Doug Bright, PhD, R.P.Bio., P.Biol.

Practice Lead – Environmental Risk Assessment

Hemmera
An Ausenco Company

EDUCATION

PhD (Biology/ Ecotoxicology), University of Victoria

M.Sc. (Biology), University of Victoria

B.Sc. (Biology), University of Victoria

DESIGNATIONS

Registered Professional Biologist (R.P.Bio.), British Columbia

Professional Biologist (P.Biol.), Alberta

ADDITIONAL TRAINING

Experts Witness Short Course, 2002

Course on Administrative Justice, 2005

Introduction to British Columbia Occupational Health and Safety Due Diligence, 2005

Ground Disturbance Level II, 2008

ATV Training Course, 2008

Emergency First Aid - Industry (OFA-1)

H2S Alive

Univariate and Multivariate Statistical Analyses

Environmental Forensics, including Contaminant Source Apportionment

Environmental Geochemistry

Benthic Community Analysis

Doug Bright is Hemmera's national practice lead for environmental risk assessment. He has more than 28 years of relevant research and work experience. Over his career, the focus of Doug's studies has transitioned from contaminated sites issues, including long-range transport of persistent organic contaminants into arctic ecosystems, to the use of quantitative environmental risk assessment and allied approaches for decisions about new project approvals, and for guiding mine site and industrial site closure and remediation. This includes the analysis of problems and pragmatic management approaches from a geochemical and systems ecology perspective (soil, wetland, lentic, lotic, estuarine and coastal marine ecosystems and biota; ecological risk assessment; environmental monitoring) as well as from the perspective of humans and the built environment (human health risk assessment, health impact assessment, engagement and consultations). Much of Doug's experience has been gained in Canadian arctic, sub-arctic, and northern temperate ecosystems, especially in British Columbia and the Yukon

Doug has extensive experience with both human health and ecological risk assessment and includes the evaluation of risks and impacts of soil and sediment contamination, airborne contaminants, noise and vibration, and radionuclides.

Doug regularly works at the science-policy-regulatory interface, to assist with environmental regulation and policy development. He has extensive experience in the development of Canadian environmental quality guidelines on behalf of the Canadian Council of Ministers of the Environment, as well as environmental quality standards, guidelines and approaches for the provinces of BC and Alberta. He has published extensively in peer-reviewed scientific literature.

RELEVANT EXPERIENCE

Environmental Assessment

Confidential Client, Environmental Assessment of a Proposed Export Facility within the Port of Vancouver for Bulk Shipment, 2015 – Ongoing: Doug is providing senior technical oversight of human health implications of a proposed port development project, based especially on potential changes in noise and air quality. He is also providing senior technical review of the evaluation of sediment and air quality issues.

Goldcorp (Kaminak Gold) Coffee Mine Project, Completion of an Environmental Assessment under the *Yukon Environmental and Socio-economic Assessment Act* of a proposed heap leach gold mine in the central Yukon, 2014 – Ongoing: Doug was a senior member of the Human Environment team that evaluated the implications of a proposed gold mine on community health and well-being. His responsibilities included the evaluation of health implications of air quality, noise, and environmental quality changes, along with influences on various social determinants of health, as evaluated using a formalized Health Impact Assessment.

BC Ministry of Transportation and Infrastructure, Environmental Assessment, George Massey Tunnel Replacement Project, 2013 – Ongoing: Doug is the project technical lead for human health risk assessment (air quality, noise) and sediment/water quality assessment. He also assisted with public and First Nations consulation as a senior technical expert.

MetroVancouver, New Waste to Energy Project, 2013 – 2015: Doug provided senior scientific/technical support based on health risk potential for project conceptualization, site selection, and similar issues.

Woodfibre LNG, 2014: Doug developed a set of risk-based stormwater and process water discharge guidelines that will be protective of the adjacent marine environment in Howe Sound, in support of the completion of an environmental assessment for the now approved Woodfibre LNG project.

Port Metro Vancouver Environmental Assessment, Container Capacity Improvement Project, Roberts Bank Terminal 2, 2011 – Ongoing: Doug is the Technical Integration Specialist lead for the completion of an environmental assessment for a proposed expansion. The proposed project would involve expansion of an existing sea island, connected to the mainland by the existing causeway, which will include dredging and various other marine works. Doug has provided senior scientific technical oversight on the evaluation of potential linkages between project-related influences on coastal geomorphology/physical oceanography and highly valued habitat and biological attributes of the Roberts Bank intertidal and adjacent deltaic front environments, including marine/estuarine invertebrates, intertidal diatomaceous biofilm, eelgrass beds, fish and fisheries resource and migratory bird species. Doug has provided senior scientific/technical advice on a wide range of issues, has been involved in First Nations Consultations, and is assisting with the CEAA Panel hearings.

Ontario Ministry of Transport / Metro Toronto, Windsor Essex Parkway, 2011: Doug handled oversight and review of the human health risk assessment and associated mitigative strategies for health risk issues associated with air quality changes during the planned construction of the Windsor Essex Parkway.

Saskatchewan Research Council, Abandoned Gunnar Uranium Mine and Mill Site, Northern Saskatchewan, 2009 – 2011: Doug developed remedial/rehabilitation options and completed a comprehensive environmental assessment under CEAA for the remediation/rehabilitation of the abandoned Gunnar uranium mine and mill site. The orphaned Gunnar Mine, which operated from 1955 to 1962 is one of the most challenging sites to remediate based on site conditions and legacy environmental issues associated with a large waste rock pile deposited adjacent to and in Lake Athabasca, the flooded open pit, and three uranium mine tailings deposits that have affected another watershed that drains into Lake Athabasca. The site is accessible only by small airplane, barge and boat, or overland from Uranium City via snow machine or ATV.

Calgary Airport Authority, Comprehensive Environmental Assessment, Parallel Runway Project, 2009 – 2010: Doug prepared a comprehensive environmental assessment of the parallel runway project's human health risk aspects, including aircraft noise and air quality. The construction of the parallel runway is currently in progress.

Canadian Nuclear Safety Commission, Review of the Predictive Accuracy of CNSC Environmental Assessment Submissions, 2009 – 2010: Doug prepared a case study review and audit of the predictive accuracy of environmental risk assessment predictions incorporated in environmental assessments of Type 1 and 2 nuclear facilities in Canada.

Indian and Northern Affairs Canada, Iqaluit, Independent Review – EA for BIPAR, 2008: Doug assisted with an environmental assessment review of the Bathurst Inlet Port and Road Project (BIPAR).

BC Ministry of Transportation, Screening EA for Bridge Upgrades, 2008: Doug prepared a screening environmental assessment and regulatory approvals for upgrades to three bridges along the Lougheed Highway, Fraser River delta.

City of Richmond, Environmental Assessment and Construction Environmental Monitoring for Improvements to the Richmond Irrigation and Drainage System, 2007: Doug prepared a screening environmental assessment and incorporation of best management practices for the design of improvements to the Richmond irrigation and drainage system. The improvements were completed in 2008. Follow-up work included the coordination of fish salvage and the Construction Environmental Management Plan.

City of Burnaby, Central Valley Greenway Project Screening EA, 2006: Doug prepared a screening environmental assessment as Sections 9-10 of the Central Valley Greenway Project. This included a trail crossing of a fish-bearing creek.

Confidential Developer, Planning for Residential Re-development of Forestry Lands, 2006: Doug conducted preliminary screening of environmental features at a large undeveloped forest land under consideration for future residential development, southern Vancouver Island.

Musqueam First Nation, EA for Residential Development, Point Grey Area, Vancouver, 2006: Doug prepared an environmental impact statement for proposed development of residential lands adjacent to the Fraser River in the Point Grey area of Vancouver, BC.

GLR Resources Inc., EA for Proposed Gold Mine, Northern Saskatchewan, 2005 – 2007: Doug completed an environmental impact assessment under CEAA and the Saskatchewan Environmental Assessment Act. Regulatory approvals were received in late 2007. The mine has yet to be developed, however, based on issues with economic feasibility.

Ministry of Transportation, BC, Expert Review of EA for Highway 10 Border Infrastructure Project, 2003 – 2004: Doug provided an expert review of the environmental assessment work in support of improvements to the Highway 10 – Border Infrastructure Project.

Defence Construction Canada, Screening EA for Physical Works Associated with DEW Line Clean-up, 2003: Doug conducted a screening environmental assessment of proposed physical works in the supralittoral and intertidal zone at Gladman Point (CAM-2), Broughton Island (FOX-5) and Cape Dyer (DYE-M), in Nunavut (Canadian Arctic). This included screening EA reports in support of the DND DEW Line Clean-Up project.

Nunavut Department of Sustainable Development, Environmental Protection Service, Government of Nunavut, Proposed Jericho Diamond Mine, Nunavut, 2003: Doug coordinated and completed an independent scientific review for the proposed development of the Jericho Diamond Project – Environmental, Socio-Economic, and Archaeological Assessments.

Environmental Monitoring

Metro Vancouver (Greater Vancouver Sewerage and Drainage District), Independent Review of the Boundary Bay Ambient Monitoring Program (BBAMP), 2017: Hemmera completed a detailed review of the Metro Vancouver BBAMP based on the collation of monitoring data collected since the initiation of the program in 2009. The review included water quality spatial and temporal trends at approximately twenty sampling sites in catchments that discharge to Boundary Bay, including the Little Campbell, Nicomekl and Serpentine River systems, marine water and sediment samples, tissue chemistry results for marine mussels and marine benthic community data. The review included recommendations for improving the BBAMP and creating greater efficiencies for aligning the monitoring program with its intended objectives under the Metro Vancouver *Integrated Liquid Waste and Resource Management Plan* (**ILWRMP**) as approved under the provincial *Environmental Management Act* (**EMA**).

BC Ministry of Environment Water Protection and Sustainability Branch, Scientific Derivation of Draft BC Molybdenum Water Quality Guidelines for Livestock Watering and Wildlife Ingestion, 2017: Hemmera was retained by the BC MOE to assist with updates to the approved water quality

guidelines (WQG) for molybdenum. In particular, the value of WQG derived in 1986 for the protection of livestock or wildlife based on potential for molybdenonsis is lower than Mo WQG for protection of other types of biota such as aquatic life. Hemmera conducted a detailed scientific review of relevant vertebrate toxicity studies published both prior to and since 1986, developed a new set of toxicity reference values, and derived an updated set of draft Mo WQG for wildlife and livestock protection based on possible multimedia exposures, uptake via forage and soil ingestion versus water, and derivation of a generically applicable soil-plant bioaccumulation factor for Mo. New draft WQG were developed for each of ruminant livestock, ruminant wildlife and non-ruminant wildlife. Doug was the senior technical lead for the project.

BC Ministry of Environment and Multistakeholder Steering Committee: Advancing the Cumulative Effects Assessment and Management Framework for the Murray River Watershed, 2016 (in progress): Hemmera was contracted to collate the existing information for the Murray River Watershed, east central British Columbia, for waster and sediment quality and aquatic biota, and develop a geospatially enabled database, interface, and query tool. There is considerable existing and proposed future development in this watershed that in turn feeds into the Peace River watershed, including coal mines, conventional and unconventional oil and gas, and windfarms. Doug is the senior scientific/technical advisor for this project.

Copper Mountain Mine, Third Party Review of the Approved Environmental Monitoring Plan, 2016: Hemmera completed a review of Copper Mountain Mine's overall environmental monitoring program (EMP), including monitoring data collected between 2011 and 2015 as well as historical data as part of British Columbia Ministry of Environment (MOE) Amended Permit 261 requirements. The outcomes of the review included recommendations on future actions to ensure compliance with the permit requirements, as well as permit amendments to improve the efficacy of the monitoring program, while limiting environmental impacts of current and future mine site activities. The major reviewed aspects of the EMP included residuals chemistry, seepage monitoring, groundwater monitoring, flow monitoring, surface water and stream sediment quality, aquatic toxicity testing, fish tissue testing, benthic invertebrate monitoring, and domestic treated effluent monitoring.

Port of Vancouver, Roberts Bank Deltaport DP3 Post-Construction Monitoring under the Adaptive Management Strategy (AMS), 2012 – 2013: As a formally educated marine benthic ecologist, Doug assisted with the interpretation of several years of monitoring data conducted under the AMS to evaluate possible changes in ecological conditions within the Roberts Bank, Fraser River Delta, intertidal zone as a result of hypothesized altered nutrient flux.

MMG, Stage III Environmental Effects Monitoring Program, Lupin Gold Mine, 2011: Doug completed a Stage III Environmental Effects Monitoring (EEM) Program (Investigation of Cause) for the Lupin Gold Mine in western Nunavut. The program focused on young-of-the-year and 1+ age class arctic grayling that use the watershed influenced by treated tailings effluent discharge for habitat prior to movement into Contwoyto Lake once reaching a larger size and age.

Water Quality

PWGSC/Transport Canada, Development of Site-Specific Water Quality Objectives for Treated Water Discharges to Rock Bay, Victoria Harbour, 2015 – 2016: Doug was asked to develop site-specific water quality objectives for treated water generated as result of the dewatering of contaminated sediment and various excavations during the remediation of coal tar contaminated sediment in Rock Bay.

Review and Revisions to the Flocculant Management Plan (FMP) For Teck's Coal Mountain Operations, 2015: Hemmera assisted with Teck Coal by providing revisions to the Flocculant Management Plan, for subsequent review and acceptance by the BC Ministry of Environment as part of the coal mine's discharge permit under the *Environmental Management Act.* Doug was the technical lead for this project. The plans facilitate use of both liquid anionic and cationic flocculants as well as solid-form flocullants (FlocBlocks) at dispersed locations that might otherwise serve as source areas for turbidity.

Review and Revisions to the Flocculant Management Plan (FMP) for Teck's Elk Valley Operations, 2014: Hemmera assisted with Teck Coal by providing revisions to the Flocculant Management Plan, for subsequent review and acceptance by the BC Ministry of Environment as part of the coal mine's discharge permit under the *Environmental Management Act.* Doug was the technical lead for this project, which involved a statistical evaluation of extensive influent and effluent turbidity monitoring data for streams that drain through coal mine works into the Elk River via sedimentation ponds. The work involved updating of the stage discharge curve for one discharge to better characterize winter-time flows, critical evaluation of TSS-turbidity relationships and variations across sub-watersheds and seasonally, laboratory testing of the efficacy and optimal application rates of anionic and cationic flocculants applied concurrently and in sequence, laboratory toxicity testing of the two flocculants to estimate threshold of effect levels for freshwater aquatic life, and revisions to the FMP and associated Standard Operating Procedures (SOPs) associated with routine FMP implementation at the mine.

Aboriginal Affairs and Northern Development Canada, Arsenic Discharges from the Abandoned Terra Mine, 2008 – 2009, 2013 – 2014: Doug provided scientific review and guidance on the design of a constructed wetland to attenuate arsenic flux into the Camsell River, NWT, from former mine operations and wastes in and around Ho Hum Lake, Silver Bear mine complex. This included a re-evaluation of water balance, the mass of arsenic residing in various environmental compartments, and estimates of annual flux under existing conditions, including upward flux into and through HoHum Lake from subaqueous tailings deposits.

Aboriginal Affairs and Northern Development Canada, Arctic Gold and Silver and Venus Closed Minesites, Ten Year Review of Water Quality / Environmental Monitoring Programs, Whitehorse, Yukon, 2013: Hemmera provides a review of the ten year monitoring program for the Venus and Arctic Gold and Silver Mine sites, which were the subject of the Yukon Devolution Transfer Agreement. AANDC (formerly INAC) had a commitment to conduct annual environmental monitoring at this site for ten years following reclamation; i.e. from 2003 to 2012. The review looked at spatial and temporal trends in surface and groundwater quality, with a focus on evolution of acidic drainage within the remediated tailings deposits. Recommendations were provided on future monitoring needs and adequacy of the original closure designs to meet environmental objectives.

Confidential Client, Sidney, Australia 2011: Doug's recommendations on risk-based marine water quality guideline selection were used in defining soil and groundwater remedial efforts at a former manufactured gas plant.

Fisheries and Oceans Canada, 2010 – 2011: Doug developed a set of provisional environmental risk-based sediment screening values for petroleum hydrocarbons at DFO small craft harbours. This involved an evaluation of several candidate approaches for examining thresholds of effects for the effects of hydrocarbons, quantified for example as the Canada-Wide Standards fractions (use of existing ecotoxicity data for petroleum products, non-polar narcosis/equilibrium partitioning approaches). The natural background concentrations of PHCs in coastal marine sediments were reviewed, as were analytical techniques and detection limits relative to proposed thresholds of biological effects.

Transport Canada / SNC Lavalin, Victoria Harbour Stormwater Contaminants Monitoring Program, 2010: Doug conducted scientific review of Transport Canada's Victoria Harbour stormwater contaminants monitoring program. The stormwater monitoring program focused on ongoing inputs of dioxins/furans, dioxin-like PCBs, brominated flame retardants and metals/metalloids from various industrial, commercial and residential stormwater catchment areas.

BC Hydro and Transport Canada, Rock Bay Sediment Remediation Project, 2006: Doug conducted an initial overview and a case study review for the development of Water Quality Performance Objectives (WQPOs) and a Construction Monitoring Plan (CMP).

Inco, Thompson, and Hudson's Bay Mining and Smelting, Flin Flon, 2005 – 2007: Doug designed and executed a study that mapped the sensitivity of Saskatchewan and Manitoba lake ecosystems to potential acidifying compounds. This work was completed in response to a re-evaluation by Environment Canada under the *Canadian Environmental Protection Act* of delayed recovery to acidification effects noted in the 1970s in some parts of central and eastern Canada, and a better recognition of the role of not just SO_2 emissions, but also NOx.

District of Sooke, 2001: Doug prepared an evaluation of implications of sanitary and storm sewer waste discharge into the marine environment in the vicinity of Sooke Basin and Harbour.

Spill Response and Strategic Advice

Husky Energy, Development of Wildlife Spill Response Plans for the Prince George Refinery and Supply Line, 2016: Hemmera was engaged by Husky Energy to assist with the completion of a risk analysis of a crude oil or refined fuel release and subsequent preparation of a wildlife and aquatic life spill response plan, including terrestrial, wetland, riparian and riverine areas. Doug is a technical lead on the project and senior contributor to the risk analysis.

National Energy Board, Post-spill Monitoring Guidance for Coastal Ecosystems, 2016: Hemmera was contracted by the NEB to provide a draft guidance document on preferred approaches and bioindicators for post-spill monitoring of petroleum hydrocarbon releases to western Canadian coastal marine ecosystems, with an emphasis on spills in urbanized and industrialized embayments. Doug was the primary author of the guidance.

National Energy Board, Independent Review of the Monitoring and Closure Reports for the 2007 Trans Mountain Pipelines Westridge Incident, 2016: Hemmera was contracted by the NEB to review monitoring reports and the closure report for the Westridge crude oil release into Burrard Inlet in 2007 as a result of a breach of a pipeline supplying the KinderMorgan refinery, which resulted in the transport of petroleum hydrocarbons into the marine environment via stormwater discharges. Doug was the primary technical expert for the review.

M/V Marathassa Heavy Fuel Release in Vancouver Harbour, Completion of an Independent Environmental Impact Study, 2015: Hemmera was engaged by the Technical Advisory Group and Legal Counsel for the ship owner to complete an environmental effects analysis for the release of approximately 3,000 L of IFO-380 (Bunker C) fuel oil to English Bay and Burrard Inlet, Vancouver Harbour, British Columbia. Doug was the technical lead and major author for fuel behavior and compositional analysis of fuel and environmental samples, sediment and water quality, and PAH uptake into local fish and shellfish.

DP World, Emergency Response (Human Health and Environmental Effects) Advice for the Centerm Terminal Trichlorisocyanuric Acid Container Fire, 2015: Doug assisted with the emergency response to a container fire incident involving a bulk chlorinated oxidant through the provision of senior technical inputs into disposition of and effects of runoff from fire-fighting as well as potential effects on humans and the adjacent marine environment.

Metro Vancouver, Independent Technical Review of CN's Spill Response and Environmental Impact Assessment of the Release of Metallurgical Coal from Three Derailed Freight Cars into Silver Creek and Burnaby Lake, Burnaby, BC, 2015: Hemmera provided a technical review of consulting work completed on behalf of CN to assess the distribution in the creek and lakebed of released coal, develop and execute coal recovery plans, re-establish important brooding habitat for SARA-listed species and evaluate aquatic ecological risks associated with residual, unrecovered coal. Doug reviewed especially the environmental chemistry and ecotoxicology aspects of the supporting studies.

BC Ferries / Joint Monitoring Program Steering Committee, Evaluation of Impacts to Seafood Resources Associated with Fuel Release from the Queen of North Wreck on the North Central BC Coast, 2006: The studies focused on PAHs in the edible tissues of cockles, butter clams, littleneck clams and mussels; recovery timelines following the initial exposure to fuel; evaluation of the broader spatiotemporal distribution of unsubstituted and alkyl-substituted PAHs in shellfish; and environmental forensics. On behalf of residents of Hartley Bay, the consumption health risks of shellfish resources affected by the sinking were evaluated.

Environmental Risk Assessment/Environmental Site Assessment

Confidential Client, Guidance on Completion of a Detailed Site-Specific Human Health and Ecological Risk Assessment of Re-developed Lands on Historical Mine Wastes, Northern Europe, 2016 – Ongoing: As a qualified international expert, Doug was asked to assist with clarifying any ongoing or future issues for humans and the environment associated with developments around historical mine spoils. This involved the development of detailed work plans for execution of a detailed site-specific aquatic and terrestrial ecological risk assessment and human health risk assessment for an area of >100 km^2.

British Columbia Crown Contaminated Sites Program, Ministry of Forests Lands and Natural Resource Operations, Completion of a Detailed Site Investigation at the Abandoned Bayonne Minesite, West Kootenays, 2017: Doug was the senior risk assessment expert, and participated in the reconnaissance and development of sampling and analysis plans, for evaluation of risks from historical contamination and metal leaching/acidic rock drainage at the abandoned Bayonne Minesite, near Salmo, BC.

Robertson GeoConsultants Inc., Nicaragua Canal Project: Development of a Relative Risk Ranking Framework and Guidance for Potential Construction Related Risks to Humans and the Environment as a Result of Acidic Rock Drainage/ Metal Leaching (ARD/ML), 2016: The construction of the Nicaragua Canal Project will require excavation and placement of approximately 4,000 million m^3 of rock and soil in Excavated Material Placement Areas (EMPAs) (generally within 3 km of the excavated canal), making the Project one of the largest earthworks projects ever undertaken by humankind. The specific objective of the study completed by Hemmera was to enable the ranking of ARD/ML risk potential across different portions of the Nicaragua Canal Project footprint by providing an approach for ranking the potential consequences to humans or the environment from ARD/ML should it occur as a consequence of local and regional soil and rock disturbance and placement in Excavated Material Placement Areas (EMPAs). Doug Bright was the senior technical lead on behalf of Hemmera.

British Columbia Crown Contaminated Sites Program, Ministry of Forests Lands and Natural Resource Operations, Completion of Modified Preliminary Site Investigations of Two Abandoned Ag-Pb-Zn Minesites Near Stewart, BC (Porter-Idaho, Dunwell Mines), 2016-2017: Doug was the senior technical expert, and participated in the reconnaissance and development of sampling and analysis plans, for evaluation of risks from historical contamination and metal leaching/acidic rock drainage at the abandoned Dunwell Minesite and Porter/Idaho Minesite.

Gibraltar Mine: Completion of an Operational Phase Human Health and Ecological Risk Assessment (HHERA) for mining affected terrestrial, wetland and aquatic ecosystems, 2014 – 2017: Hemmera was contracted by the Gibraltar Mine to complete a detailed quantitative HHERA based on changes in forest soil quality within areas around the mine especially as a result of mine-related dustfall, and changes in water and sediment quality as a result of historical and recent surface discharges of mine contact waters. The requirement to complete an HHERA was imposed as a result of Gibraltar's environmental permit amendment, based in part on concerns by local First Nations about historical and ongoing environmental contamination associated with the mine.

Imperial Oil Ltd., Post-spill Assessment of Artesian Saline Water Release at an Exploration Wellsite in Northeast British Columbia, 2014 – 2016: Doug provided data review, gap analysis, and development of approaches for evaluation of ecological and human health risks at an upstream oil and gas spill site within boreal peatland environments in northeast British Columbia. The saline produced water spill affected an adjacent boreal wetland environment (treed/shrubby bog and fen mosaic) over a length of spill run of approximately one kilometer. Following the completion of a detailed site-specific environmental risk assessment that involved novel field-based approaches for assessing the status of peatland vegetation, the client received a release from the Ministry of Environment as spill coordinating agency and the Oil and Gas Commission.

Health Canada, Guidance on Human Health Risk Assessments of Contaminated Sediments, 2013 – 2014: Doug conducted a peer review of draft guidance documents on the assessment of human exposures to contaminated sediments, on behalf of Health Canada.

Penn West, Post-spill Assessment of Emulsion Line Failure to an Alberta Wetland, 2013: Doug completed an ecological risk assessment of an emulsion line failure (produced water, PHCs) into a complex boreal wetland in north central Alberta, based on site conditions following the initial spill response. The ecological risk assessment of the mixed mosaic treed, shrubby and gramminoid fen was based on field delineation of the spatial particulars of the saline plume following produced water release and rapid bioassessment field studies of wetland vegetation and of stream invertebrates.

Marine Planning Partnership (MaPP), MaPP Study Area Marine Pollution Risk Assessment, 2013: This study examine the relative risk potential for various sub-areas, ecosystems and ecological receptors of chemical contaminants, underwater noise, and other stressors associated with various human activities along the British Columbia coastal zone from northern Vancouver Island to the Alaska border. The geospatial risk assessment examined the juxtaposition of various human activities, spills or other source types and a range of pelagic and benthic ecosystems, as well as mobile marine fauna. The marine pollution risk assessment is intended to assist MaPP with coastal marine planning, including furtherance of Ecosystem-Based Management for the BC coast.

Chevron Canada Ltd., Vernon, Quesnel, Smithers, 2012 – 2013: Doug provided senior risk assessment support for several active and decommissioned fuel distribution and bulk plan facilities.

Aboriginal Affairs and Northern Development Canada, Yukon, 2013: Doug prepared a detailed quantitative ecological and human health risk assessment of an historical diesel release at Brooks Brook, YT, a former staging area along the Alaska Highway. The work considered especially the current use of the site by the Teslin Tlingit First Nation.

Vancouver Airport Authority, 2012: Doug conducted a human health and ecological risk assessment for the development of a land parcel on Sea Island, which had previously been a recipient area for unclean fill. The focus of the risk assessment was on numerical modeling of hydrocarbon transport via groundwater into adjacent areas of the Fraser River, both at the current soil location and a proposed soils relocation area. A screening assessment of soil vapour intrusion risks was also completed for the proposed development scenario.

Crown Contaminated Sites Program, British Columbia Ministry of Forests, Lands and Natural Resource Operations, 2012: Doug completed a detailed quantitative human health and ecological risk assessment for the orphaned Midway Mine, near Moyie, BC, in the east Kootenays. Outflows from two adits, and leachate associated with ML/ARD from this Ag-Pb-Zn mine are sources of contamination to a small forested upland area, and for a large marshland that is directly adjacent to and hydraulically connected to the Moyie River and important fish habitat. The HHERA was focused especially on arsenic, and included measurements of arsenic speciation and bioaccumulation potential in terrestrial and aquatic plants, as well as water and sediment toxicity testing.

Vancouver Developer, 2012: Doug conducted an environmental risk assessment of lighter hydrocarbon and MTBE contamination in soil, groundwater, and soil vapour at a former corner gas station, which was submitted to obtain provincial regulatory approvals for redevelopment of this downtown Vancouver site as a commercial, multi-tenant residential (condominium) complex. The risk assessment focused on intrusion of volatile contaminants in soil vapours into a two-story underground parkade to be built beneath the groundwater table, and into overlying commercial and residential space. A detailed evaluation was undertaken to predict the degree of attenuation of intruding soil vapour in an underground parkade setting.

Teck Coal, 2011 – 2012: Doug was part of a team that provided a re-evaluation of contaminant distribution, and evaluated the fate and effects of PAHs and other subsurface contaminants associated with the former Michelle ByProducts metallurgical coal coking and coal tar byproducts site, near Sparwood, BC. The site buildings were de-commissioned and demolished in the 1970s to 1990, and several site characterization investigations completed since then. Doug's work involved the completion of a screening quantitative risk assessment, with a focus on groundwater-mediated contaminant transfer off-site and toward the adjacent river. This was used in support of the completion of a remedial options analysis (free-phase coal tar was still present on site) and recommended site remediation plan.

Greater Victoria Harbour Authority, 2006 – 2011: Doug produced PSI/DSI/Remediation and Risk Assessment documents for a resubmission in support of a set of Contaminated Sites Regulation applications for GVHA properties around Victoria Harbour including Fisherman's Wharf and Ogden Point.

Skaha Developments, 2006 – 2010: Doug conducted preliminary and detailed site investigations and evaluation of human health and ecological risks at a proposed residential development adjacent to the former Penticton landfill. The CSR application for a CoC was submitted to the MoE.

Department of National Defence / Public Works and Government Services Canada / Defence Construction Canada, Nanisivik, Baffin Island, Nunavut, 2008 – 2009: Doug completed an environmental baseline study (EBS), supplemental site investigation, and quantitative environmental risk assessment of the High Arctic naval dock site (former site of the Nanisivik Lead-Zinc Mine). This study included the development of site-specific remedial objectives.

Manitoba Conservation, Former Britannia Mine, Snow Lake, MB, 2009: In support of the engineering design of remedial options for mine wastes, Doug developed risk-based site-specific remedial objectives for arsenic in soils, surface water and an adjacent peatland,

Department of National Defence / PWGSC, 2008 – 2009: As a member of the Senior Advisory Panel, Doug provided oversight of the Esquimalt Harbour human health and ecological risk assessments.

Transport Canada / PWGSC, 2008 – 2009: Doug conducted a supplemental investigation of contaminant hotspots and dioxin/furan distribution in the Victoria Harbour seabed. The supplemental data acquisition provided confidence that the pre-existing level of understanding of contaminants in seabed sediments was adequate for the evaluation of ecological and human health risks, and to assessment risk management needs and remedial options.

BC Ministry of Agriculture and Lands, Crown Lands Restoration Branch, 2008 – 2009: Doug was the senior risk assessor and among the field team for completion of *Modified Preliminary Site Investigations* at (i) Emerald Glacier minesite, south of Houston, BC, and (ii) Atlin Ruffner minesite, northern British Columbia. This involved screening ecological and human health risk assessments to assist with ranking of sites for follow-up action.

PetroCanada, 2008: Doug completed an ecological risk assessment of petroleum hydrocarbon constituents, focusing on aquatic biota in a pristine foothills river within a watershed with a large number of historic flaring operations. A risk assessment and identification of potential interactions between flare pit site and river sediments was also carried out

Genstar Development Company, Calgary, AB, 2008: Doug evaluated human health risk potential associated with volatile contaminants in soil gas at a proposed development site adjacent to a closed municipal landfill.

Confidential Client, North Vancouver, 2007: Doug rostered the review and submission of a human health and ecological risk assessment of an industrial site on the north shore of Burrard Inlet.

BC Ministry of Agriculture and Lands, Crown Lands Restoration Branch, Five Orphaned Mine Sites, Kootenay Region, 2007 – 2008: Doug was the senior risk assessor and part of the field team for completion of Modified Preliminary Site Investigations. His role involved screening ecological and human health risk assessments to assist with ranking of sites for follow-up action.

City of Calgary, 2007: Based on the presence of free-phase creosote in the subsurface near a building, Doug conducted a site specific risk assessment of indoor air.

NEXT Environmental, 2006 – 2007: Doug provided expert review and sign-off of risk assessments for five separate commercial and industrial properties in the Greater Vancouver area. All sites have since received CSR instruments.

Waterwheel Developments, Nelson, BC, 2006 – 2008: Doug completed preliminary and detailed site investigations and evaluation of human health and ecological risks at a proposed residential and commercial development on the foreshore site of a former sawmill site. This site received a set of CSR CoCs and AIPs in 2008, which in turn facilitated a property transfer.

BC Rail Properties, RC Cotton Industrial Site, Williams Lake, BC, 2007: In support of a Certificate of Compliance application under the BC CSR, Doug prepared an ecological and human health risk assessment.

Transport Canada, 2005 – 2007: Doug prepared an ecological and human health risk assessment of the Transport Canada Administered Seabed in Victoria Harbour's Upper and Basins.

Indian and Northern Affairs Canada, 2005: Doug prepared a human health and ecological risk assessment for Roberts Bay and Ida Deposit in Nunavut.

Canadian Coast Guard / Fisheries and Oceans Canada, 2005: Doug conducted an ecological and human health risk assessment of six de-staffed lightstations on Canada's Pacific Coast, which included follow up comments, and analysis of the use of marine mussels to monitor petroleum hydrocarbon sources and effects. The human health risk assessment focused on light-keeper lead exposures. Blood lead testing was completed, along with surveys. The specifics of indoor dust / outdoor soil lead concentrations were examined.

Fisheries and Oceans Canada, 2005: To enable site prioritization for future contaminated sediments assessment work, Doug prepared a *Risk-based Site Ranking Framework for Small Craft Harbours in BC*.

Yukon Territorial Government / Indian Affairs and Northern Development, Whitehorse, Yukon, 2003 – 2004: Doug evaluated the risks to human health from asbestos exposure at the Clinton Creek abandoned asbestos mine.

Manitoba Conservation, 2002 – 2004: Doug conducted a site specific assessment of the human health and ecological risks from the abandoned mine site in Sherridon / Cold Lake. This very large Cu-Zn mine operated from the early 1900s, and employed flotation separation technologies that were emerging as new technologies at the time. Little of the zinc was recovered from the high sulfide ore (and tailings), and the site is one of the worst-case examples of metal leaching/acidic rock drainage in Canada.

Spray Lake Sawmills Ltd., Cochrane, Alberta, 2002: Doug prepared a preliminary qualitative risk assessment of subsurface release of chromated copper arsenate at a sawmill site. The report was presented to Alberta Environment.

Manitoba Hydro, Winnipeg, 2002 – 2004: Doug completed an ecological risk assessment of coal tar contaminated sediments in the Red River, adjacent to a former manufactured coal gas plant. This work has continued through to the present time. In 2012, Manitoba Hydro received regulatory approvals for the risk management and monitoring plans developed in large part by Doug for both the riverine environment and uplands area.

Specialized Scientific Studies

Canadian Council of Ministers of the Environment (CCME), 2016: Dr. Kevin Biggar was awarded a contract in 2016 to author a guidance document on behalf of CCME entitled *Guidance Document for the Sampling of Contaminated Sites in Permafrost Environments.* Doug was a formally designated senior technical reviewer to the project and contributed minor additions to the report.

Canadian Association of Petroleum Producers / Petroleum Technology Alliance of Canada, 2007 – 2011: Doug developed risk-based environmental quality benchmarks and assessment approaches for produced water and other salt releases to Canadian peatland ecosystems.

Skeena Queen Charlottes Regional District, 2009: Doug conducted a literature review and field reconnaissance regarding issues associated with the discharge of treated sewage effluent to British Columbia coastal peatlands.

Alberta Environment, 2008 – 2009: Doug completed a study report entitled *Trends in Soil Quality at Alberta Industrial Sites from 1984 to 2008: Analysis of the Alberta Industrial Soils Monitoring Database*.

Yukon Government, 2008: In the context of fish habitat and juvenile overwintering survivorship improvements, Doug conducted a scientific/technical review of suggested improvements to Hudgeon Lake, the abandoned Clinton Creek Asbestos Mine property, and Clinton Creek, Yukon.

Scientific Advisory Board for Contaminated Sites in British Columbia, 2007 – 2008: Doug developed revisions to protocols and policies for the development of matrix soil standards under the BC Contaminated Sites Regulation.

Skeena Queen Charlottes Regional District, 2007: Doug developed options of the disposal or re-use of residuals from sanitary wastewater treatment in remote coastal settings in British Columbia for the Skeena Queen Charlottes Regional District. This included environmentally sensitive areas and other environmental issues as well as community planning and land use development,

Alberta Environment, 2007: Doug led a study that led to development of a draft guidance document for Tier 2 Eco-Contact soil criteria adjustments. The document covered bulk soil sampling design and execution, selection of terrestrial toxicity bioassays, interpretation of results, and pathway through the regulatory regime.

Canadian Council of Ministers of the Environment, 2003 – 2007: Doug was primary author for the *Canadian Soil Quality Guidelines for Carcinogenic and Other PAHs.*

Canadian Council of Ministers of the Environment, Ecological Criteria Advisory Sub Group, 2006: Doug participated in the five-year review of the Canada-Wide standards for petroleum hydrocarbons: ecological / direct soil contact guidance, and prepared the *Report of the Soil Quality Guidelines Task Group*.

Environment Canada, 2005: Doug completed a review entitled *Use of Emamectin Benzoate in the Canadian Finfish Aquaculture Industry: A Review of Environmental Fate and Effects*.

Environment Canada, 2005: Doug completed a review entitled *Chemotherapeutant Use in British Columbia Coastal Finfish Aquaculture: Priorities for the Further Study of Non-Target Effects Based on Expected Use, Environmental Fate and Toxicity*.

Canadian Council of Ministers of the Environment, Soil Quality Guidelines Task Group, 2004: Doug coauthored the *Canadian Soil Quality Guidelines for Trichloroethylene: Environmental and Human Health (update)*.

Canadian Council of Ministers of the Environment, Soil Quality Guidelines Task Group, 2004: Doug authored *Canadian Soil Quality Guidelines for Propylene Glycol: Environmental and Human Health – Preliminary Discussion Document*.

Canadian Council of Ministers of the Environment, Soil Quality Guidelines Task Group, 2004: Along with M. Tindal from Axiom Environmental Consultants, Doug coauthored a 60-page document entitled *Literature and Information Review for the Petroleum Hydrocarbon Canada-Wide Standards.*

Inco, Thompson, Manitoba, 2004: Doug led the preparation of a terrestrial environmental effects monitoring study. The 120-page report plus included effects on boreal forest ecosystems of stack emissions: metal and sulphur loading to soils, uptake in vegetation and small mammals, and effects on jack pine, understory vegetation, and lichens.

Capital Regional District, 2003: Doug prepared a technical background document entitled *Contaminants in Landfill Leachate and Possible Treatment Approaches*.

Capital Regional District, 2003: Doug prepared a scientific review for the Capital Regional District, on *Contaminants and Sewage Treatment: What goes in, what comes out, and best management practices*.

Greater Vancouver Regional District, 2002: Doug conducted a scientific review entitled *Concern About Human Exposures to Dioxins and Furans – the Role of Biosolids Application to Agricultural Lands Within British Columbia: Background Information for Medical Health Officers, Agricultural Practitioners, and Environmental Managers.*

Chinese State Environmental Protection Administration / World Bank, 2001 – 2003: Doug was the lead among three university researchers for a World Bank/CIDA funded project entitled *Guidance on the Use of Integrated Pest Management and Other Approaches for the Curtailment of Use of Chlordane and Mirex for Termite Control,* as necessitated by China's signatory status on the Stockholm Convention.

Contaminated Sites Implementation Committee, British Columbia, and Dr. Glyn Fox, Water, Land and Air Protection, 2002: Doug authored *A Review of Soil-Water Partitioning Behaviour of Inorganic Mercury Species and Relevance for the Establishment of Generic Environmental Quality Benchmarks*.

Greater Vancouver Regional District and Highland Valley Copper Mine, 2000: Doug prepared field studies on the environmental persistence of petroleum hydrocarbon constituents in biosolids-amended mine tailings.

Northwest Biosolids Management Association, 2001 – 2002: Doug conducted a survey and preliminary source analysis of dioxins, furans and dioxin-like PCBs in contemporary production biosolids samples from treatment facilities in the Pacific Northwest.

City of Portland, Oregon, 2000 – 2002: Doug was principle researcher for a study to evaluate historical trends and possible sources of dioxins/furans in biosolids in Portland, Oregon, based on a decade of monitoring data.

BC Ministry of Transportation and Highways / BC Buildings Corporation / Canadian Association of Petroleum Producers / Ministry of Water, Land and Air Protection, 2002: Doug authored *Scientific Review and Derivation of a Protocol for the Estimation of Site-Specific Adsorption Coefficients*.

BC Ministry of Transportation and Highways / BC Buildings Corporation / Canadian Association of Petroleum Producers / Ministry of Water, Land and Air Protection, 2001 – 2002: Doug was the coauthor along with Dr. Jan Addison for *Derivation of Matrix Soil Standards for Salt under the British Columbia Contaminated Sites Regulation.*

BC Water, Land and Air Protection, Technical Communication Team, 2002: Doug authored *Re-analysis of Relationships Between Sediment Chemistry and Infaunal Macrobenthic Community Response in the Vicinity of Coastal Aquaculture Operations, Based on Brooks (2001) Data.* This review was undertaken by Doug as the Chair of the Scientific Advisory Group for the Development of a Salmon Aquaculture Waste Control Regulation under BC's Waste Management Act.

BC Water, Land and Air Protection, Technical Communication Team, 2001: As part of the report of the Scientific Advisory Group, Doug provided review comments on (i) selection of protection and measurement endpoints and (ii) methods for establishing environmentally protective thresholds, toward the sustainable management of salmon aquaculture wastes.

Environment Canada, Georgia Basin Ecosystem Initiative, BC Water, Land, and Air Protection, Jack Bryden, Victoria, 2001: Doug provided expert guidance on reducing contaminant sources to municipal wastewater treatment biosolids: dioxins/furans and mercury.

Greater Vancouver Regional District / Ministry of Water, Land and Air Protection, 1998 – 1999: Doug was the principal investigator for a validation of risk-based contaminant management strategies for the beneficial use of wastewater treatment plant biosolids in the Greater Vancouver Regional District. This work was undertaken to assist the BC Ministry of Environment develop its *Organic Matter Recycling Regulation* under the *Environmental Management Act.*

Petroleum Hydrocarbon Canada-Wide Standards Steering Committee, 1998 – 2000: Doug was a major co-author for *Derivation of Environmental Soil Quality Guidelines for Petroleum Hydrocarbons, under the Canada-Wide Standards Initiative,* which involved all exposure pathways for ecological receptors.

Transport Canada / Ministry of Environment, Lands, and Parks, BC, 1998: Doug derived matrix soil standards for DDT under the British Columbia Contaminated Site Regulation.

Environment Canada / Department of National Defence, 1995: Doug was the lead scientist for a joint study with DND, Environment Canada, and NRCan. A large team, with Coast Guard support, conducted a Baffin Region Ocean disposal investigation of seabed debris and contaminant inputs near Iqaluit, Resolution Island, Cape Dyer, and Kivitoo.

Environment Canada / Department of National Defence, 1994: Doug was the lead scientist for a multi-party investigation on historical ocean disposal in the Canadian Arctic, with an emphasis on materials disposed in Cambridge Bay and the state of the marine environment.

Director General Environment, Department of National Defence, Ottawa, 1992 – 1993: Doug was the technical lead for an environmental study of Esquimalt Harbour, including the impact associated with contaminants in sediment.

Watershed Management Plans / Sourcewater Protection

BC Ministry of Agriculture and Lands, Crown Lands Opportunities and Restoration Branch, 2010 – 2011: Doug completed a project (involving a case study approach) to examine the feasibility of using a watershed-based approach for the prioritization of risk-based remedial activities at abandoned mine sites. A case study for the McGuigan Creek watershed in the east Kootenays was completed.

City of Whitehorse, Yukon, 2003 – 2004: Doug was senior author and project manager of a watershed management plan for the City of Whitehorse. The project included two reports: Volume 1: Foundations – Background / Status Report (142 pages plus appendices) and Volume 2: Risk Assessment and Risk Management Strategies for Drinking Water Protection (141 pages).

District of Campbell River, 2003: Doug assisted in the preparation of a 36-page report containing proposed development regulations and guidelines for watershed protection. This project involved working with Mayor and Council, as well as District Staff, to examine the available approaches available to the municipality for advancing their drinking water protection goals.

PUBLICATIONS

Higginson, D.K.Y. and D.A..Bright, 2018.Raisng the Methodological Bar: The Application of Traditional Knowledge and Genomic Approaches to Project Monitoring and Adaptive Management. *Proceedings – Canadian Institute of Mining (CIM)* Conference, May 6-9, 2018. Vancouver, B.C. 9 pp.

Hobbs, J. and D.A. Bright, 2016. Environmental DNA: Implementation for resource development projects in BC and beyond. *Proceedings - Technical Research Committee on Reclamation, 2016 British Columbia Mine Reclamation Meeting*, Penticton, Sept 20-23, 2016. 13 pp.

Bright, D.A. and N. Sandys, 2015. Beyond ML/ARD: The many faces of neutral mine drainage in the context of mine closure. Proceedings - *Mine Closure 2015.* June 1-3, 2015, Vancouver, Canada. 11 pp.

Bright, D.A., C. Eickhoff and D. Bryant, 2014. Sites-specific water quality objectives for mine environmental management. Proceedings - *Technical Research Committee on Reclamation (TRCR)*, 2014 British Columbia Mine Reclamation Meeting, Prince George, Sept 22-25, 2014. 13 pp.

Bright, D.A., L. Flemming and M. Choi, 2012. Protection of groundwater and surface water at a bulk explosives facility using calculated risk-based soil guidelines. Proceedings - *Technical Research Committee on Reclamation, 2012 British Columbia Mine Reclamation Meeting,* Sept 18-20, 2012. 9 pp.

Dickin, R.C., R. Mills and D. Bright, 2010. Assessment of Atlin-Ruffner Abandoned Metal Mine, BC, Canada. Presented at the 2010 International Mine Water Association (IWMA),Sydney, Nova Scotia, Sept. 2010.

Moncur, M.C., Ptacek, C.J. Hayashi, M., Birks, S.J., Blowes, D.W., Bright, D.A. 2007. Seasonal cycle of metals discharging from an abandoned mine site in Northern Canada. In: Sudbury 2007*, Mining and the Environment* IV. Sudbury, ON. October 19-26. pp. 1-10.

Bright, D.A., M. Sanborn, N. Sawatksy, 2006. Relative sensitivity of different soil-associated flora and fauna to petroleum hydrocarbon releases: Current state of the knowledge and implications for environmental protection goals. Whitepaper produced for Alberta Environment.

Bright, Doug, Mark Richardson and Matt Dodd, 2006. Do current standards of practice measure what is relevant to human exposure at contaminated sites? I: A discussion of soil particle size and contaminant partitioning in soil. *Human and Ecological Risk Assessment*, 12: 591-605.

Richardson, Mark, Doug Bright and Matt Dodd, 2006. Do current standards of practice measure what is relevant to human exposure at contaminated sites? II: Oral bioaccessibility of contaminants in soil. *Human and Ecological Risk Assessment*, 12: 606-616.

Muir, Derek, Xiaowa Wang, Doug Bright, Lyle Lockhart and Günter Köck, 2005. Spatial and Temporal Trends of Mercury and other Metals in Landlocked Char from Lakes in the Canadian Arctic Archipelago. *Science of the Total Environment*, 351:464-78.

Bright, Doug. A., Mike Van Ham and Mark Ronayne, 2003. Organic Contaminant Source Identification and Control in Wastewater Treatment Plant Influent – Case Studies on Dioxin/Furan Inputs in Biosolids Based on More Than a Decade of Canadian and U.S. data. *Proceedings of the 2nd Canadian Organic Residuals Recycling Conference*. April 24 and 25, 2003. 22 pages.

Bright, D.A. and N. Healey, 2003. Contaminant risks from biosolids land application: Contemporary organic contaminant levels in digested sewage sludge from five treatment plants in Greater Vancouver, British Columbia. *Environ. Pollut*. 126: 39-49.

Koeck, G., C. Doblander, W. Wieser, B. Berger, D. Bright. 2001. Fish from sensitive ecosystems as bioindicators of global climate change: metal accumulation and stress response in char from small lakes in the high arctic. *Zoology* 104 (Suppl. IV), 18. (Proceedings of the 94th Annual Meeting of the Deutsche Zoologische Gesellschaft, Osnabrueck, June 4-8, 2001).

Gaudet, C., D. Bright, K. Adare and K. Potter, 2001. A rank-based approach for deriving Canadian soil and sediment quality guidelines, in The Use of Species Sensitivity Distributions (SSD) In Ecotoxicology. L. Posthuma and G.W. Suter, editors. CRC Press, Boca Raton, FL.

Bright, D.A., P.V. Hodson, K-J. Lehtinen, B. McKague, J. Rodgers, K. Solomon., 2000. Use of chlorine dioxide for the bleaching of pulp: a re-evaluation of ecological risks based on scientific progress since 1993. *Pulp and Paper Canada* 101(1): 53-55.

Muir, D., B. Braune, B. DeMarche, R. Norstrom, R. Wagemann, L. Lockhart, B. Hargrave, D. Bright, R. Addison, J. Payne, K. Reimer. 1999. Spatial and temporal trends and effects of contaminants in the Canadian Arctic marine ecosystem: a review. *The Science of the Total Environment*, 230: 83-144.

Bright, D.A., W.J. Cretney, R.W Macdonald, M. Ikononmou and S.L. Grundy, 1999. Differentiation of sources of polychlorinated dibenzo-p-dioxins and -furans in Howe Sound and the Georgia Strait, British Columbia. *Environmental Toxicology and Chemistry* 18: 1109-1117.

Simpson, C.D., D.A. Bright, C.F. Harrington, W.R Cullen, and K.J. Reimer, 1998. Polycyclic aromatic hydrocarbon composition in marine sediments near Kitimat, BC: The influence of sediment particle size and early diagenesis. *Environmental Science and Technology* 32: 3266-3272.

Bright, D.A., M. Dodd, and K. J. Reimer, 1996. Arsenic in subarctic lakes influenced by gold mine effluent: The occurrence of organoarsenicals and 'hidden' arsenic. *The Science of the Total Environment* 180: 165-182.

Bright, D.A., W.T. Dushenko, S. Englander, S.L. Grundy, K. Johnston, D. Oswald and K.J. Reimer, 1995. Composition and partitioning of dioxins, furans, and PCBs in Canadian arctic soils and plants. *Organohalogen Compounds* 24: 469-473.

Bright, D.A., S.L. Grundy and K.J. Reimer, 1995. Differential bioccumulation of non-ortho-substituted and other PCB congeners in coastal Arctic invertebrates and fish (*Myoxocephalus quadricornis, M. scorpius, Gadus ogac* and *Salvelinus alpinus*). *Environmental Science and Technology* 29: 2504 -2512.

Dushenko, W.T., D.A. Bright and K.J. Reimer, 1995. Arsenic bioaccumulation in aquatic plants exposed to gold-mine effluent: the relationship with environmental compartmentalization of As, uptake of metals, and nutrients. *Aquatic Botany* 50: 141-158.

Bright, D.A., B. Coedy, W.T. Dushenko and K.J. Reimer,1994. Arsenic transport in a watershed receiving gold mine effluent near Yellowknife, Northwest Territories, Canada. *Sci. Tot. Environ.* 155: 237- 252.

Bright, D.A., S. Brock, W.R. Cullen, G.M. Hewitt, J. Jafaar and K.J. Reimer, 1994. Methylation of arsenic by anaerobic microbial consortia isolated from lake sediment. *Applied Organometallic Chemistry* 8: 415-422.

Bryan, G. W., D.A. Bright, L.G. Hummerstone and G.R. Burt, 1993. Uptake, tissue distribution and metabolism of ^{14}C-labelled tributyltin (TBT) in the Dog-whelk, *Nucella lapillus*. *Journal of the Marine Biological Association of the United Kingdom* 73: 889-912.

Bright, D.A., 1991. Tissue variability in the infaunal bivalve *Axinopsida serricata* (Lucinacea: Thyasiridae) exposed to a marine mine-tailings discharge; and associated population effects. Ph.D. Dissertation, Biology, University of Victoria, BC.

Bright, D.A. and D.V. Ellis, 1990. A comparative survey of imposex in north east Pacific neogastropods (prosobranchia) related to tributyltin contamination, and choice of a suitable bioindicator. *Canadian Journal of Zoology* 68: 1915-1924.

Bright, D.A. and D.V. Ellis, 1989. Aspects of histology in *Macoma carlottenis* (Bivalvia: Tellinidae) and *in situ* histopathology related to a marine mine-tailings discharge. *Journal of the Marine Biological Association of the United Kingdom* 69: 447-464.

PROFESSIONAL HISTORY

Hemmera, Practice Lead, Environmental Risk Assessment, 2013 – Present

Hemmera, Business Leader, Environmental Risk Assessment, 2011 – 2013

Royal Roads University, Adjunct Professor, 2002 – Present

AECOM, Senior Environmental Scientist, 2008 – 2011

UMA Engineering Ltd., Senior Environmental Scientist, 2002-2008

Royal Roads University, Professor of Applied Research, 1995 – 2002

Royal Roads Military College, Environmental Sciences Group, Post-Doctoral Fellow and Research Associate, 1991 – 1995