Railway Infrastructure

Grade and Slope Stabilization

Environmental

DEDICATED ENGINEERING AND ENVIRONMENTAL SERVICES
KC B AND THE RAIL INDUSTRY

KCB offers our corporate commitment to dedicate our project management and the firm’s best resources to deliver responsive, proactive and multidisciplinary railway engineering, environmental and planning services to meet the needs of our clients. We continually look for opportunities to provide innovative solutions to meet the unique needs of our key railway and industry clients and expand the breadth and depth of our capabilities to do so.

In 1999, KCB became a member of the Louis Berger Group (LBG). The Louis Berger Group is a 6000-person design firm and a premier international consultant with over 80 offices worldwide. LBG has successfully provided freight, rail, and transit advisory services worldwide for more than 50 years. As part of this dynamic group, KCB has access to an extensive network of professionals and can address unique regional issues or technical specialties.

CLIENT UNDERSTANDING

KCB recognizes that the heavy rail haul industry is in a period of unprecedented growth and is subject to increased regulatory and public scrutiny, regarding rail safety. The robust import / export economy in North America is taxing our current railway systems ability to transport goods and materials, driving rapid expansion of rail infrastructure and upgrades of existing lines. With heavier, longer and more frequent trains comes a greater challenge to maintain safety and reduce service disruptions driving the need to develop multi-disciplinary innovations and maintain operational risk management systems.
ABOUT US

Klohn Crippen Berger Ltd. (KCB) is an international engineering, geoscience and environmental consulting firm with its head office in Vancouver and 10 offices in strategic locations in Canada, Peru, Australia and the UK. KCB has over 60 years of participation in some of the largest and most challenging engineering projects in the world. Our commitment to excellence is the driving force behind everything we do and, as a result, we are the recipient of over 50 national and international awards for major projects.

KCB offers a full range of services in railway, tunnels, highways, oil and gas, mining, environmental, oil sands, water, and power. Our multi-disciplinary teams focus on safety and sustainability and can take a project from concept to commissioning.

We have a long history in heavy rail haul projects dating back to the 1950s when founding partner, Charlie Ripley procured two challenging geotechnical jobs with Canadian National Railway. Through the decades our teams have acquired extensive engineering and environmental experience in the assessment, design, construction, maintenance, and mitigation through numerous linear infrastructure projects and specifically railways.

HEALTH & SAFETY

KCB is committed to safety in all aspects of professional practice. We take this commitment seriously and our company-wide philosophy of zero harm permeates throughout our employee and contractor health and safety practices. To promote a culture which ensures commitment to Health and Safety, KCB will continue to provide company guidelines for safe work procedure and provide training and instruction in health and safety to our employees. KCB is fully eRailSafe qualified.

QUALITY

KCB is committed to continually improving how we meet our clients’ requirements by using a quality management system to operate our business and manage our proposals, contracts and projects. We monitor and measure our progress to meet these objectives through a quality audit program, staff performance reviews and monthly project monitoring. KCB operates a quality management system which complies with the requirements of ISO 9001:2008.

SUSTAINABILITY

KCB is committed to sustainability in all aspects of our business, design, and construction practices. To support our vision to “Build a Better World”, we endeavour to balance social, environmental, and economic concerns both internally and in our project work to meet the needs of our clients, the community, our employees and other key stakeholders.

KCB reports annually on our sustainability performance in line with the Global Reporting Initiative’s Sustainability Reporting Framework. (http://www.klohn.com/pages/sustainability/).
RAILWAY INFRASTRUCTURE

KCB has been providing integrated geotechnical, civil and structural engineering services for major linear transportation (railways and roads) projects for over 60 years. Our team leaders bring more than 100 years of combined experience in design, construction and maintenance of track, grade, bridges and structures for the heavy-haul rail industry.

Services

Client Service Needs
Design, construction, and maintenance of track and grade
- Sidings
- Double track
- Yards
- Industrial spurs
- Trans-load facilities
- New tracks
- Upgrades (increased loading)

Design, construction, and maintenance of structures
- Bridges
- Retaining walls
- Tunnels
- Ports
- Trans-load structures
- Track protection structures (ie. rock sheds, barrier walls, etc.)

Quarry and borrow pits
- Mine plans
- Drainage
- Pit slope design

KCB Service Areas
Track design (conceptual, approval, & construction drawings)
Railway surveying
Geological / Geotechnical, civil, hydro-technical, structural, mechanical, and environmental engineering
Construction admin and QA / QC
Permitting and regulatory approvals
Mine plans
Drainage plans
Embankment and slope design
Geostructure design
Experience

Rock Slope / Rock Shed Slide Protection for CN Rail, BC, Canada
KCB designed an 80 m long rock shed for CN Rail. KCB’s modular rock shed design allows for construction under railway traffic. Our five phase methodology included: i) characterization of rock slope hazards using LiDAR and field mapping, ii) dynamic rock fall and stability analyses for conceptual design, iii) detailed structural design of rock shed, iv) preparing tender package and providing field services for installation of rockfall catchnet to protect work area, and v) QA / QC field services during construction.

Industrial Rail Yard Expansions, Canada
KCB has designed industrial rail yard expansion projects in Alberta and BC for various clients involving track, grade, and drainage design, production of drawing and specification submittals for approval by the host Class 1 railways, and approval level cost estimates. KCB provides the full spectrum of engineering and environmental services to complete all aspects of these railway infrastructure projects.

Millenium Line Skytrain Stations, BC, Canada
KCB led a joint venture responsible for the civil, mechanical and electrical design for three elevated Skytrain stations and associated traction substations on the Millennium Line extension. Each of the stations is architecturally different, a result of the client’s decision to try and make the stations neighbourhood specific.

Rockfall Protection System – Kicking Horse Pass, BC, Canada
The BC Ministry of Transportation engaged KCB to design a unique system consisting of extended drilled steel pipe piles faced with sacrificial precast concrete panels, with a proprietary Trumer Schutzbauten TS-2000-ZD (rated for 2000 kJ) fence mounted on top of the piles. This system has been in service for over seven years and has prevented rocks from hitting the highway and substantially reduced dust clouds from slides which had been obscuring the vision of drivers.

HWY 7 MSE Bin Wall Replacement & Rock Shed Design, BC, Canada
KCB designed renewal options for the deteriorating, rock-filled MSE bin wall supporting Highway 7 above the railway between Agassiz and Hope. Key to this functional design was the constructability investigation.

Kicking Horse Cantilevered Structure, BC, Canada
KCB undertook a value engineering redesign for this $17M road and bridge construction contract. The originally designed pair of bridges crossing the Kicking Horse River was replaced with a unique cantilever roadway structure which cantilevers approximately 4.5 m over the river, keeping the highway entirely on the south riverbank. KCB provided all structural, geotechnical, and highway engineering design.

41B Street Overhead at Deltaport Way, BC, Canada
KCB was retained for the preliminary and detailed design of a new railway overhead and intersection at the conjunction of 41B Street and Deltaport Way in Delta, BC. The new overhead replaced the at-grade crossing of the CN Rail tracks and the work included a new loop ramp and signalized intersection.
GRADE AND SLOPE STABILIZATION

KCB’s team of geo and hydro scientists and engineers have been providing grade and slope stabilization services for major linear transportation infrastructure (roads and railways) for more than 20 years. Our team lead developed the accepted standard of practice methodology to manage the risk associated with railway ground hazards.

Services

**Client Service Needs**

Ground hazard assessment and risk management for safety and service reliability for:
- Rock landslides (natural and man-made slopes)
- Debris landslides (falls and flows)
- Earth landslides (natural and man-made slopes)
- Subsidence (settlement, bearing capacity failure, and liquefaction)
- Surface and seepage hydraulic erosion
- River erosion
- Icing and frost heaving
- Snow avalanche
- Seismic loading

Planning, design and implementation of proactive and reactive mitigation measures
Track protection structures

**KCB Service Areas**

Geological / Geotechnical engineering
River and Geo morphology
River engineering
Hydro-technical Engineering
Geographic Information Systems (GIS)
Remote sensing (Terrestrial and airborne LiDAR, photogrammetry, InSAR)
Dynamic rock fall / rock mass modelling
Terrain mapping
Rock, debris & soil slope characterization and assessment
Railway ground hazard risk assessments
Mitigation prioritization and planning
Geotechnical investigations
Instrumentation and monitoring
Environmental
Experience

Canadian National Railways, Canada
KCB has an ongoing service agreement with CNR and have completed a variety of grade and slope stabilization projects including rock fall and rock slide assessments, embankment and slope stabilization, peat and weak soil subgrade assessments and stabilization. Work includes rock fall hazard assessments, rock shed designs, embankment and slope stabilizations, and track structure assessments. Our team has provided timely responses to numerous emergency call outs.

Rockfall Risk Management Program, BC, Canada
KCB was involved in a risk management program to reduce the relative derailment risk associated with rock fall hazards along a section of railway track in BC. This project involved the analysis of historical rock fall events and climatic triggers, semi-quantitative analysis of the relative risk, implementation of mitigation, and subsequent measurement of the risk reduction.

Jackass Mountain, BC, Canada
KCB carried out LiDAR and discrete fracture network modelling for rock slide characterization and analysis when a 53,000 m³ rock avalanche buried railway tracks and caused the collapse of a rock shed protecting the tracks.

Lac La Biche Railway Embankment Stabilization, AB, Canada
Repair of a railway embankment subject to settlement. The project involved cone penetration testing, slope stability analysis and installation of screw plate anchor piles.

Hummingbird Creek Debris Flow Risk Assessment, BC, Canada
KCB conducted a probabilistic risk assessment including preparation of magnitude-frequency relationships for debris flows from Hummingbird Creek. Our team prepared conceptual design options, conducted decision analysis to assess the risk mitigation and recommend a preferred option. The work included preliminary cost estimates for the preferred option of debris retention and training berms.

Kenville Mine Portal Slope Stability Assessment, BC, Canada
Terasen’s high pressure pipeline was located above a very steep, 25 m high slope excavated for the portal of an operating mine. KCB supervised a drilling investigation to assess the bedrock location and nature of overburden, and performed static and seismic stability analyses to confirm that the long term stability of the reinstated slope was adequate.

Trans-Canada HWY 1 Cache Creek to Rockies Program, BC, Canada
KCB conducted a probabilistic rockfall risk assessment at four high hazard rockfall bluffs along mountainous Highway 1 for the Ministry of Transportation. The study included the assessment of historic rockfall patterns, mapping and determination of rockfall mechanisms. KCB prepared magnitude-frequency relationships and assessed probabilities of rock / vehicle encounters based on binomial traffic distributions. Rockfall risks were quantified to assist client in decision making.

RISK MANAGEMENT OF RAILWAY GROUND HAZARDS

Ground hazards, broadly categorized as either, geotechnical or snow and ice related, are known to represent a significant exposure to accidental losses or risk to North American railways. Linear facilities are inherently more exposed to a wider variety and higher frequency of ground hazards than single site facilities. Furthermore, in comparison to other linear features, railways have higher exposure to ground hazards because of their grade and curvature limitations which have resulted in higher cut and fill sections. Railways traversing North America cross a wide variety of physiographic regions and relief.

As much of the terrain traversed by Canadian railways is sparsely populated, and resources available to mitigate associated hazards are finite, it is not possible to simply eliminate this risk but the risk can be managed to acceptable levels. The framework adopted by Canadian railways to manage the risk associated with ground hazards is CAN / CSA-Q850-97 standard entitled “Risk Management: Guideline for Decision-Makers”.

RISK COMMUNICATION

INITIATION
PRELIMINARY ANALYSIS
RISK ASSESSMENT
RISK ESTIMATION
RISK EVALUATION
RISK CONTROL
ACTION / MONITORING
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO BACK
GO Back
ENVIRONMENTAL

KCB offers sustainable, cost-effective environmental services. We have extensive experience in Canada and internationally and have successfully completed projects in the transportation, oil and gas, mining, infrastructure and water resource industries. Our environmental teams include, aquatic and terrestrial biology, geochemistry, limnology, meteorology, hydrology and groundwater, agrologists, socio-economists, environmental engineers and project and program managers.

Services

Client Service Needs
Rock quarries & gravel borrow permitting and mine plans
Project initiator environmental reviews (for Railway and industry) EIA’s
Environmental management plans
Environmental monitoring
Contaminated site assessment and remediation

KCB Service Areas
Environmental sciences (biophysical)
Permitting and regulatory approvals
• Environmental management plans
• Water permits
• Federal Fisheries Act
• Navigation Protection Act (after 2014)
• Environmental Constraints Identification and Mitigation Strategy Development
Environmental management plans
Environmental impact assessments
Site assessment and remediation
Socio-economic (consultation, First Nations)
Environmental Constraints Identification & Mitigation Strategy Development
Reclamation
Experience

Phase I, II, III Environmental Site Assessments and Reclamation Projects
Investigated and managed Phase I and II environmental site assessments, remediation, surface reclamation, detailed site assessments and reclamation applications of oil and gas facilities to obtain site closures on private, public and aboriginal lands.

Indian Oil & Gas Environmental Audit and Liability Assessment
Investigated and identified non-compliance issues with federal and provincial legislation, industry guidelines, and good operating practices. Identified potential contaminant sources and receptors, and provided cost estimates associated with environmental liabilities.

Liability Assessments
KCB has completed liability assessments for the oil and gas industry for remediation and/or reclamation of oil and gas facilities.

Suncor Steepbank Groundwater Monitoring
KCB is conducting groundwater monitoring for Suncor’s Steepbank Mines north of Fort McMurray, Alberta. The plan includes sampling of the current monitoring networks and the development of alternative monitoring strategies.

ISR DEW Line Landfill Monitoring, Defence Construction Canada, Indian And Northern Affairs Canada
KCB conducted geotechnical, soil and groundwater monitoring at 7 remediated former DEW Line Stations in the western arctic.

Killam Abandoned Gas Plant
KCB designed and implemented a groundwater monitoring program, conducted an intrusive soil and groundwater sampling program to delineate on and off-lease soil impacts, developed a comprehensive remediation plan to reduce social and environmental risks to the surrounding area and satisfy terms and conditions of the Environmental Protection and Enhancement Act operating approval. KCB remediated soil on-site using ex-situ remediation strategies.

Sheep Creek Fuel Spill Delineation and Remediation
KCB delineated, excavated and remediated soil on-site in a remote and environmentally sensitive area of Ivvavik National Park, Yukon.

Pipeline Leak of Condensate into Soil and Fractured Rock Impacting Groundwater in a Domestic Use Aquifer
A groundwater remediation and risk management program was implemented. A multi-phase extraction system was designed and installed at site to capture and remove free-phase, dissolved-phase and vapour-phase hydrocarbon constituents from the saturated and unsaturated zones.

Soil Monitoring for Sour Gas Plants
Designed soil monitoring proposals, implemented soil monitoring and management programs at sour gas plants in Alberta as part of ERCB directives.

Former Drilling Sump Assessment
Completed over 50 site assessments in the Mackenzie Delta. These included soil, surface water, permafrost and geophysical data collection.
TEAM LEADERS

GEOTECHNICAL / CIVIL / GEOLOGICAL / HYDROTECHNICAL

Tim Keegan, Edmonton, is a senior geotechnical / geological engineer who has spent 16 of his 29 years of his professional career working for Canadian National Railway (CN). The last 10 years with CN he worked with Engineering Services as the Senior Geotechnical Engineer in Western Canada. During this time he acquired significant experience and expertise in managing operational risk associated with ground hazards as well as design, construction, and maintenance of track infrastructure and is very familiar with their operating procedures.

Chuck Slack, Calgary, has more than 26 years of experience in a variety of surface water engineering-related projects. His specific experience includes dams and reservoirs, river engineering, hydrology, drainage, floodplain studies, municipal design, structural design, topographic mapping and surveying, earthwork design, and construction specifications.

Garry Stevenson, Vancouver, has over 35 years experience in a variety of soil and rock projects. His experience includes conducting site investigations, designs, construction supervision and project management for bridges, highways and rapid transit projects.

Neil Singh, Vancouver, is the manager of the British Columbia Engineering Division of the Mining Environmental Group. His experience includes the design of tailings and water dams, foundations, roads, retaining walls, and channels in soil and rock for static and dynamic conditions.

Dan Etheredge, Lima, has more than 20 years of experience in environmental consulting and construction management. He has management experience on projects throughout North, Central and South America.

Rick Friedel, Vancouver, is a senior geotechnical engineer and project manager with 10 years of experience in the design and layout of tailings impoundments, waste dumps, construction monitoring, site investigation, team and project management. Chris Gräpel, Lima, is a civil / geotechnical engineer with 20 years of experience in water resources, mining and transportation engineering.

Greg Noack, Sudbury, has 24 years of experience in civil and water resources engineering, principally in the mining and industrial sectors. His experience includes analysis, design, construction and project management for large environmental and infrastructure projects.

Andrew Port, Vancouver, has 17 years of experience in geotechnical services for a variety of projects including marine facilities, heavy industrial, dams, infrastructure and transportation.

Joe Quinn, Calgary, is a geological and geotechnical specialist who professional experience includes slope stability assessment, advanced 2D and 3D numerical modelling, seismic hazard analysis, seepage analysis, site investigation, and foundation design.

Robert Cross, Toronto, is a geological engineer with experience in site characterization, the design of foundations for bridges and large structures, the engineering of natural soil and rock slopes, and engineered embankments and retaining walls.

Paul O’Sullivan, Edmonton, has over 20 years of experience in engineering geology and geotechnical engineering aspects of transportation projects, highways, rail, tunnels, pipelines, slope stability and site formation works.

Mike Richardson, Calgary, is a senior geotechnical design engineer and project manager with over 15 years of experience in civil and geotechnical engineering. This includes site investigation and design and construction within the UK railway industry.

Karen Sagar, Calgary, has over 22 years of experience including project managing multi-disciplinary, multi-million dollar design projects for the Alberta’s Oil Sands Operators, geotechnical design for colliery reclamation, offshore wind farm foundations, and roads and railways in the UK, and design of roads and railways in Ireland on soft soils.

Matthieu Sturzenegger, Vancouver, is an engineering geologist with over 8 years of experience in rock engineering and structural mapping. His technical skills include geological mapping, terrestrial photogrammetry / LiDAR, rock slope stability modelling and rock fall simulations.

Keith Viles, Sudbury, has 13 years of experience performing geotechnical investigations and civil design for a broad range of projects within the residential, industrial, mining, civil and petrochemical industries.

Ann Wen, Vancouver, has experience in dam safety review, field investigations, laboratory testing, construction monitoring, settlement analysis, slope stability analysis, liquefaction assessments, pavement design, tunnel design and inspection.

Dave Wills, Vancouver, is a geological engineer with 11 years of experience. He leads the Vancouver geosciences group, manages projects, and functions as a technical team lead.
RAILWAY DESIGN & SURVEYING

Rajeel Mahant, Edmonton, is a senior designer for a wide variety of civil and transportation project. He has extensive civil, structural, transportation drafting and designing experience. He has been involved with many projects including Circle Drive south, the Trans-Canada Highway, Calgary Trail / Anthony Henday Interchanges, Whitemud Drive extension and yearly CN / CP rail siding.

Mike Jansen, Prince George, is an exclusive sub-contractor to KCB from ROCCA Surveys with over 25 years of experience in railway surveying and design. He has completed countless railway track, grade and structures projects for CNR, CP Rail and a variety of industrial clients in Western Canada.

STRUCTURAL

Bruce Hamersley, Vancouver, has over 25 years of engineering experience with a focus on bridge design, soil-structure interaction, and construction engineering. His diverse design background includes project management of large transportation projects, highway and railway bridge designs, seismic retrofit and rehabilitation of major bridges, and construction engineering for bridge erection.

Dave Mack, Calgary, is a senior hydraulic and structural design engineer who has over 33 years of experience in the civil, hydraulic, and structural engineering disciplines. He has been involved in a number of major dam, reservoir and irrigation projects primarily in Alberta.

Rick Ghag, Vancouver, has more than 26 years of experience in the design and rehabilitation of highway bridges; hydroelectric generating facilities; ports infrastructure; natural gas facilities; and mining infrastructure.

Keith Mitchell, Vancouver, is a structural engineer with over 22 years of experience in the analysis and design of bridges and industrial/commercial facilities. He has extensive experience in the development of pragmatic design solutions, particularly for retrofit and remedial challenges, including the seismic retrofit of major structures.

Lubos Petrik, Vancouver, has more than 30 years of experience in structural engineering. His area of expertise is the design of buildings and structures for the hydroelectric projects, resources processing industries, including the pulp and paper mills, mining and petrochemical operations.

ENVIRONMENTAL

Suzanne Davis-Hall, Calgary, has 20 years of experience in the resources and infrastructure sectors, with the last 10 years being in senior corporate and government environment, community and sustainability roles. Suzanne has managed numerous environment and social impact assessments of multi-disciplinary projects in socially and environmentally complex settings.

Dustin Bailey, Edmonton, is an aquatic biologist whose experience includes project management, client liaison, field program design and execution. He has a thorough knowledge of the environmental assessment and regulatory processes and has been involved in many projects related to infrastructure, transportation, oil and gas, mining, and national defence.

Joel DaCosta, Edmonton, is an Environmental Coordinator whose experiences have had him working in the upstream and downstream oil and gas sectors. Joel has more than 8 years of experience conducting over 250 Phase I, II, and III Environmental Site Assessment and Remediation projects.

Jason Duxbury, Edmonton, has over 20 years of environmental work experience. He has participated in over 30 environmental assessments throughout Alberta and British Columbia. His professional career has included multi-discipline environmental assessments for transportation projects, upgraders, gasification plants, pipelines, mines, wind farms, and airports.