

## Ramli A. Halim

SENIOR GEOTECHNICAL ENGINEER

### EDUCATION

MBA, International Business, University of Toronto, Toronto, Ontario, Canada, 1987

MEng, Geotechnical, McMaster University, Hamilton, Ontario, Canada, 1981

BASc, Civil Engineering, University of Toronto, Toronto, Ontario, Canada, 1978

### PROFESSIONAL AFFILIATIONS

State of North Dakota - Registered Professional Engineer

State of Minnesota - Registered Professional Engineer

Association of Professional Engineers, Geologist and Geophysicists of the Northwest Territories - Member

PEO - Professional Engineers of Ontario - Member

APEGM - Association of Professional Engineers and Geoscientists of the Province of Manitoba - Member

### SUMMARY OF EXPERIENCE

Ramli is a Senior Geotechnical Engineer with more than 25 years of experience in a broad range of geotechnical practice, including explorations, design and construction management. Ramli has undertaken numerous site investigations, prepared designs and carried out stability analyses relating to dams, dikes and embankments. He has also undertaken the preparation of tender documents, and supervised quality control and construction on projects located throughout North America, as well as overseas. Typical projects have been related to hydroelectric developments, mine tailing dams, dam safety reviews and rehabilitation work, transmission lines, airports, transportation facilities, environmental engineering and waste treatment facilities.

### RELEVANT EXPERIENCE

Hudson Bay Mining and Smelting Co. Ltd., Prefeasibility Study, Flin Flon, Canada. Project Manager. Prefeasibility study for expansion potential of the Zinc Pressure Leach (ZPL) Tailings Impoundment facility.

Nunavut Water Board, Review of Environment Impact Assessment, Nunavut, Canada. Project Manager. Geotechnical and geo-environmental review on a number of start-up and existing mining projects in Nunavut Territory, including Nanisivik Zinc Mine, Lupin Gold Mine, Jericho Diamond Mine, and Ulu Gold projects. An independent expert and participant in public hearings.

Nunavut Impact Review Board, Environmental Assessment, Nunavut, Canada. Project Manager. Geotechnical and geo-environmental review on a number of start-up and existing mining projects

in Nunavut Territory, including Meadowbank and Doris North gold projects. An independent expert and participant in public hearings for the Nunavut Impact Review Board.

Manitoba Hydro, Conawapa Generating Station, Winnipeg, Canada. Geotechnical Coordinator. Recommitment study of the proposed 1470 MW station. Responsible for coordinating all geotechnical designs and costs for the earth structures (dams and cofferdams), overburden and rock excavations, grouting and rock supports.

Minnesota Power, Pillager Hydroelectric, Pillager, USA. Geotechnical Engineer. Grouting program for the existing concrete dam rehabilitation project.

Diageo Global Supply, Diageo Warehouse Refurbishment, Gimli, Canada. Geotechnical Engineer. Warehouse refurbishment project.

Tantalum Mining Corporation of Canada (Tanco), Management Plan Studies, Bernic Lake, Canada. Geotechnical Engineer. Tailings management studies.

Manitoba Floodway Authority, Floodway Expansion, Winnipeg, Canada. Geotechnical Engineer. Responsible for the West dyke and Outlet structures.

Manitoba Conservation, Stabilization Methods along Red River, Emerson, Canada. Project Manager. Geotechnical study for stabilization methods along the Red River. The work included preparation of technical specifications and construction drawings for installation of a shear key and riprap slope protection along the river bank.

Manitoba Highways and Transportation, Geotechnical Investigation, St. Lazare, Canada. Project Manager. Geotechnical investigation and studies of retrogressive landslides occurring along a highway in western Manitoba. The study included preparation of short- and long-term remediation solutions for Manitoba highways and transportation.

Manitoba Hydro, Conawapa Generating Station, Winnipeg, Canada. Geotechnical Coordinator. Recommitment study of the proposed 1470 MW.

Nunavut Water Board, Geotechnical Reviews, Nunavut, Canada. Project Manager. Geotechnical reviews related to dam safety, stability and integrity of tailings dams for a number of mines.

Nunavut Water Board, Public Hearings, Nunavut, Canada. Project Manager. Independent expert in geotechnical and geo-environmental related issues during the public hearings and technical meetings of the Nanisivik Zinc Mine's Closure and Reclamation Plan.

Ontario Power Generation, Caribou Falls Generating Station, Caribou Falls, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to three dam sites in Caribou Falls.

Irving Oil Ltd., Oil Refinery's Expansion, Saint John, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to oil refinery's expansion. The expansion project included preparation for laydown areas and construction of various new refinery units on a 30-acre site.

Rolling River First Nations, Feasibility Study, Rivers, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to a feasibility study for potential groundwater resources.

Irving Paper Ltd., Upgrading of Waste Treatment Lagoon, Saint John, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and

investigation reports, and undertook designs related to upgrading of a waste treatment lagoon project at an oil refinery facility. A total of 25 boreholes were drilled, up to 25 m deep each in the dike fills and through the soft foundation containing silt and organic peat deposits.

Irving Oil Ltd., Raising Existing Rockfill Dike, Saint John, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to raising of an existing rock-fill dike at an oil refinery storage facility. The rock-fill dike, which is approximately 30 ft in height and 1000 ft long, was lined with both PVC and clay liners along its upstream slope.

Irving Oil Ltd., Rehabilitation Works, Saint John, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to rehabilitation works on a number of rock-fill and earth dikes at an oil refinery site.

Manitoba Hydro, Concrete Coring Program, Pointe du Bois, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to concrete coring program at a 60-yr old stop log spillway structure.

Elkem Metal Co., Closure Plan, Elkem, USA. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to a closure plan for fly ash disposal area and designed coal stockpile layouts.

Lester B. Pearson International Airport, Terminal 2 Extension, Toronto, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to Terminal 2 extension.

Niagara Falls Hydro, Replacement Tower Structure, Fort Erie, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to a proposed replacement of an existing 20 lattice tower structure for a 115kV transmission line.

Toronto Transit commission's Greenwood Yard, Various Structures, Toronto, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to various structures for the proposed car house maintenance and repair buildings, and in the subway yard.

Abitibi Paper Company Inc., Stabilization Twin Falls Generating Station, Iroquois Falls, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to the stabilization of the west embankment and wing wall leakage.

Ontario Hydro, Electrical Transmission Tower Foundations, Bowmanville, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to the electrical transmission tower foundations for a 175-km long, 500-kV transmission line project.

CNR Railway, Geotechnical Exploration Program, Ottawa, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to proposed Highway 416 and CNR subway.

Ontario Hydro, Substation Sites, Niagara Falls, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to Ontario Hydro substation sites.

Petro Canada, Service Tunnel, Oakville, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to a proposed service tunnel through a railway embankment.

Ontario Hydro, Geotechnical Exploration Program, Blacksmith Rapids, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to two potential hydroelectric project sites at Nine Mile Rapids and Blacksmith Rapids.

Niagara Parks Commission, Geotechnical Exploration Program, Niagara Falls, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to the Niagara Parks Commission's service center.

Shaw Pipe, Rehabilitation of Overhead Crane Tracking System, Welland, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to rehabilitation of an overhead crane tracking system.

City of St. Catharines, Realignment of Road and Extension of Sewer System, St. Catharines, Canada. Geotechnical Engineer. Supervised geotechnical exploration programs, prepared borehole logs and investigation reports, and undertook designs related to realignment of the government road and extension of the sewer system.

Manitoba Hydro, Flood Protection Dykes, Grande Pointe, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of a diversion channel and earth dykes for the flood protection.

Manitoba Conservation, Riverside Flood Protection Infrastructure, Riverside, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of river bank slope stability for the flood protection infrastructure.

Manitoba Hydro, Rehabilitated Dam, Kiskitno, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of a rehabilitated dam.

Manitoba Hydro, Gull Rapids Generating Station, Winnipeg, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of earth dikes, embankment dams, construction access roads and railway spurline.

Paint Lake Provincial Park, Sewer Treatment Lagoons, Thompson, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of earth dikes forming the sewage treatment lagoons.

Ontario Power Generation, Integrity of Earth and Rockfill Dams, Ontario, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of integrity of earth and rockfill dams at seven hydroelectric sites. The study was prepared as part of Ontario Power's dam safety program.

Manitoba Hydro, Proposed Early Warning Systems, Winnipeg, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of proposed early warning

systems at the Grand Rapids and Seven Sisters generating stations to detect and warn local residents of a dam breach occurrence.

Keenleyside Power Project, Keenleyside Power Plant, Castlegar, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of a proposed 1400-m long, partially concrete-lined approach channel, a concrete-faced rockfill embankment and construction plugs for the 170 MW power plant project design-build proposal.

Abitibi Price Inc., Kenogami Dam, JonquiFre, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of the reconstruction of dam, a 300-m long, 20-m high, zoned rock-fill dam with cement bentonite slurry trench cutoff, after extensive damage caused by a flood.

Manitoba Hydro, Grand Rapids Generating Station, Winnipeg, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of dike stability during a potential wave overtopping event. The work was part of the dam safety program.

Manitoba Hydro, Kettle Rapids Generating Station, Winnipeg, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of long-term performance of soil bentonite slurry trench cutoff walls. The work is related to the Butnau dam's slurry trench wall constructed in 1971.

Irving Paper Ltd., Aerated Stabilization Basin Dike, Saint John, Canada. Geotechnical Engineer. Carried out geotechnical designs, analysis, assessment and evaluation of the construction of an approximately 1200-m long, 10-m high aerated stabilization basin dike at a paper mill site.

Manitoba Hydro, Field Survey Work, Pointe du Bois, Canada. Geotechnical Engineer. Supervision of construction activities for field survey work using global positioning system to determine ground control stations along a 128-km long electrical transmission line from Winnipeg to Pointe du Bois.

Northwest Utilities Inc., Mamquam River Hydroelectric Project, Squamish, Canada. Geotechnical Engineer. Supervision of construction activities for rock drilling and core logging of an approximately 1300 m long pilot hole at the 50-MW hydroelectric project. The pilot hole was used to raise bore an approximate 3.5-m diameter vertical shaft connecting the upper and lower power tunnels.

Great Lakes Power, Hollingsworth Generating Station, Wawa, Canada. Geotechnical Engineer. Supervision of construction activities for rehabilitation work on the abutments.

Elkem Metals Company, Waste Retention Dam, Marietta, USA. Geotechnical Engineer. Supervision of construction activities for construction of a waste retention dam. The work consisted of placement of approximately 100 000 m<sup>3</sup> of fill.

NODECO Ltd., Hibernia Oil Development, Bull Arm, Canada. Geotechnical Engineer. Supervision of construction activities for a dry dock cofferdam. The cofferdam, which consisted of double rock-fill berms with an impervious till core, was constructed under seawater conditions.

Government of Canada - CIDA, Miscellaneous Projects, Caribbean and South America. Geotechnical Engineer. Supervision of construction activities for construction of firehall buildings, substations, protective gabion seawall, installation of underground power cables, etc, at various airports in the Caribbean and South America.

B.F. Goodrich, Remedial Work, Niagara Falls, Canada. Geotechnical Engineer. Supervision of construction activities for a remedial work for railway track and concrete approach slab for weigh scale.

Newfoundland Hydro, Long Pond Dike, Long Pond, Canada. Geotechnical Engineer. Supervision of construction activities for rehabilitation of an existing dam.

City of St. Catharines, Asphalt Placement, St. Catharines, Canada. Geotechnical Engineer. Provided supervision and quality control for asphalt placement for resurfacing of an airport runway.

Government of Canada - CIDA, Miscellaneous Projects, Caribbean. Geotechnical Engineer. Provided supervision and quality control for asphalt pavement and runway rehabilitation work at a number of airports in the Caribbean, including Vigie airport, St. Lucia, Canouan airstrip, St. Vincent and the Grenadines, Barbuda airport, Antigua-Barbuda, Newcastle airport, Nevis, and Timehri International Airport in Guyana.

Centra Gas, Centra Gas Pipeline, La Salle, Canada. Geotechnical Engineer. Carried out various geotechnical related activities, including investigations and stability analyses related to the rupture of Centra Gas natural gas pipeline where it crosses below the La Salle River to the south of Winnipeg.

BC Hydro, WAC Bennett Dam, Vancouver, Canada. Geotechnical Engineer. Carried out various geotechnical related activities, including field inspection during the compaction grouting of two sinkholes. The two sinkholes, encountered in the summer of 1996, were located within the centre and upstream of the dam's core, respectively.

Manitoba Hydro, Kelsey Generating Station, Winnipeg, Canada. Geotechnical Engineer. Carried out various geotechnical related activities, including evaluation of earthwork deficiencies and development of remediation measures.

Uganda Electricity Board, Owen Falls Extension, Jinja, Uganda. Geotechnical Engineer. Carried out various geotechnical related activities, including preparation of final design, construction documents and construction drawings related to powerhouse excavation, powerhouse and canal construction.

Manitoba Hydro, Conawapa Generating Station, Winnipeg, Canada. Geotechnical Engineer. Carried out various geotechnical related activities, including preparation of data for tenderers documents, including analysis of laboratory test results, and preparation of more than 300 borehole/test pit records for the Stage I cofferdam contract.

Riyadh's King Khaled International Airport, Laboratory Testing, Riyadh, Saudi Arabia. Laboratory Manager. Supervised soil, concrete, asphalt, and construction materials laboratory testing at main laboratory, including testing on asphalt samples and materials including asphalt mix design for the construction of International Airport.

University of Riyadh, Quality Control of Materials, Riyadh, Saudi Arabia. Laboratory Manager. Supervised soil, concrete, asphalt, and construction materials laboratory testing at main laboratory, including quality control of materials for the construction of 500 houses for the University of Riyadh housing project.

Government of Saudi Arabia Ministry of Housing, Ministry of Housing Project, Riyadh, Saudi Arabia. Laboratory Manager. Supervised soil, concrete, asphalt, and construction materials

laboratory testing at main laboratory including a series of structural plate load tests on collapsing soil behavior of aeolian sand.

Bechtel Corp., Quality Control of Pavement Materials, Riyadh, Saudi Arabia.

Geotechnical/Materials Engineer. Supervised geotechnical investigations including quality control of pavement materials for rehabilitation of existing roads in Riyadh.

Masirah Island Military Airport, Geotechnical Investigations, Riyadh, Saudi Arabia.

Geotechnical/Materials Engineer. Supervised geotechnical investigations including geophysical testing to determine earth resistivity for grounding systems of 17 transmission/communication towers in Riyadh, Jeddah, and Taif and a radar installation.

Port of Jizan Authority, Port of Jizan Geotechnical Investigations, Jizan, Saudi Arabia.

Geotechnical/ Materials Engineer. Supervised geotechnical investigations including exploratory work to determine suitability of borrow materials for the construction.

Port of Jizan Authority, Geotechnical Investigation, Jizan, Saudi Arabia. Geotechnical/Materials Engineer. Supervised geotechnical investigations including geotechnical investigation for the proposed bulk oil facilities.

Ontario Hydro, Design Study, Atikokan, Canada. Geotechnical Engineer. Carried out design studies for existing embankment dams.

Ethiopian Electric Light & Power Authority, Design Study, Ethiopia. Geotechnical Engineer. Carried out design studies for earth-fill dam for Amarti River diversion.

Union Carbide, Gas Hills Analysis for Heap Leach Uranium, Gas Hills, USA. Geotechnical Engineer. Carried out design studies for analyses for heap leach uranium recovery facilities.

Various Clients, Design Studies, Canada. Geotechnical Engineer. Carried out design studies for various other geotechnical studies including Keating Channel, Toronto; Upper Salmon hydroelectric project, Newfoundland; Lake Tana regulating dam, Ethiopia; and St. Marys redevelopment project, Ontario.

Yukon Energy Corp., Granite Canyon, Yukon Territory. Geotechnical Engineer. Carried out field geotechnical investigations for a feasibility study of a 100-ft high concrete arch dam.

E.B. Eddy Forest Products, Plant Rehabilitation, Espanola, Canada. Geotechnical Engineer. Carried out field geotechnical investigations for a hydroelectric plant rehabilitation at a paper mill site.

Client, Load Testing, Hamilton, Canada. Geotechnical Engineer. Carried out field geotechnical investigations for a full-scale load testing of pipe piles at a steel mill site.

East African Power & Lighting Company, Transmission Lines, Kenya to Mombasa, Kenya. Geotechnical Engineer. Carried out field geotechnical investigations for a 132-kV and 220-kV transmission lines and substation project.

## CAREER HISTORY

1987 - Present	Hatch, Ontario, Canada. Senior Geotechnical Engineer
1982 - 1985	Cansult Ltd / Trow Middle East, Riyadh, Saudi Arabia. Laboratory Manager
1980 - 1982	Acres Consulting Services, Niagara Falls, Ontario, Canada. Geotechnical Engineer

**TECHNICAL PAPERS**

Halim , R. (Coauthor), Design and Construction Challenges for the Plastic Concrete Cutoff Wall at the Proposed Conawapa Generating Station in Northern Manitoba, Prepared for the CDA 2008 Annual Conference, Winnipeg, Manitoba, Canada, 2008

Halim , R. (Coauthor), Long-Term Performance of Slurry Trench Cut-off Wall at Butnau Dam, Prepared for the 1st-CDA Conference, Halifax, Nova Scotia, Canada, 1998

Halim , R. (Coauthor), Environmental Constraints on Geotechnical Investigations for Power Transmission Lines., 45th Canadian Geotechnical Conference, Paper No. 80, Toronto, Ontario, Canada, 1992

Halim , R, Aggregate Surface Texture Influence on Asphaltic Concrete Skid Resistance, McMaster University, M.Eng. Thesis, Hamilton, Ontario, Canada, 1981

**PROFESSIONAL DEVELOPMENT**

Managing Projects the Hatch Way, 2008

WHMIS Awareness Program, 2008

Ethics and Technology, 2007

**LANGUAGES**

English



## **Ken Pearson**

### **GLOBAL DIRECTOR OF BACKFILL SERVICES**

#### **EDUCATION**

Diploma, Automatic Process Control, Ryerson Polytechnical Institute of Technology, Toronto, Ontario, Canada, 1968, (Chemical Engineering Technology Program)

#### **PROFESSIONAL AFFILIATIONS**

Instrument Systems, and Automation Society (ISA) - Life Member

Industrial Computing Society (ICS) - Founding Member and Award Recipient

Society of Mining, Metallurgy and Exploration (SME) - Member

CIM - Canadian Institute of Mining, Metallurgy and Petroleum - Member

#### **SUMMARY OF EXPERIENCE**

Ken has 40 years experience in EPCM the engineering design, installation and commissioning of industrial systems. He has been automation supervisor of three consulting engineering firms, project manager for several EPCM contracts, supervisor of numerous multi-trade installation contracts and held management positions in engineering and multi-trade contracting firms.

For the past 15 years he specialized in the development of tailings paste technology for use in backfill and surface disposal applications. During this time he has worked on more than 40 backfill, paste and thickened tailings projects. He was responsible for the design of 10 operating backfill plants, 12 surface disposal plants and is a recognized expert in backfill plant design and mixing.

Ken has been innovative in the adaptation of new technologies to the mining industries. He engineered the first industrial application of a PLC in a non-automotive industry - Tara Mines, Ireland, the specification of the largest hydraulic cylinder piston PD pumps - Bulyanhulu Mine, Tanzania, the specification of the largest piston diaphragm PD pumps - Goro Nickel, New Caledonia, the creation of an innovative line of backfill mixers and most recently the insitu HDPE lining of a damaged 1280 meter backfill borehole.

#### **RELEVANT EXPERIENCE**

Hatch, Global Director Backfill Services, Mississauga, Canada. Responsible for the technical and commercial operation of a specialist group within the Mining and Mineral Processing business unit.

Barrick Goldstrike Mines Inc. Paste Backfill Plant - Detailed Engineering, Nevada. Project Manager. The project includes the multi-disciplinary detailed engineering design for the completion of +/- 10% capital and operating cost estimates for the preparation of an Approval of Expenditure request to proceed with the project. This will be the first permitted paste backfill plant in the State of Nevada.

Mosaic Potash, K2 Mine, Esterhazy SK, Canada. Project Manager, of studies, engineering and specifications for the acquisition and installation of a re-locatable cemented aggregate backfill plant.

Hudson Bay Mining and Smelting, 777 Mine Borehole Lining Project. Engineering Manager for the first insitu HDPE lining of a damaged 1284 meter long backfill borehole. This was the first successful tight lining of a non-horizontal pipeline of this length and involved several innovative design concepts and custom fabrications.

Oil Sands Projects, Alberta, Canada. Process engineering specialist/consultant for tailings dewatering, mixing, pumping and deposition on three active oil sands projects. Specific details protected by confidentiality agreements.

Xstrata Nickel, Sudbury, Canada. Process Engineering Consultant for the Nickel Rim South Mine silicated hydraulic fill (gelfill) backfill plant from prefeasibility thru feasibility to current detail design phases. Tests have shown the addition of controlled amounts of sodium silicate into specific mixtures of hydraulic fill can result in improved transport, early strength, reduced drainage water and lower shrinkage. The backfill plant is currently under construction and scheduled for start-up in 2009.

Minera Yanacocha S.R.L., Cajamarca, Peru. Project Manager of the La Quinua, Gold Mill Sands Management System. Involved the de-watering the gold mill sands using a high compression thickener and pumping the thickened sands more than 3 km to a storage facility supported by heap leach pad wing walls. This is thought to be the first application this storage method. Yanacocha is the largest gold mine in the world and the autogenous gold mill is designed to process 5 million tpy of ore.

Barrick, Goldstrike Mines, Rodeo Mine, Elko, Nevada. Project manager for the Rodeo Mine Cemented Rock Fill (CRF) improvement project. The purpose was to improve the mixing, quality and strength of the CRF as well as reduce binder cost and solve operational problems with aggregate handling. Investigated several options for the existing 4330L and 4150L CRF stations which were designed to make CRF by coating crushed aggregate with a cement/flyash slurry in the backfill haul trucks. The decision was made to proceed with the selection and design engineering for the installation of a six cubic meter batch mixer at 4150L CRF station. The completed project resulted in a consistent backfill mix which was dryer, providing better handling, strength and quality at reduced operating cost.

WMC Resources Ltd., Olympic Dam Operation – South Australia. Provided project management, engineering design, technical analysis and co-ordination services for several on-going mine backfill projects. Project work included the justification, approval and commencement of installation of a temporary Cemented Aggregate Fill (CAF) plant, technical comment on the de-bottlenecking of an existing CAF plant, participation in conceptual studies of neutralization of acid leach tailings, paste fill plants, flowable CAF plants, CAF pumping and various other options considered for future backfilling requirements.

PPL Montana, Colstrip Steam Electric Station. Provided estimating, engineering design and co-ordination services for turnkey proposal to build a Neutralized Fly Ash - Surface Paste Disposal plant at a coal fired steam electric generating facility. Completed detailed engineering design for eventual EPCM contract. Updated flowsheets, P&ID's, and General Arrangement drawings. Reviewed drawings and co-ordinated work of sub-consultants and vendors. Prepared technical specifications, evaluations and recommendations for plant

equipment, automation and electrical equipment. Assisted with construction management and commissioning.

Goro Nickel, New Caledonia. Provided detailed engineering and process design functions for the surface disposal of thickened tailings from a laterite nickel mine. Prepared flowsheets, mass balances, P&ID's, and Effluent Treatment Plant GA's. Wrote the design criteria and equipment specifications for the thickened tailings preparation and pumping portion of the Effluent Treatment plant. Completed a study and evaluation of various flocculent shipping, handling and storage proposals. Design disposal rate of thickened tailings exceeds 1000 m<sup>3</sup>/h.

Doe Run Peru, Cobriza Mine, Peru. The Cobriza Mine is an underground copper mine in southern Peru which produces concentrate for the La Oroya smelter. Contracted by the owner to provide technical review of design engineering, preparation of operating manuals, commissioning and training services for a hydraulic backfill project. Discovered major design flaws in pumping and fluid dynamics that when verified by third party consultants resulted in the cancellation of the partially completed project after the expenditure of significant capital on materials, equipment and construction. The mine eventually installed a paste backfill system at a later date.

Barrick Gold, Kahama Mining, Bulyanhulu Project, Tanzania. Finalized the plant design flowsheet, prepared mass balance, reviewed general arrangement, P&ID's and other detailed drawings for the construction of a combination tailings paste disposal and batch-mix backfill plant. Assisted in the preparation of specifications, evaluations, recommendations and drawing approval of major plant equipment.

Cayeli Bakir Isletmeleri, Rise, Turkey. Prepared flowsheet, mass balance, and general arrangement drawings for preliminary engineering study. Upon award of detail engineering design contract, finalized the plant design flowsheet, prepared general arrangement, P&ID's and other detailed drawings for the construction of a continuous mix plant capable of 90 MTPH full tailings paste backfill. Also responsible for the preparation of specifications, tendering, and evaluation of major plant equipment.

Mineracao Caraiba, Bahia State, Brazil. Prepared preliminary engineering drawings and coordinated the detailed design for all engineering disciplines. The plant is a batch mix full tailings paste backfill system for distribution underground via boreholes and piping. Rated capacity is 4500 T/D

Somincor - Minas Neves Corvo, Portugal. Flowsheets and design concept drawings for feasibility report. Preliminary engineering design and plant layouts for detail engineering contract.

BHP World Minerals, Cannington Mine, NW Queensland, Australia. Responsible for preliminary and detailed design of 159MTPH batch-mix full tailings paste backfill plant. The work included all design engineering aspects, from preliminary concepts and equipment specifications, to detail construction drawings for all building disciplines. Work culminated with site supervision during final stages of control system installation and plant commissioning.

Kinross Gold Corporation, Macassa Mine, Kirkland Lake, Ontario, Canada. Responsible for the preparation of P&ID's, equipment specifications, electrical design and on-site construction supervision for the construction of a paste backfill plant utilizing the first full scale PPSM (Paste Production & Storage Mechanism) for the production of tailings paste. The batch mix

plant was designed for the use of alluvial aggregate in the backfill and delivery to a remote borehole via mixer trucks.

Tara Mines, Navan Ireland. Responsible for the automation of the hydraulic backfill plant, and conventional slurry tailings disposal system. Prepared P&ID's, instrumentation specifications, loopsheets, control panel design and was part of the start-up and commissioning team.

### **CAREER HISTORY**

2007 - Present Hatch, Mississauga, Ontario, Canada. Global Director of Backfill Services

2004 - 2007 Minefill Services Inc, V.P. Projects

1983 - 2004 Hamilton Process Control, Hamilton, Ontario, Canada. General Manager

1982 - 1983 Commonwealth Construction, Automation Manager

1981 - 1982 ICS Construction, Manager of Business Development

1979 - 1981 Burlington Mechanical Installations, Canada. Partner

1973 - 1979 Kilborn Engineering, Canada. Instrumentation Group Leader

1969 - 1973 Foxboro & Taylor Instruments, Automation Sales & Service

### **TECHNICAL PAPERS**

Published author, presenter of technical papers and tutorials on engineering, construction and software.

### **PROFESSIONAL DEVELOPMENT**

Professionally conducted courses in analog and digital instrumentation, distributed control systems, programmable controllers, micro computer software, electrical system protection, data communications, industrial processes, computer simulation

Proficient in modern computer software programs for word processing, spreadsheets, databases, and specific engineering design tools for project management, estimating, MMI graphics and code.

Participated in numerous employer and professional association sponsored personal development programs

Served in leadership rolls of numerous committees, local sections, technical divisions and board of directors of international professional societies.

Credit courses , Accounting, Economics, Business Law and Management at Ryerson University and the University of North Carolina

### **LANGUAGES**

English

## **Bruce Bennett**

### **SENIOR HYDROLOGY CONSULTANT**

#### **EDUCATION**

MSc, Hydrogeology, University of Alberta, Edmonton, Alberta, Canada,  
1989

BA, Geography and Geology, McMaster University, Hamilton, Ontario,  
Canada, 1975

#### **PROFESSIONAL AFFILIATIONS**

Association of Professional Geoscientists of Ontario - Member

International Association of Hydrogeologists - Member

#### **SUMMARY OF EXPERIENCE**

Bruce is a Senior Consultant in Hydrogeology with more than 28 years of experience in hydrogeology, environmental engineering and project management. He is responsible for technical input to domestic and international projects on hydrogeological issues related to groundwater contamination and site remediation, water supply, dewatering and groundwater modeling/regional flow evaluation. Bruce is experienced in all phases of project execution, including project planning, provision of specialized technical inputs, liaison with clients and regulatory agencies, management of multidisciplinary study teams, data analysis, and report preparation and review.

#### **RELEVANT EXPERIENCE**

Environmental Assessment, Senior Consultant, Hydrogeology.

Project Manager/Coordinator for the following environmental assessment projects:

- preparation of EA (screening) for the 100 MW Coldwell wind energy project
- preparation of a Plan of Development and Environmental Management Plan for the 189 MW Prince I and II wind power project
- review of technical documents to assess potential water quality impacts in connection with water license application for the Jericho Diamond Mine project, on behalf of Nunavut Water Board
- preparation of environmental protection plan and environmental permitting documents for Shikwamkwa replacement dam project
- review of EA documents prepared by Ontario Power Generation (OPG) in connection with OPG's submission to the Canadian Nuclear Safety Commission (CNSC) for approval of the proposed Pickering Waste Management Facility (WMF) II
- formulation of environmental assessment documents associated with navigable waters, water bodies and wetlands, terrestrial and aquatic ecology, surface water and

groundwater issues as part of bi-national integrated EA for proposed Peace Bridge expansion project

- detailed environmental screening of six runway layout options against 14 environmental factors in connection with potential Pickering reliever airport on behalf of Greater Toronto Airports Authority
- update of the Union Gas environmental assessment document for the 18 km NPS 48 gas pipeline between the Hamilton valve site and Milton
- review of Environmental Assessment Guidelines prepared in connection with OPG's proposed Darlington Used Fuel Dry Storage Facility and Pickering WMFII on behalf of a prospective power producer, review of environmental documents in connection with OPG's divestment of Mississagi River hydroelectric generating facilities
- review of draft EA documents prepared by OPG in connection with OPG's submission to the CNSC for approval to return the Pickering 'A' reactors back into operation
- review of draft terms of reference submitted by Clarington Waste Processing Centre Ltd. in connection with the proposed expansion of an existing landfill, on behalf of the Municipality of Clarington.

Contaminant Hydrogeology/Site Remediation,

Project Manager/Coordinator for the following environmental projects:

- environmental site assessment (ESA) of "brownfield" properties in connection with Brownfield Strategy/Community Improvement Plan (CIP) for City of Welland
- ESA of "brownfield" properties comprising pilot project area in connection with City-Wide CIP for City of Niagara Falls
- review of ESA documents and development of site remediation alternatives for 15.3-ha "brownfield" property to be used for Innovation Park on behalf of McMaster University
- investigation of 16-ha sized, former municipal landfill to assess potential leachate impacts to groundwater, for City of Niagara Falls
- review of ESA documents associated with investigation of former maintenance building at limestone quarry to assess redevelopment constraints on behalf of Conservation Halton
- design, construction supervision, operation and monitoring of two dual-phase product recovery systems and a potassium permanganate injection system, in connection with the remediation of groundwater impacted by petroleum hydrocarbons and trichloroethylene (TCE), respectively, at an industrial plant in New Brunswick
- environmental site assessment and screening of candidate "brownfield" properties to address issues associated with real or perceived subsurface contamination at these properties, for Town of Fort Erie Economic Development and Tourism Corporation
- geophysical (EM) investigation of 33 Niagara Catholic District School Board properties to assess whether underground storage tanks (USTs) formerly containing fuel oil may still be in place
- bench scale treatability study and preparation of leachate management plan for the removal of iron, zinc and ammonia from leachate at the Regional Municipality of Niagara's Quarry Road landfill

- soils investigation of a 40-ha sized, former, industrial plant in the City of Niagara Falls ("Brownfield" site) in connection with a proposed Institutional/Parkland/Commercial redevelopment of the property
- subsurface investigation, and preparation and implementation of an action plan for grout stabilization of soils that had subsided over a damaged, 2.1 m dia, abandoned sewer at an industrial plant located in Pt. St. Charles, Quebec
- assessment of wastewater treatment alternatives in connection with a proposal to combine two separate condiment plants into one plant located in southern Ontario
- preparation and implementation of a closure plan for the Regional Municipality of Niagara's Quarry Road landfill involving the evaluation of the final contours and cover design, leachate treatment alternatives, control of surface water drainage and the development of after-use and landscape plans
- on behalf of The Fiton Corporation, preparation and implementation of a remedial action plan for the in situ bioremediation of petroleum hydrocarbon contaminated sediments along the Pembroke Canal running through the Bermuda Electric Light Company's property
- soil and groundwater investigation, risk assessment and assessment of remediation alternatives for a commercial property in Toronto contaminated by trichloroethylene
- review of environmental issues associated with proposed landfill at a pulp and paper mill in New Brunswick, on behalf of the Eel Ground First Nation
- investigation and preparation of remediation plans for petroleum hydrocarbon contaminated soils at two thermal generating plants in Tanzania for the Ministry of Energy and Minerals
- assessment of proposed remediation and demolition plans submitted by developers for the redevelopment of the former Naval Air Station Annex lands on behalf of the Government of Bermuda
- environmental investigation and remediation of 20000 t of heavy metal and petroleum hydrocarbon contaminated fill at a glass plant in southern Ontario
- a proposed remediation plan involving the capping of four landfill sites containing cyanide waste materials, on behalf of the City of Niagara Falls and the Ministry of Environment and Energy
- contaminant hydrogeology and site remediation training to engineering staff at MACE in Bombay, India, as part of a CIDA technology transfer program.

#### Water Supply/Groundwater Modeling,

Carried out the following groundwater investigations and hydrogeologic assessments in connection with water supply, dewatering and various engineering projects:

- assessment of water supply and treatment alternatives in connection with conceptual development of integrated facility using available forms of renewable energy to produce electricity, potable water and treated wastewater for rural and semi-urban community applications in developing countries, on behalf of United Nations University

- evaluation of potential impacts to spring flow and water quality in connection with proposed excavation of granular deposits below water table at adjacent sand and gravel pit on behalf of Caledon Mountain Trout Club
- on behalf of the U.S. Army, evaluation of two production wells at Bagram Airfield, Afghanistan, to determine if wells could provide a combined supply of 1900 m3/d

evaluation of flow available from 20-Mile Creek for irrigation water supply purposes at Scenic Woods Golf & Country Club

- hydrogeological inspection of groundwater supply system at Burritt's Rapids Correctional Facility as part of the requirement for an Engineer's Report under Ontario Reg. 459/00
- prepared a Phase 1 and II Class EA report in connection with a proposed residential, retirement complex at the Scenic Woods Golf & Country Club, including the investigation and assessment of groundwater conditions, the development of a 250 m3/d water well supply, water treatment by reverse osmosis and sewage treatment using a sequencing batch reactors

Consultant, Hydrogeology.

Project Manager/Coordinator for the following waste management projects

- assessment of disposal/treatment alternatives for the proposed dredging of sediments from the Miramichi River for the Canadian Coast Guard

Phase III environmental issues inventory at the Big Trout Lake First Nation

- hydrogeologic investigation of creosote and PCP contamination at a wood preservative plant in Newfoundland
- hydrogeologic investigation and preparation of a remedial action plan for in situ remediation of soils and groundwater contaminated by petroleum hydrocarbons at an industrial plant in New Brunswick
- technical documents submitted by Laidlaw Waste Systems (Durham) in connection with a proposed infill expansion of the Newcastle landfill, on behalf of the Town of Clarington
- a proposed groundwater remediation scheme involving the removal of Bunker 'C' oil from a karstic limestone aquifer in The Pas, Manitoba, on behalf of Manitoba Environment.

Senior Hydrogeologist.

Project Manager for the following waste management projects

- hydrogeologic investigation of a former coal gasification plant and an on-site treatment area used to treat cyanide process wastes at an industrial plant in Niagara Falls, Ontario
- investigation of the volatility and leachability of naturally occurring BTEX from shale formations in connection with the Niagara River hydroelectric development project proposed by Ontario Hydro
- evaluated potential groundwater/soil contamination concerns at a site proposed for industrial development adjacent to the Smithville PCB waste management facility.

Senior Hydrogeologist.

Project Manager/Coordinator for the following waste management projects:



- development of a remediation plan for the cleanup of 50000 m<sup>3</sup> of soil and 140000 m<sup>3</sup> of harbor sediments contaminated by creosote at the Northern Wood Preservers facility in Thunder Bay, Ontario
- hydrogeologic investigation and preparation of closure plan for two landfills at the Repap pulp and paper mill, The Pas, Manitoba, for Manitoba Environment
- hydrogeologic investigation and preparation of a remediation plan to remove refuse materials formerly disposed of at the Greenwood subway yard on behalf of the Toronto Transit Commission (TTC)
- hydrogeologic investigation of a former manufactured gas plant in southern Ontario
- environmental study and remediation of 4000t of waste materials from a former wastewater pond and several former disposal areas in connection with the decommissioning of an organic peroxide plant in southern Ontario
- cleanup operation for the Ontario Ministry of Environment (OMOE) involving the recovery and reuse of liquid creosote from pools on the harbor floor of Thunder Bay
- cleanup of coal-tar contaminated sediments at Chippawa Creek for OMOE involving the excavation of about 2000 m<sup>3</sup> of contaminated sediments from the riverbed and shoreline, and decommissioning of a settling lagoon used to temporarily store the sediments and water
- geotechnical and geochemical investigations of coal-tar contaminated sediments both in and along the shoreline of Muggah Creek as part of the management of the Sydney Tar Ponds cleanup for the Nova Scotia Department of the Environment. Also provided technical liaison with the consultant conducting a hydrogeologic investigation of the coke ovens area at SYSCO's steel plant
- hydrogeologic investigation of two contaminated sites and a former landfill area at the Come-by-Chance refinery for Newfoundland and Labrador Department of Environment
- provided expert witness testimony at the Pennsylvania Environmental Hearing Board in connection with potential groundwater impacts associated with the proposed Dock Street hydro dam and reservoir
- applied a numerical model (MODFLOW) to assess potential groundwater impacts associated with a proposed dam and reservoir along the Susquahanna River at Harrisburg, Pennsylvania
- assessed for the Ministry of Mines and Metals of Iran the viability of safely extracting 3500 m<sup>3</sup>/d of fresh water over a 30-yr period from sand and gravel aquifer underlain by saline groundwater for ore processing purposes at the Gol-E-Gohar iron mine in southern Iran
- assessed for the National Iranian Steel Company the proposed extraction of up to 7000 m<sup>3</sup>/d of groundwater from alluvium or limestone aquifers for process, irrigation and domestic water supply requirements associated with the Tabas coal mine project in east central Iran.

Postgraduate Student. University of Alberta. Edmonton, Canada. Applied a 3D numerical model to theoretically assess the concept of using electrical resistivity theory to delineate and monitor groundwater contaminant plumes using a subsurface grid of electrodes.

Hydrogeologist.

Stanley Associates Engineering Limited. Edmonton, Alberta, Canada. Evaluated two high-capacity production wells (9000 L/min combined supply) developed in fractured bedrock adjacent to the Clearwater River for the Ricinus fish rearing station on behalf of Alberta Fish and Wildlife.

Evaluated a 406-mm dia. high capacity production well (9000 L/min supply) developed in floodplain sands and gravels of the Kananaskis River, as a supply for snow-making purposes at the Mount Allan ski development area (1988 Winter Olympics) for Alberta Public Works and Services.

Evaluated groundwater supplies at the Fording Coal Ltd. Genesee Power project, B.P. Canada Inc. flood injection well at Sibbald, Town of Edson, Hilliard's Bay Provincial Park (Phase 2), South Cooking Lake School, Banff Relax Inn and Wolf Creek golf resort.

Evaluated groundwater conditions at two proposed regional landfill sites for the Regional District of East Kootenay, Williams Lake Sanitary Landfills, and replacement sites for the Clover Bar Sanitary Landfill in the County of Strathcona.

Groundwater Consultants Group. St. Albert, Alberta, Canada. Hydrogeologist. Carried out groundwater supply projects at Gulf Canada Resources Gas Plant in Robb, Getty Oil Ltd. flood injection well in Cynthia, Town of Field, British Columbia for Parks Canada, and at Hilliard's Bay Provincial Park (Phase 1).

Assessed groundwater conditions surrounding a brine pond and developed a sanitary landfill monitoring program at Dow Chemical Canada, Fort Saskatchewan plant.

Water Management Supervisor. Lower Thames Valley Conservation Authority. Chatham, Ontario, Canada. Supervised the Water Management Program. Duties involved flood contingency planning, monitoring and maintenance of flood warning network, flood forecasting and coordination of emergency response, administration of ARDA dike construction and development of proposed maintenance programs, coordination of channel improvement and bank protection projects, implementation of floodplain regulations and review of municipal plan documents.

Hydrogeologist. W. L. Wardrop and Associates Limited. Bolgatanga, Ghana. Supervised and coordinated groundwater investigations involving the installation of 1200 village hand pump wells and 100 town production wells in weathered basement complex of the Upper Region of Ghana (CIDA project).

## CAREER HISTORY

2003 - Present	Hatch, Niagara Falls, Canada. Senior Consultant, Hydrogeology
1996 - 2003	Acres & Associated Environmental Limited, Toronto, Canada. Senior Consultant, Hydrogeology
1994 - 1995	Acres International, Niagara Falls, Canada. Consultant, Hydrogeology
1993 - 1994	Gartner Lee Inc., Niagara Falls, New York, USA. Senior Hydrogeologist
1986 - 1993	Acres International, Niagara Falls, Canada. Senior Hydrogeologist
1984 - 1986	University of Alberta, Edmonton, Canada. Postgraduate Student
1982 - 1984	Stanley Associates Engineering Limited, Edmonton, Canada. Hydrogeologist

- 1980 - 1982     Groundwater Consultants Group, St. Albert, Canada. Hydrogeologist
- 1978 - 1980     Lower Thames Valley Conservation Authority, Chatham, Canada. Water Management Supervisor
- 1976 - 1977     W. L. Wardrop and Associates Limited, Bolgatanga, Ghana. Hydrogeologist

**TECHNICAL PAPERS**

Armstrong, M. D., Hoyle, W. R., and Bennett, B. G., Small Scale Treatment System to Remediate TCE Contamination, Sea to Sky Geotechnique 2006, 59th Geotechnical Conference and 7th Joint CGS/IAH-CNC Groundwater Specialty Conference, Vancouver, 2006

Armstrong, M. D., Hoyle, W. R., and Bennett, B. G., Use of Small Scale Treatment Systems to Remediate Multiple Contaminated Zones At A Site, 58th Canadian Geotechnical Conference and 6th Joint IAH-CNC and CGS Groundwater Specialty Conference, Saskatchewan, 2005

Bennett, B. G., Steele, R. J., and Miles, P. C., Management of Underwater Contaminated Sediments, 26th Annual H. G. Acres Seminar on Trends in Waste Management, Remediation and Environmental Management, Niagara Falls, 1995

Bennett, B. G., Hill, I. K., and Erzindoglu, A. Z., Underwater Cleanup of a Pool of Liquid Creosote and Cleanup of a Coal Tar Deposit Using a Vacuum Clam, Dredging '94, 2nd International Conference and Exhibition on Dredging and Dredged Material Placement, Florida, 1994

Bennett, B. G., Hill, I. K., Miles, P. C., and Tammemagi, H., Remediation of Underwater Contamination, Hazardous Materials Managements, Vol. 3, No. 5, pp 6-8; 1991., 1991

Bennett, B. G., Monitoring Contaminant Plumes in Groundwater Using a Three-Dimensional Grid of Electrodes, M.Sc. Thesis, Department of Geology, University of Alberta, Edmonton, 1989

**LANGUAGES**

English

## **John B. Binns**

**SENIOR CONSULTANT**

### **EDUCATION**

MSc, Interdisciplinary Studies, University of British Columbia,  
Vancouver, British Columbia, Canada, 1995

MSc, Applied Geophysics, Royal School of Mines, London, United  
Kingdom, 1981

BSc, Mining Engineering, University of Newcastle upon Tyne, Newcastle upon Tyne, United  
Kingdom, 1969

### **PROFESSIONAL AFFILIATIONS**

Professional Engineers of Ontario (PEO) - Member

Canadian Institute of Mining, Metallurgy and Petroleum (CIM) - Member

Institution of Mining & Metallurgy (London) - Member

Canadian Environmental Auditing Association (ISO 14001 EMS auditor) - Member

### **SUMMARY OF EXPERIENCE**

Extensive international experience in environmental management including mine closure,  
mine water chemistry, EMS, environmental auditing.

Highly organized, bottom-line oriented professional who can effectively manage technically  
complex issues and diverse technical support resources.

Possesses a high degree of sensitivity to foreign cultures.

### **RELEVANT EXPERIENCE**

Hatch Consultants. Mississauga, Canada. Senior Consultant. Internal technical review of  
environmental components of mining projects. External due-diligence review of  
environmental components of mining projects. Environmental lead on major projects in North  
and South America including:

- Environmental Advisor to Hatch Metals pyrometallurgical group on study for disposal of  
by-products from roasting of VBN leach residues
- Total Loss Management (TLM) Lead for Hatch Energy on PCOSI Fort Hills Ore Processing  
Plant (FEL3) project. Responsible for Health & Safety, Risk Management, Quality,  
Environmental and permitting activities. 2007-2008
- Environmental Lead for Hatch Metals on Vale Inco CMERP (FEL3) project. 2008
- Environmental Advisor to Hatch Metals (FEL3) project for Skye Resources-Fenix project,  
Guatemala 2007

- Environmental Lead for Hatch Metals on Xstrata Copper El Morro (FEL2) project in Region III, Chile-2006

Crystallex International Corporation. Toronto, Ontario. Vice-President, Environment & Community Relations. Responsible for all technical aspects of obtaining environmental permits for Las Cristinas gold project, Venezuela. Supervised drafting of new EIS to World Bank requirements by SNC-Lavalin. Responsible for the development of all Community Relations programs. Responsible for implementation of ISO 14001 compliant EMS. Implemented improved environmental management practices at existing producing properties in the El Callao district, Venezuela.

Barrick Gold Corporation. La Serena, Chile. Director, Environmental Affairs, Compania Minera El Indio. Managed the development of the final closure plan for the El Indio mine in the IV region, Chile, while based in La Serena, Chile. Supervised the technical studies carried out by consultants to support the closure plan as well as compilation of the reports for Barrick internal approval and submittal to the authorities. The plan minimized environmental liability of the site and protected downstream water quality whilst minimizing long-term financial commitment.

Project involved the integration of studies related to stability of three tailings impoundments, decontamination of soil and plant facility, management of Probable Maximum Flood events in a channel mimicking a natural watercourse in a high energy Andean environment and prediction of future surface and underground drainage water quality based on hydrogeological and geochemical modelling.

Barrick Gold Corporation. Santiago, Chile. Manager of Environmental Affairs for South America. Responsible for environmental affairs at Pierina mine, Peru; El Indio-Tambo mines, Chile; Pascua-Lama development project, Chile-Argentina and Bulyanhulu mine, Tanzania, reporting to the Vice-President Environment. Identified long-term environmental issues and proposed cost-effective solutions involving internal and external consultants. Technical review of EIA and both conceptual and feasibility level closure plans. Government affairs activities, development of environmental legislation and environmental standards. Environmental auditing of Barrick operations using compliance, EMS and closure protocols.

RTZ Mining & Exploration, South American Exploration Division. Santiago, Chile. Technical Director, South American Exploration Division. Managed multi-disciplinary group providing technical support to exploration activities in Chile, Argentina, Peru, Bolivia and Ecuador, including remote sensing, geophysics, geochemistry and Environment, Health & Safety and Community Relations (EHSC).

RTZ Mining & Exploration, South American Exploration Division. Santiago, Chile. Manager, Environment, Health & Safety. Developed management system for Environment, Health & Safety and Community Relations (EHSC) and was responsible for management of EHSC activities for group exploration activities in Argentina, Bolivia, Chile, Ecuador and Peru.

University of British Columbia, Vancouver, Canada. Faculty of Graduate Studies. M.Sc. Interdisciplinary studies. Thesis topic: Rehabilitation of five abandoned mine-sites in British Columbia.

British Columbia Ministry of Energy, Mines & Petroleum Resources. Smithers, B.C., Canada. Inspector of Mines (Exploration). Managed inspections and enforcement of Environmental and Health & Safety standards at mineral exploration and placer projects.

Independent Consultant. Vancouver, Canada. Exploration Consultant. Provided exploration expertise to major mining companies based in Vancouver, B.C.

RioFinEx Ltd. (RTZ), European Exploration Group (Formerly BP Minerals International Ltd.). Clermont Ferrand, France. Exploration Manager: Hexamines S.A., Clermont Ferrand (French exploration subsidiary). Managed all gold exploration activities in France including negotiating with French government for exploration licences, re-organization of technical structure and JV farm-out opportunities.

RioFinEx Ltd. (RTZ), European Exploration Group (Formerly BP Minerals International Ltd.). Newbury, U.K. Senior Physicist: European Exploration Division (European Exploration Division based in UK). Technical manager with overall responsibility for geophysics and computing including internal and external consultants and contractors. Consultant to BPMIL for geophysical R & D projects.

## **CAREER HISTORY**

- |                |   |
|----------------|---|
| 2006 - Present | Hatch, Mississauga, Ontario, Canada. Senior Consultant  |
| 2004 - 2006    | Crystallex International Corporation, Toronto, Ontario, Canada. Vice-President, Environment & Community Relations                       |
| 2002 - 2003    | Barrick Gold Corporation, La Serena, Chile. Director, Environmental Affairs, Compania Minera El Indio                                   |
| 1998 - 2002    | Barrick Gold Corporation, Santiago, Chile. Manager of Environmental Affairs for South America   |
| 1970 - 1999    | Geoterrex Ltd, Ottawa, Ontario, Canada. Manager of Geophysical Operations for South Africa, Field Geophysicist                          |
| 1997 - 1998    | RTZ Mining & Exploration, South American Exploration Division, Santiago, Chile. Technical Director, South American Exploration Division |
| 1995 - 1997    | RTZ Mining & Exploration, South American Exploration Division, Santiago, Chile. Manager, Environment, Health & Safety                   |
| 1991 - 1995    | University of British Columbia, Vancouver, BC, Canada. Faculty of Graduate Studies  |
| 1994 - 1994    | British Columbia Ministry of Energy, Mines & Petroleum Resources, Smithers, B.C., Canada. Inspector of Mines (Exploration)              |
| 1991 - 1993    | Independent Consultant, Vancouver, BC, Canada. Exploration Consultant   |
| 1987 - 1991    | RioFinEx Ltd. (RTZ), European Exploration Group, Clermont Ferrand, France. Exploration Manager - Hexamines S.A., Clermont Ferrand       |
| 1984 - 1987    | RioFinEx Ltd. (RTZ), European Exploration Group, Newbury, United Kingdom. Senior Geophysicist: European Exploration Division            |

- 1970 - 1984      Geoterrex Ltd, Ottawa, Ontario, Canada. Technical Support for Geophysical Operations, Paris, Manager of Seismic Operations
- 1969 - 1970      Noranda Ltd., Geco Mine, Manitouwadge, Canada. Graduate Mining Engineer in Training

#### **PROFESSIONAL DEVELOPMENT**

ISO 14001- EMS Audit Team Leader training July, 2003

#### **LANGUAGES**

English, French, Spanish