauges in remote areas of Black River and Black Lake. Performed surveying of elevations of existing survey monuments and deployed gauges.

*Sediment Characterization, East Chicago, Indiana*—Analyzed historical chemistry data for sampling and analysis plan in preparation for sediment characterization field activities along the west branch of the Grand Calumet River. Conducted field sampling, quality assurance, and documentation assistance during sediment characterization. Coordinated with laboratories throughout project, performed quality control verification, and prepared summary of data gathered during project.

*Evaluation of Metals from Sand and Gravel Mining, Maury Island, Washington*—Compiled data and composed sampling report for sand and gravel mining site. Wrote report to supplement previous analytical data from the site and to quantify potential metals contamination along a road for which a future road repair effort was planned.

## Publications

Tolbert, L. 2007. Ambient concentrations of organophosphorus pesticides caused by volatilization during seasonal pesticide application. Thesis. University of Washington, Seattle, WA. 159 pp.

## Presentations/Posters

Zieber, P., R.A. Schoof, and L. Tolbert. 2009. Probabilistic risk assessment of incremental risk between site and background arsenic in soil. Poster presented at the Society of Toxicology Annual Meeting, March 17, Baltimore, MD.

