



Intrinsik Corp.

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Senior Scientist

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EDUCATION AND DESIGNATIONS

- 2016** Qualified Professional (QP) for Risk Assessment in Saskatchewan (#10020764).
2012 Member of Environmental Careers Organization of Canada – Certified Environmental Professional (EP). Expired 2012 to 2018.
2008 Member of Society of Environmental Toxicology and Chemistry (SETAC). Expired 2008 to 2018.
2007 Member of Alberta Society of Professional Biologist (P.Biol. #1418).
1996 Post Baccalaureate Diploma (PBD), Ecotoxicology, Concordia University, Montreal, Quebec.
1995 B.Sc, Biology, and Minor in Geology, Concordia University, Montreal, Quebec.

AREAS OF SCIENTIFIC INTEREST

- Human Health Risk Assessment
- Ecological Risk Assessment
- Air Quality Assessment
- Exposure and Risk Modelling
- Contaminated Site Assessment
- Brownfield Development

EMPLOYMENT HISTORY

- 2000- Present** **INTRINSIK CORP.**
Calgary, Alberta
Senior Scientist
Responsibilities: Project Management and reporting, perform risk analysis for human and ecological projects and develop human and wildlife health exposure assessment models.
- 1998-2000** **GOLDER ASSOCIATES LTD.**
Calgary, Alberta
Risk Assessor
Responsibilities: Performed risk analysis for human and ecological projects, developed human and wildlife health assessment models and developed web sites for internal communication.
- 1996-1997** **CLINICAL TRIALS BIO RESEARCH (CTBR)**
Senneville, PQ
Quality Assurance Agent
Responsibilities: Verified studies to be in compliance with the protocol, FDA regulations, SOP and GLP.

PRESENTATIONS

- EnviroTech. (Calgary, AB 2019). Bromacil Residues in Soil and Groundwater at Contaminated Sites - Do they matter?
- EIC. (Calgary, AB 2019). Bromacil Residues in Soil and Groundwater at Contaminated Sites - Do they matter? Presentation to Environmental Interactive Club (EIC).
- BEST. (Whistler, BC 2018). Presentation on Diesel Particulate Matter and Health Risk: What to do About it?
- EnviroTech. (Calgary, AB 2018). Presentation on Diesel Particulate Matter and Health Risk: What to do About it?
- CRAZ. (Strathmore, AB 2018). Presentation on Diesel Particulate Matter and Health Risk: What to do About it? Wheatland County and Calgary Regional Airshed Zone (CRAZ) Transportation and Air Quality Workshop.
- Queen Elizabeth High School. (Calgary, AB 2018). Communicating Environmental Results. Presentation to class regarding environmental impacts in West Hillhurst as a result of Canada Cresote.
- SustainTech. (Saskatoon, SK 2018). Presentation on evaluation of outcomes of risk assessments of contaminated sites.
- WaterTech Symposium. (Banff, AB 2017). Presentation on indoor vapour inhalation risks from a leaded gasoline additive (1,2-dichloroethane) that still contaminates groundwater.
- WaterTech Symposium. (Banff, AB 2017). Presentation on the interpretation of risks to aquatic life based on species sensitivity distributions: Using chloride as an example.
- EXOVA (2017). Environmental Seminar. The Use of a physiologically-based pharmacokinetic (PBPK) model to improve our understanding of cadmium risks to adults from organ meat consumption in an Aboriginal community.
- EXOVA (2016). Environmental Seminar. Development of interim CCME PCB soil quality guidelines for missing pathways of exposure for the protection of human health and ecological receptors.
- RPIC (2016). Real-estate Property Institute of Canada Federal Contaminated Sites Workshop (Montreal, QC). Development of interim CCME PCB soil quality guidelines for missing pathways of exposure for the protection of human health and ecological receptors.
- SETAC. (2015). A human health and ecological impacts from pipeline valve staining: risk assessment coupled with research. SETAC North America 36th Annual Meeting. Salt Lake City, Utah, USA.
- WaterTech Symposium. (Banff, AB 2015). Presentation of human health and ecological impacts from pipeline valve staining: risk assessment coupled with research. Kananaskis, Alberta.
- Alberta Society of Professional Biologist (ASPB). (2015). Presentation of approach for the ecological risk assessment of an accidental bitumen release from a Steam Assisted Gravity Drainage (SAGD) operation on surrounding wildlife. Canmore Alberta.

- The 10th International Conference on Mercury as a Global Pollutant (ICMGP). (2011). Presentation of mercury-related human health risks associated with the consumption of fish from the Athabasca oil sands region in northeast Alberta, Canada.
- HazMat Magazine. (2010) Presentation at a Brownfields Breakfast Summit Series in Edmonton regarding human health risks from petroleum hydrocarbon (PHC) impacts in urban communities - lessons learned through observations.
- Society of Toxicology (SOT). (2010) Preparation of poster describing methods for selection of toxicity reference values for human health risk assessment for the SOT Annual Meeting and ToxExpo™ in Salt Lake City.
- Canadian Prairie & Northern Section (CPANS) of the Air & Waste Management Association. (2009). Presentation at conference regarding health impacts related to ozone.
- Sherritt. (2007) Public meeting presentation of poster describing human health risk assessment for the proposed gasification plant in Ryley Alberta.
- Alberta Society of Professional Biologists (ASPB) Conference. (2007) Predicting Arsenic Concentrations & Risks in Moose in the Athabasca Oil Sands. April 19th Calgary.
- Trace Metals and Air Contaminants Working Group (TMAC). (2005) Presentation on Assessing Ecological Health in the Oil Sands Region. December 2nd Calgary.
- Teck Cominco. (2004) Public meeting presentation of poster describing terrestrial modeling for the wide area site assessment in Trail BC.
- Sears Canada. (2004) Regulatory meeting with Alberta Environment, Calgary Health Region and City of Calgary to present methodology for derivation of Tier 2 soil quality.
- Teck Cominco. (2003) Public meeting presentation of poster describing terrestrial modeling for the wide area site assessment in Trail BC.

PUBLICATIONS

Gainer A, **Bresee K**, Hogan N, Siciliano SD. Advancing soil ecological risk assessments for petroleum hydrocarbon contaminated soils in Canada: Persistence, organic carbon normalization and relevance of species assemblages. *Sci Total Environ*. 2019; 668: Pages 400-410.

Berger Robert G., Melissa Whitfield Aslund, Greg Sanders, Michael Charlebois, Loren D. Knopper, **Karl E. Bresee**. 2016. A multiple lines of evidence approach for the ecological risk assessment of an accidental bitumen release from a steam assisted gravity drainage (SAGD) well in the Athabasca oil sands region. *Science of The Total Environment*. Volume 542, Part A, 15 January 2016, Pages 495–504

Hull, Ruth N. and **Bresee, Karl**. 2011. Risk Assessment and Environmental Management. A Case Study in Sudbury, Ontario, Canada. Chapter 11. *Ecological Risk Assessment: Evaluating Risks to Terrestrial Wildlife*. Maralte B.V. Leiden, The Netherlands. pp 454.

WORKSHOPS AND LECTURES

Invited Lecturer to Grade 9 Class at Queen Elizabeth High School, Calgary. (2018)
Communicating Environmental Results.

Matrix Environmental Solutions Training Days. (2014). Theory and practice of ecological risk assessment. Calgary, Alberta.

Dr, Loren Knopper and **Bresee, Karl**. (2013). Alberta Society of Professional Biologist (ASPB) one day workshop on the theory and practice of ecological risk assessment. Calgary Alberta.

Invited Lecturer at University of Saskatchewan Toxicology Department. (2013). Application of Human Health Risk Assessment in the Regulatory Process.

Professional Associations

- Chairman of the Professional Development Committee for the Alberta Society of Professional Biologists since 2010 (volunteer position).

HEARING EXPERIENCE

- AER Public Hearing Coalspur Vista Coal Project, Hinton, AB. Expert Panel (2014) – HHRA. Hearing Decision Number: 2014 ABAER 004. Application Numbers: 1726915, 1726923, 1726927.
- Manitoba Clean Environment Commission Public Hearing Keeyask Generation Project, Fort Garry. Hotel Winnipeg, MB. Expert Panel (2013) – HHRA for methyl mercury health risks. Hearing Decision and Application Numbers not available. Additional information: <http://www.cecmanitoba.ca/hearings/index.cfm?hearingid=39#3>
- AUC Hearing Mustus Energy Ltd., La Crete, AB. Expert Panel (2009) – HHRA. Hearing Decision Number: 2009-101. Application Number: 1574133. Proceeding ID Number 182.
- TERA Hearing Inco and Falconbridge. Sudbury, ON. Expert Panel (2005) – Ecological Risk Assessment. Hearing Decision Number and Application Number: not available.
- Alberta Environmental Appeal Board Hearing. Inland Cement Ltd, Edmonton, AB. Expert Panel (2002) – HHRA for a fuel conversion project for a proposed cement plant in Edmonton Alberta. Appeal Numbers: 02-023, 024, 026, 029, 037, 047, 074-13.
- AEUB Hearing Canada Crude Separators, Edson, AB. Expert Panel (2001) – HHRA of air emissions from an upstream oil field processing plant. Hearing Decision Number: 2002-055. Application Numbers: 2000343, 1242258, 1096927, 1096321.
- AEUB Hearing for TransAlta Energy Corporation, 900-MW Keephills Power Plant Expansion. Wabamun, Alberta. Technical Lead (2001) – HHRA. Hearing Decision Number 2002-014. Application Number: 2001200.
- AEUB Hearing for Epcor Generation Inc. and Epcor Power Development Corporation, 490 - MW Genesee Power Plant Expansion. Wabamun, AB. Technical Lead (2001) – HHRA. Hearing Decision Number 2001-111. Application Number. 2001173.

PROJECT EXPERIENCE (2000 – Present)

Risk Assessment

- Slokker Homes. (2020). Human and ecological risk assessment of PHC, PAH and metals and development of a risk management plan in consultation with AEP and the City of Calgary for a proposed residential development in south west Calgary.

- Federated Co-operatives Ltd. (2020). Human health and ecological risk assessment for residual petroleum hydrocarbon (PHC) impacts at a Co-op cardlock in Wadena, Saskatchewan (SK).
- SaskPower. Tier 3 human health and ecological risk assessment (HHERA) of residual soil and groundwater impacts at the SaskPower Storage Centre in White City, Saskatchewan.
- Bridgestone Retail Operations LLC. (2019). Developed sub-slab soil vapour quality guidelines for the protection indoor vapour inhalation at a commercial property in Moose Jaw, Saskatchewan.
- Fond du Lac First Nations. (2019). Developed soil vapour quality guidelines and indoor air quality guidelines for a detailed PHC risk assessment in Fond du Lac, Saskatchewan.
- Federated Co-operatives Ltd. (2019). Human health and ecological risk assessment for exposure to residual BTEX and PHC from an accidental diesel spill in 2017 near Turtleford, Saskatchewan.
- Government of Yukon. (2019). Review of a quantitative human health and ecological risk assessment for a site located at 5th Avenue (Rogers to Jeckell Street) in Whitehorse, Yukon.
- Trans Mountain Corp. (2019). Aquatic and terrestrial ecological risk assessment of PHC and PAH impacts from a historical pipeline leak in 1954 that occurred along the Trans Mountain oil pipeline right-of-way located near Wabamun, Alberta. Developed site-specific risk-based guidelines for COC in surface water, sediment and soil that were used for delineation and monitoring of the proposed excavation.
- Alberta Environment and Parks. (2017-2021). Assessment of potential human health impacts associated with creosote, petroleum hydrocarbon and polycyclic aromatic hydrocarbon impacts in soil, groundwater, soil vapour and indoor air at West Hillhurst community in Calgary, AB.
- Confidential Client. (2019). Quantitative aquatic and terrestrial ecological risk assessment of PHC, PAH, metals and routine parameters at a historical rail spur and right of way in Alberta. Preparation for expert testimony.
- Federated Co-operatives Limited. (2019). Human health and ecological risk assessment of PHC impacts at three sites in Saskatchewan.
- TransCanada. (2019). Completed human health and ecological risk assessment based on research and development program with the University of Saskatchewan and Natural Sciences and Engineering Research Council of Canada (NSERC) regarding environmental fate and toxicity of pipeline valve lubricants.
- Town of Hay River. (2019). Subject matter expert for addressing human health and ecological risks associated with the accidental Hay River landfill fire in the Northwest Territories.
- Hopewell Golden West LP. (2019). Tier 2 risk assessment of the petroleum hydrocarbon (PHC) impacts in soil and groundwater for a proposed commercial property re-development in Red Deer, Alberta.
- CalTrax Calgary. (2019). Tier 3 risk assessment of the petroleum hydrocarbon (PHC) and polycyclic aromatic hydrocarbon (PAH) impacts in soil and groundwater at the CalTrax Calgary facility.

- Tidewater. (2019). Ecological risk assessment of potential chloride impacts at two Tidewater Windfall sites.
- Domtar. (2018). Human health risk assessment of a former wood preserving site in Edmonton, AB. Ongoing.
- SaskPower. (2018). Tier 3 risk assessment of the residual soil and groundwater impacts of polycyclic aromatic hydrocarbons (PAH) at the SaskPower Wynyard Service Centre in Saskatchewan.
- SaskPower. (2018). Human health and ecological risk assessment of residual soil and groundwater concentrations of bromacil at the SaskPower Success Power Station, Saskatchewan.
- Keyera / Trace Associates. (2018). Assessment of risks and development of site-specific guidelines for naphthalene in soil and groundwater at the Keyera facility located near Cynthia, Alberta.
- Trace Associates. (2018). Screening-level risk assessment for a commercial property at 2180 - 15 Avenue SE, Medicine Hat, Alberta.
- Trace Associates / ParklandGeo. (2018). Development of preliminary site-specific guideline values for soil and groundwater at 460 Macalpine Crescent Fort McMurray, Alberta.
- NuVista Energy. (2018). Human health and ecological assessment of historical PHC, PAH and metal impacts at Hay-Zama Lake Battery Site in Northern Alberta, which is an inland wetland and wildland park designated wetland of international importance.
- SaskTel. (2018). Human and ecological quantitative risk assessment of PHC for Kane Lake Sasktel Radio Tower, Saskatchewan.
- Federated Co-operatives Limited. (2018). Development of detailed risk assessment check list for internal QA/QC purposes.
- TransCanada. (2018). Updating the Quantitative Environmental Safety Tool (QuEST) Lite tool which provides rapid and quantitative risk-based hazard quotients based on environmental data.
- SaskTel. (2018). Human and ecological quantitative risk assessment of PHC for David Lake Rapids Sasktel Radio Tower, Saskatchewan.
- Enbridge. (2018). Human and ecological quantitative risk assessment of PAH and PHC impacts in soil and groundwater for an Enbridge Pipeline Site near Rosetown, Saskatchewan. Calculated site-specific guidelines for protection of indoor vapour inhalation and aquatic-life.
- Saskatchewan Ministry of the Economy. (2018). Human health risk assessment of air samples collected following the January 2, 2018 emission event in the Town of Unity, Saskatchewan.
- Confidential Client. (2018). Human health risk assessment of an accidental hydrocarbon release into a drinking water supply. Alberta.
- Confidential Client. (2018). Human health risk assessment of radiological impacts from NORM in a consumer and industrial product. Alberta.

- Confidential Client. (2018). Detailed human health and ecological risk assessment of sub-surface impacts from a former wood treatment facility in a parkland area adjacent to a residential community. Alberta.
- TransCanada Pipeline / Trace Environmental. (2017). Assessment of barite-barium impacts to ecological receptors associated with a former remote sump near Conklin, Alberta.
- Parks Canada / Clifton Associates. (2017). Detailed quantitative human health and ecological risk assessment associated with PAH, PHC and metal impacts in soil at the historical Donald Mine in Glacier National Park, BC.
- Pacesetter Petroleum Limited / KBL Environmental Ltd. (2017). Assessment of BTEX, PHC and PAH impacts to human health and ecological receptors from an accidental fuel spill near Whitehorse, Yukon.
- Modern Beauty Supplies Inc. / Nichols Environmental. (2017). Assessment of potential human health impacts associated with PAH and metal impacts from a proposed daycare play area in Edmonton, Alberta.
- Federated Co-operatives Limited. (2017). Human and ecological assessment of residual impacts of PHCs in soil and groundwater at the former gas bar and neighbouring on Stephen Street in Boissevain, Manitoba. Provided third party review.
- Enviro Analytics Group. (2017). Detailed quantitative human health and ecological risk assessment associated with petroleum hydrocarbon impacts in soil, groundwater and soil vapour at AJ's Salvage Yard which was a Former Shell Terminal Bulk Plant in Saskatoon, Saskatchewan. Project also included assessment of LNAPL.
- Bifrost Environmental. (2017). Assessment of indoor air quality for the protection of human health for a commercial property located at 7400 Macleod Trail SE in Calgary, Alberta. The sampling program focused on BTEX, PHC and VOC. Provided opinion letter.
- Suncor. (2017). Detailed quantitative ecological risk assessment of metals and polycyclic aromatic hydrocarbons in reclaimed landscapes with an operating mine. Project involved detailed food chain modelling and risk characterization. Alberta.
- Federated Co-operatives Limited / Trace Associates. (2017). Human and ecological assessment of residual impacts of PAHs and PHCs in soil and groundwater at a Former Co-op Bulk Fuel Depot near Riceton, Saskatchewan. Provided opinion letter.
- Parks Canada / Matrix Solutions. (2017). Detailed quantitative human health and ecological risk assessment associated with petroleum hydrocarbon impacts in soil, groundwater and soil vapour at Yoho Gas Brothers gasoline station in Field, BC.
- Federated Co-operatives Limited / Clifton Associates. (2016). Conducted a due diligence risk assessment on the former Neepawa Co-op bulk fuel facility in Neepawa, Manitoba.
- Federated Co-operatives Limited / Nichols Environmental. (2016). Opinion memorandum and subject matter expert regarding human and ecological risks from an accidental biodiesel spill in Tail Creek, Alberta. Evaluated risks associated with accidental fuel spill and associated constituents (i.e., PHC and PAH) in surface water and sediment.
- Government of Northwest Territories Department of Transportation. (2016). Assessment of potential health risks posed to people eating fish caught from James Creek,

Northwest Territories. Risks associated with accidental fuel spills and associated constituents (i.e., PHC and PAH).

- SaskPower. (2016). Assessment of fate and degradation of n-nitrosodimethylamine (NDMA) with particular focus of aquatic environments for Boundary Dam Power Generating Station near Estevan, Saskatchewan. Assessment consisted of a literature search and summary combined with Level III fugacity modeling to gain a better understanding of the environmental fate and predicted concentrations of nitrosamines. Also included supplemental assessment of risks to wildlife and worker exposure.
- TransCanada. (2016). Developed a Quantitative Environmental Safety Tool (QuEST) to provide rapid and quantitative risk based hazard quotients based on environmental data. The sophisticated program QuEST Lite was designed to provide environmental managers an easy and rapid tool to screen environmental site data (i.e., soil, water or sediment) against federal or provincial guidelines on a site by site basis.
- Matrix Solutions. (2016). Developed an interim groundwater quality guideline for the protection of the indoor vapour intrusion pathway from dimethyl disulphide for a contaminated industrial site in Calgary, Alberta.
- Clifton Associates. (2016). Human health and vapour intrusion assessment of petroleum hydrocarbon migration from an adjacent property at the Decent of the Holy Ghost Regina in Regina, Saskatchewan.
- Enbridge / Trace Associates. (2016). Human health and ecological risk assessment of residual polycyclic aromatic hydrocarbons from a historical pipeline release in Saskatchewan.
- Enviro Analytics Group. (2016). Development of residential and commercial soil vapour remediation guidelines for property development in the Province of Alberta, Saskatchewan and Manitoba.
- SaskEnergy / Trace Associates. (2016). Human health and ecological risk assessment of an accidental fuel oil spill adjacent to a homestead in Otthon, Saskatchewan.
- Sears / Clifton Associates. (2016). Assessment of potential human health impacts associated with petroleum hydrocarbon impacts in soil, groundwater, soil vapour and indoor air in a residential neighbourhood in Hounsfeld Heights, Calgary, Alberta. Includes the development of soil vapour remediation guidelines and risk management plan, and public consultation and risk communication.
- Road Runners Ltd. and PINTER and Associates Ltd. (2016). Assessment of potential human health impacts associated with petroleum hydrocarbon impacts in soil, groundwater, soil vapour and indoor air, and development of site-specific guidelines at a former gas station in Saskatoon, Saskatchewan.
- Federated Co-operatives Ltd. (2016). Assessment of potential human health impacts associated with petroleum hydrocarbon impacts in soil, groundwater and soil vapour at the Former Gas Bar in Drumheller, Alberta.
- Federated Co-operatives Ltd. (2016). Assessment of potential human health impacts associated with petroleum hydrocarbon impacts in soil, groundwater, soil vapour and indoor air at the Former Gas Bar and Bulk Fuel Facility in Arrowwood, Alberta.
- Clifton Associates. (2016). Assessment of indoor air quality for the protection of human health at Loreburn Central School in Saskatchewan. The sampling program focused on

benzene, toluene, ethylbenzene and xylenes (BTEX) as well as the F1 (C6-10) and F2 (C>10-16) petroleum hydrocarbon (PHC) fractions. Provided opinion letter.

- TransCanada. (2016). Research and development program with the University of Saskatchewan and Natural Sciences and Engineering Research Council of Canada (NSERCC) regarding environmental fate and toxicity of pipeline valve lubricants.
- Bifrost Environmental. (2016). Assessment of indoor air quality for the protection of human health for a commercial property located at 7400 Macleod Trail SE in Calgary, Alberta. The sampling program focused on BTEX, PHC and VOC. Provided opinion letter.
- City of Regina / Clifton Associates. (2016). Assessment of potential human health impacts associated with petroleum hydrocarbon impacts in soil, groundwater, soil vapour and indoor air at the Transit Operations Centre in Regina, Saskatchewan.
- Regina School Board / Clifton Associates. (2016). Assessment of potential human health impacts associated with BTEX and PHCs measured in soil as part of a sampling program for the Balfour Collegiate School in Regina, Saskatchewan.
- Pemcor Investment Corporation. (2016). Assessment of potential human health impacts associated with chlorinated solvent contamination in soil and groundwater beneath an apartment complex in west Edmonton. Developed risk based soil, groundwater and soil vapour guidelines for chemicals of concern with the use of the Johnson and Ettinger Indoor Vapour Intrusion Model. Intrinsic developed and has managed the risk management plan for this property since 2003.
- Nexen Energy ULC. (2015). Assessment of potential human health and ecological risks associated with an accidental bitumen emulsion release from Long Lake operations near Fort McMurray, AB.
- Government of Nunavut. (2014). Review of the Proposed Kiggavik Uranium mine Final Environmental Impact Statement (FEIS), specifically related to the Human Health Risk Assessment (HHRA) and the Ecological Risk Assessment (ERA) for the Departments of Health and Environment located in Baker Lake, Nunavut.
- Natech Environmental Services and NB Department of Transportation and Infrastructure (2014). Screening ecological risk assessment of aerated stabilization and ash basins at a former pulp and paper mill in Miramichi, NB.
- TransCanada. (2014). Development of interim soil, sediment and water quality guidelines for PCBs.
- Clean Air Strategic Alliance (CASA). 2014. Chemical screening of emissions associated with electrical generation facilities in Alberta. Based on information on toxicity potency, bioaccumulation and persistence potential. The assessment focused on electrical power generation facilities based on combustion of coal, natural gas and biomass.
- Clean Air Strategic Alliance (CASA). 2014. Conducted an ecological effects review for emissions from electrical power generation in Alberta.
- Watters Environmental Group. (2014). Human health and ecological risk assessment for the Commercial Property (Lethbridge Property) located at 200 4th Avenue South, Lethbridge, Alberta. In addition, aided in developing a risk management plan for the site with ESRD.

- Clifton Associates Ltd. (2014). Human health and ecological risk assessment for a commercial property located at 620 46th Avenue NE, Calgary.
- TransCanada. (2013). Revised Human health risk assessment of pipeline valve lubricants at multiple sites across Canada.
- Parkland Industries Ltd. (2013). Due diligence risk Assessment for 5408 50th Avenue, Bonnyville, Alberta.
- Parkland Industries Ltd. (2013). Screening level human health risk assessment and ecological risk assessment for Fas Gas fueling station located at Station # 9 5301 Highway 2A Ponoka, Alberta.
- Consumer Association of Canada, Manitoba Public Law Office and G&P Resource Services Inc. (2013). Review of Keeyask Partnership Generation Project in Manitoba, specifically related to the human Health risk assessment of existing and predicted future methyl mercury health risks from fish consumption. Submitted intervener evidence included a biologically based exposure model, Monte Carlo simulation, bio-monitoring and hazard assessment.
- Clifton Associates Ltd. (2013). Human health and ecological risk assessment for Race Trac gas bar station located at 101 Government road, Dundurn, Saskatchewan. Involving soil, groundwater and soil vapour testing.
- Government of Alberta. (2013). Helping Alberta Health and Occupational Health identify and link available occupational and environmental health network data into a health surveillance system to facilitate communication, use and transparency of available health information in Alberta.
- Keystone Environmental. (2013). Updated risk assessment of human health and ecological risks presented by a historical Wood Forest Products Pulp Mill site near Squamish, BC.
- Devon Canada. (2013). Ecological risk assessment for an accidental bitumen release in 2010 from a SAGD pipeline in northern Alberta in 2010. Risks from exposure to PHCs, metals and PAHs were characterized for terrestrial mammals, plants and invertebrates.
- Agrium. (2013) Updated assessment of potential human health impacts associated with a proposed polymer fertilizer application.
- Conoco Phillips Canada (2012). Risk assessment in support of an air management strategy.
- Confidential Client (2012). Development of a detailed risk assessment and environmental management tool for multiple sites across Canada. Project Manager
- Confidential Client. (2011) Screening level Human health risk assessment of pipeline valve lubricants at multiple sites across Canada. Project Manager
- Capital Power Corporation and TransAlta Generation Partnership. (2011) Human health risk assessment for the Genesee-Wabamun Bio-monitoring Program for coal fired power plants west of Edmonton. Project Manager
- City of Longview and MPE Engineering. (2010) Completion of human health and ecological risk assessments in association with a proposed wastewater treatment plant and discharge.
- PWGSC / Parks Canada. (2010) Human health and ecological risk assessment of two Warden Sites impacted with petroleum hydrocarbons in Jasper National Park, Alberta.

- Xstrata-Zinc Operations. (2010) Ecological risk assessment of historic and current emissions of metals from the Belledune Smelter in New Brunswick.
- Clifton Associates Ltd. (2009) Assessment of potential human health and ecological impacts from historical underground petroleum storage tank leaks at a commercial property on First Nation Lands at Onion Lake Saskatchewan.
- Confidential. (2008) Assessment potential human health impacts from an accidental benzene release from a refinery. Performed probabilistic exposure modeling.
- TransCanada. (2008) Assessment of potential human and livestock health impacts as a result of PCB impacted property from lubricants and crankcase oils used at a compressor station.
- EPCOR and TransAlta Wabamun Genesee Bio-monitoring Program (WGBMP). (2008) Revaluation of human health risks based on measured environmental data in Wabamun Lake region, Alberta. Project Manager
- Trace Metals & Air Contaminants (TMAC) Working Group. (2007) Literature review of potential wildlife impacts in the oil sands region of Alberta. Project Manager
- Alberta Health & Wellness. (2006) Detailed human health risk assessment of ambient and incremental arsenic risks in the Oil Sands / Wood Buffalo Region in Northern Alberta.
- Earth Tech Environmental Inc. (2006) Human health risk assessment of game meat consumption in Swan Hills region - on a spatial and temporal basis.
- Glen Park Management. (2006) Human and ecological risk assessment of a proposed golf course and residential development at the Fernie landfill in Fernie BC.
- Curtis Environmental Engineering. (2006) Human health risk assessment from on-site and off-site petroleum hydrocarbon impacts in soil and groundwater from a historical leaking underground storage tank in a residential area Calgary, Alberta.
- Sears Canada. (2005) Human health risk assessment of petroleum hydrocarbon impacts at a commercial site in Calgary, Alberta. Project Manager
- Joseph Libin Holdings Ltd. (2005) Human health risk assessment of petroleum hydrocarbon and metal impacts at a commercial property in Calgary, Alberta.
- TransCanada. (2005) Assessment of potential human health impacts as a result of cattle foraging on PCB impacted property from lubricants and crankcase oils used at a compressor station. Development of a probabilistic foraging model for cattle to fully realize the potential concentrations of PCBs in beef and evaluate the potential for adverse health impacts.
- PHH Environmental. (2005) Assessment of potential human health and ecological impacts of a commercial center (i.e., Newton Crossing) associated with petroleum hydrocarbon and chlorinated organics in soil and groundwater in Surrey, BC.
- Bel-MK. (2005) Assessment of potential human health and ecological impacts associated with petroleum hydrocarbon and metal contamination in soil and groundwater from an abandoned Greyhound maintenance yard in downtown Calgary. Site investigations complicated with migration of off-site contamination. Risk assessment requires use of the Johnson and Ettinger Indoor Vapour Inhalation Model and development of remediation criteria.

- TransCanada. (2004) Assessment of potential cattle health impacts as a result of historical off-site migration of PCBs from lubricants and crankcase oils used at a compressor station. Development of a probabilistic foraging model for cattle to fully realize the frequency and magnitude of exposure and associated adverse health impacts (complete).
- Sudbury Area Risk Assessment Group (SARA Group) Sudbury, Ontario. (2004) Ecological risk assessment of historic and current emissions of metals from smelting facilities in the Sudbury area for Vale-Inco and Xstrata.
- City of Edmonton. (2003) Provide a detailed human kinetic dermal exposure and depuration exposure model to assess the likelihood of an alleged human poisoning episode involving polychlorinated biphenyl exposure following an accidental release of capacitor oil in August 2001 at the Commonwealth Stadium in Edmonton. Results and conclusions supported expert testimony at a trial in the Provincial Court of Alberta in 2004.
- Sears / Bennett Jones. (2003 to 2006) Assessment of potential human health impacts associated with petroleum hydrocarbon contamination in soil in a residential neighbourhood in west Calgary. Development of a risk based soil concentration with the use of the Johnson and Ettinger Indoor Vapour Inhalation Model.
- Agrium. (2003) Assessment of potential human health impacts associated with a proposed polymer fertilizer application. Probabilistic fate and exposure modeling.
- Imperial Oil Limited. Assessment of potential ecological impacts associated with a decommissioned gas plant near Battle Lake Alberta.
- Imperial Oil Limited/ Blake, Cassels & Graydon LLP. (2003) Assessment of potential human health impacts associated with lead contamination in soil in a residential neighbourhood in east Calgary. Development of a risk based soil concentration with the use of the U.S. EPA integrated exposure uptake biokinetic model (IEUBK) for children.
- Cominco Inc., Trail, British Columbia. (2000 to 2006) Ecological risk assessment of historic and current emissions of metals from a smelter facility. Risk assessment involved an information and GIS database, fate and transport modeling, exposure modeling, risk characterization, risk management and integration of efforts into a previously explored human health risk assessment.
- Jack Andrews Pharmacy Ltd. / D'Arcy & Deacon LLP, Winnipeg, Manitoba. (2000 to 2001) Provide an exposure model to assess the likelihood of an alleged human poisoning episode involving phenol exposure following an accidental release.
- Confidential, Alberta, Canada. (2000 to 2001) Human health risk assessment of exposure to volatile compounds released from an abandoned landfill to local residents. Predictive modeling of indoor air concentrations of BTEX and other volatile organic compounds from measured soil vapour concentrations. Predicted concentrations were used in a quantitative air exposure model for children and adults in residential, commercial, community center and school areas.
- Canadian Crude Separators in Swan Hills, Alberta. (2000) Ecological and human health risk assessment of a former waste oil pit. Evaluated vapour inhalation by humans and vapour inhalation, soil ingestion and plant uptake by herbivores.
- Ainsworth Lumber, Alberta, Canada. (2000) Screening level human health risk assessment of air emissions from a proposed oriented strand board facility. Risk

assessment involved modeling potential human receptor exposure to volatile organic compounds and air quality irritants.

Environmental Impact Assessment

- Suncor. (2019). Human health and ecological risk assessment of the proposed Froth Treatment Tailings Amendment Application north of Fort McMurray, Alberta.
- Atlantic Mining. (2018). Evaluation of exposure potential related to dust deposition from haul road traffic onto soils berries and vegetation. Atlantic Mining Beaver Dam Mine Project, Nova Scotia.
- Devon Canada. (2018). Human health and ecological risk assessment of the proposed Pike 2 SAGD project north of Fort McMurray, Alberta.
- Pembina Gas Services Ltd. (2018). Human health and ecological risk assessment of the proposed Two Lakes Sour Gas Processing Facility in Northwestern Alberta
- CNRL. (2018). Human health and ecological risk assessment of the proposed Horizon Oil Sands Mine North Pit Extension project north of Fort McMurray, Alberta.
- Atlantic Mining. (2018). Evaluation of potential human exposures and risks related to emissions from the Fifteen Mile Stream Mine Pit Project (i.e., dust deposition; recreational water usage; and country foods), which is a proposed gold mine near Trafalgar, Nova Scotia.
- Atlantic Power Corp. (2017). Assessment of the human health risks associated the proposed changes in emissions from the Williams Lake Power Plant (biomass-fuelled electricity generating facility), British Columbia.
- Baffinland Iron Mines Corporation. (2017) Human and wildlife risk assessment of the proposed May River iron ore mine expansion south of Pond Inlet in Nunavut Territory, Canada.
- MEG Energy. (2016). Human health risk assessment of the proposed May River SAGD project south of Fort McMurray, Alberta. Project Manager
- Teck Resources Ltd. (2015) Human health and ecological risk assessment to support approval of the proposed Frontier Oil Sands Mine project North of Fort McMurray Alberta.
- Sabina Gold and Silver Corporation. (2015). Human and ecological risk assessment for the final environmental impact statement for the Back River Project (Goose Property) located in the western Kitikmeot Region of Nunavut.
- Iron Ore Company (2015). Human health risk assessment of an iron ore mine expansion in Wabush near Labrador City in Newfoundland and Labrador.
- Suncor. (2014). Human health and ecological risk assessment of the proposed Meadow Creek Project near Fort McMurray Alberta.
- ConocoPhillips. (2014). Human Health Risk Assessment and Screening Level Ecological Risk Assessment of Surmont 3 Project near Fort McMurray Alberta.
- Government of Nunavut. (2014). Conducted a review of the Proposed Kiggavik Uranium mine FEIS, specifically related to the human health risk assessment and the ecological risk assessment for the Department of Health and Environment.

- Kinder Morgan Canada. (2013). Human health risk assessment of the proposed twinning and expansion of the Trans Mountain Pipeline between Edmonton, Alberta and Burnaby, British Columbia.
- Total E & P Canada. (2013). Re-assessment of human health and ecological risks associated with a proposed Oil Sands Mine project North of Fort McMurray, Alberta.
- ConocoPhillips. (2013). Human health and ecological risk assessment of the proposed Surmont 3 Project near Fort McMurray Alberta.
- SASOL Canada Holdings Ltd. (2013). Human health risk assessment, screening level ecological risk assessment and odour assessment of the SASOL Gas-to-Liquids (GTL) facility.
- Athabasca Oil Corporation. (2013). Human health risk assessment of the proposed Hangingstone SAGD project near Fort McMurray Alberta. Project Manager
- Osum. (2013). Human health risk assessment and screening level ecological risk assessment for the proposed Sepiko Kesik SAGD project.
- Value Creation Inc. (2012). Human health risk assessment and screening level wildlife risk assessment of the proposed Advanced TriStar Project near Fort McMurray, Alberta.
- Devon Pike. (2012). Human health and ecological risk assessment to support approval of a proposal for a SAGD Project northwest of Conklin, Alberta.
- MEG Energy Corp Surmont. (2012) Human health and ecological risk assessment to support approval of a proposal for a SAGD Project north of Janvier, Alberta.
- CNRL Grouse. (2012) Human health and ecological risk assessment to support approval of a proposal for a SAGD Project north of the Cold Lake area, located in Lac La Biche County, Alberta.
- Coalspur Mines. (2012) Human health risk assessment in support of coal mine application for the Vista Coal Project near Hinton, Alberta. Project Manager
- Coal Valley Resources Inc. (2012) Human health risk assessment in support of coal mine application for the Robb Trend Project near Hinton, Alberta. Project Manager
- BlackPearl Resources Inc. (2012) Human health risk assessment and screening level wildlife risk assessment of the proposed Blackrod SAGD Project south of Fort McMurray, Alberta.
- CNRL Kirby North Expansion. (2011) Human health and ecological risk assessment to support approval of a proposal for a SAGD Project north of the Cold Lake area, Alberta.
- Laracina Energy. (2011) Human health risk assessment and screening level wildlife risk assessment of the proposed Germain SAGD Project west of Fort McMurray, Alberta.
- Southern Pacific Resources Ltd. (2011) Human health risk assessment and screening level ecological risk assessment of the proposed McKay Thermal Project west of Fort McMurray, Alberta. Project Manager
- Silverbirch Teck. (2011) Human health and ecological risk assessment to support approval of a proposal for an Oil Sands Mine project North of Fort McMurray Alberta.
- Blake, Cassels & Graydon LLP on behalf of Compton Petroleum Corporation (Compton) and Darian Resources Ltd. (2010) Human health risk assessment from upstream oil & gas emissions in the Vulcan area of Alberta. The assessment was commissioned in response to concerns expressed by Hayduke & Associates Ltd. (Hayduke) alleging that

a resident's health was adversely affected from exposure to the emissions. The assessment formed part of the evidence in support of the licensing of a number of installations and facilities in the Vulcan area that are currently the subject of a series of Review Proceedings announced by the Energy Resources Conservation Board (ERCB).

- Baffinland Iron Mines Corporation. (2010) Human and wildlife risk assessment of a proposed iron ore mine expansion in Nunavut Territory, Canada.
- Devon Canada. (2010) Human health risk assessment and screening level ecological risk assessment of the Devon Canada Jackpine 3 SAGD south of Fort McMurray, Alberta.
- Korean National Oil Corporation. (2010) Human health risk assessment to support development of steam-assisted-gravity-drainage (SAGD) project for bitumen production south of Fort McMurray, Alberta.
- Connacher Oil and Gas Ltd. (2010) Human health and ecological risk assessment to support development of steam-assisted-gravity-drainage (SAGD) project for bitumen production south of Fort McMurray, Alberta. Project Manager
- Enmax Energy. (2010). Human health risk assessment of a proposed gas-fired power plant in the Bonnybrook area, City of Calgary.
- Enmax Energy. (2010) Human health risk assessment of a proposed gas-fired power plant in the Shepard area, City of Calgary.
- Total SA. (2009) Human health and ecological risk assessment to support approval of a proposal for an Oil Sands Mine project North of Fort McMurray Alberta.
- Athabasca Oil Sands Company. (2009) Human health risk assessment to support development of steam-assisted-gravity-drainage (SAGD) project for bitumen production east of Fort Mckay, Alberta.
- Shell Canada. (2009) Human health and ecological risk assessment to support development of in situ expansion project for Peace River Carmon Creek project east of Peace River, Alberta.
- MEG Energy. (2008) Human health risk assessment to support development of steam-assisted-gravity-drainage (SAGD) project for bitumen production south of Fort McMurray, Alberta.
- Conoco Phillips. (2009) Assessment of potential human health from an accidental blow out of a sour gas well located near Tumbler Ridge BC.
- Conoco Phillips. (2009) Assessment of potential human health and livestock health impacts associated with Brassey well fire near Chetwynd, BC.
- Graymont/Inland Parson's Creek EIA. (2008) Human health risk assessment in support of application for limestone quarry and aggregate mine near Fort McMurray, Alberta.
- Coal Valley Mine. (2008) Human health risk assessment in support of coal mine application near Mercoal and Coalspur, Alberta. Project Manager
- MEG Christina Lake 3. (2008) Human health risk assessment to support further development steam-assisted-gravity-drainage (SAGD) project for bitumen production south of Fort McMurray, Alberta.

- CNRL Kirby. (2008) Human health and ecological risk assessment to support further development steam-assisted-gravity-drainage (SAGD) project for bitumen production south of Fort McMurray, Alberta.
- Total SA. (2007) Human health risk assessment to support approval of a proposal for an Upgrader facility in Fort Saskatchewan, Alberta.
- Shell AOSP. (2007) Human health and ecological risk assessment to support approval of a proposal for an Oil Sands Mine project North of Fort McMurray Alberta.
- North American Oil Sands Corporation. (2007) Human health risk assessment to support approval of a proposal for an Upgrader facility in Fort Saskatchewan, Alberta.
- Petro Canada Ltd. Sullivan Creek. (2007) Human health risk assessment in support of health concerns for a sour gas drilling program in Kananaskis country.
- Petro Canada. (2007) Human and Livestock Health Risk Assessment of 11 proposed “sour” natural gas wells from five surface locations in the Sullivan field southwest of Longview, Alberta.
- Zinnifex High Lake Mine. (2007) Human and ecological risk assessment in support of development of copper, gold, lead, silver and zinc mine in the North West territories.
- Sherritt Power. (2007) Human and ecological risk assessment in support of development of the Dodds-Roundhill Coal Gasification Plant near Ryley, Alberta.
Project Manager
- Shell Canada. (2007) Human health risk assessment to support approval of a proposal for expansion of the Scotford Upgrader2 in Sherwood Park Alberta.
- Voisey Bay Nickel Company. (2007) Ecological risk assessment in support of an application to develop of a commercial nickel processing plant to be located at Long Harbour, Newfoundland and Labrador.
- Nexen Long Lake Phase 2. (2006) Human health risk assessment to support further development of the Long Lake property using steam-assisted-gravity-drainage (SAGD) for bitumen production and field upgrading south of Fort McMurray, Alberta. Project Manager
- North American Oil Sands Corporation. (2006) Human health risk assessment to support approval of a proposal for an SAGD facility near Conklin, Alberta.
- Synenco. (2006) Northern Lights. Human health risk assessment to support approval of a proposal for an upgrading facility near Edmonton, Alberta.
- Devon Canada. (2006) Human health risk assessment to support application for approval of the Jackfish 2 Project using steam-assisted-gravity-drainage (SAGD) for bitumen production near Conklin, Alberta.
- Petro Canada – Sturgeon Expansion. (2006) Human health risk assessment to support approval of a proposal for an oil sands upgrading facility for the Fort Hills oils sands project in Sturgeon County, northeast of Edmonton, Alberta.
- Graymont/Inland Cement. (2006) Human health risk assessment for a proposed gravel pit (Parson’s Creek Resources Project) north of Fort McMurray, Alberta.
- Luscar Coal Valley Mine. (2006) Human health risk assessment for a proposed coal mine expansion (Yellowhead and Mercoal West area) Near Edson, Alberta.

- Shell Canada Carmen Creek. (2006) Human health risk assessment to support approval of a proposal for expansion of the heavy oil operation in Grand Prairie, Alberta
- Luscar. (2006) Human health risk assessment to support approval of a proposal for a 1000MW coal-fire electrical generating station in Brooks, Alberta (“Greenfield Site”).
- Dominion Exploration Canada Ltd. (2006) Human health risk assessment in support of health concerns for a sour gas drilling program.
- Northwest Upgrader. (2005) Human health risk assessment to support approval of proposed oil sands bitumen upgrader in Sturgeon County Alberta.
- Deer Creek Energy Ltd. (2005) Human health and ecological risk assessment to support approval of a proposal for an Oil Sands Mine project North of Fort McMurray Alberta. Project Manager
- Petro Canada McKay River II. (2005) Human health and ecological risk assessment to support approval for a proposed SAGD operation near Fort McMurray Alberta.
- MEG Energy. (2005) Human health risk assessment to support approval for a proposed SAGD operation near Fort McMurray Alberta.
- Shell Canada. (2005) Human health risk assessment to support approval of a proposal for expansion of the Scotford Upgrader in Sherwood Park Alberta.
- BA Energy. (2005) Human health risk assessment to support approval of a proposal for construction of an Upgrader in Sherwood Park Alberta.
- Vancouver Port Authority. (2004) Human and ecological health assessment of the Roberts Bank container expansion project.
- Husky Energy. (2004) Human health risk assessment to support approval of a proposal for a steam assisted gravity drainage (SAGD) thermal recovery project (Sunrise) in the Oil Sands Region of Alberta.
- Deer Creek Energy Ltd. (2003) Human health risk assessment to support approval of a proposal for a steam assisted gravity drainage (SAGD) thermal recovery project in Alberta’s Oil Sands Region.
- BP West Coast Products Ltd. (2003) Assessment of potential human health impacts associated with air emissions from a proposed co-generation facility (Cherry Point) to be constructed in the U.S. Pacific Northwest. Probabilistic inhalation exposure modeling.
- Sumas Energy 2. (2003) Assessment of potential livestock and human health impacts associated with air emissions from a proposed natural gas facility to be constructed in the U.S. Pacific Northwest Probabilistic inhalation exposure modeling.
- Devon Canada. (2003) Human health risk assessment to support approval of a proposal for a steam assisted gravity drainage (SAGD) thermal recovery project (Jackfish) in Alberta’s Oil Sands Region. Exposure modeling.
- Husky Energy. (2003) Human health risk assessment to support approval of a proposal for a steam assisted gravity drainage (SAGD) thermal recovery project (Tucker) in the Cold Lake Alberta.
- Inland Cement. (2002) Assessment of potential human health impacts associated with air emissions from a Cement Plant in Edmonton Alberta converting to coal as a fuel source. Detailed fate and exposure modeling.

- EPCOR Power Development Corporation, Edmonton, Alberta. (2002) Providing consulting services for the development of a multilateral monitoring program for the expansion of a coal-fire electrical generating station.
- JACOS, Fort McMurray, Alberta. (2002) Human health risk assessment to support approval of a proposal for a steam assisted gravity drainage (SAGD) thermal recovery project immediately south of Alberta's Oil Sands Region.
- Shell Canada Ltd., Alberta. (2002) Human health and ecological risk assessment of a proposed mine in Alberta's Oil Sands Region (Jackpine). Exposure modeling.
- Fording, Brooks, Alberta. (2002) Human health impact/risk assessment for the construction of a coal-fire electrical generating station. Exposure modeling.
- Canada Crude Separators, Edson, Alberta. (2001) Human health risk assessment to support approval of a proposal for construction of an upstream oil field processing plant located West of Edson.
- Murphy Oil Corporation. (2001) Human and wildlife health impact/risk assessment of potential impacts associated with emissions from exploration and development activities surrounding a proposed critical "sour gas" well in central Alberta. Exposure modeling.
- Petro Canada, Edmonton, Alberta. (2001) Human health risk assessment to support approval of a proposal for an expansion of the Petro Canada Edmonton Conversion Refinery located in the Strathcona Industrial Park of east Edmonton. Exposure modeling
- Petro Canada, Fort McMurray, Alberta. (2001) Human health risk assessment to support approval of a proposal for a steam assisted gravity drainage (SAGD) thermal recovery project (Lewis) in Alberta's Oil Sands Region.
- Trans Alta Utilities, Edmonton, Alberta. (2001) Human health impact/risk assessment for the expansion of a coal-fire electrical generating station. Review and exposure modeling of airborne component transfer through multiple pathways to various human receptors. Exposure modeling, report preparation and hearing attendance.
- EPCOR Power Development Corporation, Edmonton, Alberta. (2001) Human health impact/risk assessment for the expansion of a coal-fire electrical generating station. Review and exposure modeling of airborne component transfer through multiple pathways to various human receptors. Exposure modeling, report preparation and hearing attendance.

OTHER SELECTED PROJECT EXPERIENCE (Prior to 2000)

Risk Assessment

- Shield Source, Peterborough, Ontario. Human health risk assessment of multi-media radiological (i.e., tritium) exposure to local residents and determination of stack emission limits protective of human health.
- Confidential, Alberta, Canada. Derivation of generic risk-based guidelines for disposal of PAH contaminated sediments in a residential parkland setting.
- Noranda, Idaho, USA. Terrestrial ecological risk assessment, provided database support to project staff and conducted a deterministic wildlife risk assessment.

- Confidential, Northwest Territories, Canada. Human health risk assessment of diesel fuel in soil at 27 sites across the NWT and Nunavut.
- Confidential, Louisiana, USA. Compiled extensive risk analysis data into concise tables to organize the client's concerns into a risk matrix for decision-making.
- Union Gas Risk Analysis, Alberta, Canada. Risk analysis to organize client's concerns into a risk matrix for decision-making.
- TransAlta Utilities, Alberta, Canada. Risk assessment approach to help identify issues, formulate testable scientific hypotheses, design and conduct scientific studies, and provide guidance for optimized mitigation.
- Department of National Defence (DND), Alberta, Canada. Site assessment of the former Harvey Barracks and associated practice lands situated in Calgary, Alberta.

Environmental Impact Assessment (Prior to 2000)

- Suncor Energy Inc., Alberta, Canada. Human and wildlife health impact/risk assessment components of an environmental impact assessment for the proposed SAGD Firebag Project in the Oil Sands of Northern Alberta.
- Ministry of the Environment (MOE), Moira River, Ontario. Ecological impact assessment of the abandoned Deloro mine site on the Moira River basin, situated north of Belleville, to provide remediation guidance for the mine site.
- Mobil Inc., Alberta, Canada. Baseline human and wildlife health impact/risk assessment components of an environmental impact assessment for the proposed Kearl Lake Oil Sands Project in Northern Alberta.
- AAFRD (Alberta Agricultural Food and Rural Development), Alberta, Canada. Assessment of potential environmental effects due to the increasing levels of intensive agricultural activity in the province of Alberta.
- Suncor Energy Inc., Alberta, Canada. Human and wildlife health impact/risk assessment components of an environmental impact assessment for the proposed Project Millennium in the Oil Sands of Northern Alberta.
- Shell Canada Ltd., Alberta, Canada. Human and wildlife health impact/risk assessment components of an environmental impact assessment for the proposed Shell Muskeg Project in the Oil Sands of Northern Alberta.

Development of Quality Assurance Project Plans

- Department of National Defence (DND), Calgary, Alberta. Site Assessment of the Former Harvey Barracks and practice Lands. Developed and implemented a quality assurance project plan for QA/QC of field sampling, analytical laboratory programs and data management for the decommissioning of a former Canadian military base.

Toxicological Review

- Fort McKay Food Study, Alberta, Canada. Study objective was to determine if oil sands emissions influence plant tissue concentrations in the local area and to determine if levels found were hazardous to native consumption.

- NOVA Chemicals, Alberta, Canada. Historical review of pesticide efficacy and potential off-site impacts of the pest control program at a major petrochemical facility in Joffre Alberta.
- Suncor Energy Inc., Alberta, Canada. Literature review and literature database for the evaluation of information on the health impacts of particulate matter.

Field Experience

- Alberta Power, Alberta, Canada. Fish salvage after a power generating station shut down water flow for routine maintenance.
- ATCO Power, Alberta, Canada. Monitor and collect fish samples from a routine plant release of chlorine and ammonia rinse into an outflow canal that leads into the Battle River.
- Department of National Defence (DND), Calgary, Alberta. Field assessment of the Former Harvey Barracks and Practice Lands to determine the likelihood and frequency of lead fragment occurrence on the surface of the soil.
- City of Calgary, Alberta, Canada. Investigative sediment sampling program in the Prince's Island Lagoon to determine levels of metal, organic and PAH contamination to develop generic soil quality guidelines and estimate remediation costs.

Joël Nolin, P.Eng.

Senior Environmental Engineer

Education	Years of Experience	Licenses/Registrations	Professional Affiliations
University of Manitoba, B.Sc. Civil Engineering, 1994	With AECOM: 6 With Other Firms: 20	Professional Engineer, Alberta	Association of Professional Engineers & Geosciences, Northwest Territories and Nunavut
Justice Institute of British Columbia, Hazardous Materials Emergency Response Technician		Professional Engineer, Permission to Consult, Saskatchewan	Association of Professional Engineers & Geoscientists of Alberta
		Level II (Secret) Reliability Status, Government of Canada	Association of Professional Engineers & Geoscientists of Saskatchewan

Summary

Mr. Nolin is a Senior Environmental Engineer with experience in the management and execution of Environmental Site Assessments (ESAs), Contaminated Site Remediation, Solid Waste Management, Industrial Hygiene, and Hazardous Materials Emergency Response. Based in Calgary, Mr. Nolin is AECOM's District Market Sector Manager focusing on the Remediation Consulting and Construction practice, as well as the firm's southern Alberta regional manager.

Selected Project Experience

Contaminated Sites – Federal/Provincial

Public Services and Procurement Canada (PSPC) Rayrock Mine Remedial Action Plan (RAP) Development: Project Manager for the development of a RAP for an abandoned Uranium Mine in the Northwest Territories [Jan 2018 – Present].

PSPC BAR-B RAP Development: Senior technical review for a RAP prepared for a former military site (BAR-B Stokes Point Beach Refueling Area) on the coast of the Beaufort Sea in the Yukon Territory [Dec 2017].

PSPC BAF-3 RAP Development: Senior technical review for a RAP prepared for a former military site (former Distant Early Warning site) located on Brevoort Island, Nunanut - located on the southeastern side of Baffin Island [Dec 2017].

Brewster Travel Canada, Columbia Icefields Remediation, Alberta: Project Manager the investigation and remediation of petroleum hydrocarbon (PHC)-impacted soils in the vicinity of a former tourism vehicle staging area located near the Columbia Icefield Discovery Center in Jasper National Park, Alberta, Canada. Work included Phase 2 ESA, a geotechnical slope stability review, remedial action plan development, remediation construction oversight and reporting [Nov 2014 – June 2017].

Brewster Travel Canada, Maligne Lake, Alberta: Project Manager for the investigation of an impacted site at a commercial tourism facility in Jasper National Park. Activities have included Phase II ESA, completion of a Remedial Options Analysis, client support with regulatory correspondence [Nov 2016 – Present (May 2018)]

Brewster Travel Canada, Columbia Icefields Staff Camp Phase II ESA, Alberta: Project Manager for the investigation of petroleum hydrocarbon (PHC)-impacted soils in the vicinity of fuel storage tanks [July 2017 – February 2018].

Glacier Park, Inc., Prince of Wales Hotel Former Maintenance Garage, Phase II ESA and Remedial Action Planning, Alberta: Project Advisor/Director for the investigation of impacted soils in the vicinity of a former maintenance garage. Work included Phase II and II ESA, including the installation of vapour monitoring wells and limited human health risk assessment as well as soil remediation [December 2017 – Present (September 2019)].

Brewster Travel Canada, Columbia Icefields Staff Camp Phase II ESA, Alberta: Project Manager for the investigation of petroleum hydrocarbon (PHC)-impacted soils in the vicinity of fuel storage tanks [July 2017 – February 2018].

Project Manager/Senior Technical Advisor for two contracts for Public Works and Government Services Canada (PWGSC, 2010-2013) respecting contaminated site assessment, risk assessment, designated substance management, and petroleum storage tank management amongst other environmental projects. Clients included for Parks Canada, Royal Canadian Mounted Police (RCMP), Health Canada and several other federal departments.

Project Manager for a Phase I ESA of the Town of Banff Maintenance Compound (completed for PWGSC on behalf of Parks Canada). The work scope included site assessment, cost estimation and classification using the National Classification System for Contaminated Sites and the development of remedial options.

Project Manager/Lead Engineer for the management of a petroleum-impacted site at a golf course in Prince Albert National Park in Saskatchewan. Work included a Phase II ESA, environmental site monitoring, and the development of an environmental management options analysis exploring options such as monitored natural attenuation, excavation and offsite disposal, in situ chemical oxidation (ISCO) and ozonation amongst others.

Project Manager/Lead Engineer for a Phase II ESA and Remedial Options Analysis for former firing ranges at the RCMP's main training facility in Regina, SK. The work scope included site assessment, cost estimation and classification using the National Classification System for Contaminated Sites and the development of remedial options.

Project Manager/Responsible Engineer for UST removals at three locations in Alberta for the RCMP. Work included the preparation of cost estimates, preparation of specifications using National Master Specifications, design of a new back-up fuel tank, and client support during tendering and project execution.

Project Manager for a Phase II ESA of the wharf at the Port of Churchill (completed for PWGSC on behalf of Transport Canada). The work scope included environmental drilling in a remote location, development of a site-specific safety plan, site assessment, cost estimation and classification using the National Classification System for Contaminated Sites, and the development of a Remedial Action Plan.

Project Auditor for the Thunder Bay Airport Environmental Baseline Study conducted for Transport Canada. During the project Mr. Nolin conducted over 35 environmental compliance audits, 43 petroleum storage tank inspections, and 15 environmental investigations. These investigations included conducting five EM-61 geophysical surveys; the drilling of 94 boreholes, installation of 49 monitoring wells, and associated sampling and analyses; and the preparation of a 5-volume final report. Work was completed at petroleum storage sites, a former landfill, a former firing range, and at sites impacted by glycol.

Preparation of Phase 2 ESAs at airports containing petroleum-contaminated soils, including site investigation, data collection, report writing, and site classification according to the National Classification for Contaminated Sites.

Management of, and participation in several environmental investigation projects at the Winnipeg International Airport for both the Winnipeg Airports Authority and several tenants including Air Canada and Bison Transport. Projects ranged from addressing glycol migration issues through to the investigation and remediation of petroleum-impacted areas.

Contaminated Sites – First Nations

Project Manager for an Environmental Baseline Study of a northern Manitoba First Nation in preparation for transfer of land management under the First Nations Lands Management Act. The project involved the individual assessment of over 600 properties with the results incorporated into a GIS database.

Project Engineer/Construction Manager for the Miskoosepi School soil remediation project completed for the Bloodvein First Nation in Bloodvein, Manitoba. Activities included the supervision and coordination of the First Nation contractor during the removal of 3500 m³ of PHC-contaminated soil and associated site restoration. Coordinated the activities of up to 20 contractor personnel and equipment.

Project Engineer for Environmental Investigations undertaken at the Miskoosepi School and Teacherages at the Bloodvein First Nation in Manitoba. The first stage of the project involved manual borehole drilling, monitoring well installations, and soil and groundwater sampling at a school site impacted by spilled fuel. Follow-up investigations included delineation and indoor environment investigations (including air quality and swab sampling for diesel and bacteriological contamination).

Project Engineer for various projects undertaken for the Opaskwayak Cree Nation, located near The Pas, Manitoba. These projects have included Phase I and II ESAs for 13 petroleum storage sites, and the completion of five Phase I and II ESAs for property transactions undertaken as a part of the Treaty Land Entitlement process.

Contaminated Sites –Municipal

Project Manager, Stage 1 Cover Design and Construction, Spyhill Waste Management Facility, The City of Calgary: Scope of work comprised the design of an evapotranspiration cover for a closed landfill followed by construction contract administration (capital cost ~\$25 M). [2014-2021]

Project Advisor, Calgary Municipal Lands Corporation (CMLC), former Canada Creosote Site environmental support as provided by AECOM (2016/ 2017)

Project Manager/Lead Engineer for assessment work at the former Canada Creosote Site in Calgary, Alberta for The City of Calgary, 2013-2015. Project activities included an assessment of an existing groundwater management system, groundwater monitoring and groundwater modelling; the development of a Remedial Options Analysis; and an assessment of the site's existing groundwater containment system.

Project Manager, Phase 2 ESA, Highfield Snow Dump, Calgary, Alberta (2016-2018). Project activities included borehole drilling, monitoring well installation, Tier 2 site evaluation and completion of a regional groundwater review. Follow-up 2017 work included groundwater sampling and assessment of potential impacts to adjacent properties.

Project Manager, Shepherd Landfill Cell 1 Expansion, The City of Calgary: Technical scope of work includes client landfill cell design review, cost estimation, and resident engineering. [2017-2018]

Project Manager, Stage 3 Cell Development, Spyhill Waste Management Facility, The City of Calgary: Project comprised the development of two new waste disposal cells. [2014-2016]

Project Manager/Project Engineer, Spyhill Waste Management Facility, Overburden Excavation: Scope of work included on-site soil classification, soil sampling and analyses, reporting. [2017]

Project Engineer for the Environmental Site Evaluation of the City of Saskatoon's Central Business District. The evaluation included the assessment of over 600 individual properties and the preparation of a computerized Environmental Database that summarized the results of the investigation.

Contaminated Sites - Energy (Oil & Gas/ Pipelines/ Power)

Program Advisor/Program Director, Master Services Agreement, Shell Canada, 2001-2013: Provided oversight, review and technical support services for project delivery at a portfolio of downstream retail and bulk (active, idle and decommissioned) properties in central and western Canada. Projects included Phase I and II environmental site assessment (ESA), remediation, human health and ecological risk assessment and associated activities.

Environmental Due Diligence, Natural Gas Co-Generation Stations, March/April 2019: Project Manager and Lead Assessor for the identification of environmental liabilities associated with the potential purchase of four natural gas co-generation stations in BC (1), AB (2) and ON (1). Work was completed within a three week period on schedule and on budget.

Environmental Due Diligence, Oil Transfer Facility, Alberta, 2014: Project comprised the identification of environmental liabilities associated with a potential asset purchase. Work was completed within five days of notification to proceed and included the development of long term environmental liability and environmental operation and maintenance cost estimates.

Environmental Services Master Service Agreement, TransCanada, 2005-2013, Project Director, Manager and/or Lead Engineer for an ESA, remediation and monitoring program at a pipeline and compressor stations for a major Canadian Energy company at sites in BC, AB, SK, MB and ON. Selected assignments for this client included:

- TransCanada, Keystone Pipeline Conversion, 2007, Project Manager for an ESA, remediation and monitoring program with a capital cost of \$8 M at a pipeline and compressor stations for a major Canadian Energy company. The project was delivered with Cost and Schedule Performance Indices less than 1.0.
- Natural Gas Compressor Station Demolition Program, Canada, 1999-2005, TransCanada, Project Director, Responsible Engineer - Work program comprised environmental inspection (pre-, during, and post-demolition) of main line compressor stations in Saskatchewan, Manitoba and Ontario. Work scope included sampling of building materials, soil and groundwater to determine environmental quality and waste disposal/ management options.
- Project Manager for a \$1.0 M PCB-impacted soil remediation and wetland development project near Regina, SK; a \$300 k impacted soil remediation project at a natural gas compressor station near Regina, SK; and a \$400 k soil remediation project at a natural gas compressor station in eastern Saskatchewan.

Project Director, Enerplus Environmental Master Services Agreement, Alberta, Canada, 2007-2013, Responsible Engineer, senior technical review for Phase I, II and III ESAs and remedial activities at upstream oil and gas (well) sites in Alberta.

Confidential Oilsands Operator, Environmental Performance Benchmarking Study, 2014 - Project Manager and Responsible Engineer to compare the client's environmental performance against industry peers for a Steam Assisted Gravity Drainage (SAGD) oilsands facility.

Environmental Due Diligence, Wellsite and Battery Acquisition, Alberta, 2013-2014, Responsible Engineer - Provided technical advisory services in relation to environmental due diligence completed for the acquisition of approximately 100 well sites and batteries in southern Alberta. The work scope included a desktop identification of environmental and social liabilities, as well as conceptual cost modelling for future site investigation, remediation and reclamation costs.

Sounding Lake Gas Plant, Environmental Compliance Monitoring, Crescent Point Energy, 2012, Responsible Engineer - preparation of site investigation (soil and groundwater) and monitoring for environmental license compliance.

Gas Plant Demolition Remedial Cost Estimate, Alberta, Canada, Enbridge, 2006, Project Manager/ Engineer - development of a remedial activity (soil and groundwater) conceptual cost estimate for the decommissioning of a gas plant located near Edmonton.

Pipeline Break Saltwater Spill Geophysical Delineation and Phase II ESA, Manitoba, Canada, Enbridge, 2005, Project Manager - delineation of saltwater spill plume using geophysics followed by monitoring well installation and associated sampling.

Project Auditor during the assessment of 41 Manitoba Hydro substations in northern and central Manitoba to evaluate the potential risks associated with uncontained releases of transformer oil.

Project Engineer for the development of Ecological Risks Assessments (ERAs) for The North West Company in Oxford House, MB, and for Husky Oil in Cochrane, ON. The ERAs involved a detailed identification of the hazards posed by petroleum contamination, potential environmental receptors to the contamination, and an evaluation of the pathways and associated risks of impact between the hazards and receptors.

Project Engineer for UST removals and/or upgrading throughout Manitoba and Saskatchewan for a major integrated oil and gas company. These projects involved a lithological description of the excavation, coordination of contaminated soil disposal (if any), confirmatory soil sampling, interpretation of laboratory analyses, and report preparation suitable for applicable regulatory agencies. In selected cases of tank replacement, specifications were prepared for tender.

Sewage disposal and water supply system integrity inspections for retail and bulk fuel facilities in Alberta, Manitoba, and the Northwest Territories for a major integrated oil company. Provision of training for sewage disposal and water supply system operations at 17 retail facilities in Manitoba, Alberta, and British Columbia.

Contaminated Sites - Other

Project Manager for a 24-hour/day, 365-day/year emergency response program for a national railway company. Duties also include being a primary responder to emergency incidents in both a professional and a "hands-on" capacity.

Management of Phase II ESAs in remote locations in Northern Manitoba for The North West Company and several First Nations. These projects required extensive logistical coordination to ensure efficient transportation, equipment and supply shipments, use of available resources, and identification of alternative project methodologies. These investigations were generally performed in response to the identification of on-site subsurface soil and groundwater contamination. The results were used in the design of long-term remediation action plans submitted to local environmental authorities and administrative officials.

Management of site remediation projects in northern Manitoba. These projects involved identification of the project team and interested parties, scope of work development and contractor selection, liaison with regulatory and local administrative authorities, application and confirmation of all required permits and licensing, scheduling of activities, project quality and budget control, ongoing communication with all parties involved, and project reporting.

Project Engineer/Construction Manager for a remediation project in Norway House, Manitoba. Activities included siting, design, and construction supervision for a soil treatment facility; and construction supervision and coordination of the First Nation contractor during the removal of 7200 m³ of petroleum-contaminated soil and associated site restoration.

Waste Management

Project Manager/Project Engineer, City of Brooks Former Landfill Cover Assessment and Annual Monitoring: Scope of work included geotechnical borehole drilling, soil sampling and laboratory analyses to assess the existing landfill cap condition; groundwater monitoring; and the development of recommendations and cost estimates for cover improvement. [2017]

Project Manager, Lead Engineer for the environmental management of the Forty Mile Creek Landfill in Banff, Alberta: Site work included Phase III ESA and environmental site monitoring, preparation of a design for stabilization of a creek bank that was eroding into the landfill (including the preparation of tender specifications using National Master Specifications. The project involved the inclusion of multiple stakeholders and regulators, including: Parks Canada, Environment Canada, Fisheries and Oceans and the Town of Banff. [2012-2013]

Management of Jones Road Landfill Monitoring Project for the City of Kenora. This project involved the management of three subconsultants utilized during the provision of environmental monitoring services. Key components of the project involved the installation of pneumatic piezometers and monitoring wells, benthic organism and fish sampling and analyses, and surface and groundwater sampling and analyses. [2001]

Management of landfill siting and design project for the Dauphin River Community Council. This project involved detailed siting and suitability investigations followed by the design and tendering of heavy civil works for road access and landfill development.

Project Engineer for the assessment of two Waste Disposal Grounds (WDGs) for the Bloodvein First Nation. Work included environmental assessments of both sites, the preparation of a WDG Decommissioning plan for one site, and the design and development of an Operation and Maintenance Plan for the second WDG. First Nation employees were trained on environmental field sampling techniques during this project.

Project Engineer for the assessment of three WDGs for the Waywayseecappo First Nation. Work included environmental and hydrogeological assessments, and the preparation of WDG decommissioning plans for each site. The work included the preparation of design drawings and an O&M Plan for a new WDG.

Sewage disposal and water supply system integrity inspections for retail and bulk fuel facilities in Alberta, Manitoba, and the Northwest Territories for a major integrated oil company. Provision of training for sewage disposal and water supply system operations at 17 retail facilities in Manitoba, Alberta, and British Columbia.



Mike Sanborn M.Sc., R.P.Bio.

Senior Risk Assessor

Education

MSc, Earth and Ocean Sciences,
University of Victoria, 2003

BSc, Biology and Environmental
Science, Trent University, 2000

Years of Experience

With AECOM: 15
With Other Firms: 3
As Specialist: 11

Areas of Expertise

Contaminated sites investigation; human health and ecological risk assessment; monitoring programs; regulatory support/technical advice; data collection, analysis and modelling; regulatory and permitting applications; remedial options evaluations; regulatory submissions; quality assurance; environmental sampling; water quality modelling.

Professional Affiliations

College of Applied Biology

Society of Environmental Toxicology and Chemistry

Registrations

Registered Professional Biologist, British Columbia, 2012

Summary

Mr. Sanborn is an Environmental Scientist and Senior Risk Assessor with 15 years' experience focused on environmental impact and risk assessment. He has extensive experience in the design, implementation, and conduct of site investigations involving water and sediment quality, chemical tracers, contaminant fate and transport, environmental chemistry, metals speciation, geochemistry, radionuclide assessment, biological observations and toxicity testing. His expertise includes computational food-web modelling and exposure assessment for human health and ecological risk assessments as well as statistical analysis. In addition, Mr. Sanborn is an experienced user of the GoldSim™ modelling platform and has completed several quantitative human health and ecological risk assessments using the GoldSim platform.

Relevant Project Experience

Rayrock Mine Site Sediment Investigations, NWT. Public Services and Procurement Canada. Conducted sediment investigation in Mill Lake at the abandoned Rayrock Mine Site. Developed a sampling and analysis plan for the collection of sediment cores from the former water supply lake in support of remedial planning. Mobilized equipment and personnel to conduct sediment investigations, carried out vibracoring program under challenging winter working conditions. Collected sediment were inspected logged, and subsampled for environmental chemistry, radiochemistry, and geotechnical analysis. Results were presented to the federal regulating agencies in support of remedial planning.

Class Level Human Health and Ecological Risk Assessment of Navigation Aid Stations (NAS) on the Mackenzie River, NWT. Fisheries and Oceans Canada. Developed a strategy for class level HHERA incorporating federal risk assessment guidance from Health Canada and Environment and Climate Change Canada where applicable. Collated analytical dataset with historically collected data, conducted statistical analysis, and quantitative risk assessment for 46 individual NAS. Developed lines of evidence for a-priori assessment of sites not specifically assessed. Prepared a detailed report for review by federal expert support under strenuous timelines. The AECOM deliverable allowed for the cost-effective assessment and prioritization of relative risks associated with 228 individual sites along the length of the Mackenzie River.

Sediment Characterization and Human Health and Ecological Risk Assessment of Historically Contaminated Sediments in the Vicinity of a Former Pulp Mill for Disposal at Sea, Prince Rupert, BC. BG Group. Prepared and executed a multiyear marine sediment investigation in support of a disposal at sea permit application off the western shore of Ridley Island. Was responsible for all aspects of the project including; development of sampling and analysis plans; sediment collection; sediment description and subsampling; coordination of chemistry and bioassay analysis; preparation of a sediment characterization report. Conducted a quantitative HHERA designed to assess risks to human and ecological receptors. Developed a detailed food web model; assessed sediment and tissue concentrations, assessed dietary intake of PAHs, PCBs, dioxin/furan following a traditional First Nation's diet. Prepared a comprehensive report for submission with CEAA Environmental Impact Assessment; made recommendations for risk management measures; participated in multi-stakeholder marine working group meetings with Prince Rupert Port Authority, federal and provincial regulators and local First Nations for effective communication of program results and potential impacts.

Predictive water balance and water quality model for Tundra Mine Site Tailings Remedial Option Assessment. Public works and Government Services Canada. Constructed a predictive water balance and water quality model using the GoldSim modelling platform to predict impacts to water quality in a chain of lakes in Canada's high arctic. Model incorporated

meteorological, hydrological, and geochemical data to predict concentrations of arsenic and other regulated metals in on-site and of-site waterbodies over a 35year timeframe. The model allows for sensitivity and scenario testing in order to provide site managers with an informed direction for site management decision making.

Predictive Water Quality Model and Development of Hexavalent Chromium Mitigation Measures for BRE Tunnel Rehabilitation. TECK Resources Limited. Constructed a predictive water balance and water quality model using the GoldSim modelling platform to assess in water quality associated with rehabilitation activities involving shotcrete application to a coal transport tunnel. Developed laboratory bench scale tests to assess shotcrete hexavalent chromium contribution under various potential operating conditions. Developed a multiple linear regression model to predict the required ferrous sulphate addition for effective mitigation of hexavalent chromium release.

Human Risk Assessment, Squamish Rail Yards, Squamish BC. BC Rail. Conducted a human health risk assessment (HHRA) at the BC Rail Squamish Rail Yards in support of a submission for a BC Ministry of Environment Certificate of Compliance. Detailed quantitative risk assessment was carried out to assess risks to commercial and construction workers as a result of soil and soil vapour exposure. GoldSim™ was used to develop a spatially explicit risk estimate based on grid quadrants, providing a valuable geographically delineating assessment making future site development more efficient. The alternative approach used by most other consultants would have imposed restrictions on the entire property.

Chevron Kitimat LNG Site Investigation and Remediation Project, Kitimat, British Columbia. Detailed site investigation of the former Eurocan Pulp Mill site in Kitimat BC. Provided senior input to development of sampling and analysis plans; collected sediment samples; developed multiple line of evidence approach for sediment assessment; technical lead development of passive sampling techniques for porewater assessment; collected sediments for bioassays and coordinated with toxicology lab to develop appropriate bioassay suite; tabulated and interpreted sediment and bioassay data; calculated site specific risk-based sediment criteria; prepared risk-based perspective on environmental site liabilities; provide senior review of detailed site investigation reports.

Central Terminal Expansion Project – Sediment Characterization for Disposal at Sea Permit Application, Vancouver, British Columbia. Port of Vancouver. Detailed sediment characterization of potentially contaminated sediments in the vicinity of a container terminal in a busy urban harbor. Duties include consultation with federal regulators; design, planning and implementation of sampling and analysis plan; field processing and logging of collected sediments; senior technical advice on deviations from approved SAP; evaluated and interpreted sediment chemistry; prepared detailed sediment characterization report; development of sampling and analysis plan for confirmation sampling; interaction with federal regulators (ECCC) to establish complex project staging and regulatory acceptance.

Toquaht Bay Campground, Ucluelet, British Columbia. BC Crown Contaminated Sites. Conducted detailed site investigations of terrestrial and marine contamination as a result of historical deposition of arsenic contaminated tailings. Conducted data review and gap analysis, prepared sampling and analysis plans, conducted sampling of marine sediments and biological tissues, conducted pore water collection and analysis, assessed marine geochemistry and sediment contaminant fate and transport, collected and analyzed bivalve tissue for arsenic speciation, and interpreted chemistry data in abiotic and biotic matrices, compiled data, and prepared detailed site investigation report. Conducted statistical analysis of environmental quality data. Conducted a quantitative human health risk assessment of arsenic and iron contaminated soils.

Human Health and Ecological Risk Assessment Highway 17 and Highway 108, Spragge, Ontario. Imperial Oil Limited. Conducted senior technical review of a detailed due diligence human health and ecological risk assessment for a former IOL service station. Reviewed previous contaminated site investigation report, reviewed technical work scope prior to development of the HHERA, provided technical review and sign off of the HHERA.

Tier 2 Soil Remedial Objectives for the Protection of Vapour Inhalation. Imperial Oil Limited. Calculated site-specific remedial objectives for a contaminated site undergoing remediation in Lethbridge Alberta. Reviewed site investigation reports to determine appropriate adjustment opportunities. Calculated remedial soil objectives for the protection of the vapour intrusion pathway. Prepared a technical memorandum describing the rationale and results of the adjustment.

Tier 2 Soil and Groundwater Remedial Objectives for 2510 Oakmoor Drive SW, Calgary, Alberta. Calculated site-specific remedial objectives for a contaminated site undergoing remediation. Reviewed site investigation reports to determine appropriate adjustment opportunities. Calculated remedial soil objectives for the protection of the vapour intrusion pathway and protection of groundwater mediated transport to an aquatic receiving environment. Prepared a technical memorandum describing the rationale and results of the adjustment. All work was internally reviewed by IOLs technical experts and met with approval.

Morag McPherson, M.Sc.

Senior Aquatic Biologist

Education

M.Sc., Conservation Ecology
Renewable Resources
University of Alberta, 2020

B.Sc., Natural Resources
Agriculture and Life Sciences
Cornell University, 1999

Training and Certifications

Canadian Aquatic Biomonitoring (CABIN)
Training (2012)
Field Health & Safety Training (annual)
Backpack Electrofishing Training (2010)
Aquatic Animal User Certification (2014)

Years of experience 17

Years with AECOM 2



Summary

Ms. McPherson is a senior aquatic biologist. Prior to starting with AECOM, Morag had 16 years of professional work experience, with over 7 years in the regulatory and environmental assessment field focused primarily on abandoned mine site remediation in northern Canada. Her experience includes regulatory review and environmental assessment in northern jurisdictions, preparation of *Fisheries Act* authorizations and implementation of compliance activities related to fisheries protection. Morag's responsibilities have also included analyzing biological data, scientific information and technical documents related to aquatic resources and development impacts. She has utilized a variety of fisheries assessment and fish habitat restoration techniques. Morag has participated in and coordinated multi-stakeholder groups to achieve common fisheries conservation and environmental protection goals.

AECOM Project Experience

Public Services and Procurement Canada – Giant Mine Remediation Project, Northwest Territories. Member of project team tasked with developing *Fisheries Act* Authorization applications for the remediation of Baker Creek, installation of a water treatment outfall structure and placement of cover materials in Yellowknife Bay. Activities have included calculations of fish habitat losses and gains, development of conceptual fish habitat offsetting measures, mitigation plans, fish habitat and aquatic monitoring programs, and drafting of Water Licence closure criteria for Baker Creek. Currently providing technical support to Baker Creek and Yellowknife Bay design reviews and project engagement activities with advisory committees, working groups, and local Indigenous communities. Timeline | 06/2020 – Ongoing.

Public Services and Procurement Canada - Great Bear Lake Sites Remediation Project, Northwest Territories. Lead a project team in the development of a Baseline Water Quality Monitoring Report and the 2020 Water Quality Monitoring Report for the pre-remediation Great Bear Lake Sites. Provided coordination, technical support, advice and review to summarize water quality data sets for each project site, including statistical summaries and temporal and spatial trend analyses to characterize baseline water quality conditions. Identified data gaps and made recommendations for pre-remediation water quality monitoring to establish baseline water quality values in order to detect and evaluate changes in water chemistry during and after remediation. Timeline | 12/2019 – 12/2020.

Public Services and Procurement Canada – Tundra Mine Post-Remediation Site, Northwest Territories. Member of a project team that developed a Status of the Environment Report and Long-term Monitoring Plan for the post-remediation Tundra Mine site. Consolidated and summarized results from the water quality and ecological monitoring programs conducted as part of the Construction Monitoring Program. Evaluated trends in water quality and aquatic ecological conditions to assess the overall health of the aquatic environment and provided recommendations for environmental components to be included in long-term monitoring. Lead the development of a Long-Term Monitoring Plan for the post-remediation Tundra Mine site including geotechnical, water quality, and aquatic ecology components that will be used to evaluate the effectiveness of the remedial actions over time, provide early indication if contingency measures are needed, and monitor contaminant levels in the receiving environment to ensure compliance and protection of human health and the environment. Timeline | 12/2019 – 12/2020.

Indigenous and Northern Affairs Canada – Faro Mine Remediation, Yukon. Part of a project team that developed the Project report for the Environmental Assessment of the Faro Mine Remediation Project. Provided technical support for the fish and fish habitat component of the Biophysical Environmental Effects Assessment. Reviewed background and

Morag McPherson, [M.Sc.](#)

supporting documents, completed a gap analysis to determine sufficiency of information to meet regulatory requirements, and developed of information requests to help focus the remediation planning and support the determination of impacts. Timeline | 12/2016 – 05/2017.

Alberta Transportation – Highway 2 Twinning and Peace River Bridge, Alberta. Provided technical review and advice on the evaluation and development of conceptual fish habitat offset plans for the Peace River Bridge *Fisheries Act* Authorization required as part of the twinning project. Timeline | 02/2017 – 05/2017.

Various clients – Aquatic monitoring review and design, Alberta and Northwest Territories. Provided technical review and input for the design of sampling programs to monitor aquatic habitats surrounding the Cell 7 Landfill operated by Hinton Pulp. Reviewed sampling reports to validate results and develop a monitoring plan related to the response to a sewage release for the City of Cold Lake. Reviewed and summarized approved aquatic and revegetation monitoring plans at remediated mine sites in the Northwest Territories to support a preliminary remote monitoring technology feasibility study for Indigenous and Northern Affairs Canada. Timeline | 12/2016 – 05/2017.

Other Experience

Fisheries and Oceans Canada, Regulatory Review, Edmonton, AB. Conducted *Fisheries Act* regulatory reviews for oil sands mining, oil and gas, transportation and flood protection development activities that may impact fish and fish habitat. Provided regulatory advice to protect fish and fish habitat, including methods to avoid, mitigate or offset impacts to fish. Conducted reviews of proposed fisheries offsetting plans, participated in Indigenous consultations and developed environmental assessment submissions. Provided technical review and input on sampling plan designs for fisheries monitoring programs. Conducted monitoring and inspections to confirm compliance with the fisheries protection provisions of the *Fisheries Act*. Evaluated technical information and analyzed biological data related to fish and fish habitat. Provided advice and recommendations related to the assessment of fisheries productivity, habitat restoration and the potential impacts to fisheries from development activities. Worked collaboratively with industry, public, environmental organizations, Indigenous groups and other government agencies to promote the sustainability of fisheries resources. Timeline | 05/2016 – 10/2016.

Fisheries and Oceans Canada, Regulatory Review and Contaminated Sites, Yellowknife, NT. Conducted regulatory reviews of remediation projects at federal contaminated sites to verify compliance with the *Fisheries Act*. Provided regulatory advice to avoid and mitigate impacts to fish and fish habitat from proposed remediation activity. Project experience includes abandoned mine sites in northern Canada, as well as abandoned DEW line, high arctic weather station and mining, oil and gas exploration sites. These large remediation projects in northern Canada involve the development of roads, stream crossing structures, quarries, landfills, large excavations and in-water activity. Developed and prepared *Fisheries Act* authorizations, including agreements to offset impacts to fish and fish habitat. Conducted inspections and compliance monitoring to confirm fisheries protection measures were implemented at federal remediation projects. Reviewed and provided technical advice on environmental site assessments, ecological risk assessments, remedial action plans, and site management and monitoring plans related to potential risks and impacts to the aquatic environment. Assisted in the development of investigations, studies and sampling programs designed to assess or monitor impacts to aquatic resources resulting from contamination and remediation activities at federal contaminated sites. Provided advice and training on methods for assessment, habitat enhancement and monitoring in the aquatic environment. Participated in meetings, public hearings and consultation sessions involving government agencies, northern resource management boards, Indigenous groups, community members, consultants and industry representatives. Timeframe | 07/2008 – 08/2015.

Natural Resources Canada, Mackenzie Gas Project, Yellowknife, NTT. Indigenous consultation. Coordinated and facilitated consultations between the Government of Canada and Indigenous groups regarding the proposed Mackenzie Gas Project, which included the development of gas fields, pipelines and associated camps, roads, borrow sources, bridges and wharfs. Engaged and developed working relationships with Indigenous groups affected by the proposed development. Developed communication materials, presentations and information packages for Government of Canada information sessions and consultations with Indigenous communities. Documented and coordinated information related to consultation activities and provided records, recommendations and briefing material to federal decision-makers, including

Morag McPherson, [M.Sc.](#)

a report on Crown consultation activities to the National Energy Board. Interpreted policy, legal opinions and court decisions on Indigenous consultation matters. Timeline | 11/2005 – 06/2008.

Training and Certifications (Additional)

- River Habitats and Hydraulics - Canadian Rivers Institute, University of New Brunswick (2014)
- Stream Restoration: Design and Monitoring - University of New Brunswick (2013)
- Aquatic Sites Framework for Assessing and Managing Aquatic Contaminated Sites (FCSAP) - Fisheries & Oceans Canada (2010)
- Habitat Inspections and Investigations - Fisheries & Oceans Canada (2009)
- Bioengineering Techniques for Riparian Restoration - Polster Environmental Services (2010)
- Hydro-Ecology of Streams - Water Survey of Canada (2009)
- Essential Fisheries Field Skills Certificate - Vancouver Island University (2008)
- Watercourse Alteration Training - Maritime College of Forest Technology (2009)
- National Energy Board Hearing Witness Training - Department of Justice (2005)

Publications

Cott, P.A., Zadlik, B.B., Palmer, M.J., and McPherson, M.D. 2015. Arsenic and mercury in lake whitefish and burbot near the abandoned Giant Mine on Great Slave Lake. *Journal of Great Lakes Research*. DOI.org/10.1016/j.jglr.2015.11.004.

Hewitt, M., M.D. McPherson, and M. Tokarek. 2013. Bioengineering techniques for revegetation of riparian areas at Colomac Mine, Northwest Territories. *Proceedings of the 2013 Mine Reclamation Symposium*. Canadian Land Reclamation Association.

Rob McCullough, BES, CET, CESA, EP

Senior Technical Lead

Education	Memberships	Registrations	Awards
Bachelor of Environmental Studies, University of Waterloo, Waterloo, Ontario, 2000	Member, Ontario Association of Certified Engineering Technicians & Technologists	Certified Cleanup Contractor, Nova Scotia Environment	2005 Canadian Consulting Engineers Award for Excellence, Remediation of the Sungai Berra Basin, Brunei, Indonesia
Geotechnical Technologist Diploma, Sir Sandford Fleming College, ON, 1984	Member, East Coast Oilfield Technical Society	Certified Engineering Technologist, TechNova	
Geological Technician Diploma, Sir Sandford Fleming College, ON 1983	Member, Associated Environmental Site Assessors of Canada Inc. and sit on the registration board. Certified Environmental Site Assessor	Certified Engineering Technologist, Ontario Association of Certified Engineering Technicians & Technologists	
Years of Experience	Member, National Ground Water Association	Certified Concrete Field Testing Technician, Grade I, Canadian Standards Association	
With AECOM: 1	Member of the Environmental Industry Associate, EP.		
With Other Firms: 34			

Summary

Mr. McCullough is a Senior Technical Lead in the Remediation/Geoscience practice with AECOM in Halifax, Nova Scotia. Rob's experience includes Site Auditing – both risk and environmental/compliance, detailed site assessment and remediation and site management on a variety of projects including Dry Cleaning sites, Remote Light House Stations, the Air Navigation System across the Canadian Arctic, the Distant Early Warning System (DEW line) and upstream/downstream petrochemical across Canada and overseas. Most of Rob's career has been in remote areas and the Arctic, across mainland Canada and abroad, carrying out bio-remediation, freeze back and landfill systems, hazmat, site remediation, mine reclamation and emergency response for DND, PWGSC, INAC, RCMP, Transport Canada, Environment Canada, GNWT, NT, and Hamlets throughout the Arctic. Projects located in remote areas requiring a high level of training and competence to direct multi-discipline teams. In addition, Rob has experience in management, co-ordination and facilitation of significant teams on large-scale pipeline spills in Canada. Rob has been responsible for the daily management of many integrity digs in pipeline maintenance programs and large complex projects across Canada with his extensive 34 years of experience in the Canadian Arctic in the North West Territories, Nunavut, Yukon and Greenland. Mr. McCullough's experience also includes working extensively in South America and Indonesia, lectured in Moscow, Cambridge England and Hobart, Tasmania. From 2004 to 2006, Rob supervised the cleanup of the MK Airline 747B crash at Halifax International Airport. Senior technical lead for assessment of JET A-1 fuel and Arctic diesel contamination, 2007 to 2010 at DND DEW Line BAF-3, Nunavut and former Colomac Gold Mine in the NT for INAC. In addition, Rob was the senior technical lead for major oil spill response in Alberta, Ontario and the Northwest Territories. From 2015 to present, Rob was the Senior Department Representative and Senior Project Manager for the closure and reclamation of the Bullmoose Ruth Mine sites and Gordon Lakes Group Mine sites, Northwest Territories.

Project Experience

Northern Site Assessment and Remediation

Residential Fuel Tank Remediation, Maritime Provinces (Project Manager/Technical Lead), 2000-2010. Senior project manager/site Supervisor for approximately 200 residential fuel tank failures and subsequent remediation of sites.

Emergency Response and site Remediation, BAF-3 Radar Site, Breevort Island, Nunavut. Senior Technical Lead, Site Supervisor: 150,000L Jet Fuel Release from Summit fuel piping system, Feb 2006 to Oct. 2011. Worked with DND and Nassitug to manage and remediate the effects of a large fuel release at the summit of the station. Responsible for representing the Crown in all aspects of the project from logistics to Site Remediation Supervision. Confirmation of cleanup objectives and quantities incurred. Conducting site operations and regulatory and stakeholder tours/inspections.

Emergency Response and site Remediation, BAF-3 Radar Site, Breevort Island, Nunavut. Senior Technical Lead, Site Supervisor: 10,000 L arctic Diesel P -50 from Beach tank following water removal in tank containment berm, fuel recovery, marine boom deployment in the ocean, beach remediation, tank cleaning and repair, risk assessment and closure. July 2010.

Worked with DND and Nassitug to manage and remediate spill and effects on the marine environment. Responsible for representing the Crown in all aspects of the project from logistics to Site Remediation Supervision. Confirmation of cleanup objectives and quantities incurred. Conducting site operations and regulatory and stakeholder tours/inspections.

Bullmoose Ruth Mine Site Remediation, Near Yellowknife, Northwest Territories (Senior Departmental Representative/Backup Project Manager), 2017-2018. Client: Public Works/INAC. Senior DR and Backup Project Manager. Responsible for all site operations and supervision of Contractor. Responsible for representing the Crown in all aspects of the project from logistics to Site Remediation Supervision. Confirmation of cleanup objectives and quantities incurred. Conducting site operations and regulatory and stakeholder tours/inspections.

Gordon Lakes Group Mine Sites, Near Yellowknife, Northwest Territories (Senior Project Manager/Senior Departmental Representative), 2017-2018. Client: Public Works/INAC. Senior DR and Senior Project Manager. Responsible for all site operations and supervision of Contractor. Responsible for representing the Crown in all aspects of the project from logistics to Site Remediation Supervision. Confirmation of cleanup objectives and quantities incurred. Conducting site operations and regulatory and stakeholder tours/inspections. Responsible for all contract obligations, design and tender specifications, change orders and financial management of both site/contractor and Stantec Departmental Representative team for site supervision.

Line 21 Integrity Assessment Program Client: Enbridge Pipelines (NT) Inc. Integrity Drilling Assessment Program, Line 21 Zama, Alberta to Norman Wells, NT. (2012-2013) Field supervisor and technical Director of assessment team carrying out a borehole drilling and sampling /soil vapor analysis of several anomalous locations along the pipeline using helicopter portable drilling equipment.

Environmental Site Assessments Phase I, II, III Gasoline Release, Resolute Bay Bulk Fuel Storage, Resolute Bay (Remediation Specialist), 2012-2015. Client: Government of Nunavut. Supervised the assessment and subsequent remediation of 5000 M3 of gasoline impacted soil and 500,000 L of impacted water resulting from a release of 87,000 L of gasoline at bulk fuel storage area. Completed the assessment over time winter/spring 2012/2013 and remediation commenced in July 2013 to 2018.

Remedial Systems Design/Operation/Maintenance, Resolute Bay, Cambridge Bay, BAF 3 Dewline, Nunavut (Senior PM, Site Supervisor/Technical Lead), 2000-2015. Client: Transport Canada, DND/Government of Nunavut. Senior technical lead on design and implementation of numerous hydrocarbon impacted water collection/containment and treatment with carbon/sand filtration and total/multi-phase pumping systems.

Operation and Maintenance of numerous Bioremediation Facilities across Canada and the Arctic, upstream to Downstream oil and Gas operation- retail/commercial/industrial facility remediation, Transport Canada/Nav Canada, Qulliq Energy, Nu. Iron Ore Company of Canada, Various DND DEW Line sites in Nunavut and NWT.

Site Remediation and Jet A-1 Fuel spill mitigation - MK Airlines 747 Crash Site near the Halifax International Airport, Nova Scotia (Project Officer in Charge of Site, Senior Site Supervisor and Senior Project Manager). Site cleanup, salvage organization, fuel spill mitigation, fuselage removal, body part recovery, aided in Transportation Safety Board Investigation and completed the site restoration for Clyde and Co. (Lloyds of London Insurance Company).

Various Projects in Remote and Arctic Site. (Senior Technical Lead/Project Manager) 60 Phase I and 10 Phase II ESA's in various locations in the Canadian High Arctic: (1997-2001) Phase I and II ESA and compliance Audits, Nav Canada, various Canadian and U.S. military facilities, Goose Bay, Labrador(1998); Phase I and II ESA's at seven Remote Light House Islands - Canadian Coast Guard(1999), Phase I and II ESA at the Atmospheric Weather Station Site, Sable Island, Nova Scotia(1998), Limited Phase II Site Assessment – DND Northern Fuel Cache, Quebec, Nunavut, NFLD and Labrador (2002), Twelve Phase I and II ESA's at RCMP facilities in Nunavut at Clyde River, Pond Inlet, Igloodik, Hall Beach, Iqaluit and Cape Dorset, Phase III ESA and Remedial Action Plan for the old town site in Clyde River, Nunavut, Phase II ESA Nav Canada for proposed radar Installation, Iqaluit, Nunavut.

Client: Transport Canada. (Senior Project Manager/Technical Specialist) Lead field Assessor for the Environmental Baseline Study at the Resolute Bay Airport, Resolute Bay, North West Territories, conducted for Transport Canada. Senior project team leader for the assessment program, which entailed a detailed three-week intrusive field program, laboratory analysis and assessment report with a detailed remedial action plan.

Phase II ESA and Human Health Ecological Risk Assessment – Eureka - High Arctic Weather Station, Nunavut. (Senior Technical Lead/Senior Reviewer) Senior Technical Specialist for the Site Assessment and Remedial Action Plan of the landfill, barrel crushing area and beach and foreshore sediments, Eureka Atmospheric Environment Station, Axel Heiberg Island, Nunavut.

Mould Bay High Arctic Weather Station, NT, 2015-2016. Senior Technical Lead, Senior Site Supervisor, field investigation and sampling program to support the gap analysis of HHERA and Site Assessment for the proposed remediation of the station. Field supervisor for the assessment team, established a temporary camp (weather haven) and responsible for field program and logistics to and from station and while on site.

Mould Bay High Arctic Weather Station, NT, 2016-2017. Senior Technical Lead, Senior Site Supervisor for supplementary field investigation and Fuel Tank Assessment to support Remedial Action Plan for station remediation and Vertical Fuel Tank Decommissioning. Field supervisor for the assessment team and Petroleum Contractor, responsible for field program and logistics to and from station and while on site.

Former Colomac Gold Mine, Northwest Territories. (Senior Project Manager/Technical Specialist) Technical Supervisor for a multi-phased project to monitor melt water/groundwater, Free phase hydrocarbons in 40 monitoring wells across the former fuel storage area of the mine, the construction of land farm for several thousand cubic meters of hydrocarbon impacted material, the assessment and cleaning of approximately 1500 – 205L barrels and the conceptual design of a remedial system to address the phase separated product noted across the site in the fractured bedrock.

Former Colomac Gold Mine, Yellowknife, NWT. 2014-2016 Client: AANDC (Senior PM, Site Supervisor/Technical Lead) Standing offer with AANDC to carry out the Colomac Comprehensive Monitoring Plan (CCMP). Where we monitor soil groundwater, surface water, air, wildlife and vegetation as post remedial monitoring, resulting from the mine reclamation.

Nanisivik Mine, Nanisivik, Nunavut. 2005-2014 Client: Tidewater Resources (Senior Technical Lead) Senior Technical Lead for the post remedial monitoring of former Nanisivik lead/zinc mine, tailings cap monitoring and construction of land farm for hydrocarbon impacted soil form fuel tank farm.

Other Site Assessment and Remediation

Willow Lake River Crude Oil Release, Wrigley, Northwest Territories (Senior Technical Lead, Site Supervisor), 2011-2013. Client: Enbridge Pipelines (NT) Inc. Senior Site supervisor and technical specialist for the remediation and reclamation of a 1700 cubic meter release of Crude oil in the area of the Willow Lake River, NT. On-site technical lead for the initial emergency response, site assessment and remediation of a 50 person field compliment of First Nations, Enbridge and Stantec personnel. Work entailed the initial emergency response to mitigate any impacts from entering the WLR and MacKenzie River system. Followed by a significant 50 MW and 100 TP assessment and delineation program done concurrent with the initial remediation followed by significant remediation, which was carried out for two years almost continuously.

Cheecham Terminal, Fort McMurray, Alberta (Field Technical Lead and Field Supervisor), 2013- 2014. Client: Enbridge Pipelines (Athabasca) Ltd. Field technical lead and field supervisor of major synthetic crude oil release from the terminal ROW pipeline. Supervised a significant field team, provided technical support to project management and liaised with from the initial emergency response through the assessment and then remediation of the site.

Elk Point Compressor Station, Elk Point, Alberta. Major Sour Crude Release Emergency Response 2014-2015. Client: Enbridge Pipeline Inc. Technical lead and field supervisor of major sour crude oil release from the terminal at station. Supervised large field team, provided technical support to project management to complete the emergency response, Assessment and remediation, including off-site impacts.

Remediation of Sungai Bera Holding Basin, Seria, Brunei Darussalam (Senior Technical Lead – Site Assessment), 2003. Jacques Whitford (now Stantec) completed a 30 million dollar project which entailed the site remediation and Low Temperature Thermal Desorption (LLTD) Treatment of 150,000 tonnes of petroleum impacted drilling muds, cuttings, sludges and soil. This design build project included detailed design, set up, operation and site remediation for the former disposal area for the oil field wastes. The project was extremely successful and completed on time and on budget.

Halifax Stanfield International Airport, Fire Training Area, Halifax, Nova Scotia Halifax Airport Authority and Transport Canada 2004 Borehole/monitoring well installation/ development and sampling. Acid Rock investigation and fractured flow analysis

Halifax DCD School, Halifax, Nova Scotia, Defense Construction Canada, 1992 – 2000 Various environmental sampling programs and training at the Firefighting school, sediment testing and analysis and remedial excavation supervision

Moncton Airport Fire Training Area Remediation, Moncton International Airport, Moncton, NB. 1988. Environmental Remediation and significant remedial excavation of existing Fire Training Area fuel impacts at the Moncton Airport and the subsequent re installation of a new system for fire fighting training.

Air Canada Flight 624, Halifax, NS (Senior Technical Lead), 2015 Client: Air Canada. Senior Technical Lead, Site Supervisor of crash of Air Canada Airbus 320 on approach to Halifax Stanfield International Airport. Supervised plane remedial runway jet fuel and hydraulic oil collection and site (snow) collection/remediation.

Bioassessment - Bio Remediation of Arctic Diesel Contaminated Soil, Remote Transmitter Site, Cambridge Bay, Nunavut. (Senior Project Manager and Senior Technical Lead). Assessment and Remediation of the Transport Canada Transmitter site. Constructed and operated a biopile (4 years) to treat approximately 1000 tonnes of hydrocarbon-impacted soil at a remote Navigation Tower site several km from Cambridge Bay, NU. Successfully treated hydrocarbon concentrations in soil to acceptable levels and used soil on site for road construction.

Bioremediation - Fuel Release, DND Long Range Radar Site at BAF-3, Brevoort Island, Nunavut. (Senior Project Manager/Senior Technical Specialist/Site Operations). Emergency Spill Response, Control & Mitigation, Phase 2 and 3 ESA, Risk Assessment, Remedial Action Plan development and implementation, and remediation (Free product recovery, soil flushing, excavation and bio remediation) of a 150,000 L Jet A-1 fuel spill for the Nasittuq Corporation (on behalf of DND) at an active DND Long Range Radar site.

Phase II and III ESA and Remedial Excavation, Shell Canex Stores - CFB Shearwater and CFB Gagetown and Recreation Centre CFB Greenwood. (Project Manager and Site Remediation Specialist), 1999-2001. Assessment and remediation of the gas stations installed at the CFB Gagetown, N.B and the CFB Shearwater, N.S Former Canex Gas Bars. Assessment and remediation of fuel oil contaminated soil and water at the CFB Greenwood, N.S. Recreation Centre.

Phase III ESA, Former C&D Landfill Facility, Harrietsfield, Nova Scotia on site, Project Director for a detailed site assessment and gap analysis at the former C&D Facility located in Harrietsfield, Nova Scotia, site assessment through geophysics, detailed survey, waste characterization, test pit and Borehole/monitoring well installation and analysis of site parameters in various media to arrive at a proposed closure mechanism for the property and surrounding lands.

Bulk Diesel Storage Compliance Audit, Eureka, Nunavut. Auditor. Technical Lead Responsible for visiting the site and gathering information regarding the bulk diesel storage system. Interviewed staff about daily, weekly, monthly, and annual tasks and requirements of the storage system. Compiled a detailed summary of the requirements of the storage system with respect to the applicable regulations, codes, and standards, as well as the work completed from the previous out-of-service inspection.

Modified Phase I/II Environmental/Compliance Audits, Government of Nunavut Properties, Nunavut. (Senior Technical Lead/Senior Reviewer) Senior Technical Specialist for the Modified Phase I and II Site assessments of approximately 1500 Government of Nunavut facilities in the Kitikmeot, Kivalik and Baffin Regions of Nunavut.

Environmental Compliance Audit, Canadian Helicopters Operation, Goosebay, Labrador. Senior Site Auditor for the compliance audit of the Canadian Helicopter hanger and flight service centre at the Goosebay Airport, Goose Bay, Labrador.



Harriet Phillips, Ph.D., QP_{RA}

Risk Assessment Division Manager

EXPERTISE

Project Management

Human Health and Ecological Risk Assessments

Radiological Risk Assessments

Toxicology

Community Health Assessments

EDUCATION

Ph.D., Chemical Engineering,
University of Waterloo
1991

M.Eng., Chemical
Engineering, McGill University
1984

B.Sc. (Hon.) Biochemistry
University of Western Ontario
1981

AFFILIATIONS

Society of Risk Analysis

EMPLOYMENT HISTORY

Apr 2016–Present

Risk Assessment Division
Manager
Canada North Environmental
Services
Markham, ON

1996–2015

Senior Specialist Risk
Assessment and Toxicology
SENEC Consultants Limited
(acquired by ARCADIS 2013)
Richmond Hill, ON

1991-1996

Research Associate and
Sessional Lecturer
University of Waterloo
Waterloo, ON

Harriet Phillips is a senior risk assessor at CanNorth with 22 years of experience in human health and ecological risk assessments (HHERAs). She has managed many complex risk assessment (RA) projects involving many disciplines. She is designated as a Qualified Person for Risk Assessment (QP_{RA}) under the Ontario Regulation 153/04. Dr. Phillips has extensive experience on HHERAs for a number of different sectors including smelters, mining operations (development, operation and decommissioning), coal mines, natural gas-fired generating stations, coal and nuclear generating stations, and contaminated and industrial sites. She has evaluated the impacts of environmental contamination on community health for a number of projects. She has been the senior risk assessor in many RAs, both ecological and human health, involving exposure to metals, dioxins, volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), benzene, toluene, ethylbenzene and xylene (BTEX) compounds, and polycyclic aromatic hydrocarbons (PAHs).

She has wide-ranging experience on human health assessments in Canada including British Columbia, Saskatchewan, Northwest Territories, Yukon, Nunavut, Manitoba, Nova Scotia, New Brunswick, and Ontario. In addition, she has carried out RAs internationally in the United States, Germany, Mongolia, South America, and the Caribbean. Dr. Phillips also has experience in liaising with regulators such as Health Canada, Environment Canada, Canadian Nuclear Safety Commission (CNSC), and Provincial agencies, and has peer review experience on many RAs on behalf of First Nations, lawyers, regulatory agencies, and the private sector.

PROJECT EXPERIENCE

Human Health and Ecological Risk Assessment

- Senior technical lead on the risk assessment for the preferred remedial option at Giant Mine site. The project involves taking the information from the numerous studies conducted at the site and Yellowknife area and integrating into the HHERA.
- Senior technical lead on a project for the Government of the Northwest Territories evaluating off-site legacy impacts from Giant and Con Mines.
- Developed and evaluated site-specific criteria for PHC for remedial activities at Sawmill Bay, NWT.
- Senior technical lead for assessment of potential impacts from seepage from expansion of the Triangle Lake TMF at Seabee, Saskatchewan.
- Lead risk assessment specialist for a human health and ecological risk assessment for former uranium Mill site in Spokane Washington.
- Project manager and senior risk assessor for numerous risk assessments conducted at the abandoned Keno Hills Mine site in the Yukon including a district-wide HHERA, a human health risk assessment for Keno City, and the development of risk-based target levels for post remediation. Involved in the preparation of all the reports. Liaised with the client on a regular basis to keep them abreast of the progress and findings. Presented the results of the numerous assessments to the residents of Mayo, Keno City, and the Medical Officer of Health. Currently involved in the development of risk-based target levels as well as the development of the HHERA for the preferred remedial alternative.

PROJECT EXPERIENCE CONTINUED

- Project manager and senior scientist involved in the risk assessments for the Rayrock Mine Site, NWT as input to the remedial options analysis for the site.
- Project manager and senior risk assessor for numerous risk assessments conducted at the Faro Mine Complex. This project involved the integration of information from various disciplines such as water quality, vegetation, wildlife and fish and fish habitat, water treatment and management into the risk assessment. Public consultation with First Nations communities and other affected communities was an integral part of these projects as well as liaising with regulators.
- Project manager and senior scientist involved in the risk assessments for the Mount Nansen Mine Site, Yukon as part of the overall remedial strategy for the site. This project involved the integration of information related to various disciplines such as water quality, pit water quality, water management, vegetation, and wildlife. Public consultation with Little Salmon/Carmacks First Nation was an integral part of these projects as well as liaising with regulators.
- Project manager on the Health Impact Assessment (risk assessment) and development of site specific remedial criteria in support of the Environmental Assessment (EA) for the Gunnar Mine Site in Northern Saskatchewan. This project involved the evaluation of the health impacts due to air emissions, noise and water emissions associated with the development of remedial options at the Gunnar Mine Site. It also involved the review and input into the three volumes of documentation for the EA and liaising with the Saskatchewan Research Council and the preparation of presentation material. Currently involved in risk assessment in support of remedial alternatives for waste rock and other site aspects.
- Senior risk assessor for evaluation of the remedial options at the Gunnar Mine site. This involved risk calculations for the options for the Gunnar pit, waste rock, acid plant, and other debris.
- Senior risk assessor on the development of an innovative risk assessment strategy to evaluate the human health and ecological risks related to exposure to petroleum hydrocarbons and metals at dozens of sites along the 370 km corridor of the former Canol pipeline. The assessment used the Health Canada framework, combined with a Monte Carlo framework that was developed for calculating spatially averaged exposure point concentrations and a framework for assessing the human health and ecological risks. Public consultation with First Nations communities and other affected communities was an integral part of this project as well as liaising with regulators. Provided input from the risk assessment into the remedial plan development.
- Project Manager and Senior Risk Assessor on screening level human health and ecological risk assessments performed on twelve mine sites (Giant, Colomac, Faro, Mount Nansen, Clinton Creek, Discovery, Port Radium, Tundra, Silver Bear, United Keno, Contact Lake, and Roberts Bay) and thirteen former military sites (Resolution Island, Cape Christian, Radio Island, Sarcpa Lake, Atkinson Point, Bear Island, Padloping Island, Axe Point, Simpson Lake, Clifton Point, Ekalgud Fjord, Tunnuk, and Bray Island) in the Yukon, Northwest Territories, and Nunavut. This work was undertaken for Indian and Northern Affairs Canada to characterize the relative risks presented by the sites for input to a process for prioritizing reclamation funding.
- Project manager and senior risk assessor on several HHERAs in Northern Saskatchewan including McClean Lake, Rabbit Lake, Cigar Lake, Beaverlodge and Cluff Lake operations. These projects involved fate and transport modelling, probabilistic risk assessments, the use of CSA N288.6, and liaising with CNSC and other regulators.
- Senior risk assessment specialist on the Technical Advisor team on the Giant Mine Remediation Project for Aboriginal Affairs and Northern Development Canada (AANDC). Senior risk assessor for three separate HHERAs on the project involving options for long-term management of arsenic trioxide dust stored in underground mine workings/chambers, reclamation of contaminated surface soils and buildings, remediation of Baker Creek (which flows through the mine site), and treatment of mine water with discharge to Yellowknife Bay. Providing support on the health effects to workers due to exposure from arsenic in air due to remediation activities. This involved calculations of urinary arsenic levels and extensive review of sources of arsenic exposure.
- Senior technical lead on the ecological risk assessment for the Darlington New Build and the Darlington Refurbishment Projects in support of the Environmental Assessment. This involved reviewing the field sampling plan and taking the results from numerous technical support documents for the projects and conducting the ERA as well as providing inputs and advice into the EA. Participation in the CNSC hearings.

PROJECT EXPERIENCE CONTINUED

- Project manager and senior scientist for several HHERAs on mining projects in the Northwest Territories and the Yukon including: risk assessments for a number of mine sites on, Great Bear Lake, the Silver Bear Mine sites, El Bonanza Mine site, Contact Lake Mine site, Indore Hottah Mine site, and North Inca Mine site; assessment of arsenic exposure at the Tundra Mine site, assessment of treatment alternatives and discharge of tailings water from the Colomac gold mine; evaluation of the Port Radium uranium/radium/silver mine; assessments of remedial alternatives at the Anvil Range lead/zinc mine, and Mount Nansen in Yukon.
- Project manager and senior technical risk assessment lead on the development of risk-based target levels for residential, parkland, and commercial exposures at the site of a former heavy water plant in Glace Bay, Nova Scotia. These target levels were then used within the soils management plan to manage all the soils on site, saving Public Works and Government Services Canada (PWGSC; formerly Enterprise Cape Breton Corporation) millions of dollars. In addition oversaw the development of a closure report for the site.
- Senior risk assessor for a number of coal mining properties in Nova Scotia, including the Lingan, Dominion 11, Franklin, and Dominion 6 mine sites. This involved the preparation of a class RA for sites without waterbodies for the Cape Breton Development Corporation (CBDC), as well as involvement in a committee for the development of a screening and risk assessment methodology for all CBDC sites.
- Senior risk assessor on estimating the potential risks from exposure to gamma fields at the Beaverlodge properties based on spatial considerations, land use, and measured gamma radiation levels. Part of the project involved conducting a survey in the nearby town of Uranium City to determine how the Beaverlodge properties are being used since decommissioning has been completed at the sites. In addition, the project involved recommendations for future remediation work to achieve an acceptable risk level so the properties could be transferred over to the Institutional Control Program administered by the Government of Saskatchewan.
- Project manager and senior risk assessor on behalf of Atomic Energy of Canada Ltd. on the development of clean-up criteria for uranium in soil in Port Hope, Ontario. The project involved developing the risk-based criteria and presenting the results and report to various regulators such as the Ontario Ministry of the Environment and the CNSC.
- Senior risk assessor for a number of gas-fired generating stations in Ontario on behalf of TransCanada including Portlands Energy Center, Halton Hills, and Oakville. Assessments were also done for other clients in Manitoba. These projects involve obtaining information from the air quality specialists and biologists and integrating this information into a risk assessment framework. Public presentations and liaising with regulators was an integral part of these projects.
- Senior risk assessor for an HHERA related to a transportation corridor in the Windsor area (the Detroit River International Crossing [DRIC], or Windsor-Essex Parkway). This project involved a human health risk assessment to help interpret the potential for overall adverse effect of the proposed parkway as compared to the “No Build” scenario (i.e., the roadway in its current configuration), including potential adverse effects to people in the immediate area surrounding the proposed roadway. In addition a risk assessment was carried out for construction workers carrying out the road building.
- Senior risk assessor for assessing the risks of emissions from the rice and saw mill industries on behalf of the Guyana Environmental Protection Agency (EPA).
- Project manager and senior scientist for an HHERA for an aluminium smelter in Trinidad and Tobago, which also involved liaising with the Environmental Management Authority.
- Project manager on the development of the human health risk assessment associated with the Country Foods Study for the Beaverlodge Mine Area (near Uranium City) and the Athabasca Basin Area, in Northern Saskatchewan. These projects involved the compilation of data from different foods collected by other teams and conducting a risk assessment for metals including uranium, molybdenum, and selenium as well as radionuclides using consumption patterns derived for Uranium City residents and the Hatchet Lake Dietary Survey.

Brownfields Risk Assessments

- Senior technical reviewer of RAs under Ontario Regulation 153/04 on behalf of the Ontario Ministry of the Environment and Climate Change. One aspect of the project is to review toxicity data and approach to ensure that the assessment has been done in accordance with the current regulations.
- Senior risk assessor for six (6) due diligence risk assessments involving petroleumhydrocarbons, VOCs, PAHs and metals in Ontario for Brownfield sites carried out in the spirit of O.Reg 153/04.

PROJECT EXPERIENCE CONTINUED

- Project manager for the development of a reference tool for completing Community Assessment Reports (CARs), including the completion of a jurisdictional review of existing programs and procedures, on behalf of the Ontario Ministry of the Environment and Climate Change.
- QP_{RA} and senior risk assessor for the redevelopment of former industrial lands in downtown Hamilton for commercial/retail land uses conducted under O. Reg. 153/04 in order to obtain a Record of Site Condition (RSC). The RA addressed metals and PHCs including non-aqueous phase liquids (NAPL) in the groundwater present at the site. Property specific standards were developed which incorporated risk management measures to mitigate potential exposure opportunities, and an RSC was obtained.
- Senior risk assessor on the preparation of numerous human health and ecological risk assessments for the Concord Adex Developments Corp. for 22 ha of former CN railway lands situated west of the Roger's Centre in downtown Toronto. The human health and ecological risk assessment and developed risk management measures allowed for some 750,000 m³ of soil exceeding MOECC residential standards to be used in raising grades to meet municipal design objectives below the non-residential components (parks and road alignments) of the proposed development. This MOECC and City of Toronto accepted approach resulted in realized cost savings of over \$60 million.
- Project manager and senior scientist in several HHERAs for various contaminated sites in the Port Industrial area of Toronto and other areas in Ontario.
- Senior risk assessor for a site specific risk assessment to determine the potential impacts to human health and ecological receptors exposed to PAH contamination from coal tar in the soil at the Thompson Groceries site in Toronto.
- Project manager and senior scientist involved in an RA and toxicological evaluation of Smithville Site in Ontario which is contaminated with PCBs; for the Ontario Ministry of the Environment.
- Involved in several human health risk assessment and ecological risk assessment have been carried out for several properties owned by the National Capital Commission (NCC). These sites are generally used for parkland (either natural areas or active use urban parks). The contaminants include metals, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (PHCs), chlorinated solvents, PCBs as well as others.

Community Health

- Senior scientist for two air pollution studies for the City of Toronto and the City of Hamilton whereby conducted a health impact assessment using air pollution data. The studies considered recent air pollutant concentration levels as well as updated data on health risks from air pollutants obtained from literature. To provide additional context, calculations were also carried out with the Ontario Medical Association's Illness Cost of Air Pollution (ICAP) model as well as with the Health Canada's Air Quality Benefits Assessment Tool (AQBAT) model.
- Project manager and senior scientist for a human health risk assessment evaluating the impacts of a smelter and other industrial facilities on a community in Northern New Brunswick. The results were linked to a community health status assessment for New Brunswick Health and Welfare.
- Project manager and senior scientist on a team involved in updating the Canadian blood lead guidance for Health Canada. This project involved the development of a guidance document for physicians and public health practitioners and consultation with Medical Officers of Health as well as Public Health units. A handout was developed for physicians and health practitioners.
- Project manager and senior technical lead on the development of scientifically defensible and critically evaluated probabilistic estimated daily intake rates (EDIs) by the Canadian population for 14 chemicals for Health Canada. This involved a comprehensive literature review of peer-reviewed studies on concentrations of the chemicals in ambient air, indoor air, indoor settled dust, soil, water, breast milk, and food, followed by critical evaluation of the studies in order to select data for the derivation. These EDIs were used for updating Soil Quality Guidance.

Peer Review

Dr. Phillips has carried out numerous peer reviews on behalf of various clients including the Alberta Government, Nunavut Government, the Ontario Ministry of the Environment and Climate Change, Public Works, First Nations, and industrial clients. Some of the projects are listed below.

- Reviewed a number of ecological risk assessments related to natural enhanced radioactivity on behalf of the World Nuclear Association.

PROJECT EXPERIENCE CONTINUED

- Peer review of the draft United States EPA Selenium Aquatic Life Guidelines.
- Performed for the Atomic Energy Control Board of Canada a critical literature review of the status of biological dosimeters for assessing exposure to ionizing radiation.
- Carried out a review of the human health risk assessment sections for the Shell JackPine EIA and the Suncor Voyager South Mine as a third party review on behalf of Alberta Environment.
- Led Peer Review of Health Impact Assessment (air quality and noise) for Billy Bishop Airport in Toronto. The supporting documents on were reviewed, and the methodology and findings were analyzed to determine accuracy and bias.

Other Projects

- Project manager and senior scientist on a Jurisdictional Review and Guidance Manual for Green Chemistry on behalf of the Ontario Ministry of the Environment. This project involved carrying out a world-wide jurisdictional review on green chemical substitution and the development of a guidance tool for industries to consult when changing their process chemicals to a greener alternative. Liaison with the client through bi-weekly meetings and several face-to-face meetings as well as a presentation to industry representatives.
- Senior technical lead on a review of the sulphur dioxide ambient air quality objective for Metro Vancouver. The project included a review and summary of established ambient air quality criteria in other jurisdictions in North America and other parts of the world, a review of recent SO₂ human health science assessments, a review of current SO₂ ecosystem health science, and a review of sulphur emissions from natural environments that can contribute to ambient sulphur dioxide concentrations.
- Technical lead in the development of numerous species sensitivity distributions (SSDs) for aquatic toxicity for site-specific application, including for Rabbit Lake Operation (SK), McClean Lake Operation (SK), and Great Slave Lake Mines (NT).
- Project manager and senior scientist involved in the development of a Radiological Risk Assessment Manual for Health Canada.
- Senior scientist involved in assessing the fate and significance of selected contaminants in sewage sludge biosolids applied to agricultural land for the Ontario Ministry of the Environment.
- Project manager and senior scientist for a study involving epidemiological studies of trihalomethanes in drinking water on behalf of Health Canada.
- Project manager and senior toxicologist involved in the assessment microbes and chemicals for treatment options for wastewater disinfection as well as senior scientist participating in a risk-based decision model for Community Water Systems. A novel risk and decision model was developed for the Ministry of Health in British Columbia to assess the presence of microbes/chemicals in drinking water.
- Senior scientist on presentation of Emergency Management training for Point LePreau. Involved in developing a workshop for and presenting to the Health Department.

SELECTED PUBLICATIONS AND CONFERENCE PRESENTATIONS

- Thackeray, N., H. Phillips, K. Woolhouse, and S. Fernandes. 2018. An Approach to Scoring Toxicity Data for the Development of Wildlife TRVs. Presented at SETAC Laurentian, Kingston, June 2018.
- Phillips, H., S. Fernandes, C. Lucas, N. Thackeray, R. Froess, J. Amphlett and E. Nyssonen. 2018. Development of a Country Foods Dietary Survey and Collection of Voluntary Country Food Samples in Support of the Giant Mine Risk Assessment. Presented at RPIC May 2018.
- Lucas, C., N. Thackeray, K. Woolhouse, S. Fernandes and H. Phillips. 2017. The Development of Regional Background Concentrations with Consideration of Naturally Elevated Areas. Presented at SETAC Laurentian, Oshawa, June 2017.
- Thackeray, N., K. Woolhouse, H. Phillips and S. Fernandes. 2017. An Approach to Deriving Criteria for Elements with Insufficient Available Toxicity Data. Presented at SETAC Laurentian, Oshawa, 2017.
- Phillips, H. 2017 Human Health and Ecological Risk Assessment of Proposed Alutrint Project on the La Brea Community in Aluminium Smelting: Health, Environmental and Engineering Perspectives. Aluminum Health Environmental and Engineering Perspectives. Ian Randle Publishers. May 2017.

- Phillips, H., and L. Leon. 2016. Using Inputs from an Indigenous Community in Evaluating Remedial Options at a Large Mine Site. Presented at the Canadian Ecotoxicity Workshop, Edmonton, September 2016.
- Phillips, H., L. Leon and S. Fernandes. 2015. Risk Evaluation of Country Foods Study Near Decommissioned Beaverlodge Mine. Presented at the Canadian Ecotoxicity Workshop, Saskatoon, October 2015.
- Phillips, H., S. Fernandes, and K. Woolhouse. 2014. How to develop and fit species sensitivity distributions for use in risk assessments. Presented at the Society for Environmental Toxicology and Chemistry (SETAC) North America 35th Annual Meeting, Vancouver, British Columbia, November 2014.
- Phillips, H., M. Tokarek, and J. Hoyt. 2014. Risk assessment of the Canol Trail: a complex linear corridor. Presented at Real Property Institute of Canada Federal Contaminated Sites National Workshop, Ottawa, Ontario, April 2014.
- Fernandes, S., H. Phillips, and L. Leon. 2013. Challenges of human health risk assessment for contaminated sediment. Poster presented at SETAC North America 34th Annual Meeting, Nashville, Tennessee, November 2013.
- Fernandes, S., H. Phillips, M. Tai, and K. Woolhouse. 2013. Use of species sensitivity distributions in risk assessment. Presented at Laurentian SETAC Annual General Meeting, Hamilton, Ontario, June 2013.
- Phillips, H., S. Fernandes, B. Halbert, C. Hamer, and M. Webster. 2013. Contaminant transport and pathways model for assessment of current and future risks in Beaverlodge Lake area, Canada. Presented at Laurentian SETAC Annual General Meeting, Hamilton, Ontario, June 2013.
- Chambers, D.B., H. Phillips, S. Fernandes, and A. Garva. 2008. Radioactivity. In: Encyclopedia of Ecology, Elsevier B.V., 2008.

Mr. Dave Bynski is a results oriented Professional Engineer and Project Management Professional with Extensive Experience in Program, Project and Construction Management on Civil, Geotechnical and Environmental Projects (on individual annual programs up to \$200 million in value) in the Private Sector and with the Federal Government of Canada at sites throughout Western and Arctic Canada, Chile, Peru, Mexico and Guatemala. He has provided support and advice to Project Owners (Senior Executive and Directors) during the short and long term planning and execution of Major Mine Site Remediation & Development Projects. He has developed Strategic Plans, Organizational Structures, project specific PM Processes (templates and guidance documents) Project Plans, Project Schedules, Cost Estimates, Risk Assessments (including FMEA and MAA), Procurement Strategies, Funding and Project Approval documents for the Treasury Board of Canada and Private Lenders. He has led the development of the technical components of Consultant and Construction Contract documents (including specifications, ToRs, BoPs, Evaluation Criteria, etc.). He has provided technical reviews and design integration & coordination in support of Project Designs. He has completed constructability Reviews and Execution Planning on Mine Remediation, Development and Expansion Projects. He has carried out all aspects of Project Management, Cost Estimating (AACE Level 5-1 and Class D–A) and Scheduling on numerous Projects. Mr. Bynski has extensive experience in managing multidisciplinary teams as a project manager, construction manager, general contractor, consultant and member of the public service. He has also worked extensively with Governing Bodies to secure and ensure adherence to applicable permits. Mr. Bynski has also worked closely to develop and execute projects to maximize involvement and socio-economic opportunities for local and indigenous communities and ensure project success for all.

PROJECT EXPERIENCE

GIANT MINE REMEDIATION PROJECT, NT, DXB PROJECTS

Senior Project Advisor (2010-present)

- \$1B Underground and Surface Mine Remediation Project
- Provided strategic advice to PSPC & CIRNAC Project Directors on all aspects of the project and led the the development of: Overall Project Management Plan, Procurement Strategy, Request for Proposal Documents for Engineering and Construction Contracts (Terms of Reference, Evaluation Criteria, Basis of Payment, contract risk management plan), Monthly and Quarterly Project Reporting Format and guidance documents
- Developed the following tools and associated user guidance documents: work package project plan (WPPP), Project Execution Plan (PEP), Project Implementation Plan (PIP), Cost/Benefit Analysis
- Developed TB PPA documents, Briefing Notes, GMRP Organization Structure and associated Roles and Responsibilities
- Developed the Preliminary Project Execution Plan and associated Class B Cost Estimate
- Participate in the Technical Review Committee and developed tools and associated user guidance documents on design stages/lifecycle, contingency estimating, cost/benefit analysis and

EDUCATION

B.A. Sc. Civil Engineering, University of Manitoba, 1994

Project Management Professional, PMI International, 2003

AREA OF EXPERTISE

Consulting civil engineer with specialization in project & construction management on remediation of contaminated sites and mine closure in northern and cold weather environments and mine expansion projects in Central and South America. Significant experience in developing project specific project management and technical tools and associated guidance documents

EXPERIENCE

Principal Project Manager
DXB Projects Inc.
January 2007 - Present

Senior Project Manager
PSPC – Northern Contaminated Sites
Western Region
Sept 2001 – Dec 2006

Manager/Engineer
Clifton Engineering
Manitoba Office
Sept 2000 – Aug 2001

Environmental/Geotechnical Engineer
Agra Earth & Environmental (AMEC)
Sept 1995 – Aug 2000

Field Engineer
ID Engineering
May 1994 – Aug 1995

25 years – Engineering, Project Management and Construction Management Experience.

REGISTRATIONS/AFFILIATIONS

Member, Association of Professional Engineers and Geoscientists of Manitoba (APEGM)

Member, Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists (NAPEG)

Member, Association of Professional Engineers of Yukon (APEY)

Member, Project Management Institute (PMI)

constructability reviews. Participant in technical design sessions that have supported the progression of the Passive Freeze system and tailings cover designs that have incorporated long term climate change modelling.

CANTUNG MINE REMEDIATION, DXB Projects

Senior Technical Advisor (2019 – current)

- \$60M Surface and UG Mine Remedation Project
- The Mine site is in receivership and is currently being managed by a court appointed receiver Alveraz & Marsal (A&M).
- DXB provides technical support and advice to A&M's Senior Director regarding scoping of engineering assessment and design in support of development of a remediation planning, as well as review of designs and technical documents and participation in design review workshops
- Support in care & maintenance and capital upgrade planning to ensure the site is kept in environmental and health and safety compliance, as well as to ensure the infrastructure can support future site remediation.

CIRNAC -NORTHERN CONTAMINATED SITES BRANCH (NCSB), DXB Projects

Senior Project Manager (2008 – 2009)

- \$60M Surface Mine Remedation Project
- Sub-Contractor to PSPC reporting to Project Director. Planning of Tundra Mine Remediation Project with Mass Civil Works (tailings dam re-inforcement, tailings covers, borrow development)
- Development of Care & Maintenance and Engineering Design Contracts, Development of Construction Contract
- Review of Designs for Constructability and Value Engineering), Risk Assessments of Overall Project, Site Infrastructure and Construction Risks (including Leading a Failure Modes Effects Analysis), Technical Support during MacKenzie Valley Water Licencing process

COLOMAC MINE/GORDON LAKE MINES/RAYROCK MINE REMEDIATION, NT, PSPC & DXB Projects

Senior Project Manager (April 2001 – December 2006 / April 2016 - present)

- \$100M/\$20M/\$25M Site Remediation Projects
- Work on the Gordon Lake and Colomac projects consisted of a combination of covering of tailings, construction of earthen dams, outlet channels and spillway structures, road construction, borrow development and granular material crushing, contaminated soil excavation and water collection and treatment and demolition of structures
- Work on the Rayrock project involves working closely with Design Consultants to develop a challenging design (requiring drainage and treatment of lake and consolidation and encapsulation of radionuclide contaminated sediments), facilitating MAA and FMEAs, as well as supporting PSPC and CIRNAC in project engagement

UKHM MINE REMEDIATION

Senior Project Advisor (2018 – present)

- \$100M Surface and UG Mine Remedation Project
- The Mine site was in receivership and the Government of Canada completed a 'reverse' sale to a contractor to carry out Care & Maintenance and develop and execute the Remediation of the Site (which is scheduled to begin in 2021 or 2022)
- Closure Cost and Execution Plan Critical Review: in conjunction with Henry Wong completed review of contractor developed cost estimate and execution plan to ensure plan and associated costs were accurate and in alignment with industry practice and market conditions, as well as the framework for transition to a CM approach for project delivery
- Construction Management (CM) Contract Framework: developed a framework for a CM delivery approach for the Remediation, that included pros & cons, CM's scope of work, organizational structure, roles & responsibilities and a payment structure

CIRNAC -NORTHERN CONTAMINATED SITES BRANCH (NCSB), DXB Projects**Senior Project Advisor (2010 – present)**

- Major Projects Office: assisted with the interpretation of guidance documents and subsequent development of Project Charters and Execution Plans for NCSB Major Projects.
- Project Technical Office: part of a working group that developed the function, roles & responsibilities, organizational structure and guidance
- Long Term Cost Tool (LTCT): led a working group and assisted with the development of the LTCT and associated guidance documentation. LTCT assess the costs of post remediation - long term operation, maintenance and surveillance activities and costs of infrastructure that remains at remediated mine sites

CERRO BLANCO MINE, GUATEMALA – BLUE STONE RESOURCES, DXB Projects & Praetorian CM**Senior Project Manager (2019)**

- Mine Development (\$200M)
- Contract development and management of Gold Process Plant Supply, Engineering and Site Construction Contracts
- Development of Project Execution Plan

MINERA PENAQUITO, MEXICO – GOLDCORP INC., DXB Projects & Praetorian CM**Senior Project Manager (2017)**

- CLR Stabilization and Expansion Project (\$100M)
- Co-led (with Senior Contracts Manager) the development of CLR contract (including developing work packaging, review and revisions of work packages, evaluation criteria, contract risk assessment and overall tender process management), as well as co-developed the construction work packages
- Worked with the Project Director to develop the Project Organizational Chart and Project Execution Plan and to gain project approval from the Goldcorp Value Assurance Group.

QUABRDA BLANCA MINE, CHILE - TECK RESOURCES, DXB Projects & Praetorian CM**Senior Project Manager (2016)**

- QB2 Dam Development Project (\$500M)
- Constructability advice (including Risk Assessment) to the Teck Project Director
- Development of Preliminary Construction Execution Plan

DIAVIK DIAMOND MINE – CONSTRUCTION & ENGINEERING GROUP, LAC DE GRAS, DXB Projects & Praetorian CM**Lead Project Manager (2007)**

2007 Infrastructure Program (\$200 Million) - Overall site planning & development (drainage, roads, road crossings, pipelines, traffic flows, etc.), Water Treatment Plant Construction, PKC facility construction (15 m high)

- All aspects of PM from program and project definition through planning through contract development through execution. Management of PMs, administrative, financial and procurement staff, design consultants, contractors, sub-contractors and suppliers
- Assisted with the development of the Organization Structure and associated roles and responsibilities and PM control systems (including guidance documents) for the Engineering and Construction Department
- Member of Senior Management Team at Diavik Mine Site, responsible for overall site coordination and planning (site transportation network)

OTHER SPECIALIZED EXPERIENCE

- Facilitation of Meetings and Workshops (MAA, FMEA, Strategic Planning, Project Implementation, etc.)
- Training of staff on Project Management techniques, EMS and WHMIS systems
- Planning for (logistics, temporary camps, H&S requirements, work packages, etc.) and working at isolated, uninhabited high arctic sites
- Working in areas of both continuous and dis-continuous perma-frost environments
- Negotiating on and establishing contract provisions that incorporate CLCA and Self Governing 1st Nation socio-economic benefits requirements
- General management of staffs of scientists, engineers and engineering technologists, construction trades and procurement, financial and administrative personnel
- Communication (written and verbal, including meetings and presentations) with all levels of government (from entry level personnel to Ministers), regulators (including MVLWB), 1st Nations Communities and client representatives (in the private and public sectors)
- Leading and providing technical support for acquisition of Building Permits and Variances (MB) and Water Licences (NT)
- Part of group responsible for revision of Manitoba Onsite Wastewater Management Systems Program to allow the use of new technologies

COMMUNITY INVOLVEMENT

- Board Member – Winnipeg Lawn Tennis Club **2020-current**
- Board Member – Riverview Community Centre (responsible for grant applications and PM on renovation projects for the facility) **2014-current**
- Player – Thistle Oldtimers Soccer Club **2014-current**
- Player & Coach – Rovers FC Men's Soccer Club **2008-current**
- Hockey Coach (Assistant and Head) with Fort Garry North Hockey Association **2008-2015**
- Soccer Coach Riverview Community Centre **2004-2011**