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Priscilla Tomlinson **Managing Scientist**

PROFESSIONAL PROFILE

Ms. Priscilla Tomlinson is a toxicologist with 25 years of experience in the fields of risk assessment, risk management, risk communication, site investigation, and regulatory compliance with the Washington Model Toxics Control Act (MTCA). She has provided toxicological support and conducted risk assessments in support of private clients, city and county agencies, the U.S. Navy, and the Department of Energy for sites throughout the United States. She has extensive experience evaluating risks associated with and developing cleanup levels for sites contaminated with petroleum products, arsenic, and dioxins/furans. She assists in the design of site investigations, particularly in relation to risk assessment support and regulatory compliance. Ms. Tomlinson teaches classes on MTCA and has applied her regulatory expertise at numerous sites throughout Washington State. She also teaches classes on Washington State Department of Ecology's (Ecology) spreadsheets for evaluating leaching of petroleum and other hazardous substances.

CREDENTIALS AND PROFESSIONAL HONORS

M.S., Toxicology, University of Washington, Seattle, Washington, 1986
A.B., Biology, Occidental College, Los Angeles, California, 1983

PROFESSIONAL AFFILIATIONS

Associate Member of Society of Toxicology (elected 1995)
Member of Association for Women in Science (President of Seattle Area Chapter, 1991 to 1994)

RELEVANT EXPERIENCE

Risk Assessment

Probabilistic Risk Assessment for Arsenic in a Community, New England—Managing a probabilistic and deterministic risk assessment of arsenic in soil in a community surrounding a pesticide manufacturer undergoing a RCRA corrective action. The risk assessment is designed to compare risks associated with site and background arsenic concentrations and to support selection of corrective actions. Supervising staff who are developing probability density functions and point estimates for input variables,

performing Monte Carlo simulation evaluations of incidental soil ingestion, and performing deterministic calculations of soil intake through incidental ingestion and dermal contact. Providing quality assurance of results. Future tasks will include probabilistic exposure estimates of dietary, dermal, and inhalation exposure pathways to support urinary arsenic modeling to be conducted by another project team member.

Human Health Risk Assessment for a Wood Treating Facility, Minnesota—Managed an extensive human health risk assessment for a wood-treating facility in Minnesota. Developed exposure parameter values for receptors and exposure pathways, considering traditional tribal lifeways of Native Americans living in the community. Designed and provided quality assurance for the development of a comprehensive spreadsheet system for calculating risks for 6 receptors, 12 exposure pathways, 10 exposure areas, and 85 individual exposure locations. Statistically evaluated data sets for soil, sediment, groundwater, surface water, wild rice, and fish. Calculated exposure point concentrations for seven chemicals of potential concern, including polychlorinated biphenyls (PCBs), carcinogenic polycyclic aromatic hydrocarbons (PAHs), pentachlorophenol, and dioxins/furans. Developed site-specific preliminary remediation goals (PRGs) based on residential and industrial land use for carcinogenic PAHs and dioxins/furans. Evaluated the potential impacts of EPA's ongoing dioxin reassessment of the dioxin/furan PRGs.

Risk Assessments for Recreational Land Use, Alaska—In support of engineering evaluations/costs analyses for a wood products company in a remote area of Alaska, conducted human health risk assessments for two remote locations with potential future recreational land use. Conducted streamlined Tier 1 and Tier 2 risk evaluations according to Alaska Department of Environmental Conservation (ADEC) guidance. Chemicals of concern included petroleum, PAHs, arsenic, cadmium, iron, lead, manganese, and dioxins and furans. Exposure pathways included direct contact with soils and sediments and ingestion of surface water. Performed statistical evaluations of site data to calculate exposure point concentrations. Calculated alternative, site-specific risk-based concentrations for lead and petroleum. The findings, which supported no further action, were accepted by EPA and ADEC.

Technical Advisor to Community Oversight Group, Bellingham, Washington—Provided technical review of EPA's human health risk assessment, feasibility study, and proposed cleanup plan for a community oversight group of property owners surrounding a Superfund site. Attended two board meetings to discuss the documents and evaluate the impacts of site cleanup activities on local land owners. Summarized and evaluated the risk assessment in layman's language. Presented an evaluation of the results of the risk assessment at a public meeting. Provided official comment on the proposed plan at a public hearing. Chemicals of concern included creosote, petroleum, pentachlorophenol, PAHs, and dioxins and furans. Exposure pathways included direct contact with soil, sediment, and surface water and transport of windblown dust to offsite residences.

Baseline Human Health Risk Assessment for a Chemical Handling Facility, Seattle, Washington—Provided senior leadership on a complex RCRA baseline human health risk assessment

involving multiple subcontractors. Evaluated soil and groundwater contamination at a chemical handling facility in Washington. The risk assessment was designed to comply with the risk assessment guidance of both RCRA and MTCA. Chemicals of concern included chlorinated and nonchlorinated solvents, metals, semivolatile organic chemicals, and petroleum hydrocarbons. Led the toxicity assessment and discussion of risk results. Contributed to each phase of the project. Supported the project manager by providing perspectives on important risk issues and recommending approaches.

Baseline Human Health and Ecological Risk Assessment for a Dry Cleaning Facility, Washington— Performed a MTCA baseline human health exposure evaluation and an environmental evaluation for a dry cleaning facility in Washington. Indicator hazardous substances for human health included tetrachloroethene; trichloroethene (TCE); and gasoline-, diesel-, and heavy-oil-range petroleum. Human exposure pathways included incidental ingestion of surface and subsurface soil, ingestion of groundwater, and inhalation of vapors from groundwater. Evaluated petroleum risks using Ecology's Interim Total Petroleum Hydrocarbons (TPH) Policy. The environmental evaluation addressed risks to aquatic receptors in surface water impacted by groundwater.

Baseline Ecological Risk Assessment for a Former Air Force Facility, King Salmon, Alaska— Assisted in the design and planning of a baseline ecological risk assessment at a former Air Force facility in King Salmon, Alaska. Supervised the implementation of the risk assessment approach for 10 separate sites. Chemicals of concern at the site included petroleum, metals, PCBs, pesticides, and dioxins. Selected indicator chemicals to represent the chemical and toxicological characteristics of fractions of petroleum. Evaluated risks to 23 species of mammals and birds by using toxicity reference values and the hazard quotient approach analogous to EPA's approach for noncarcinogenic human health effects. Exposure pathways included ingestion of soil, water, and prey. Evaluated risks to fish and aquatic invertebrates by using water risk-based concentrations, analogous to EPA's water quality criteria. Evaluated risks to plants by using soil risk-based concentrations. Developed toxicity reference values, water risk-based concentrations, and soil risk-based concentrations from an extensive literature review, using uncertainty factors. Obtained intake rates for wildlife from EPA's Wildlife Exposure Factors Handbook, or estimated them by using allometric equations. Chemicals of concern for wildlife included creosote, petroleum, pentachlorophenol, PAHs, and dioxins and furans. Exposure pathways included direct contact with soil, sediment, and surface water and transport of windblown dust to offsite residences. The risk assessment was accepted by ADEC. Presented the work in a poster session sponsored by the Society of Toxicology. Coauthored a book chapter describing the work.

Endangerment Assessment for an Equipment Manufacturer, Oregon— Participated in an endangerment assessment (baseline human health risk assessment) for a groundwater contamination plume at a site with multiple sources of contamination and high public visibility for an equipment manufacturer in Oregon. Chemicals of concern included TCE, tetrachloroethene, and 1,2-*cis*-dichloroethene. Exposure pathways included ingestion of

and dermal contact with groundwater during household use, inhalation of vapors from groundwater during household use, dermal contact with groundwater or surface water during agricultural and recreational activities, and inhalation of vapors from groundwater or surface water during agricultural and recreational activities. Conducted an extensive literature review of the toxicology of TCE to support development of toxicity reference values in the absence of toxicity data provided by EPA. Conducted an extensive literature review of methods for estimating volatilization of chemicals from domestic water use. Supervised implementation of the risk calculation spreadsheets. Provided senior technical review of the report. Coordinated efforts with two other consulting firms on the project.

Implementation of Ecology's Interim TPH Policy for a Superfund Site, Seattle, Washington—Using Ecology's Interim TPH Policy, evaluated petroleum soil contamination at a property that is part of the Harbor Island Superfund Site. Calculated hazard quotients for direct contact with soil. Using Raoult's Law, predicted groundwater concentrations due to the leaching pathway. The evaluation found that TPH hot spots were unlikely to impact groundwater. The findings were accepted by EPA.

Environmental Compatibility Evaluation for a Wood Products Facility, Washington—For a wood products facility in Washington, performed an environmental compatibility evaluation of several options for managing secondary solids in a waste lagoon. Developed a relative risk scoring method to compare the human health and environmental risks posed by different management options without the need to perform more expensive risk calculations. The method evaluated the presence of exposure pathways and the relative concentration of dioxins and furans for each option. This cost-effective approach provided the necessary information for choosing among the options.

Probabilistic Risk Assessment Work Plan for a Wood Products Facility, Alaska—Participated in the development of a work plan for a probabilistic risk assessment using Monte Carlo modeling for chloroform at a wood products facility in Alaska. The work plan specified the statistical distributions for exposure and toxicity parameters. Investigated toxicological issues associated with chloroform. The work plan was accepted by ADEC.

Baseline Human Health Risk Assessment for a Waste Handling Facility, Washington—Performed a MTCA baseline risk assessment for a waste handling facility in Washington. Evaluated ingestion, inhalation, and dermal exposures to volatile organic chemicals in groundwater. Evaluated transport of groundwater to surface water for impacts on aquatic organisms and humans eating fish. Evaluated volatilization of chemicals from groundwater to ambient air. Ecology accepted the recommendation of no further action.

Baseline Human Health Risk Assessment for a Pesticide Handling Facility, Washington—Performed a MTCA baseline risk evaluation for a pesticide handling facility in Washington. The risk evaluation was structured to comply with requirements of a purchase agreement and to support delisting of the site from Ecology's Hazardous Sites List. Performed extensive data evaluation according to Ecology's statistical guidance. Indicator hazardous substances included alachlor, aldrin, dieldrin, dichloro-diphenyl-dichloroethylene, and DDT. Human exposure pathways included ingestion of, and dermal contact with, soil.

Transport of chemicals to groundwater, surface water, and air were eliminated based on screening evaluations and observations of contamination patterns. Ecology accepted the recommendation of no further action.

Risk Evaluation for an Airport Facility, Washington—Evaluated the risks associated with petroleum contamination in soil according to Ecology’s Interim TPH Policy, using fractionated petroleum data. Exposure pathways included direct contact with soil, residual saturation in soil, leaching to groundwater, and potable use of groundwater. Evaluated travel time for groundwater to reach potential receptor points and natural attenuation during travel.

Endangerment Assessment for a Landfill, Oregon—Participated in CERCLA-focused endangerment assessment for a landfill in Oregon. Calculated risks for ingestion and dermal exposure to metals and volatile organic chemicals in groundwater. Reviewed toxicity literature to evaluate dermal absorption and to discuss uncertainties related to the risk results.

Endangerment Assessment for a Battery Recycler, Oregon—Conducted a CERCLA-focused endangerment assessment for a battery recycler in Oregon. Chemicals of concern included arsenic, cadmium, and lead. Exposure pathways included incidental ingestion of soil and inhalation of airborne particulates. Three receptor populations were evaluated: onsite workers, offsite workers, and young adult trespassers. Used a “disaggregate” biokinetic model to predict workers’ blood-lead levels and compare them with acceptable blood lead levels. Evaluated the acute toxicity of lead to determine the acceptability of lead exposures for the trespasser. Presented the work at a poster session sponsored by the Society of Toxicology.

Baseline Human Health Risk Assessment for a Naval Facility, Adak Island, Alaska—Conducted CERCLA baseline human health risk assessments for seven U.S. Navy sites on Adak Island, Alaska. Chemicals of concern included PCBs, dioxins and furans, PAHs, metals, volatile organic chemicals, and pesticides. Exposure pathways included ingestion of soil and surface water, inhalation of dust, dermal contact with soil, and ingestion of fish and caribou meat. Conducted an extensive literature review to evaluate plant uptake parameters.

Human Health Risk Assessment for an Ore Handling Facility, Skagway, Alaska—Evaluated the health risks associated with consumption of seafood contaminated by lead, mercury, and zinc in harbor water and sediments from ore handling activities in Skagway, Alaska. Used EPA’s Integrated Uptake/Biokinetic model to predict incremental increases in blood-lead levels based on several seafood consumption patterns.

Evaluation of Baseline Human Health Risk Assessment for a Transformer Recycler, Purdy, Washington—Reviewed and evaluated the CERCLA baseline risk assessment for the Strandley-Manning transformer recycling facility in Purdy, Washington. Compared the approach of the risk assessment conducted in 1985 with 1991 guidance. Evaluated the impact of the changes in regulations and guidance on the remedial decision-making for the site. The comparison included methods, assumptions, statistical treatment of data, and

recalculation of some risks. Chemicals of concern included PCBs, dioxins and furans, and 1,2,5-trichlorobenzene. Exposure pathways included ingestion of soil and groundwater, dermal contact with soil, and ingestion of shellfish. Presented the historical comparison at a professional meeting sponsored by the Air and Waste Management Association.

Risk Assessment Technical Support for a Former Arsenal, Commerce City, Colorado—Provided risk assessment support to a state law department for a Superfund site, including technical reviews of nontraditional toxicity assessment and exposure assessment methods used by the U.S. Army. Evaluated equation formats, exposure assumptions, and modeling approaches used to estimate soil intakes and methods of analyzing uncertainty based on EPA guidance and recommendations. The evaluation aided State of Colorado Department of Law's understanding of the results of the nontraditional risk assessment.

Uncertainty Analysis for a Copper Smelter, Tacoma, Washington—Contributed to the uncertainty analysis of the CERCLA baseline human health risk assessment for a copper smelter in Tacoma, Washington. Conducted a sensitivity analysis of the following parameters in the risk assessment: arsenic bioavailability, time allocation between indoors and outdoors, exposure duration, soil and dust concentrations, and half-life of arsenic in soil. Supervised the comparison of EPA's LEAD4 and LEAD5 Integrated Uptake/Biokinetic models.

Baseline Human Health Risk Assessment for a Naval Facility, Bremerton, Washington—Supervised a CERCLA baseline human health risk assessment for three sites at a naval housing complex near Bremerton, Washington. Contributed the toxicity assessment section, including analysis of dermal absorption data. Chemicals of concern included metals, PAHs, and ordnance. Exposure pathways included ingestion of soil, sediment, and surface water; dermal contact with soil, sediment, and surface water; and ingestion of crabs and bivalves.

Baseline Human Health Risk Assessment for a Naval Facility, Bangor, Washington—Supervised a CERCLA baseline risk assessment for two sites on a submarine base in Bangor, Washington. Contributed the toxicity assessment section, including analysis of dermal absorption data. Chemicals of concern included metals, PCBs, dioxins and furans, benzene, and PAHs. Exposure pathways included ingestion of soil and groundwater, dermal contact with soil and groundwater, inhalation of suspended particulates, and inhalation of volatiles from groundwater.

Baseline Human Health Risk Assessment for a Plating Facility, Portland, Oregon—Supervised CERCLA baseline risk assessment for a metal plating facility in Portland, Oregon. Analyzed dermal sensitization data for nickel and chromium. Chemicals of concern included metals, PAHs, chloroform, and carbon tetrachloride. Exposure pathways included ingestion of soil and groundwater, dermal contact with soil, inhalation of suspended particulates, and inhalation of volatiles from groundwater.

Environmental Impact Report for a Sewage Outfall, Los Angeles, California—Evaluated and compared human health risks associated with consumption of seafood from various areas

in Santa Monica Bay, California, and background reference locations. Reviewed the literature and summarized the spatial distribution of tissue concentrations of metals and organic compounds in seafood. Chemicals of concern included cadmium, lead, mercury, PAHs, PCBs, and DDT. Contributed to the environmental impact report for the Hyperion full secondary sewage outfall.

MTCA Regulatory Expertise

Risk Assessment Work Plan for Low-Level Waste Facility, Richland, Washington—Developed a work plan for performing risk assessment and determining cleanup levels for an RI/FS under MTCA for a commercial low-level radioactive waste disposal site in Richland, Washington. Performed a regulatory analysis of the site and identified MTCA compliance options. To focus risk assessment efforts and reduce the RI/FS budget, identified a bounding exposure scenario that would yield the most conservative risk results. Provided input to the sampling and analysis plan to ensure sampling results would be compatible with the needs of the risk assessment. Coordinated with Ecology staff members to address their concerns throughout the development of the work plan.

Remedial Investigation/Feasibility Study for a Brownfields Site, Bellingham, Washington—Provided technical support for an RI/FS at a park located next to a Superfund site. Developed a work plan, including a data gap analysis and a tiered analytical approach to reduce analytical costs without compromising the completeness of the database. Evaluated site data and selected indicator hazardous substances according to MTCA. Produced the remedial investigation report. Provided technical oversight of EPA's engineering evaluation/cost analysis on behalf of the city. Participated in meetings with the city, state, EPA, and community stakeholders to address administrative and technical concerns throughout the process.

MTCA vs. CERCLA Workshops, Richland, Washington—Provided regulatory support in evaluating issues related to complying with both MTCA and CERCLA at the Hanford nuclear reservation. Conducted an extensive side-by-side comparison of remedial investigation/feasibility study and risk assessment requirements between CERCLA and MTCA. Interviewed personnel to identify regulatory questions and issues affecting progress on projects. Presented a series of workshops to Fluor Hanford and Department of Energy personnel to discuss regulatory issues of concern. Participated in developing a white paper recommending approaches to resolve key regulatory issues.

MTCA Regulatory Support, Richland, Washington—Assisted a U.S. Department of Energy contractor in responding to comments on a baseline human health risk assessment by providing MTCA regulatory expertise and negotiating with Ecology to find ways of incorporating MTCA requirements into the CERCLA risk assessment. In a separate effort, provided regulatory review of a draft document providing the technical and regulatory justification required by MTCA for an alternative leaching model.

Cleanup Levels and MTCA Regulatory Compliance for Terminal 117, Seattle, Washington—Provides risk assessment and MTCA regulatory compliance support for the engineering

evaluation/cost analysis of the Terminal 117 early action area in the Lower Duwamish Waterway Superfund Site. Determines MTCA cleanup levels, assists in design of upland sampling efforts, and provides strategic regulatory compliance support. Successfully negotiated a higher PCB soil cleanup level than the value proposed by Ecology, which will lead to reduced remediation costs.

Risk Assessment and Toxicological Support for an Airport, SeaTac, Washington—For a commercial airport in western Washington, calculated soil cleanup levels for more than 30 chemicals based on the leaching pathway, using Ecology’s MTCASGL10 spreadsheet. Provided toxicological support for a groundwater study. Attended a meeting of Ecology’s Area-Wide Contamination Task Force, which studied regional, low-level arsenic contamination, and summarized the issues discussed.

Risk Assessment Support for a Bulk Fuel Terminal, Edmonds, Washington—Provided risk assessment and MTCA regulatory support for a bulk fuel terminal contaminated with petroleum and metals. Remediation was conducted in two phases on different portions of the site. Evaluated the technical issues surrounding the development of MTCA surface water cleanup levels for protection of both human health and ecological receptors. Performed two terrestrial ecological evaluations. Developed Method B groundwater cleanup levels based on protection of surface water and soil cleanup levels based on direct contact, protection of groundwater, and protection of ecological receptors. Modeled the leaching pathway for TPH and arsenic. Evaluated statistical correlations between arsenic and antimony in soil. Evaluated composition patterns of TPH in groundwater. Advised on statistical issues related to compliance sampling. Drafted a fact sheet for distribution to the local community. Participated in meetings with attorneys and regulators to resolve technical and regulatory comments. The first phase has been completed, Ecology has granted no further action, and the property has been redeveloped for residential land use. Remediation is ongoing for the second phase of the project.

Cleanup Levels for a Marine Transportation Facility, Seattle, Washington—Determined cleanup levels for soil, groundwater, and surface water, and designed an argument for no further action under MTCA at a marine transportation facility. Evaluated area background contamination patterns to determine which contaminants were site-related. Conducted statistical analyses to determine whether site concentrations were in compliance with the cleanup levels. Evaluated transport from soil to groundwater and from groundwater to surface water. Indicator hazardous substances included TPH, PCBs, PAHs, and metals. Ecology granted no further action for site soils.

Groundwater Cleanup Levels for Landfill, Yakima, Washington—Determined groundwater cleanup levels and wrote content for cleanup levels and conceptual site model sections of the feasibility study report for a landfill undergoing MTCA cleanup in Yakima, Washington. Advised project manager on strategies for achieving no further action. Feasibility study has been submitted to Ecology.

Evaluation of Petroleum Risk Assessment Methods, Washington—Participated in Ecology’s TPH Subcommittee to provide technical review of risk-based methods for evaluating petroleum.

Participated in the 2001 Washington Policy Advisory Committee's Risk Assessment Subcommittee by running a case study evaluating several approaches for modeling the soil-to-groundwater pathway for a retail gas station. Ran a case study evaluating the American Society for Testing and Materials risk-based corrective action fractionation approach for evaluating TPH mixtures.

Cleanup Levels

Sediment and Shellfish Criteria for a Petroleum-Contaminated Beach, Washington—Managed a risk assessment support project for a Native American tribe in the Puget Sound region of Washington State. An oil spill washed ashore on a beach and marsh used by tribal members for subsistence shellfish collection and traditional cultural activities. Assessed exposures to carcinogenic and noncarcinogenic PAHs in shellfish and sediments. Evaluated toxicity and bioavailability of PAHs. Advised the tribe on safety of beach use and appropriate exposure control measures. Produced public outreach communication materials. Participated in negotiations to determine shellfish reopening criteria with multiple stakeholders, including Washington departments of Ecology and Health, National Oceanic and Atmospheric Administration, and representatives of the responsible party. The criteria recognized the unusually high shellfish consumption rate of the tribe and subsistence lifestyle activities.

Risk Assessment Support for Retail Gas Stations, Washington and Idaho—Provided risk assessment/regulatory support for cleanups at multiple gas station sites in Washington and Idaho. Determined MTCA Method B soil cleanup levels for direct contact, protection of groundwater, and protection of ecological receptors for multiple stations in Washington. Prepared Tier 2 risk-based corrective action evaluations for two stations in Idaho. One site in Idaho and one site in Washington have received no further action. Regulatory responses or additional remediation are pending on the other sites.

Soil and Groundwater Cleanup Levels for a Chemical Manufacturer, Oregon—Developed RCRA soil and groundwater cleanup levels for volatile organic chemicals at a chemical manufacturer in Oregon. Used EPA's spreadsheet system based on the Johnson and Ettinger model to evaluate the volatilization of chemicals from groundwater and soil to indoor air and air in a trench. Contoured risk by sampling location. Evaluated risks and air cleanup levels for emissions from the groundwater treatment system.

Literature Review of Sediment Cleanup Levels for a Chemical Manufacturer, Washington—Reviewed the toxicological literature for exotic chemicals and for sediment screening methods for a chemical manufacturer in Washington. Because the toxicological literature was sparse for the exotic chemicals, a simple classification scheme using acute toxicity was developed based on state regulations and literature sources, and the chemicals were compared based on relative toxicity. The following sediment screening methods were compared: apparent effects threshold, bioeffects/contaminant co-occurrence analyses, equilibrium partitioning, effects range low, background concentrations, screening level concentration, sediment quality triad, spiked sediment bioassay, and tissue residue.

Comparisons considered practical issues related to implementing the method, such as the availability of data; broadness of applicability to multiple chemicals and multiple sites; confidence in the method; and the strength of the biological basis of the method. The effects range low method, developed by the National Oceanic and Atmospheric Administration, was selected as the most useful for initial screening purposes. Presented the work in a poster session sponsored by the Society of Toxicology.

Soil Cleanup Levels for a Metal Plating Facility, California—Determined CERCLA soil cleanup levels based on direct human contact for lead, copper, and petroleum hydrocarbons for a metal plating facility in California. Used EPA's Integrated Uptake/Biokinetic Model to develop the cleanup level for lead. The cleanup levels supported a finding of no further action from the local health agency.

Evaluation of Soil Cleanup Criteria for a State Regulatory Agency, Oregon—Reviewed, summarized, and evaluated the methodologies for establishing soil cleanup levels for hazardous waste sites used by three states and EPA's RCRA program. Analyzed and compared the assumptions used for standardized risk assessment procedures. Applied the four approaches for establishing cleanup levels to three case studies and compared the results. Developed a reference dose for lead to be used for the purposes of the case studies. The study assisted the Oregon Department of Environmental Quality in designing its state hazardous waste cleanup program.

House Dust and Soil Cleanup Levels for an Ore Handling Facility, Skagway, Alaska—Evaluated risks associated with lead ore contamination from ore handling activities in Skagway, Alaska, and recommended cleanup levels for lead in house dust and industrial, residential, and garden soils. Reviewed the toxicology of lead and other contaminants and summarized the environmental fate of lead in soils. Recommended methods for sampling and cleaning contaminated houses.

Soil Cleanup Levels for a Pesticide Handling Facility, Boise, Idaho—Conducted a quick turnaround risk assessment and recommended emergency soil cleanup levels for aldrin, dieldrin, and heptachlor for an agricultural chemical facility in Boise, Idaho.

Toxicology

Review of Provisional Peer Reviewed Toxicity Values, Nationwide—Reviewed four manuscripts for provisional peer reviewed toxicity values for the National Center for Environmental Assessment. The manuscripts included oral reference doses and slope factors and inhalation reference concentrations and unit risks. The reviews covered technical adequacy, adherence to standard methodologies, and editorial quality.

Lead Toxicology and Bioavailability, Colorado—For a mining company, reviewed and summarized the 2005 draft ATSDR Toxicology Profile and the 2005 draft Air Quality Criteria Document for lead, focusing on health effects reported at blood lead levels below 10 µg/dL. Evaluated the results of bioaccessible fraction studies and calculated relative oral bioavailability values for lead in soils in a mining town in Colorado.

Product Toxicity Evaluation for a Railroad Company, Alaska—Participated in a product substitution evaluation for a railroad company in Alaska. Reviewed and ranked the acute toxicity and carcinogenicity of products used at their facilities to identify the products with the highest health hazards, which were candidates for substitution.

Toxicity Assessment for a Mine Tailings Site, Midvale, Utah—Provided toxicological litigation support to a state department of health for a Superfund site. Reviewed the literature and summarized the current issues concerning the health effects of lead. Evaluated the uncertainties associated with several methods of determining the noncarcinogenic dose-response relationship for lead.

Toxicity Evaluation of Propylene Glycol Dinitrate, Washington State—Developed a noncarcinogenic toxicity reference value for propylene glycol dinitrate, the main component of the torpedo propellant Otto Fuel. Reviewed the toxicological literature and evaluated toxicity. Calculated several reference values using alternative methods and assumptions. Coordinated with EPA on the choice and use of the reference value for calculating risks.

Metabolism of Methyl Parathion in Rat Hepatocytes—Evaluated the metabolism of methyl parathion in isolated hepatocytes and several subcellular fractions by comparing the production of toxic and detoxified metabolites. Determined the differences in metabolism among the various cellular and subcellular preparations. Developed a high-performance liquid chromatographic method for separating, identifying, and measuring the parent compound and five metabolites.

Toxicity of Bromoform in Mytilus edulis—Studied the toxic effects of bromoform on the gill morphology of the mussel *Mytilus edulis* using scanning and transmission electron microscopy.

Removal Projects

Superfund Removal at a Junkyard, Spokane, Washington—Served as the project manager supervising four people for the EPA Superfund removal at the Corigliano junkyard site. Collected more than 1,000 soil samples at the transformer recycling and junkyard facility for rapid turnaround analyses for lead and PCBs. Modeled contamination patterns and monitored worker exposures. Project received the highest possible rating from the client.

Superfund Removal in a Lead Smelting Community, Kellogg, Idaho—Served as the interim project manager supervising four people for the EPA Superfund removal in Kellogg, Idaho, and surrounding communities for one summer. Lead smelting activities had contaminated a 26-square-mile area. Conducted ambient air monitoring, worker exposure monitoring, and soil sampling and analyses for lead. Project received the highest possible rating from the client.

Superfund Removal at a Transformer Recycler, Rathdrum, Idaho—Participated in the EPA removal action at the ARRCOM transformer recycling facility in Rathdrum, Idaho. Wrote site safety plan and participated in sampling four large tanks in Level B protection. Used

nitrogen to inert the atmosphere prior to the subcontractor welding one tank with unknown contents. Provided oversight for the removal contractor. Primary chemicals of concern were PCBs and metals. Performed confirmation sampling at the end of the removal using EPA's Contract Laboratory Program.

PUBLICATIONS

(P. Tomlinson also published as P. Zieber and P.N. Anderson.)

Peterson, J.A., M. Reilly, T.L. Foster, and P.A. Zieber. 1997. Ecological risk assessment at an Alaska airport. Chapter 13. In: *Contaminated Soil*, Volume 2. P.T. Kostecky, E.J. Calabrese, and M. Bonazountas (eds). Amherst Scientific Publishers, Amherst, MA.

Anderson, P.N., D.L. Eaton, and S.D. Murphy. 1991. Comparative metabolism of methyl parathion in intact and subcellular fractions of isolated rat hepatocytes. *Fundam. Appl. Toxicol.* 18:221-226.

Anderson, P.N. 1986. Metabolism of methyl parathion in isolated hepatocytes and subcellular fractions. Masters thesis. University of Washington, Seattle, WA.

Anderson, P.N., D.L. Eaton, and S.D. Murphy. 1985. Analysis of methyl parathion metabolites with reverse phase ion-pair high-performance liquid chromatography. Abstract. *The Toxicologist* 6:80.

DeRoos, R.L. 1985. Environmental health risk assessment work force competencies and education. American Public Health Association Environment Section. Primary participant in researching and writing report submitted to U.S. Department of Health and Human Services Bureau of Health Manpower and Centers for Disease Control and Prevention National Institute for Occupational Safety and Health.

INVITED PRESENTATIONS/COURSES

Use of MTCA Spreadsheets, Northwest Environmental Training Center, Seattle, Washington—Ongoing contract beginning in 2002 to present 6 hours of material in a training course on the Excel spreadsheets provided by Ecology to calculate direct contact soil cleanup levels and implement the three- and four-phase leaching models specified by MTCA. The course targets project managers and environmental professionals. Topics include theoretical basis for the calculations; obtaining appropriate data for input to the spreadsheets; preparation of data for input; interpretation of results; and alternatives to the spreadsheets. Provide data sets for students to use in hands-on exercises. The courses consistently receive good reviews.

Introduction to MTCA and Cleanup Levels under MTCA, Northwest Environmental Training Center, Seattle, Washington—Ongoing contract beginning in 2001 to present 12 hours of material in a 3-day series of two training courses on MTCA. The courses target project managers and environmental professionals. Topics include qualifying for Methods A, B, and C; determining beneficial uses of surface water, groundwater, and soil; cleanup levels

for surface water, groundwater, and soil; soil cleanup levels for protection of groundwater; and the terrestrial ecological evaluation. Provide case studies for students to evaluate. The courses consistently receive good reviews.

Risk Assessment in MTCA, Northwest Environmental Training Center, Seattle, Washington—Presented 4 hours of material during a training course on the 2001 revisions to MTCA. The course targeted project managers and environmental professionals. Topics included risk assessment methods for carcinogens and noncarcinogens, cleanup levels for carcinogens and noncarcinogens, chemicals with unusual toxicological features, human health risk assessment features in the revised MTCA, and the terrestrial ecological evaluation. The course received good reviews from students.

Introduction to MTCA, Northwest Environmental Training Center, Seattle, Washington—Ongoing contract to present 2 hours of material during a training course on the 2001 revisions to MTCA. The course targets project managers and environmental professionals. Topics include an overview of cleanup levels for soil, groundwater, and surface water; and soil cleanup levels for protection of groundwater. The courses consistently receive good reviews.

Risk Communication, U.S. Navy, Washington—Presented a lecture on risk communication to 15 U.S. Naval Base Commanders for the Pacific Northwest Region. The half-hour briefing targeted information needs of high-ranking officers commanding naval facilities. The program was designed to improve risk communication skills and to provide tools for making risk communication decisions and moderating public meetings. The lecture received excellent reviews.

Risk Assessment in MTCA, Lacey, Washington—Presented a 2-hour training session on the use of risk assessment in MTCA to Ecology's Toxics Cleanup Section. The presentation included a conceptual discussion of risk assessment, conceptual explanation of the derivation of cleanup levels under MTCA, and comparison of the roles of risk assessment in MTCA and CERCLA.

Risk Assessment, Cancer and Carcinogenesis, Shoreline Community College, Shoreline, Washington—Acted as a guest lecturer for 2 years in a course titled "Hazardous Materials Health Effects." Presented two 2-hour lectures on the topics of cancer and carcinogenesis and risk assessment, respectively. Provided class study problems and test questions and answers to the course teacher.

PRESENTATIONS/POSTERS

(Note: P. Tomlinson published as P. Zieber and P.N. Anderson.)

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.

Zieber, P., A. Cardenas, R. Schoof, and T. Ostrom. 2006. Traditional tribal lifeways exposure scenario for an oiled beach in the Pacific Northwest. Poster presented at the Toxics in Puget Sound Forum, April 5, and the Pacific Northwest Society of Environmental Toxicology and Chemistry Conference, April 13–15, Port Townsend, WA.

Preziosi, D.V., P. Zieber, and R. Schoof. 2004. Savvy strategies and informed decisions—getting the most bang for your buck in Brownfields risk assessment. 2004 USEPA Brownfields Meeting, St. Louis, MO.

Zieber, P. 1995. Review of methods for establishing sediment quality criteria. Poster presented at International Congress of Toxicology, Seattle, WA.

Zieber, P., and J.A. Peterson. 1995. Case study of an ecological risk assessment for King Salmon Airport, Alaska. Poster presented at International Congress of Toxicology, Seattle, WA.

Zieber, P., T.L. Foster, and J.J. McKenna. 1995. Methodology for deriving lead cleanup levels at industrial sites. Poster presented at International Congress of Toxicology. Seattle, WA.

Anderson, P.N. 1993. Historical reevaluation of a risk assessment. Paper presented at Air and Waste Management Association annual meeting, Denver, CO.

DeRoos, R.L., and P.N. Anderson. 1984. Environmental health risk assessment work force characteristics and training needs: Definition and scope: A framework for discussion. Paper presented at American Public Health Association annual meeting in Anaheim, CA.