



Torgny J. Vigerstad, Ph.D., P. Biol.

**Science Director
Emergency & Environmental Claims Management Ltd.**

Professional Designations

P. Biol.(Professional Biologist – Alberta Society of Professional Biologist (ASPB))

Professional Affiliations

American College of Toxicology - Full Member
Society of Environmental Toxicology and Chemistry
American Conference of Government and Industrial Hygienists (ACGIH) – Associate Member
Nova Scotia Environmental Industry Association

- Past-President (1999–2000)
- President (1998–1999)

Canadian Environment Industry Association

- Board Member (1999–2000)

Academic Appointments

- Honourary Adjunct Professor, School for Resource and Environmental Studies, Dalhousie University, Halifax, Nova Scotia. 1992–2010
- Research Associate, l'Université de Moncton, Moncton, New Brunswick. 1997–2000
- Board Member, Administrative Board for the Certificate Program in Environmental Management, DalTech at Dalhousie University. 1993–1999
- Adjunct Professor, Environmental Health Sciences Department, University of South Carolina. 1982–1983

Invited Participation

- Member of the Atlantic Insurance Bureau of Canada's Oil Spill Remediation Committee.
- Member of the NSERC Research Partnerships Program Panel Reviews, 1998–2001: Reviewer and Site Visit Panel Member for the *Metals in the Environment Program (MITE)*
- Member of the NSERC Strategic Grants Panel D: *Environmental Technologies*, 1999–2002
- Reviewer for the Canadian Environment Industry Association document, *A Science Assessment Document for Ground-level Ozone: A Report by the Federal-Provincial Working Group on Air Quality Objectives and Guidelines*; April, 1999

Fellowships and Awards

- Oak Ridge Associated Universities Fellow
- Honors in Biology, Upsala College

Education

- Ph.D. Biology, 1980, University of Rhode Island, Kingston, Rhode Island
- M.Sc. Zoology, 1974, University of Rhode Island, Kingston, Rhode Island
- B.Sc. Biology, 1971, Upsala College, East Orange, New Jersey

Continuing Education

Fundamentals of Restoration. Insurance Institute Seminar, Halifax. N.S. December 1, 2006
R.B.C. A. Risk Based Corrective Action Seminar. Insurance Bureau of Canada and Nova Scotia Environment & Labour. November 28, 2006.

Advanced Forum on Identifying, Managing and Preventing Mould Claims. The Canadian Institute, Toronto, Ontario, April 27-28, 2005..

Environmental Toxic Torts&the Insurance Industry. ExecuSummit, Hotel Pennsylvania, New York, New York, March 31, 2005

Mould, Muck and Toxins. – Environmental Losses and Litigation. CIP Society of Ontario, Insurance Institute of Ontario. Mar 2, 2005.

Mould Remediation: The National Quest for Uniformity Symposium, American Conference of Governmental and Industrial Hygienists (ACGIH), Orlando Florida, CM Points 3.0, November 3-5, 2003

Atlantic RBCA Training Seminar, N.S. Environmental Industry Association, Halifax N.S., May 26-27, 2003.

National Forum on Toxic Mould Claims, A Comprehensive Guide to the Latest Legal, Insurance and Scientific Developments, The Canadian Institute, Toronto, Ontario, December 8-9, 2002

Mold, Moisture & Remediation Workshop, American Conference of Governmental and Industrial Hygienists (ACGIH) , Cincinnati, Ohio, CM Points 4.0 IH, November 18-21, 2002

- National Contaminated Sites Training Program: 8-Hour Refresher Hazardous Waste Operations (HAZWOPER) Training Course, Dartmouth, Nova Scotia, February, 2002.

- National Contaminated Sites Training Program: 8-Hour Refresher Hazardous Waste Operations (HAZWOPER) Training Course, Waverly, Nova Scotia, March 2000.

- The Atlantic Risk Based Corrective Action (RBCA) Training Program, Moncton, NB, December 1 & 2, 1998

- Adjustment of TLVs to Accommodate Specific Conditions in the Workplace. Technical Session - Fall 1998; AIHA Atlantic Provinces Section, Moncton, New Brunswick; November 20, 1998.

- National Contaminated Sites Training Program: 40-Hour Contaminated Site Health and Safety Training Course. Water Technology Corporation, Halifax Nova Scotia; May 1997. This course satisfies general Canadian (Federal and Provincial) and U.S. (29 CFR 1910.120, "HAZWOPER") health and safety training requirements for contaminated site workers.

- Advanced Commercial Mediation. Atlantic Provinces Arbitration and Mediation Institute, Halifax, Nova Scotia; November 8–10, 1995.

- Generic Mediation Training – Level I. Atlantic Provinces Arbitration and Mediation Institute, Halifax, Nova Scotia; June 20–23, 1995.

- Environmental Mediation Issues. Winter Semester, Continuing Education Division, Technical University of Nova Scotia; 1995.

- A Short Course on Product Life-Cycle Assessment: Concept, Methods, and Applications. Annual Meeting; Society for Environmental Toxicology and Chemistry (SETAC), Cincinnati, OH; November 8, 1992.

- Seminar on Indoor Air Quality. Continuing Education Centre, Technical University of Nova Scotia; September 22, 1992.
- Environmental Toxicology. U.S. National Institutes of Health Foundation for Advanced Education in the Sciences, Bethesda, MD; January–May, 1985.
- Essentials of Toxicology. U.S. National Institutes of Health Foundation for Advanced Education in the Sciences, Bethesda, MD. A 3-credit course recognised for medical school in the State of Maryland; September–December, 1984.
- Toxic Substances Policy. U.S. National Institutes of Health Foundation for Advanced Education in the Sciences, Bethesda, MD; January–May, 1984.

Employment

Present Science Director, Emergency & Environmental Claims Management Ltd.
 2000- 2014 Director for Scientific Investigations, EFI Global (formerly Environmental Solutions™ Remediation Services.) A division of Cunningham Lindsey Claims Services Canada Limited

- 1996-2000 President, Bio-Response Systems Limited, Halifax, NS
- 1987-1996 Director of Technical Services, Bio-Response Systems Limited, Halifax, NS
- 1985-1987 Associate Scientist, Thomas and Thomas Technologies Limited, Arlington, VA
- 1983-1985 Senior Scientist, Labat-Anderson, Inc., Rosslyn, VA
- 1982-1983 Consulting Biologist, Columbia, S.C.
- 1980-1982 Project Manager, South Carolina Energy Research Institute, Columbia, S.C.
- 1978-1980 Project Scientist, South Carolina Energy Research Institute, Columbia, S.C.
- 1977-1978 Biologist, E.I. duPont deNemours, Inc., Aiken, S.C.
- 1974-1977 Researcher, Savannah River Laboratory, Aiken, S.C.

CURRENT RESPONSIBILITIES AND EXPERIENCE

INSURANCE RELATED CLAIMS

Regular Responsibilities:

Responsible for field assessments and writing of regulatory reports for home heating oil loss claims - over 70 projects completed in Atlantic Canada in the last two years

Provide scientific advice, scientific reviews and cost audits to adjusters in 9 of 10 Provinces in Canada on home heating oil remediations – provided peer review and expense audits for files in Ontario worth over 3 million dollars

Provide scientific advice, sampling and direction of remediation efforts for over 100 mold claims across Canada – provide peer reviews for reports for mold related claims - interviewed and quoted in the magazine Canadian Adjuster concerning mold claims – responsible for scientific investigation of a material believed to be anthrax (it was wall board dust!).

Provide communication services for claims involving multiple chemical sensitivity and assessment of claims of adverse health effects from exposure to chemicals and molds.

Provide advice and direction for assessment and communications of sewage releases into freshwater environments from municipal systems.

Responsible for developing training materials and delivering technical education and training for field investigators and remediation managers for petroleum spills and mould investigations.

Provision of Expert Opinion for Litigation Involving The Determination of the Source, Cause and Age of Petroleum Contamination at a Residential Property in Halifax, N.S..

A homeowner noticed the odour of fuel oil in the basement of the home. What appeared to be a small leak was discovered to have migrated to the adjacent property. The investigation required review of all available data to determine the source of the petroleum hydrocarbon contamination, including the identification of any alternative originating sources, contracting for metallurgical services to determine the approximate age of a crack in the oil line, the calculation of mass balance to determine the approximate amount of petroleum lost and the aging of the petroleum using standard chemical techniques to demonstrate the period of time over which the leak had occurred. (Client is Heustis Rich for Meloche Monex, April 2005 to present).

Provision of Expert Opinion and Completion of a Remedial Action Plan for the Former CP Railyard, Kentville, N.S

The Mayor and Council of the Town of Kentville requested advice from Environmental Solutions Remediation Services (ESRS) on whether or not the Town should assume ownership of an abandoned railroad repair facility owned by the Canadian Pacific Railway. ESRS completed a quantitative human and environmental risk assessment which was used by the Town to form a decision. Following purchase of the property, ESRS developed and completed a phased Remedial Action Plan (which included public consultation) for the Town which can be funded by further sale of lands and tax revenues. A portion of the purchased property has already been sold to a developer and the remaining remedial actions will begin in the summer of 2007 and are ongoing. To this date, this "Brownfield" development program has received no Provincial or Federal funding. (Client is Town of Kentville, N.S., 2004 to present)

PAST EXPERIENCE

LEGAL

Provision of Case Management Assistance for Litigation Involving Alleged Mold Damage to a Building from Faulty Windows Installation in a Commercial Property.

A commercial office building was completely renovated. Several years later, windows were discovered to be leaking, as well as the roof and other parts of the building. Investigation revealed mold in various parts of the building and, upon advice from an engineering firm, the building was evacuated and completely gutted and rebuilt. We are assisting the defendants attorney in evaluating the available information to determine if evacuation was justified, if the quantum for remediation was justified and if there was evidence that any errors in installation that would have led to water intrusion such that the alleged damage would have been created. (Client is Cox & Palmer, Fredericton, N.B.)

Provision of Expert Opinion Concerning a Workers Compensation Claim

A shipyard painter developed Aspergillosis during a period of time when he was painting in a confined space of an oil rig in dry dock. His claim for Workers Compensation was repeatedly denied. Based on the medical evidence in the file and a review of the published medical and nautical technical literature, an Injury Investigation, Exposure Investigation and an Injury Characterization were completed and an opinion provided. The opinion was presented to the Workers Advisory who was then able to reopen the case. The worker's injury was recognized as a result of the report. (Client was Cox and Palmer, Halifax)

Provision of Expert Opinion for Litigation Involving Alleged Human Health Effects from Exposure to Mould in a Home.

Preparation of an Affidavit for submission to Superior Court of Justice in Ontario and follow-up letter report for litigation involving the claim of adverse human health effects and the need to evacuate the home by a homeowner who had windows installed that were alleged to have leaked to cause mold to form in the house. The claim for human health effects was withdrawn. In the trial to determine the responsibility for the cause of water damage and subsequent mould I was certified and gave evidence as an expert in:

- (a) biology with expertise in the toxicology of mould
- (b) mould assessment and its relationship to the existence of moisture
- (c) proper evaluation and documentation of the origin and cause of mould growth
- (d) supervision of mould remediation
- (e) assessment of health effects from exposure to chemicals and mould

(Tompkins v. Sunview Home Improvement: Client is McCarthy Tetrault LLP, Toronto, Ontario)

Investigation of Multiple Employee Exposures for an Appeal to the Workers' Compensation Review Board

Nurses working in a dialysis facility in a Nova Scotia hospital claimed various skin and respiratory injuries related to exposures to chemicals due to improper workplace practices and improper ventilation. The investigation included a review of the air handling system in the employee's work area, documentation of the conditions leading to exposures, and a summary of the toxicology of the chemicals of concern. All of this information was synthesized into a report which was submitted to the Workers Compensation Review Board. I was then certified as an expert before a Review Panel. Recognition for injury was given but compensation was denied. (Client: The Nova Scotia Workers' Advisers Program. Completion date: Spring 2003)

Assessment of Potential Exposure to Children at a School, Located Nearby to a Petroleum Refinery Carla Berry et al. v. Vista School Board and Her Majesty the Queen in Right of Newfoundland

Local parents sued the School Board to prevent their children from being sent to an elementary school nearby to a petroleum refinery. They were concerned for the children's health and safety. I provided expert opinion on behalf of the parents on the risk to human health using recent air quality monitoring data provided by the refinery and government. (Client: Goodland O'Flaherty, St Johns Newfoundland, Spring 2001)

An Investigative Process to Determine the Relationship of a Reported Work Injury to Environmental Factors in the Workplace

The Nova Scotia Workers' Advisers Program asked for an investigative process to be designed that could be used in claims of injury due to workplace exposure to chemical or other agents. I was also asked to apply the process to a previously rejected current claim, to determine if further investigation of the claim was warranted. I designed a four-step process that uses a process of elimination and standard toxicological methods to determine whether or not an injury or illness is as likely as not to result from workplace exposure. Comparison of the process to the physician's investigation methods used in the rejected claim demonstrated that further investigation of the claim was warranted. (Client: The Nova Scotia Workers' Advisers Program. Completion date: September, 1998)

Toxicological Review and Analysis of Pesticide Exposure for a Workers' Compensation Claim

A worker in New Brunswick claimed that his skin disease was the result of exposure to pesticides during his period of employment as a pesticide applicator. I reviewed the issues related to diseases of the skin and the application of pesticides, and provided the worker's law firm with a preliminary analysis of the technical aspects of the case. (Client: Petrie Richmond and Goss, Barristers and Solicitors, Fredericton, NB. Completion date: June, 1998)

Investigation of Employee Exposure for an Appeal to the Workers' Compensation Review Board

A hospital recovery room nurse appealed the denial of her claim for Workers' Compensation. My investigation in support of her appeal concluded that she was exposed to anaesthetic gases in her workplace. The investigation included a review of the air handling system in the employee's work area, documentation of the conditions leading to her exposures, and a summary of the toxicology of anaesthetic gases. All of this information was synthesized into a report which was submitted to the Workers Compensation Review Board. I was then certified as an expert before a Review Panel. A bench-decision for the claimant was given. (Client: The Nova Scotia Workers' Advisers Program. Completion date: September, 1997)

Site Investigation of 17 Parkdale Drive, Sydney River, NS

A legal firm asked for an evaluation of the extent of lead contamination in a home exposed to nearby sandblasting of the exterior of petroleum storage tanks. I reviewed all available documentation of the incident, designed and carried out a sampling of indoor surfaces and surrounding property of the house for lead, advised on blood sampling protocols for the family and reviewed the results, wrote a detailed report of the assessment of health and trespass issues, and provided advice on negotiation with the company accused of causing the contamination. The company agreed to compensate the family and remediate the property. (Client: Requested by the homeowner and submitted to Douglas J. Livingstone, Barrister, Dartmouth, NS. Completion date: Spring, 1998)

Litigation Support

A U.S. company produces a product which has been the subject of ongoing litigation for potential adverse health effects. The company requires expert review of the relevant toxicological literature on a ongoing and on an as-needed basis. I produced ten written reports on various aspects of the toxicology of complex mixtures, and five databases reviewing 300 published papers on various aspects of the toxicology of specific complex mixtures. (Client: Confidential; subcontract with Thomas and Thomas Technologies, Limited, Arlington, VA. Completion date: June 1992)

Worker's Compensation Cases Re: Petroleum Refinery Solvents

A worker at an Irving Oil refinery in Saint John, New Brunswick claimed liver damage as a result of occupational exposure and requested Worker's Compensation. I reviewed the case file, the medical records and the toxicology of the compounds in question, and provided written expert opinion that was accepted by the Workers' Compensation Review Board. (Client: Petrie Richmond and Goss, Barristers and Solicitors, Fredericton, NB. Completion date: March, 1995)

Support of Discovery Regarding Hazardous Waste Litigation

Hazardous waste ("Superfund") sites were often owned and operated by U.S. Federal Agencies. In this case, a lawsuit was brought by homeowners against the U.S. Navy as a result of the contamination of drinking water by chlorinated solvents. The case involved over 200 plaintiffs. I reviewed the medical records of all 200 plaintiffs, screened out medical conditions unlikely to be associated with exposure to chlorinated solvents, and produced a database which cross-referenced relevant medical issues of each plaintiff with potential levels of exposure to chlorinated solvents. This database, along with expert toxicological evaluation, was used to guide the legal team during Discovery and to determine the need for further Expert Witness support. (Client: Confidential; subcontract with Thomas and Thomas Technologies, Limited, Arlington, VA. Completion date: June, 1990)

Exposure of a Homeowner to Malathion

Expert evaluation and testimony was solicited on behalf of a pesticide applications firm in its defense against a claim for chronic injury as a result of accidental over-application of Malathion in a home. I reviewed the case records and did an exposure evaluation based on the pesticide application records. I reviewed the toxicological literature on Malathion and produced a dose-response assessment. I then put that information into layman's language, using visual aids.

(Client: Confidential; subcontract with Thomas and Thomas Technologies, Limited, Arlington, VA. Completion date: February, 1990)

Provision of Expert Opinion in Numerous Single Plaintiff Cases

I provided the background research and documentation for expert testimony in the following cases.

Exposure of Workers to:

- Chlorine
- Paint Fumes
- Sulfuric Acid Fumes
- Nickel Compounds by Inhalation
- Exposure of a Homeowner to Malathion
- Proposed Uses of Pesticides by Federal Agencies
- The Toxicology of Heroin

- Animal Models of Inhalation of Complex Mixtures such as Cigarette Smoke and Petroleum Hydrocarbons
- Exposure to Solvents in the Drinking Water of Homeowners
- Heavy Metals in Mine Tailings
- The Toxicology of DPT Vaccinations

(Client names for this service are confidential.)

ENVIRONMENTAL MANAGEMENT

Site Professional - Decommissioning of a Former Disposal Facility for Ash from a Power Plant Fueled by Bunker C Oil.

A storage facility created in the 1970's contained ash with unusually high concentrations of leachable vanadium was identified for decommissioning. Using the process of the CCME (1991) Guidelines for the Decommissioning of Industrial Sites as a model, the history of the facility and a detailed assessment of the quantity and quality of the soils, groundwater and surface water was completed. A cost effective improvement plan was then developed which was implemented by the client. The final condition of the property, including soils and groundwater, following completion of the improvement plan, was documented and a residual risk characterization was made. Documentation of the entire process was submitted for evaluation and accepted without revision by the N.S. Department of the Environment. Client was N.S. Power. (September 2002 to July 2007)

Project Manager and Senior Scientist – Clean-up of Petroleum Hydrocarbon Contamination ; 48 properties in Town of Kentville, Municipality of the County of Kings, Truro and Municipality of the County of Colchester, Nova Scotia.

The floodwaters of March 2003 carried petroleum hydrocarbons from a number of sources onto private properties in various parts of the Towns of Kentville and Truro, N.S. These properties were cleaned up to regulatory standards as part of a Provincial Emergency Response operation. Client was the Emergency Measures Organization, Province of Nova Scotia (April, 2003 to November, 2003).

Scientific Consultation to a Construction and Demolition Resources Recycler Seeking Regulatory Approval for Innovative Products

Halifax County C&D Recycling Limited required scientific and communications advice on the potential environmental impacts of the use of products manufactured from construction and demolition resources. Together with OCL Services, Dartmouth, NS we developed a materials testing program to help formulate several products, called Ballfield Matrix and Remediation Matrix. We monitored the results of using Remediation Matrix to mitigate acidic runoff from a disused slate/shale quarry and provided advice on how to complete the restoration of the property. We helped the company obtain government approval for further field testing of both matrices using improved formulations. We provided advice and direction on how to approach public consultations and presented the scientific perspective in public meetings and Open Houses. (Client: Halifax County Construction & Debris Recycling Limited, Halifax, NS. Joint project with OCL Services Limited, Dartmouth, NS. 1998 - Ongoing)

Rehabilitation of Moncton Properties, Moncton, N.B. – winner of the USEPA Phoenix Award for International Brownfield Development, www.brownfields.com/Feature/Feature-Phoenix.htm

Canada Lands Company wished to clean up a 300-acre property in downtown Moncton, NB to sell for private use. The property consisted of a former railcar repair facility, a storage yard, a construction debris landfill and a marshaling yard. I provided full environmental management services, including detailed review of all previous site assessments, development of corporate policy for environmentally sustainable development of brownfield properties, development of an overall action plan, preparation of Terms of Reference for contractors and other consultants, supervision of work, liaison with public and government agencies, and preparation of Environmental Action and Management Plans for each of nine sub-sections of the property. [Client: Canada Lands Company (formerly CN Real Estate). Subcontract with OCL Services Limited, Dartmouth, NS. Completed: 1998]

Risk Assessment/Risk Management Consultant for Canadian Coast Guard Light Station Environmental Site Assessments and Remediation Plans

The Canadian Coast Guard wished to transfer 30 lighthouse stations to the private sector. To accomplish this task in a manner protective of public health, they hired me as an environmental management consultant for the development of Terms of Reference and to review proposals for Phase II and Phase III site assessments. I reviewed draft reports for technical accuracy, and reviewed data for prioritization of clean-up efforts. I designed and completed a training program in Phase I Site Assessment for Coast Guard personnel, so that minor lighthouse properties could be assessed without the need for outside contractors. (Client: Canadian Coast Guard, Dartmouth, NS. Completed: April, 1998)

Canadian Coast Guard Light Station Phase I Environmental Site Assessments

The Canadian Coast Guard requested a review of the toxicology of mercury and lead in relation to data reported in Phase I/II site assessments for 87 lighthouses. I prepared a report that considered a range of potential exposure groups. It concluded with recommendations for further testing and a discussion of factors to be considered in management options, including applicable remediation guidelines. (Client: Canadian Coast Guard, Dartmouth, NS, subcontract with Public Works Canada, Halifax, NS. Completed: December, 1996)

Environmental Assessment Screening Document for Development of 3240 Kempt Road, Halifax

To complete preparations to sell the above property, Canada Lands Company requested a screening assessment to determine the best alternative for disposal of the contents of 59 intermodal containers stored on the site. They contained soil and other materials contaminated with PCBs and heavy metals. Five options for remediation were developed, and the relative risks and benefits to human health and the environment were evaluated. (Client: Canada Lands Company. Subcontract with OCL Services Ltd. Dartmouth, NS. Completed: July, 1996)

The Further Assessment of the Recovery of the *Irving Whale* in Light of the Presence of PCBs

The Government of Canada wished to recover the sunken oil barge *Irving Whale* from the seabed of the Gulf of St. Lawrence. I assisted in the compilation of assessment data and in the development of the Environmental Impact Assessment (EIA) document. I evaluated the potential risks associated with this project, with respect to the various possible human and environmental impact scenarios associated with the recovery options. I gave advice on public consultation strategies. The EIA passed Federal Judicial Review and received favourable review during extensive public hearings. The barge was successfully raised without environmental damage. (Client: Environment Canada. Completed: March, 1996)

HUMAN AND ENVIRONMENTAL RISK ASSESSMENT

Air Quality Investigation at Metro Transit Facility, Based on an Assessment of Airborne Contaminants and Worker Exposures

The Halifax Regional Municipality requested investigation, sampling, analysis and recommendations to improve the indoor air quality at the Metro Transit facility. The work involved a thorough investigation of existing occupational health and safety practices; physical plant and engineering; worker activities, complaints, and health and other records; process operations; and inventories of raw materials, by-products and supplies. Extensive air samples were taken and analysed, and compared with appropriate indoor air quality standards. Airborne dust and hydrocarbon contamination from diesel combustion and from exposed fuels and lubricants were of primary concern. (Client: Halifax Regional Municipality. Subcontract with OCL Group, Ltd., Dartmouth, NS. Completed: March, 2000)

Risk Analysis and Management of Dust in a Manufacturer's Warehouse

A Halifax manufacturer requested an analysis of the risk to workers from the presence of dust in their warehouse. We advised the principal contractor, Neill and Gunter Design and Consulting Engineers, on a sampling strategy for airborne particulates. We also provided expert opinion on the degree of risk to workers from the dust and on how best to manage this contaminant in the workplace. (Client: Proprietary. Subcontract with Neill and Gunter (Nova Scotia) Limited. Completed: October, 1999)

Quantitative Risk Assessment for Gladstone Stores

The Canadian Department of National Defence required a quantitative risk assessment for a property in Halifax called the Gladstone Stores. Neill and Gunter Design and Consulting Engineers (<http://www.nginc.com>) requested our assistance in completing the risk assessment portion of the project. We provided advice to Neill and Gunter on supplemental data requirements to support the risk assessment, and worked closely with Neill and Gunter staff to complete the formal risk assessment sections of the final report. Our analysis resulted in a substantial reduction in the estimates for the final clean-up of the property. (Client: Canadian Department of National Defence. Subcontract with Neill and Gunter (Nova Scotia) Limited, Dartmouth, NS. Completed: October, 1999)

Quantitative Risk Assessment Burnt Ash Pile CFB Greenwood

The Canadian Department of National Defence (DND) asked Neill and Gunter (Nova Scotia) Limited to conduct a Quantitative Risk Assessment for the Burnt Ash Pile at Canadian Forces Base Greenwood, Nova Scotia. The pile contained ash, boiler scale, construction wastes and fill, and forms an embankment adjacent to the wetlands that form the flood plain of a nearby river. Bio-Response Systems was asked to design a risk-based approach to screen for contaminants of concern and to perform a detailed environmental and human health risk assessment for any contaminants that exceeded the screening levels. Neill and Gunter used the results of the Assessment to recommend further delineation of the presence of PAHs, remediation of areas with contaminant and physical hazards, and investigation of possible wetland sediment contamination. [Client: Defense Construction Canada. Subcontract with Neill and Gunter (Nova Scotia) Limited. Completed: 1998]

Risk Assessment – Spring Gulch Drum Disposal Area, Canadian Forces Base, Goose Bay, Labrador

From 1940 to the late 1970s, unspecified amounts of solid and liquid hazardous and non-hazardous wastes were disposed of in a wetland adjacent to an airfield operated by the U.S. Government for the Allied and NATO forces. The Canadian Department of National Defense removed over 8,000 drums that previously contained hazardous chemicals from the surface of the bank of a stream called Spring Gulch. They required an assessment of whether it was advisable to dig into the stream bank to attempt to remove any drums that might be buried.

(Client: Canadian Department of National Defense. Subcontract with Lynn McCarty Scientific Research and Consulting, Oakville, ON. Completed: September, 1995)

Assessment of the Toxicology of Elemental Phosphorus and NORM Waste

An Environmental Impact Assessment (EIA) was required to support the decommissioning of an industrial facility in Newfoundland which had produced commercial-grade elemental white phosphorus. I was the senior technical adviser and analyst for the human and environmental risk assessment section of the EIA. Many issues were addressed, including the disposition of naturally-occurring radioactive materials (NORM). Since there were no available Federal or Provincial standards for elemental phosphorus, vanadium and thallium, I scientifically determined soil remediation guidelines for these elements, using techniques of human and environmental risk assessment. I provided written response to questions on methods, and factual information on a wide variety of issues raised by the Assessment Review Panel of Newfoundland. (Client: Albright and Wilson. Subcontract with Jacques Whitford Environment Limited, Dartmouth, NS. Completed: March, 1995)

Risk Assessment for the Recreational Use of an Island with Soil Contamination

The Canadian Coast Guard wished to transfer an island in the Saint John, New Brunswick harbour to a private group for eco-tourism. The island had been a turn-of-the-century immigrant processing centre and had been used by the military for coastal defense in both World Wars. The long-term use of a coal-burning incinerator and former munitions storage raised concerns about soil contamination. I was asked to conduct a human health risk assessment to determine if soils containing levels of inorganic metals in excess of Canadian Council of Ministers of the Environment (CCME) criteria would require significant remediation efforts in order to allow the island to be used for the proposed recreational purposes. (Client: Canadian Coast Guard. Subcontract with Public Works Canada. Completed: July, 1994)

Risk Assessment for a Pulp and Paper Mill Clean-up Evaluation

A preliminary assessment was completed on the potential human health effects of an upgrade to a treatment system at Boat Harbour, NS. Guidance was provided to a citizen/industry/government task force on the use of risk assessment information in decision making. (Client: Nova Scotia Department of Supply and Services. Subcontract with Jacques Whitford Environment Limited, Dartmouth, NS. Completed: July, 1994)

Polychaete Assay for Sediment Toxicology

I provided guidance to Environment Canada's Ocean Dumping Control Action Plan on the development of a bioassay using marine polychaetes for sediment toxicity evaluation. (Client: Environment Canada. Subcontract with Arenicola Marine, Dartmouth, NS. Completed: April, 1994)

Endangerment Evaluation for an Oil Refinery

An air quality assessment was conducted for a small, independent oil refinery in Newfoundland. I assessed the potential adverse health consequences of exposure of local populations to elevated levels of acid-producing gases. (Client: Confidential. Subcontract with Jacques Whitford Environment Limited, Dartmouth, NS. Completed: October, 1993)

Ecological Risk Assessment for the Burnside Waste-to-Energy Facility Environmental Assessment

The environmental impact assessment for a proposed waste-to-energy facility was augmented by the use of ecological risk assessment techniques. The ecological risk of exposure to stack emissions was evaluated for aquatic and terrestrial organisms. (Client: (Halifax Region) Metropolitan Authority. Subcontract with Jacques Whitford Environment Limited, Dartmouth, NS. Completed: October, 1993)

Risk Assessment for a No. 2 Fuel Oil Spill at a Primary School

A 1400-litre leak of No. 2 fuel oil from a ruptured feed line contaminated the ground surrounding and under a Halifax primary school, causing the school to be closed pending remediation. I provided human health risk assessment support for the engineering firm contracted to perform site remediation, and for a school and public health officials' information program for concerned parents and staff. (Client: Halifax City School Board. Subcontract with Jacques Whitford Environment Limited, Halifax, NS. Completed: February, 1993)

Risk Assessment for a Bunker C Oil Spill Remediation Project, Fredericton, New Brunswick

The discovery of a small spill of Bunker C Oil in a perched aquifer led to an evaluation of the required level of remediation using risk assessment techniques. The remediation proposal was developed and completed for the use of the law firm retained by the property owners to evaluate options for cleanup. (Client: Confidential. Subcontract with Jacques Whitford Associates, Fredericton, NB. Completed: January, 1993)

Toxicological Evaluation and Risk Assessment for the Environmental Impact Assessment of a Sewage Treatment Facility Proposed for Halifax Harbour

A human health risk assessment was completed that characterized the risk to human health and provided recommendations for policy makers regarding the use of the harbour for primary contact recreation and the consumption of lobster harvested from harbour waters. Seven contaminants (lead, mercury, cadmium, copper, zinc, PCBs and PAHs) have been measured in significant quantities in the lobster, and the harbour is known to contain pathogenic bacteria from sewage effluents. (Client: Halifax Harbour Cleanup Inc. Subcontract with Jacques Whitford Environment Limited, Dartmouth, NS. Completed: April, 1992)

Toxicological Evaluation and Risk Assessment for the Remediation of Hazardous Waste Disposal, Canadian Forces Base, Goose Bay, Labrador

From 1940 to the late 1970s, unspecified amounts of solid and liquid hazardous wastes were disposed of in a wetland area adjacent to an airfield operated by the U.S. Government for the Allied and NATO forces. The extent and severity of the environmental contamination resulting from improper waste management practices were documented and assessed. Specific recommendations were made for prioritizing clean-up efforts. (Client: Canadian Department of National Defense. Subcontract with Jacques Whitford Environment Limited, Dartmouth, NS. Completed: March, 1992)

Hazard Evaluation for the Clean-up of a Decommissioned Electroplating Plant, Hull, Quebec

During an investigation of the requirements for the decommissioning of an electroplating plant, a significant level of potassium cyanide was discovered. Based on the toxicological evaluation of the levels found, an appropriate response was recommended to ensure adequate protection of public health and worker safety during cleanup. (Client: Confidential. Subcontract with Jacques Whitford Associates, Ottawa, ON. Completed: February, 1992)

POLICY DEVELOPMENT

Scientific Review and Recommendation for Ontario Ambient Air Quality Guidelines for Priority Toxic Contaminants

The Ontario Ministry of the Environment and Energy identified the need to develop and/or update air guidelines/standards for priority toxic contaminants. The Ministry decided to make use of work carried out by other regulatory agencies around the world. Information on thirteen substances prepared by seven agencies was obtained and scientifically reviewed. For each substance, a recommendation was made concerning which existing guideline could be adopted for use in Ontario with minimal additional technical work. (Client: The Ontario Ministry of the Environment and Energy, Standards Development Branch. Subcontract with Lynn McCarty Scientific Research and Consulting, Oakville, ON. Completed: June, 1996)

Recommendations on Risk Assessment Principles for Inclusion in The Canadian Environmental Protection Act

In response to the Government of Canada's proposed revision of the Canadian Environmental Protection Act (CEPA), the Canadian Electricity Association and the Canadian Steel Producers Association requested recommendations on the human and environmental risk characterization and assessment principles that must be included in the revised Act in order to facilitate and guide the management of toxic substances. (Clients: The Canadian Electricity Association and the Canadian Steel Producers Association, Ottawa, ON. Completed: March, 1996)

Report on Exposure and Risk

To comply with the Government of Canada's Strategic Options Process review under the Canadian Environmental Protection Act (CEPA), the Canadian Electric Power Generation (Fossil Fuel) Sector Issue Table Task Group 2 requested an evaluation of the necessary and relevant technical and scientific information from which recommendations could be drawn for management of release of 13 substances. (Client: The Canadian Electricity Association, Ottawa, ON. Completed: March, 1996)

EXPERT REVIEW

Scientific Reviewer for NSERC

The Canadian National Science Engineering and Research Council (NSERC) (<http://www.nserc.ca/index.htm>) has invited Dr. Vigerstad to serve as a scientific reviewer on their Panel D - Environmental Technologies. The appointment is for three years. During that time, Dr. Vigerstad and the other Panel members will review applications for the support of scientific research at colleges and universities throughout Canada. Last year, Dr. Vigerstad served on the review panel for the Metals in the Environment program. (<http://mite.agg.gsc.nrcan.gc.ca/default.htm>). This joint government and mining industry supported program funds research vital to clarifying our understanding of the behaviour and effects of metals in the environment, so that a scientifically based management strategy can be implemented, in Canada and in other countries. (Client: Canadian National Science Engineering and Research Council, Ottawa, ON; 1998 - 2002)

Evaluation of Sydney Tar Ponds Risk Assessment for Determining PAH Sediment Remediation Criteria

A U.S. firm was contracted in 1990 to develop remediation criteria for the highly-contaminated sediment in the Sydney Tar Ponds, using risk assessment techniques. I was asked to review this document for adequacy as a management tool for remediation. (Client: Nova Scotia Department of Supply and Services. Completed: July, 1995)

Evaluation of a Risk Assessment for a Contaminated Site in Saco, Maine

The owners of a small private school located on the edge of an industrial facility site with heavily contaminated groundwater requested that I review the Public Health Risk Evaluation Report and supporting documentation produced by the site owner's contractors. They wished to know if the reports were accurate and if they were adequate as management tools to meet the needs of the school in negotiation with the contaminated site owners. (Client: Sweetser Children's Home.

Subcontract with Jacques Whitford Environment Limited, Portland, ME. Completed: March, 1995)

Evaluation of Recent Pesticide Literature in Relation to Forest and Rangeland Management

Human health risk assessments were completed for Environmental Impact Statements prepared under the US National Environmental Policy Act. The US Bureau of Land Management (BLM) requested that the scientific literature from the past three years be evaluated to determine if new information had been published that would alter conclusions reached in previous assessments. The review of this literature was used to develop contracting needs for updated assessments by the BLM for the following fiscal year. (Client: United States Bureau of Land Management. Subcontract with Thomas and Thomas Technologies, McLean, VA. Completed: 1990)

Preparer

Summary EIA and Supporting Documentatation -Tracadie Two Rivers Link Channel, Tracadie-Sheila, N.B.

The Corporation du Developpement des Deux Rivieres Tracadie, Inc. wished to construct a 4.5-km channel inside the local barrier islands to provide access for the Little Tracadie River and the Town Wharf to the Gulf of St. Lawrence. The Environmental Impact Assessment report was reviewed, a Summary EIA report was prepared, supporting documentation for the Canadian Environmental Assessment Agency was prepared, and Environmental Action Plans for the Construction and Operation phases were prepared. (Client: Corporation du Developpement des Deux Rivieres Tracadie, Inc. Subcontract with Roy Consultant Group, N.B. Completed: 1999)

Toxicology/Aquatic Ecology - Environmental impact statement on the eradication of cannabis on federal lands in the Continental United States. U.S. Department of Justice, 1985.

Environmental Factors - Concise environmental review, proposed nuclear power plant sale, El Daba, Egypt. U.S. Department of State, 1985.

Aquatic Ecology - Final environmental impact statement on comprehensive impacts of permit decisions under Tennessee Federal Program. U.S. Department of the Interior, 1985.

Toxicology/Aquatic Ecology - Environmental impact statement on the eradication of cannabis on non-federal and Indian lands in the contiguous United States and Hawaii. U.S. Department of Justice, 1985.

Reviewer with R.D. Thomas

ATSDR Draft Profile on 1,1,2,2 Tetrachloroethane

ATSDR Draft Profile on Ethylene oxide

ATSDR Draft Profile on bis(2-chloroethyl)ether
Mefluidide: A Review of Its Toxic Properties and Environmental Fate Characteristics. Labat-Anderson Inc.

Chlorosulfuron: A Review of Its Toxic Properties and Environmental Fate Characteristics. Labat-Anderson Inc.

Prometryn: A Review of Its Toxic Properties and Environmental Fate Characteristics. Labat-Anderson Inc.

Clopralid: A Review of Its Toxic Properties and Environmental Fate Characteristics. Labat-Anderson Inc.

Human Health Effects and Risk Assessment. Draft Environmental Impact Statement, Region 5. USDA Forest Service, 1988.

Human Health Effects and Risk Assessment. Managing Competing and Unwanted Vegetation Draft Environmental Impact Statement, Region 6. USDA Forest Service, 1988.

Human Health Effects and Risk Assessment. Western Oregon Vegetation Management Draft Environmental Impact Statement. Bureau of Land Management, 1988.

Human Health Effects and Risk Assessment. Supplement to the Northwest Area Noxious Weed Control Program. Draft Environmental Impact Statement. U.S. Department of the Interior, 1987.

Professional Activities

EDUCATIONAL

- Instructor, Human Health Risk Assessment Section. In course: Workplace Health and Safety. Certificate Program in Environmental Management. Continuing Education Division, DalTech at Dalhousie University, Halifax, NS. 1993–1999.
- Co-instructor, Environmental Mediation. Certificate Program in Environmental Management. Continuing Education Division, DalTech at Dalhousie University, Halifax, NS. Spring, Autumn, 1995.
- Co-instructor, Environmental Toxicology. Graduate course given at the School for Resource and Environmental Studies, Dalhousie University, Halifax, NS. Autumn, 1995.
- Co-instructor, Aquatic Toxicology and Water Quality Assessment. Graduate course given at the School for Resource and Environmental Studies, Dalhousie University, Halifax, NS. Spring, 1995.
- Co-instructor, Total Quality Environmental Management (TQEM). Certificate Program in Environmental Management. Continuing Education Division, DalTech at Dalhousie University, Halifax, NS. Spring, 1994.

PRESENTATIONS

The New Nova Scotia Contaminated Sites Regulations. Insurance Institute of Nova Scotia, Dartmouth N.S, November 7, 2013 and January 29, 2014.

Fuel Oil Forensics. Insurance Institute of Nova Scotia, Ramada Inn, Dartmouth N.S, 12 June 2012..

Vapour Intrusion, A Pandora's Box. International Sites and Spills Conference and Expo. Hazmat Management. November 3-4, 2011

Pollution Environmental Seminar: The Site Professional's Role? With Nick MacDonald and Serge Melanson, Insurance Institute of Nova Scotia, Halifax, N.S. February 3, 2010.

Pollution Environmental Seminar: The Site Professional's Role? With Nick MacDonald and Serge Melanson, Insurance Institute of New Brunswick, Moncton, B.B. October 6, 2009.

Contaminated Sites, Spills and Insurance, Atlantic Reclamation Conference 2008. ESANS, October 20-21, 2008.

Environmental Law a Sustainable Practice? Tips on Home Heating Oil Releases, Mould and Chemical Injury Claims. Invited Presentation to Shake the Midwinter Blues, CBA New Brunswick, Saint John, NB February 8-9, 2008.

Why Does It Takes So Long And Cost So Much To Close A Petroleum Fuel Oil Release File? Invited Presentation to the Nova Scotia Insurance Institute, Dartmouth, N.S., November 22, 2007.

Why Does It Takes So Long And Cost So Much To Close A Petroleum Fuel Oil Release File And What Can Be Done About It? Invited Presentation to the Nova Scotia Claims Insurance Managers Association, Halifax, N.S. October 3, 2007.

Why Does It Takes So Long And Cost So Much To Close A Petroleum Fuel Oil Release File? Invited Presentation to New Brunswick Insurance Institute, Moncton, N.B., May 24, 2007 and Saint John, N. B., May 25, 2007.

Mould Investigations – An Insurance Perspective. Invited Presentation to Advanced Forum on Identifying, Managing and Preventing Mould Claims. The Canadian Institute, Toronto, Ontario, April 27-28, 2005..

Mould and Sewage Claims. Mould, Muck and Toxins. – Environmental Losses and Litigation. CIP Society of Ontario, Insurance Institute of Ontario. Mar 2, 2005.

Are Mould Claims Really Water Damage Claims? Insurance Women's Association, Halifax Chapter, February, 2003.

Effective Risk Communication - Halifax Chapter of American Indoor Air Quality Council – Halifax, N.S., October , 2001

How To Produce An Auditable File For Petroleum Releases, CRIMS Conference, Reflections 2000 in Edmonton Alberta

Ecosystem Risk Assessment: Paradigms and Applications. Invited presentation to the Thirteenth Central Canadian Symposium on Water Pollution Research, sponsored by the Canadian Association of Water Quality and the National Water Research Institute, Canada Centre for Inland Waters, Burlington, ON. February 6-7, 1995.

Baseline Risk Assessment for the Consumption of Lobster from Halifax Harbour, Vigerstad, T.J., J.C. Juskevich, L. White, and M. Charles *Poster Presentation*, Coastal Zone Canada '94 International Conference, Halifax, NS. September 23, 1994.

Ecosystem Risk Assessment: Paradigms and Applications. Invited presentation to the Canadian Network of Toxicology Centres' (CNTC) National Workshop on the Characterization of Risks to Humans and the Environment, Hull, PQ. June, 1993.

Seafood Safety. A presentation given at The Bedford Institute of Oceanography's *Ocean Business Day*, '92, The Bedford Institute of Oceanography, Dartmouth, NS. November 24, 1992.

Using dose-response data from the rotifer acute toxicity test for brackish and marine environments. Snell, T.W. and T.J. Vigerstad The Seventeenth Annual Aquatic Toxicity Workshop, Vancouver, BC. November 5-7, 1990.

SELECTED PUBLICATIONS AND REPORTS

Vigersad, T. 2009. Soil Vapour and Indoor Air Monitoring Assessments: A Pandora's Box for the Insurance Industry and the Homeowner . Environmental Solutions Remediation Services, 16 pp,

Vigerstad, T. and M.E.Samis,. 2008. Fuel oil and diesel spills: what are the Issues when the Ontario Environmental Protection Act applies. WP Without Prejudice Volume 72, No. 5. pp. 12-19.

La Point TW, Belanger SE, Crommentuijn T., Goodrich-Mahoney J, Kent, RA, Mount D"l, Spry DJ, Vigerstad T., Di Toro, DM, Keating FJ Jr.and Reiley, MC. 2003. *Problem Formulation In: Reevaluation of the State of the Science for Water Quality Criteria Development*. SETAC Press, Pensacola FL pp 1-14.

Vigerstad,TJ and LS. McCarty. 2000. *The ecosystem paradigm and environmental risk management*. Human and Ecological Risk Assessment: An International Journal 6(3): 369-381.

Vigerstad,TJ. 1996. *Recommendations on Risk Assessment Principles for Inclusion in The Canadian Environmental Protection Act*. Canadian Electricity Association, Ottawa, ON. 23 pages.

Vigerstad, T.J. 1996. *Report on Exposure and Risk*. Canadian Electricity Association, Ottawa, ON. 56 pages.

Elder, D. and T.J. Vigerstad. 1994. *Risk Assessment Approach to Develop a Remediation Criterion for P₄ in Soil*. Jacques Whitford Environment Limited, Dartmouth, NS. 24 pages.

Vigerstad, T.J. 1994. *A Risk Assessment for Partridge Island*. Public Works Canada. 81 pages.

Vigerstad, T.J., J.C. Juskevich, L. White and M. Charles. 1992. *Final Report to Halifax Harbour Cleanup Incorporated on Human Health Risk Assessment*. Halifax Harbour Cleanup Incorporated, Halifax, NS. 89 pages.

Snell, T.W. and T.J. Vigerstad. 1991. *Using Dose-response Data from the Rotifer Acute Toxicity Test for Brackish and Marine Environments*. Canadian Technical Report of Fisheries and Aquatic Sciences No. 1774, 1:341-346.

Thomas, R.D. and T.J. Vigerstad. 1989. *The Use of Laboratory Animal Models in Investigating Emphysema and Cigarette Smoking in Humans*. Regulatory Toxicology and Pharmacology, 10:264-271.

Vigerstad, T.J. 1980. *Determination of Production Biology of Cladocera in a Reservoir Receiving Hyperthermal Effluents from a Nuclear Production Reactor (Par Pond)*. US DOE Report # DOE/OR 00033-T4, Ph.D. Dissertation, University of Rhode Island, Kingston, R.I..

Alberts, J.J., L.J. Tilly and T.J. Vigerstad. 1979. *Seasonal cycling of cesium-137 in a reservoir*. Science 203:6749-651,

Vigerstad, T.J. and S. Cobb. 1978. *Effects of predation by sea-run juvenile alewives (Alosa pseudoharengus) on the zooplankton community of Hamilton Reservoir, Rhode Island*. Estuaries and Coasts 1(1): 1559-11723.

Vigerstad, T.J. and L.J. Tilly. 1977. *Hyperthermal effluent effects on helioplanktonic Cladocera and the influence of submerged macrophytes*. Hydrobiologica 55(1): 81-85.