

embracing
CHANGE

2017
SUSTAINABILITY REPORT



Geotechnical lab, BC, Canada

IN THIS REPORT



01

Message from the President



03

About the Report



05

About KCB



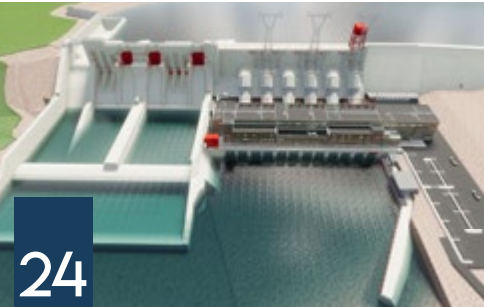
07

Performance Summary



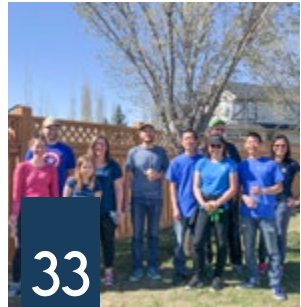
14

Embracing Change



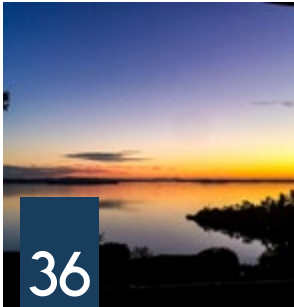
24

Our Projects



33

Our Community



36

Index

FROM THE PRESIDENT

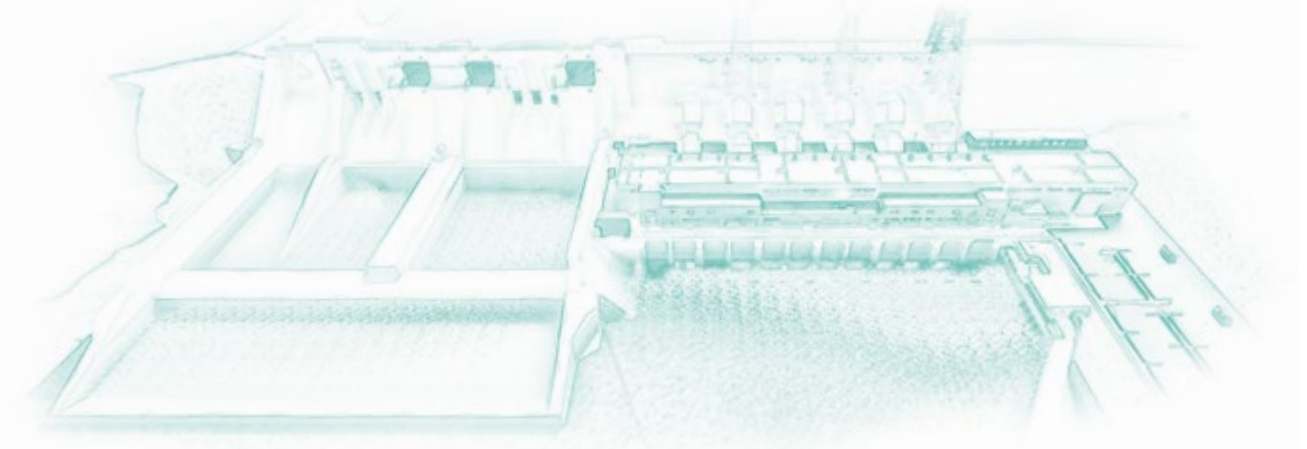
This year's theme for our sixth Sustainability Report is embracing change – the notion that in the consulting business **there is no finish line**, and that we must continue to evolve and improve as a company. Change at KCB includes the transition of senior management to the next generation of leaders, and the digital transformation of our industry.



Len M. Murray, P.Eng., P.E.
President and CEO

In terms of leadership, we recently appointed three of our seasoned professionals to the Vice President role. I welcome Dave Mack, P.Eng. as VP of our Alberta group and Ryan Douglas, P.Eng. as VP of our Power & Transportation group. I wish them success as they continue the exemplary performance of their predecessors Brian Rogers, P.Eng. and Shane Johnson, P.Eng., respectively. I also congratulate Chris Langton, P.Geo. as the newly appointed VP of our Australasia group, following recent successful growth in our business unit headquartered in Brisbane.

Recent senior management promotions include Andrew Port, P.Eng. to Principal. Andrew succeeds Garry Stevenson, P.Geo./P.Eng. who successfully managed the Geo Structures group in our Power & Transportation business unit for many years. We have also invited a cohort of talented staff to become Associates of the company (see page 15 in this report for more details). The opportunity to become a Principal or Associate is a significant career milestone and I congratulate them all.



Digital model of the Site C Clean Energy Project, BC, Canada

In terms of our digital future, the emergence and adoption of new technologies is helping to increase efficiencies and deliver better, sustainable solutions to our clients. In this report, we highlight digital data collection using tablets in the field, design of hydropower facilities by 3D modelling, and advancing a client's capabilities by establishing a soil testing laboratory in Papua New Guinea.

Company Update for 2017

Economic Impacts: When the company is doing well, it has a direct economic impact on our employees, business partners and communities where we work. With strong performance, we continue to invest in our people, help fund applied scientific research and donate to local communities. I am proud of our record and that we are recognized by others as a Platinum member of Canada's Best Managed Companies, and in PSMJ's Circle of Excellence, which is the top 20% of companies measured by a basket of governance metrics. KCB is the only company in the history of PSMJ's Circle of Excellence to achieve this result for 10 years in a row.

Social Impacts: Our duty of care for our employees, clients and communities is paramount. In 2017, we surveyed our employees about their engagement and started a peer-to-peer recognition program. It was such a success that we've implemented the recognition program as part of our daily business. We continue to invest in our people with close to \$1M spent in training last year. We also re-launched our in-house Consulting

101 series, led by the Principals and Associates, on the history of our company, how we manage risks and opportunities, and how to advance your career at KCB.

Environmental Impacts: While not losing sight of the amount of energy and materials we use in our offices, our impact is greater in improving our professional practice and designing infrastructure with sustainability in mind. Society demands that public and private infrastructure owners and operators consider the long-term impacts and life-cycle costs of their facilities. In addition, KCB has taken on the challenge of managing tailings and mine waste, and was recently recognized by the Canadian Dam Association (CDA) for the company's contributions to tailings dam engineering.

Company Outlook

I visited all our regional offices and visited many of our clients over the past few months. There is a lot of confidence in our future and in our market sectors. Renewable energy, mining and oil sands opportunities continue to strengthen and our infrastructure work is growing steadily.

As we have seen in other industries, traditional planning and design approaches by engineers and scientists are being disrupted. Developing sustainable solutions while integrating advanced technology in our work is the key to success for KCB and our stakeholders.

I welcome your feedback on our 2017 Sustainability Report at lmurray@klohn.com.



Fruta del Norte Project, Ecuador

ABOUT THE REPORT

This report follows the Global Reporting Initiative's (GRI's) Sustainability Reporting Guidelines – the international reference for sustainability reporting – and is the disclosure of KCB's performance related to selected environmental, social and economic topics (or "Standard Disclosures"). Each report section is mapped to the corresponding GRI Standard Disclosure listed on page 36.

Report Scope

This annual report is for KCB's stakeholders, including our employees, clients, shareholders and industry peers. The scope of this report includes material information from our global operations in 2017 and up to the date of publication in June 2018.

Where available, we include comparative historical data to demonstrate trends, following on from our previous report published in June 2017.

Report Focus

In this report, we focus on the sustainability of our operations and highlight the sustainable attributes of four recent projects located in Australasia and Canada.

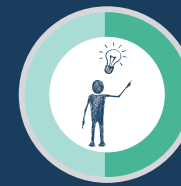
We report on the progress of our operations under the following categories:

- > About KCB
- > Performance Summary
- > Embracing Change
- > Our Projects
- > Our Community

If you have any questions or comments, please contact us at info@klohn.com.

STAKEHOLDER ENGAGEMENT

Topics included in this report are selected based on interactions with our invested stakeholders: our employees, clients, shareholders and industry peers. Report content is also influenced by third-party stakeholders such as industry associations, the scientific community, government and regulatory agencies, and the communities where we work.



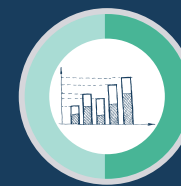
Employees

- > Employee meetings
- > Employee feedback surveys
- > Employee reports on ethics or conduct
- > Safety reports



Industry peers and scientific community

- > Partnering agreements
- > Subcontractor agreements
- > Industry association participation
- > Scientific research and sponsorship



Shareholders

- > Shareholder meetings
- > Annual general meetings
- > Shareholder reports on ethics or conduct



Public community

- > Public consultation for projects
- > Volunteer initiatives
- > Sponsorship of community events
- > Company donations to charities and community groups



Government and regulators

- > Regulatory committee participation
- > Adherence to occupational health and safety, and environmental laws
- > Adherence to employment and labour regulations
- > Adherence to laws governing engineering, geoscience and other disciplines



Clients

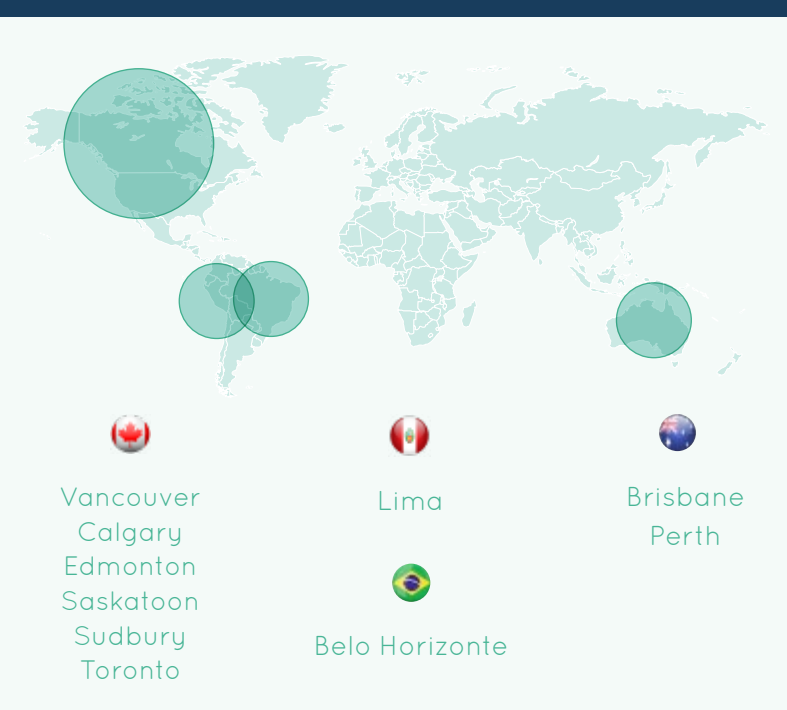
- > Client feedback surveys
- > Pre-qualification surveys
- > Project requirements
- > Contract requirements
- > Participation on client technical review boards

ABOUT KCB

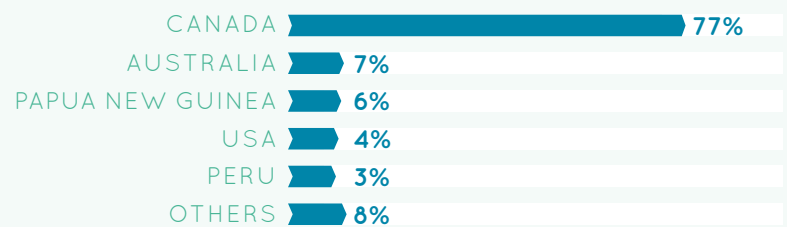
KCB is an award-winning engineering, geoscience and environmental consulting firm with offices in Canada, Australia, Peru, and Brazil. Since 1951, we have helped to sustainably develop resources, reclaim landscapes, build communities and stimulate economies by participating in some of the largest and most challenging projects in the world. We have a strong reputation for quality work and technical experience. Our commitment to excellence is the driving force behind everything we do.

We are affiliated with Louis Berger, a global infrastructure and development firm, and we work on energy, hydropower, infrastructure, mining and transportation projects in over 20 countries.

OFFICE LOCATIONS



FEE REVENUE BY COUNTRY



Corporate Governance

KCB's Board of Directors consists of three members nominated by the employee shareholders and three members nominated by Louis Berger. The Board of Directors appoints the President, who in turn appoints the Operating Committee, an advisory group which meets quarterly to review company performance.



CORPORATE GOVERNANCE COMMITTEES

- > Operating Committee
- > Audit Committee
- > Risk Assessment Committee
- > Project and Proposal Monitoring Committee
- > Global Quality, Health & Safety and Environment (QHSE) Team
- > Pension Committee
- > Donations Committee

VOLUNTEER COMMITTEES

- > Joint Health and Safety Committee
- > Sustainability / Environmental Committee
- > Employee Engagement Committee
- > Women-in-Klohn Committee
- > Young Professionals Committee



Integrated Management System

KCB's business is governed using an integrated management system (IMS) consisting of quality, health and safety, and environment procedures. This system steers our business conduct, the way we undertake our projects, and how we interact with our clients, the community and the environment.

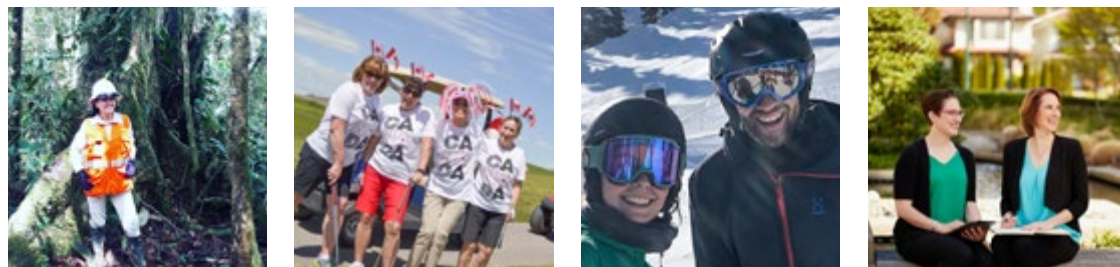
Our IMS is registered to the ISO 9001, ISO 14001 and OHSAS 18001 standards, which promote effective corporate governance, while keeping us honest through regular audits. We regularly assess the effectiveness of our IMS by carefully listening to client feedback, seeking input from employees and others we work with, conducting audits and inspections of our activities, and reviewing progress of all our active projects each month. We believe that this approach leads to strong client satisfaction, high employee engagement and the continued success of KCB.

Business Conduct and Ethics

KCB's success, including our ability to positively impact invested stakeholders, depends upon the integrity of our employees, the quality of our services, and on the trust and confidence of the people we work with. We are guided by KCB's Charter, a moral compass for our daily work.

We conduct our business ethically, with integrity and honesty, and reinforce this expectation in our Code of Business Conduct and Ethics for employees, and for subconsultants, subcontractors and suppliers. Violations of our Charter or Code of Conduct may be reported to our Ethics Officer who reports directly to KCB's Board of Directors.

PERFORMANCE SUMMARY



KCB's performance and impact on our stakeholders is reported in terms of selected economic, social and environmental metrics and results.

Legal Compliance

In this report, we confirm that KCB continues to comply with applicable employment, occupational health and safety, and environmental laws and regulations, including regulations related to professional engineering, geoscience and environmental services. KCB has no pending court orders or fines related to non-compliance with these legal requirements.

ECONOMIC IMPACTS

Disclosure on our economic impact on clients, employees, shareholders, local communities, and business partners, including subconsultants, subcontractors and suppliers.



For the 10th consecutive year, KCB is one of Canada's Best Managed Companies, recognizing our continued financial success, effective strategic planning and commitment to improvement.



For the 3rd year in a row, KCB's Australasia group was recognized as an Employer of Choice at the Australian Business Awards. This award is given to organizations that maximize the full potential of their workforce through effective employee recruitment, engagement and retention.



PSMJ'S Circle of Excellence - Top 20% of Companies

Each year we compare our performance to about 300 industry peers in North America by participating in PSMI's Financial Performance Survey. Based on 13 metrics, KCB continues to be in the top 20% of companies and is the only company to achieve this result for 10 years in a row.

Community Investments

Across our offices in 2017, we donated over **\$105,000** to various charitable organizations and fundraising events.



United Way

- > In 2017, KCB donated \$68,000 to the United Way.
- > Since 1992, employees have donated \$434,000 to the United Way, matched dollar-for-dollar by the company.

Subconsultant Engagement

Over **180** subconsultants were employed in 2017

\$8M paid out in services

STRONG CLIENT SATISFACTION

86% of our clients are repeat clients

95% of our clients, when asked, are either very likely or extremely likely to recommend us to others



Alberta Transportation

KCB is innovative (using tools like ERT, down-hole LiDAR, InSAR) and we value this willingness to try new methods. The technical aspects of KCB's work is superior, being both practical and effective."



Metro Vancouver

Close cooperation of KCB staff in getting good quality work is appreciated.



Great quality of work and client understanding. Brown and Caldwell



Mine site, BC, Canada

SOCIAL IMPACTS

Disclosure on our impact on the social systems within which we operate, including the composition of our employees, our duty of care for health and safety, and the training, education and skills upgrading of our employees.

OUR PEOPLE

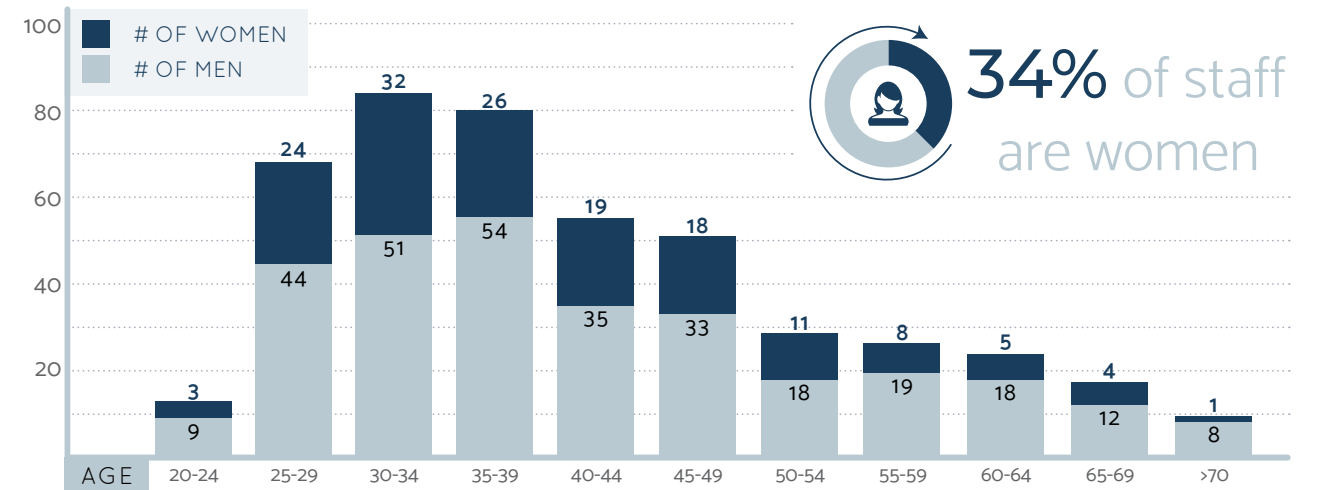
| STAFF COUNT | | Full-time | Part-time | Total |
|-------------|-----------|-----------|-----------|-------|
| 437 | Canada | 300 | 39 | 339 |
| | Peru | 34 | 2 | 36 |
| | Australia | 53 | 6 | 59 |
| | Brazil | 3 | 0 | 3 |

Average years of service is 7

Average age is 41 years

GENDER STATISTICS

| | |
|-------------------------|---------------------------|
| BOARD OF DIRECTORS | 1 of 6 members is a woman |
| MANAGEMENT TEAM | 3 of 16 members are women |
| PRINCIPALS & ASSOCIATES | 9 of 69 members are women |



HEALTH & SAFETY

KCB promotes a proactive safety culture by encouraging employees to report safety observations, near miss incidents and incidents resulting in injury, illness or property damage (minor losses).

| | | | |
|----------------------------|-------------------|--------------------|-------------------------|
| 226 safety observations | 32 near misses | 68 minor losses | 0 lost time injuries |
|----------------------------|-------------------|--------------------|-------------------------|

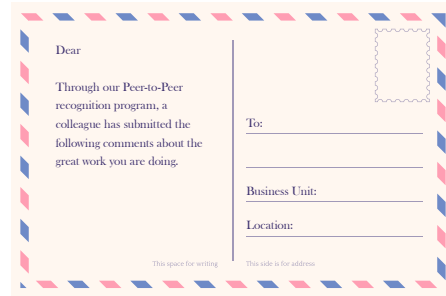
TRAINING & EDUCATION

\$930,000 invested in training annually

| | | | | | |
|---|----------------|-------------------------------------|-----------|---|------------|
| Annual amount invested in training per employee | \$2,100 | Average training hours per employee | 24 | Workforce involved in mentoring program | 11% |
|---|----------------|-------------------------------------|-----------|---|------------|

MINI PULSE CHECK SURVEYS

Staff were asked for feedback about their engagement on a weekly basis over several months. The surveys included a peer-to-peer recognition section where staff could give accolades to their colleagues using postcards. The peer-to-peer recognition was so popular that it has continued into 2018.



CONSULTING 101

Our young professionals interested in learning more about the consulting business were invited to attend our Consulting 101 series presentations.



- Topics covered:
- > Our Company History
 - > Our Consulting Business
 - > Managing Risk at KCB
 - > Your Career Path at KCB

MENTAL HEALTH ASSESSMENTS IN LIMA OFFICE

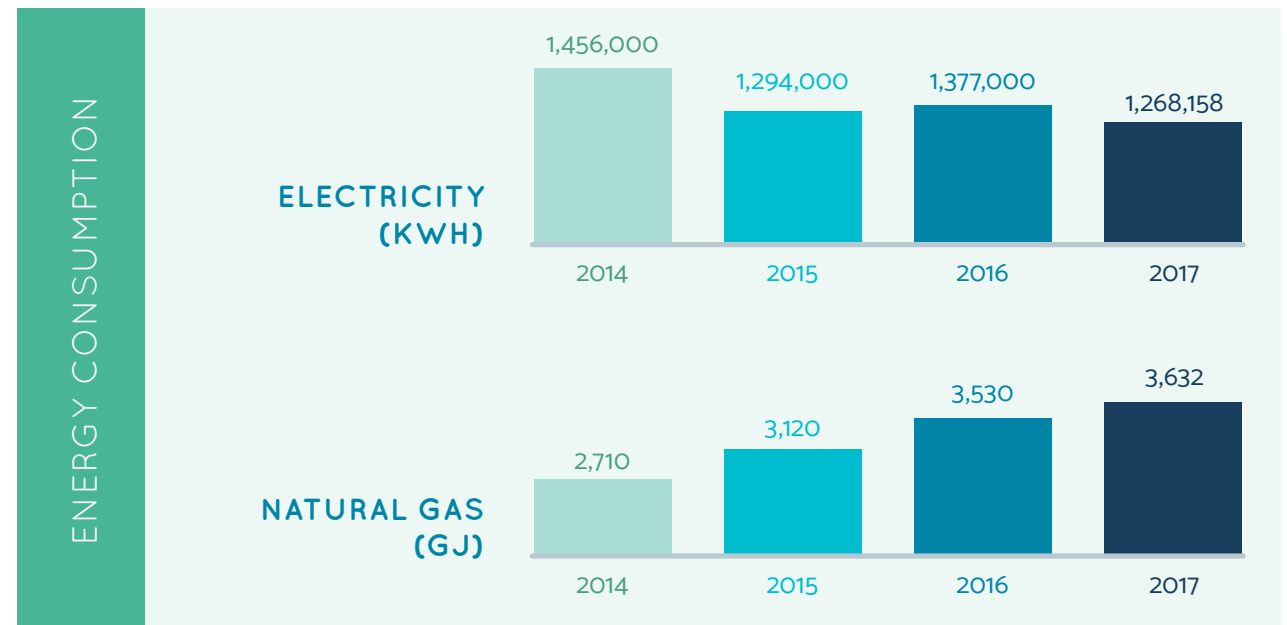
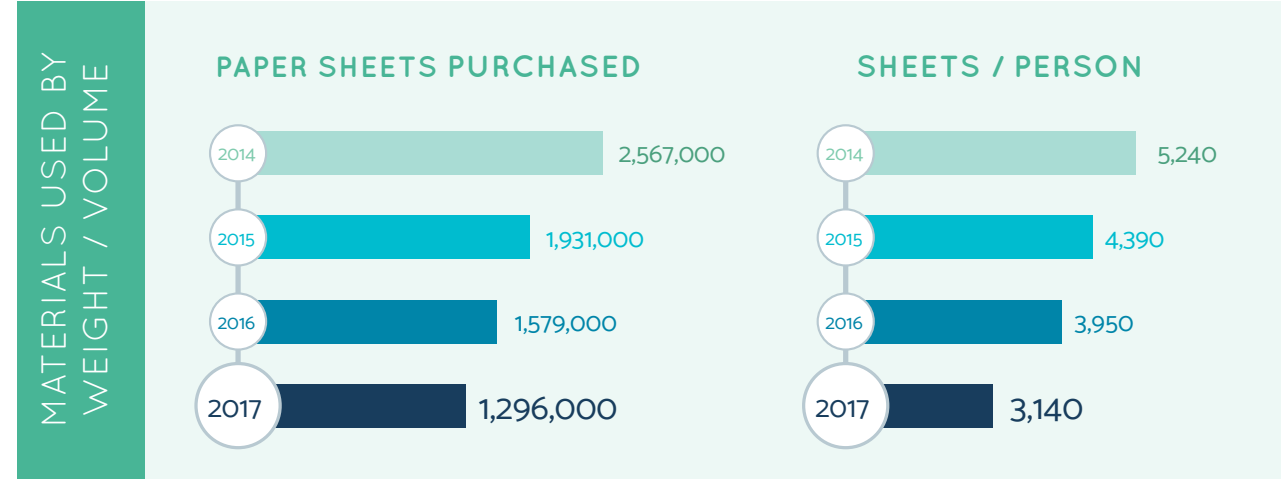
In April 2017, our Lima office conducted an employee mental health assessment, following Peruvian regulations. Based on the results of the assessment, our Lima office implemented an Emotional Intelligence Program consisting of three sessions for all employees. A second program is planned for 2018.

HEALTHY WORKPLACE MONTH

Employee wellness is critical for everyone's personal and professional success, and each year we participate in several health campaigns including Healthy Workplace Month in October. Last year, we hosted a healthy potluck and a wellness lunch and learn session.

ENVIRONMENTAL IMPACTS

Disclosure on our impact on natural systems, including our paper and energy consumption, and our move to use less paper. Per-person data is based on full-time equivalent employees at year end.



Greener choices in our offices

Our Calgary office installed energy efficient LED lighting in meeting rooms and participated in their building's new compost program, helping divert waste from the landfill.

Our Lima office installed water filtration units to reduce the use of delivered bottled water, reducing our costs, plastic use and carbon footprint.

In Vancouver, our technical library collection is being weeded for outdated books and periodicals, and replenished with subscriptions to digital journals and e-books. Old books and other materials are donated to charity.



EMBRACING CHANGE

“

Change is inevitable.
Change is constant.

Benjamin Disraeli

”

Embracing change means we are willing to continue to evolve and improve - because there is no finish line in our consulting business. Recent changes at KCB include the phased transition of senior management to the next generation of leaders, and the digital transformation of our business.

RESILIENT LEADERSHIP



RYAN DOUGLAS

appointed

**Vice President
Power and Transportation**

Ryan is a Civil Engineer with the Power & Transportation business unit based in Vancouver. He has over 20 years of experience in civil, hydrotechnical and geotechnical engineering, and project management related to hydroelectric and other civil projects. His career spans throughout North America, Asia and South Africa. Ryan will assume the role of Vice President, Power & Transportation in August 2018.



DAVE MACK

appointed

**Vice President
Alberta**

Dave is a Hydraulic and Structural Engineer with the Alberta business unit headquartered in Calgary. He has over 35 years of experience in civil, hydraulic and structural engineering, and has been involved in significant dam, reservoir and irrigation projects, primarily in Alberta and Saskatchewan. Dave's experience includes conceptual to detailed design, tendering and construction, and safety and design reviews of dam projects. Dave assumed the role of Vice President, Alberta in January 2018.



CHRIS LANGTON

appointed

**Vice President
Australasia**

Chris is a Hydrogeologist with the Australasia business unit headquartered in Brisbane. He has over 25 years of groundwater and environmental project experience in the mining, industrial and commercial infrastructure sectors. His career spans throughout Australasia, Canada, Russia, South America and South Africa. Chris assumed the role of Vice President, Australasia in January 2018.

ASSOCIATES APPOINTED IN 2017



JEREMY BRUCE

Jeremy is a Civil Engineer with a focus on hydrotechnical engineering. He has 12 years of experience in the management, engineering, and design of major hydraulic conveyance components relating to hydroelectric and water resource infrastructure projects.



KATIE DODMAN

Katie is a Structural Engineer with 12 years of experience in the analysis and design of hydroelectric and transportation infrastructure. She is currently the Powerhouse Package Manager for BC Hydro's Site C Clean Energy Project.



MATTHEW IND

Matt is a Civil Engineer and manager of our Australasian engineering team. With over 20 years of experience in managing and leading mine and civil design projects, Matt has worked on projects throughout Australia, DRC (Congo), New Caledonia, Papua New Guinea, Fiji, Canada, Vietnam and Peru.



ANDREW WITTE

Andrew is a Geotechnical Engineer with 13 years of consulting experience on a variety of projects, with a focus on the geotechnical aspects of mining projects, specifically related to the safe operation of tailings dams.

PRINCIPAL APPOINTED IN 2018



ANDREW PORT

Andrew is Geotechnical Engineer and Manager, Geostructures with the Power & Transportation business unit in Vancouver. He has 20 years of experience in geotechnical services for a variety of projects, including highways, bridges, airports, heavy industrial facilities, dams, mining, infrastructure and marine facilities.



Staff in our Calgary office, Alberta, Canada

ASSOCIATES APPOINTED IN 2018



RAYMOND ALAVA

Ray is a Mechanical Engineer with 15 years of experience, including detailed design, engineering analysis, and layout of mechanical systems and components, primarily relating to hydroelectric projects.



HECTOR BARRIGA

Hector is a Geotechnical Engineer specializing in geotechnical designs and site investigations. He has conducted evaluations and designs for tailings storage facilities and waste rock dumps at various projects in North and South America.



CARLOS DIAZ

Carlos is a Civil Engineer and Manager, Engineering in our Sudbury office. He has 15 years of experience in a variety of projects, including modelling and design of water conveyance and retention structures, storm water management systems, geotechnical designs and site investigations, and dam safety inspections and reviews.



KRISTIN GREINACHER

Kristin is a Structural Engineer and has been the lead design engineer for various concrete and steel bridges. She has also worked on several marine engineering projects, and the analysis and design of a run-of-river hydroelectric facility.



VERONICA LAU

Veronica is a Geotechnical Engineer with 12 years of experience in site investigation and construction field reviews for commercial and industrial developments. Her experience also includes highway and tunnel design, and construction monitoring.



ANDREW MUIR

Andrew is a Civil Engineer and has been involved in various civil design and construction monitoring projects in Canada and Namibia, including hydro dams and municipal infrastructure. He has successfully managed design projects, construction monitoring projects, and public safety and security assessments.



ANN WEN

Ann is a Geotechnical Engineer and has worked on a wide variety of projects in Canada, U.S., Mauritania, Peru and Papua New Guinea. Her experience includes site investigation and design for dams, tunnels, and other heavy civil and mining infrastructures.



DAVID WILLMS

David is a Geological/Geotechnical Engineer with a focus on the geotechnical engineering of tailings facilities, from design and construction, to concept and closure. He has 15 years of experience and has worked throughout North America, Asia, Australia and Europe.



WILLIAM WU

William is a Structural Engineer with 20 years of experience, with a focus on bridge design, dynamic soil-structural interaction analyses, and construction engineering. He has been involved in condition assessments, renewal option analyses, and repair designs for bridges, powerhouses and other facilities.

OUR DIGITAL FUTURE

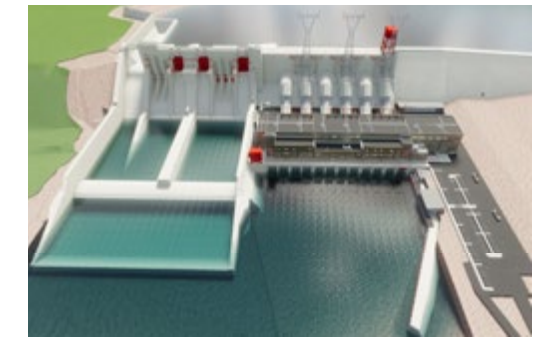
Our industry is being transformed through technological change. Our business operations and the professional practice of engineering, geoscience and environmental consulting are becoming increasingly digital, impacting how we work with our clients and enhancing the capabilities of our employees.



Use of the pLog software on an all-weather tablet

Digital Data Collection

Using all-weather tablets, our field teams can record core logging data directly into pLog™ software with standardized templates. Gone are the days of handwritten drilling logs, re-entry of the same data into a spreadsheet by a different person back in the office, and assigning someone else to compile the data so it can be used to make decisions a few days later. Now, field staff can compile the data as it is generated, and work with complete data far earlier in the site investigation and design process. This means more time is spent interpreting and understanding the data for the benefit of our clients and professional practice.



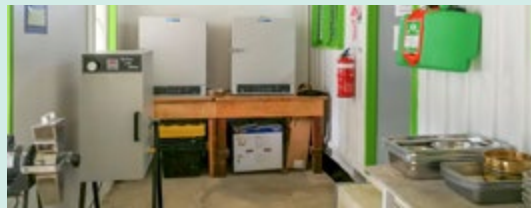
Site C Clean Energy Project, BC, Canada

Design by Digital Modelling

Using Autodesk's Revit™ building information modelling software, our engineering designers and modellers design complicated structures, such as hydropower facilities, in a 3D model. As a model is developed, our team uses the clash detection tool for resolving issues between components or disciplines. Drawings are developed and produced directly from the 3D model and annotated with 2D elements.

The beauty of designing in 3D is that while the model can be rendered, akin to an artist's impression for visualizing the work and for virtual reality walkthroughs, it contains accurate and comprehensive details of the design, from every structural concrete block, gate guide and anchor bolt to every steel connection and electrical switch.

ADVANCED SOIL TESTING LAB IN PAPUA NEW GUINEA



Front area of lab, open to outside



Run-down shelter prior to remediation

KCB worked with Newcrest Mining to convert a run-down shelter into a state-of-the-art soil testing lab at the Lihir Mine on Aniolam Island in Papua New Guinea.

Established in October 2017, the temporary lab is an important part of KCB's site investigation program, with over 200 advanced soil tests completed to date.

The lab is one of only a few advanced soil testing labs in the world, and was set up to the same standards as KCB's geotechnical labs in Vancouver and Calgary. It has calibrated equipment, including consolidation, triaxial and direct simple shear testing machines. The simple shear test is significant because it determines how soil materials will react during an earthquake.

The old shelter consisted of two containers and an open-air area. It required new electrical wiring and plugs for the testing equipment, which was shipped from the UK and North America; and new plumbing and air conditioning units were installed. The lab was completed with sturdy work benches for the heavy testing equipment, some weighing more than 100 kg.

The Lihir lab was set up in collaboration with Newcrest employees from Papua New Guinea, and gave them the opportunity to acquire new soil testing skills by working with KCB's experienced lab personnel.

SHARING KNOWLEDGE AND BEST PRACTICES

Our senior consultants continue to be recognized for their excellence in engineering, and services to the profession and to society. These recognitions show a commitment by KCB senior staff to advancing engineering best practices and sharing their knowledge with their peers.

Harvey McLeod, Vice President, Strategic Marketing and Bill Chin, Senior Geotechnical Engineer were both inducted as Fellows of the Engineering Institute of Canada (EIC) in 2017 and 2018, respectively.



Harvey McLeod (left) inducted as Fellow of the EIC in 2017

Harvey McLeod has been a leader in the evolution and development of mine waste management practices and in integrating socio-environmental responsibility with the engineered aspects of tailings and waste rock. He was the Chair of the Tailings Technical Review subcommittee for B.C.'s Ministry of Energy and Mines, updating the province's Mining Code to include the recommendations from the inquiry into the Mount Polley tailings spill, which has set a new standard for the safe management of tailings storage facilities.



Bill Chin (left) inducted as Fellow of the EIC in 2018

Bill Chin has demonstrated excellence as a practicing geotechnical engineer, mentor, technical author, and active participant in professional associations. He inspires colleagues to produce great work and look for opportunities to give back. Bill has been a key contributor to the development of the geotechnical sections of the Canadian Dam Association's Dam Safety Guidelines, and has assisted the Alberta government's Environment and Parks agency with the update of its provincial dam safety guidelines. He contributed significantly to setting and improving geotechnical safety standards and has had a major impact on improving industry best practices.



Julia Lenton
(Source: Engineers and Geoscientists BC)

Supporting Further Education

KCB helped establish the Sheri Plewes Scholarship for Women in Engineering through the Engineers and Geoscientists BC Foundation in memory of our friend and colleague Sheri Plewes, who passed away in 2014. In 2017, this scholarship valued at \$2,000 was awarded to Julia Lenton, a mechanical engineering student at the University of British Columbia - Okanagan. Julia is passionate about promoting the enrolment, success, and employment of women in engineering, and encouraging female high school students to study engineering.



Recognizing the gaps in understanding leakage through geomembrane holes in a tailings storage facility application

Queen's University GeoEngineering Centre research on the effects of holes in geomembrane liners

Current research has shown that tailings placed directly onto a geomembrane liner dramatically reduces the leakage rate through holes in the liner, as opposed to systems that place drains between the tailings and the liner. This research will help estimate leakage through geomembrane-lined tailings facilities under different configurations and stress conditions for optimal design.

Rowe, R.K., Joshi, P., Brachman, R.W I., McLeod, H. 2017. "Leakage Through Holes in Geomembranes Below Saturated Tailings". Journal of Geotechnical and Geoenvironmental Engineering, Vol.143(2), DOI: 10.1061/(ASCE)GT.1943-5606.0001606.



Mine site, BC, Canada

Supporting Industry Associations

We encourage our engineers and scientists to participate in both regulatory and scientific arenas. Our industry association activities are listed below.

[Alberta Chamber of Resources, Dam Integrity Advisory Committee](#) > Pam Fines, Member

[Alberta Chamber of Resources, Responsible Development Committee](#) > Jason Duxbury, Member

[Alberta Institute of Agrologists, Alberta Soils Network](#) > Stephanie Hannem, Executive Member

[Alberta Native Plant Council](#) > Kim MacKenzie, Board Member

[Association of Consulting Engineers of British Columbia](#)

> Sharon Batchelor, Human Resources Council Co-chair

> Mike Chin, TransLink Liaison Committee Member

[Canadian Dam Association, 2019 Conference Committee](#) > Bill Chin, Chair

[Canadian Dam Association, International Committee](#) > Harvey McLeod, Member

[Canadian Dam Association, Mining Dams Committee](#)

> Greg Noack, Chair

> Joanna Chen, Member

> Harvey McLeod, Member

[Consulting Engineers of Alberta, Private Sector Committee](#) > Brian Rogers, Member

[International Commission on Large Dams](#) > Harvey McLeod, Canadian Representative and Chair of Tailings Subcommittee

[International Mine Water Association](#) > Len Murray, Associate Editor for Mine Water and Environment Journal

[Mining Association of Canada, Environment and Science Committee](#) > Lindsay Robertson, Member

[Nature Alberta](#) > Kim MacKenzie, Board Member

[Ontario Mining Association, Environmental Committee](#)

> Lindsay Robertson, Member

> Lyne Thompson, Member

[Women in Mining British Columbia](#) > Sahar Pakzad, Events Committee Chair



Mine site, BC, Canada

OUR PROJECTS

2017
PROJECT LOCATIONS



KCB'S SUSTAINABLE PROJECT ATTRIBUTES

| | |
|---------------|--|
| ENVIRONMENTAL | <ul style="list-style-type: none"> E1 Responsible water management E2 Special consideration for flora and fauna E3 Rehabilitation |
| SOCIAL | <ul style="list-style-type: none"> S1 Mentoring local people S2 Design or service to improve social conditions S3 Transfer of technology S4 First Nations integration and application of traditional knowledge |
| INNOVATION | <ul style="list-style-type: none"> I1 Advancement in research and technology |
| DESIGN | <ul style="list-style-type: none"> D1 Responsible land use D2 Design to reduce, repurpose or reuse remaining materials D3 Design to improve safety conditions |

VEDDER BRIDGE REPLACEMENT

CHILLIWACK, BRITISH COLUMBIA, CANADA

A fundamental goal in constructing the new Vedder Bridge, and demolishing the old bridge, was to avoid any work within the river. This was important from both an environmental standpoint in protecting the salmon-bearing river, and a construction scheduling standpoint because the fisheries windows for working in the river were very short. Avoiding work within the river also reduced construction safety risks, and so assembling the bridge along the north side of the river and launching it into place was the preferred installation method.

| KCB'S SUSTAINABLE PROJECT ATTRIBUTES | |
|--------------------------------------|--|
| E1 | Responsible water management |
| I1 | Advancement in research and technology |
| D1 | Responsible land use |
| D2 | Design to reduce, repurpose or reuse remaining materials |
| D3 | Design to improve safety conditions |



The new Vedder Bridge blends into the local environment with minimal disturbance



Innovative Launch Method

The Vedder Bridge arch span required temporary strengthening for the launch sequence, which was provided by a KCB-designed cable kingpost support system. Using the kingpost, the bridge was picked up from its temporary supports and propelled across the river in one metre increments using hydraulic jacks on four travelling skid shoes. The Vedder Bridge is believed to be the world's first steel arch bridge launched into place using a kingpost support system.

The demolition of the old bridge would ordinarily require temporary supports in the river. This would have been very difficult at this environmentally sensitive site and would have extended the project schedule and significantly increased costs. The solution was to modify and re-use the kingpost system to remove the old bridge. This method avoided working in the river, resulting in a safer, low risk solution for the client, the City of Chilliwack.



Small Environmental Footprint

The bridge structures were assembled and disassembled on land, increasing safety for the construction team and minimizing the environmental footprint of the project. In addition, precast deck panels were used as a launching counterweight, eliminating the cost of hauling other types of counterweight to the site. The precast deck panels also acted as formwork for the cast-in-place deck topping, avoiding construction of timber formwork over the water. These design efficiencies further minimized the environmental footprint of the project.

The completion of the new Vedder Bridge brings safe and convenient access for tourists and residents to the popular lakes in the area, contributing to the development of the community. The project recently won an ACEC-BC Award for Engineering Excellence in the Transportation & Bridges category.



The new bridge improves the hydraulic performance of the Vedder River

DECOMMISSIONING OF THE SALMON RIVER DIVERSION DAM

CAMPBELL RIVER, BRITISH COLUMBIA, CANADA

The Salmon River Diversion Dam, located on Vancouver Island, was built in 1958 to divert flow from the Salmon River into the Lower Campbell Reservoir to increase the capacity of the Ladore and John Hart Hydro Facilities. The diversion dam infrastructure was ageing and required rehabilitation for continued operations and to improve fish passage at the dam.



Project team site visit, attended by BC Ministry of Transportation

BC Hydro decided to decommission the diversion dam, based on the marginal economic benefit of refurbishment and the significant environmental benefits of decommissioning. The decision was made with the support of the Wei Wai Kum and We Wai Kai First Nations who co-managed the project. KCB and Hatch Ltd. were engaged by BC Hydro to develop a plan for the dam's decommissioning and restoration of the Salmon River channel.

The dam was considered a contaminated site because it was constructed from creosote-treated timbers, and materials were carefully dismantled and disposed of. The natural flow of the Salmon River was restored allowing for unhindered fish passage upstream. Disturbed areas in and around the decommissioned sites were restored using riprap placement, rough and loose treatment of riparian embankments, and woody debris to control erosion and improve habitat diversity.

Throughout the project, local community organizations were consulted and they were very satisfied with the outcome of the project. The project recently won an ACEC-BC Award of Merit in the Natural Resource and Habitat category.

KCB'S SUSTAINABLE PROJECT ATTRIBUTES

- E1 Responsible water management
- E2 Special consideration for flora and fauna
- E3 Rehabilitation
- S4 First Nations integration and application of traditional knowledge



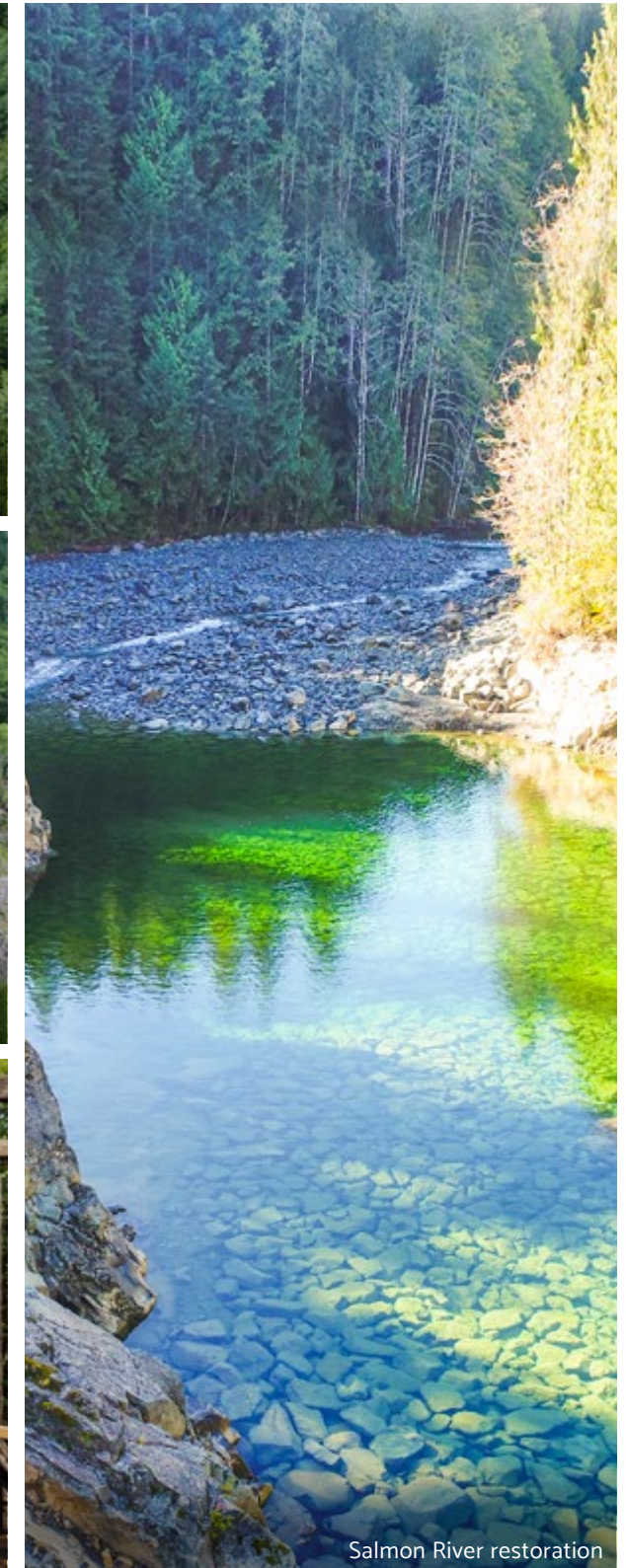
Aerial photo prior to dam removal



Use of diversion channel as treatment pond for contaminated effluent



Flume decommissioning



Salmon River restoration

RIVERDALE AVENUE RETAINING WALL REPLACEMENT

CALGARY, ALBERTA, CANADA

The Riverdale Avenue Retaining Wall Replacement project is an innovative example of solving a riverbank slope stabilization problem with bioengineering, the practice of incorporating natural materials into the design of engineered structures.

KCB'S SUSTAINABLE PROJECT ATTRIBUTES

- E1 Responsible water management
- E2 Special consideration for flora and fauna
- E3 Rehabilitation
- S4 First Nations integration and application of traditional knowledge

From 2014 to 2017, KCB worked with the City of Calgary to replace a 245-m long creosote-treated timber retaining wall along the bank of the Elbow River. The retaining wall protects a busy pedestrian pathway, residential street and buried utilities from river erosion. In addition, the City wanted to restore the damaged riverbank habitat following the significant flood in 2013.

Bioengineering Structures

KCB designed and monitored the construction of three bioengineering structures: wattle fences, live grating, and a vegetated "H-pile" wall (using piles in the shape of the letter "H").

- > The wattle fence section was made entirely of willow and dogwood cuttings, and backfilled with native river bank soils and gravel.
- > The live grating structure was made from a grid of untreated logs planted with willow

cuttings, native trees and shrubs in the grid spaces, protected by riprap at the toe of the slope. Once established, the trees, shrubs and grasses will enhance slope stability and reduce the potential for erosion during a flood.

- > The H-pile wall was built with reinforced concrete panels and a vegetated riprap toe, and included 'windows' in the concrete structural panels for planting native shrubs. To make the new retaining wall look natural, a local artist was commissioned to design a façade consisting of cobbles, gravel and sand, with ledges for nesting swallows and bee habitats.

The three structures were monitored for effectiveness and maintained by scheduled watering and weeding, and installing temporary protective fences to prevent beavers and muskrats from disturbing the newly bioengineered slopes.

Developing Applied Knowledge

The Riverdale project team pioneered three techniques for stabilizing river banks in urban environments, and each can be applied to other river habitats in the Calgary area and across Alberta.

WATTLE FENCE



LIVE GRATING



VEGETATED H-PILE WALL



HIDDEN VALLEY MINE TAILINGS DISPOSAL

MOROBE PROVINCE, PAPUA NEW GUINEA

KCB'S SUSTAINABLE PROJECT ATTRIBUTES

- S1 Mentoring local people
- S3 Transfer of technology
- I1 Advancement in research and technology

The Hidden Valley mine is a gold mine in Papua New Guinea (PNG) with the first engineered tailings storage facility since large-scale mining began in the country over 80 years ago. In PNG, mine tailings were typically discharged into the local river systems, rather than contained in impoundments, because the climate and foundation soils were considered unsuitable for tailings dams.

With improvements in tailings dam design techniques and site investigation methods, the tailings dam at Hidden Valley was designed to withstand high rainfall, the weak tropical soils and weathered rock in a seismically active zone. KCB also designed large waste rock dumps to manage sediment loads and acid-generation from mine waste during routine mining activities. The design and construction of the Hidden Valley tailings storage facility is the culmination of over 30 years of work by KCB in PNG.

Sustainable Mining Practices and Construction Methods

Construction of the Hidden Valley tailings dam marks an historic achievement in socially and environmentally sustainable mining practices in PNG. The tailings dam was constructed entirely from mine waste and built by PNG nationals who were trained to operate heavy mine equipment.

The Hidden Valley area is extremely wet year-round, so typical construction methods had to be altered to suit the environment, including:

- > The embankments are constructed using materials based on the weather conditions; for example, fine-grained materials are only placed under dry conditions, whereas coarser materials and rock can be placed under wet or dry conditions.
- > The construction placement rates were increased to exceed daily targets during dry periods, to offset the less than average placement rates under extremely wet conditions.
- > Parts of the dam were closed to vehicular traffic during periods of high rainfall, to prevent rutting in soft areas and ponding of water.
- > The dam crest was designed with an exaggerated camber to direct surface water away from key areas of the dam, so that construction work can begin sooner when the rain stops.

Training and Technology Transfer

PNG nationals continue to be employed and trained by the mine owner, Harmony Gold, with assistance from KCB. Harmony Gold's community engagement has been well received, setting a precedent for mining industry knowledge and skills transfer to the local population.



OUR COMMUNITY

We are committed to giving back to the communities where we operate through charitable donations, scholarships and investment in research. KCB and its employees have a long-term affiliation with several charitable groups including the United Way, B.C. Children's Hospital, Australia's Biggest Morning Tea and the Calgary Corporate Challenge.



Operation Minerva

Several Grade 8 girls from Calgary schools visited KCB's Calgary office for a day of conversation, activities and mentoring as part of Operation Minerva, an annual initiative of the Alberta Women's Science Network. KCB staff gave the students a tour of one of our projects on the Bow River.



Helping Wildfire Victims

In 2017, British Columbia experienced the worst wildfire season on record. KCB and its employees donated over \$5,000 to support the victims, through the Association of Consulting Engineering Companies' Red Cross fundraising campaign.

Calgary Corporate Challenge

The Calgary Corporate Challenge brings organizations together by emphasizing team-building, fitness and fun in an inclusive environment where there is something for everyone. KCB's Calgary office signed up for the first time in 2013 and is a strong challenger each year, raising more than \$10,000 for various charities in 2017.



Epilepsy Awareness Day

Staff from our Brisbane office organized a morning tea to raise funds for Purple Day, an international grassroots effort dedicated to increasing awareness about epilepsy worldwide. KCB matched all funds raised.

Alberta Women in Sciences Network

KCB received a certificate of appreciation from the Alberta Women in Sciences Network for work we have done with their Work Re-engagement Program and for supporting and encouraging women in their pursuit of life-long careers in the science, technology, engineering and mathematics fields.



Edmonton staff volunteering at Mustard Seed

Plywood Cup

This charity event based in Vancouver, raises money for the Small Talk Centre, helping children overcome language development disorders. A team of four employees represented KCB in this event, where participants need to build a boat out of two sheets of plywood and row it across False Creek and back.



Adopt-a-Family and Santa to Seniors

Staff from the Vancouver office donated gifts and funds in support of the Christmas Bureau's programs, helping local families and seniors in need over the holiday season.



Pathway and River Cleanup

Staff from our Calgary office once again participated in the annual Pathway and River Cleanup event. This annual event helps clean up the city's pathways and river banks, while promoting environmental stewardship among its citizens.



Support for the RSPCA

KCB staff in Brisbane participated in Cupcake Day to raise funds for abandoned, injured, neglected and sick animals who need the RSPCA's help every year. The RSPCA prevents cruelty to animals by actively promoting their care and protection.

Supporting Local Shelters on International Women's Day

Women-in-Klohn groups organized drives for donations of toiletries, cosmetics, treats, new or gently-used handbags and small backpacks for local women's shelters.

BC Children's Hospital Fundraisers

Our Vancouver office participates in various events throughout the year to raise funds for the B.C. Children's Hospital. We participated in Mining for Miracles fundraisers, including Jeans Day and the Slo-Pitch tournament.



G4 COMPLIANCE MATRIX

| G4 CONTENT INDEX | TITLE | PAGE(S) |
|-------------------------|---|------------------|
| G4-1 | Message from the President | 1, 2 |
| G4-3 to G4-10 | Organizational profile | 5, 6 |
| G4-16 | List memberships of associations in which the organization holds a position on the governance body, participates in committees | 22 |
| G4-18 | Explain the process of defining the report and aspect boundaries | 3 |
| G4-19 | List all the material aspects identified in the process for defining report content | 3, 4 |
| G4-24 | List of stakeholder groups engaged by the organization | 4 |
| G4-26 | Organization's approach to stakeholder engagement | 4-6, 8-11, 20-22 |
| G4-28 to G4-31 | Report profile | 3 |
| G4-34 | Report the governance structure of the organization, including committees of the highest governance body. Identify any committees responsible for decision-making on economic, environmental and social impacts | 6 |
| G4-35 | Process for delegating authority for economic, environmental and social topics from the highest governance body to senior executives and other employees | 6 |
| G4-56 | Organization's values, principles, standards and norms of behavior such as codes of conduct and codes of ethics | 6 |
| G4-EC1 | Direct economic value generated and distributed | 8 |
| G4-EN1 | Materials used by weight and volume | 12 |
| G4-EN3 | Energy consumption | 12 |
| G4-EN29, G4-S08, G4-PR9 | Compliance with laws and regulations | 7 |
| G4-LA6 | Health & safety performance | 10 |
| G4-LA9 | Training and education | 11 |
| G4-LA12 | Percentage of employees by age category and gender | 10 |

KCB'S SUSTAINABLE PROJECT ATTRIBUTES

| CATEGORY | | PAGE(S) |
|---------------|---|------------|
| ENVIRONMENTAL | E1 Responsible water management | 25, 27, 29 |
| | E2 Special consideration for flora and fauna | 27, 29 |
| | E3 Rehabilitation | 27, 29 |
| SOCIAL | S1 Mentoring local people | 31 |
| | S2 Design or service to improve social conditions | - |
| | S3 Transfer of technology | 31 |
| | S4 First Nations integration and application of traditional knowledge | 27, 29 |
| INNOVATION | I1 Advancement in research and technology | 25, 31 |
| DESIGN | D1 Responsible land use | 25 |
| | D2 Design to reduce, repurpose or reuse remaining materials | 25 |
| | D3 Design to improve safety conditions | 25 |



2017 SUSTAINABILITY REPORT

ISSUED JUNE 2018

