





#### **BGC** Engineering Inc.

Vancouver | Victoria | Kelowna | Kamloops | Calgary | Edmonton | Toronto | Kingston Ottawa | Halifax | Fredericton | Golden | Santiago | Santo Domingo | Brisbane

bgcengineering.ca/bgc-squared





### **Overview**

Founded in 1990, BGC Engineering (BGC) is an international consulting firm that provides professional services in applied earth sciences. Giving back to communities has always been a part of BGC's culture, and in 2014, this commitment to giving back was made official with the creation of BGC Squared. BGC's philanthropic program, BGC Squared, is dedicated to sustainably addressing critical applied earth science challenges, creating, and promoting science education, and supporting employee-championed fundraisers for charities and organizations. In our backyard and across the globe, we support not-for-profit organizations and community-driven initiatives. Our projects rely on BGC employees' dedicated time, expertise, and passion, and are driven by our partner organizations and communities goals, needs, and commitments.

A BGC Squared project is one that:

**EMPOWERS** individuals through a transfer of knowledge and skills to build on local technical capacity.

**CREATES** sustainable, long-term community development.

**PROMOTES** environmental stewardship.

**INSPIRES** and motivates BGC employees to give back to their communities.

In our 2022 Retrospective, we reflect on the work we've accomplished with communities this year, the students we've connected with, and the donations raised between October 2021 and September 2022. We are grateful for all the opportunities we've had to partner with organizations across the globe during this period and we are excited to connect and collaborate with our partner organizations on future projects.



Cover: Groundwater Well in Zambia Photographer: Paul Bauman

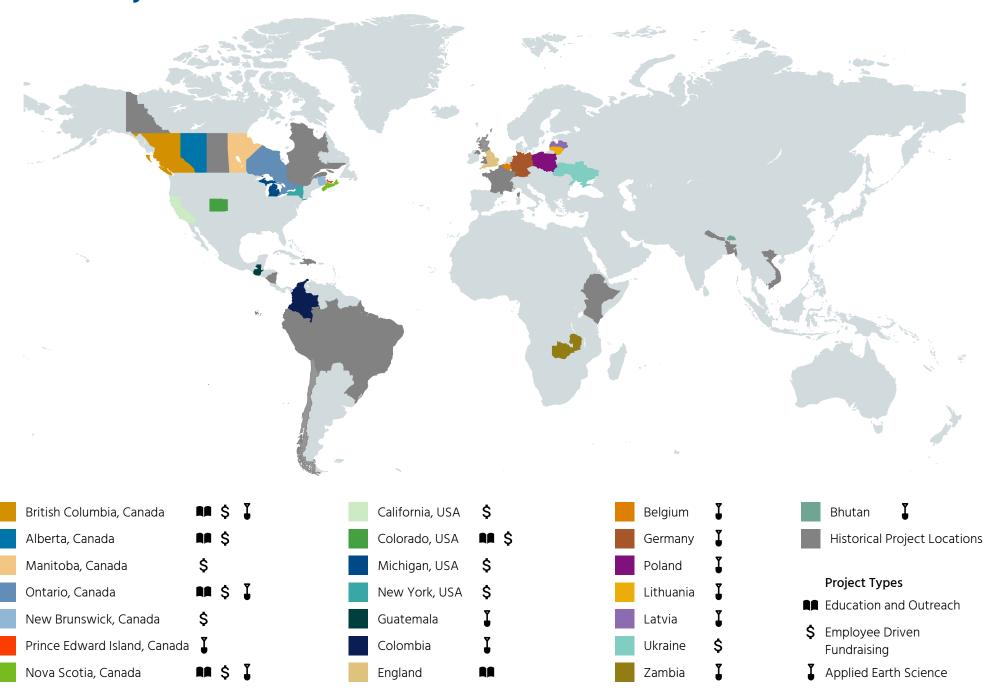


# A NOTE FROM BGC ENGINEERING'S PRESIDENT & CEO, STEVE HEDBERG

"In 2014, a couple of BGC employees provided in-kind support of their geotechnical expertise to two organizations. This simple act formed the foundations of BGC Squared. Since that time, BGC Squared has grown to partner with 68 organizations this year alone, reaching beyond our technical abilities, with half of our projects aimed to inspire and educate youth. This past year we rallied together to support each other, the communities where we live and work, and beyond. BGCers fundraised more than ever for causes close to their hearts and tripled the previous years' donations. Reflecting on the work done through BGC Squared this past year makes me realize that more than ever we are all connected, and when we work as a team, we can achieve some incredible things. From Canada to the United Kingdom and Poland to Zambia, the reach of BGC Squared's impact continues to inspire me. Thank you to each and every BGCer, community, and partner organization who has played a role in supporting BGC Squared projects and causes this past year." - Steve Hedberg



# 2022 Project Locations



# 2022 In Numbers

68
Partner
Organizations

Applied Earth
Science and
Education
and Outreach
Projects

+5,250 Employee Hours

Donated In-Kind

25%
BGC Staff
Engaged in Projects

+750
Employee Volunteer
Hours

\$198,000 CAD Donated by BGC



## **Project Showcase**

We are grateful for the trust of our partner organizations and the opportunity to support the great work they do. We hope you enjoy reading about a handful of projects that we have contributed to this year.

#### **APPLIED EARTH SCIENCE**

We partner with communities and organizations to address applied earth science challenges around the world. Our primary focus is on natural disaster risk management, climate change adaptation, improving natural resource development practices, and the protection of community and cultural infrastructure.

#### 2021 EMERGENCY FLOOD RESPONSE IN BRITISH COLUMBIA

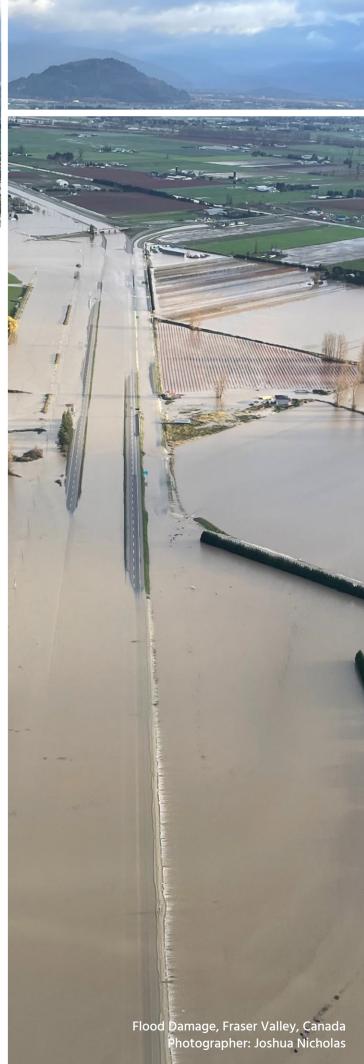
Canadian Space Agency (CSA), Natural Resources Canada (NRCan), Anonymous BC First Nations | British Columbia, Canada

BGC Project Team: Celeste Melliship, Christy Rouault, Ivy Li, Jeanine Engelbrecht, and Zeneca Kubota

In November of 2021, southwestern British Columbia, Canada, and northwestern Washington State, USA were affected by a series of atmospheric rivers that caused the destruction of critical infrastructure. This weather event resulted in massive precipitation leading to flooding, landslides, and debris slides that impacted many communities.

The Sumas Prairie experienced severe flooding from the Sumas and Nooksack Rivers in 2021 resulting in the evacuation of 1,100 homes in Abbotsford. In partnership with the CSA and NRCan, BGCers created daily flood inundation maps to support disaster response efforts in the area. Freely available satellite data from Radarsat Constellation Mission and Sentinel-1 was used in the analysis. Ground inspection teams used the resulting data to guide their damage assessment surveys and to clear evacuation zones allowing residents to return to their homes and businesses.

In the Nicola Valley, BGC created artificial reality models of flood and hazard assessments in First Nations communities. This tool created a platform for BGCers to talk with communities about the hazards they face, and to learn about what is at stake and local knowledge from community members.





#### **GROUNDWATER WELLS IN ZAMBIA**

The SAM Project, Geoscientists Without Borders® | Zimba District, Southern Province, Zambia

#### BGC Project Team: Max Layton, Maddy Hughes, Paul Bauman, and Will Hoppe

In partnership with the "The SAM Project" (Sustainability through Agriculture and Microenterprises), BGCers completed geophysics surveys in the search for sub-surface drinking water targets to install drinking water wells for health clinics and communities with no reasonable access to safe water sources.

The name of this project, as chosen by the SAM NGO, is Kujana. "Kujana" means "to find" in Chitonga, the primary language in the Zimba District of Zambia. Kujana is a Geoscientists Without Borders® funded project focused on providing water in this district where walking more than 5 km or pulling an animal-drawn trailer more than 10 km to gather water is normal. Of the 116 districts in Zambia, Zimba is one of Zambia's most water-scarce, due to a short and erratic rainy season with relatively low precipitation (760 mm annually), high evaporative losses over the dry season, and being underlain by relatively recent geological intrusions that have been largely resistant to weathering processes that are typically responsible for creating aquifers. In this setting, the only available year-round source of safe water is groundwater; though, an intensive geophysical exploration program is required to locate possible aquifers. These groundwater resources are especially important in the context of climate change adaptation, since handpump-equipped boreholes offer vulnerable communities a drought-resilient source of clean water.

The drilling success rate in the Zimba District is about 5%. The Kujana project used advanced geophysical methods to improve borehole success rates. The project used a combination of surface terrain conductivity mapping and 2-D resistivity cross-sectional imaging to map and identify the thickness of weathered crystalline rock. All the fieldwork was done while training engineering and geoscience students from Zambian universities.

To date, one successful water well has been completed, allowing a new health clinic in the village of Kanyanga to open. Based on the geophysical results, 13 more wells are planned to be drilled and completed in 2024. The Kujana project has also repaired four water wells supporting about 2,500 beneficiaries.



"BGC Squared provides an invaluable resource in the recognition and support of the projects that drive BGCers passion beyond the workday. I was honoured to feel, not only supported but also, encouraged to participate in the targeting of rural hand pumps in Zambia. I'm fortunate to be a part of an organization so keen to assist in the participation of humanitarian projects that recognizes the value in establishing connections between communities and not-for-profits, striving to make the world a better place."

- Will Hoppe



Redd Fish Restoration | Tofino, British Columbia, Canada

#### BGC Project Team: Blanca Marin-Esteve, Kathleen Horita, and Sarah Davidson

BGC has been working with Redd Fish Restoration (previously Central Westcoast Forest Society-CWFS) since 2018, supporting river restoration projects on the west coast of Vancouver Island. Over the past century, poorly regulated logging practices have heavily impacted many rivers along the coast, altering the channel morphology and reducing habitat availability for spawning salmon.

Recent studies of watersheds on western Vancouver Island concluded that Chinook populations were declining within these coastal watersheds. There are several potential explanations for why but there are also several data gaps that were identified during the assessment: a lack of stream discharge data in small watersheds across Vancouver Island, limited understanding of bedload movement, and the frequency or magnitude of scour in known Chinook spawning areas.

In 2021, Redd Fish Restoration partnered with BGC to address these data gaps. A pilot study was started at Hilsyaq\(\frac{\lambda}\) is (Tranquil Creek), located within the traditional territory of the Tla-o-qui-aht First Nation, approximately 20 km east of Tofino, in Clayoquot Sound, British Columbia. Redd Fish Restoration installed a hydrometric station on Tranquil Creek to collect stream discharge data. BGCers installed scour accelerometers to measure the timing of bedload movement in key spawning areas. The remaining work is to investigate the hydrology of Tranquil Creek, use the accelerometers to identify threshold discharges for scour, and develop a two-dimensional model of the area of interest that can be used to help predict the potential frequency of scour in these key locations. If successful, the pilot study can be expanded to include other watersheds on Vancouver Island.

BGC Squared is proud to support the work being done by Redd Fish Restoration and their partnering nations; the Hesquiaht First Nation, Ahousaht First Nation, and Tla-o-qui-aht First Nation.



# TRAINING AND TECHNICAL SUPPORT FOR UNMARKED GRAVE MAPPING FOR THE SADDLE LAKE CREE NATION

Acimowin Opaspiw Society | Alberta, Canada

BGC Project Team: Alastair McClymont, Carly Schultz, Izzy Rotsaert, Max Layton, Paul Bauman, and Riley Morin

In the late 19th and through the 20th century countless Indigenous children from the Saddle Lake Cree Nation (SLCN) were subjected to horrific abuse and unsanitary conditions at the Sacred Heart and Blue Quills residential schools, located near St. Paul, Alberta. The Sacred Heart Residential School archival records indicate that at least 200 children died while boarding at the school and were buried, without notifying their families, in unmarked graves located on the former grounds of the school.

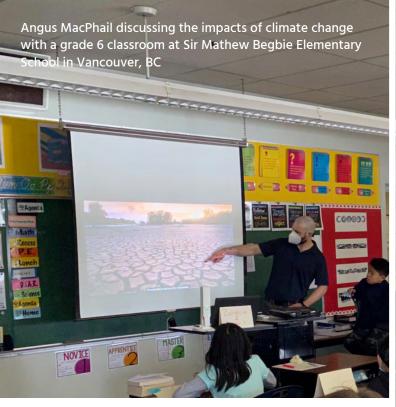
A cemetery is still in use close to the site and, as it encroaches on the unmarked graves, accidental exhumations have occurred, bringing further trauma to the community. BGC partnered with the Acimowin Opaspiw Society (AOS), a group of tribal council, elders, survivors, and researchers from the SLCN to assist with training and technical advice for mapping unmarked graves using geophysical methods.

In September 2022, BGCers and the AOS began geophysical surveys using ground-penetrating radar (GPR) with trainees from the SLCN. Base funding for this project was partially provided by federal grants to the AOS. Thanks to additional funding support from BGC Squared, BGCers also completed drone photogrammetry, electrical resistivity, and electromagnetic (EM) terrain conductivity surveys to complement the ongoing GPR investigation. Through the training program, the AOS will be able to independently acquire and analyse GPR survey data for the ongoing investigation. BGC will also continue to advise and provide technical support and update other geophysical and drone surveys where needed.



"I grew up relatively close to Saddle Lake, so I was eager to accept the opportunity of working with BGC Squared near a place I called home. Uncovering unmarked graves from residential schools is emotionally heavy and incredibly important work that the Saddle Lake Cree Nation is undertaking, and it was a privilege to be part of the BGC Squared team that helped them by sharing our technical knowledge and skills. Participating in this work opened my eyes to how big of an impact we can have when we share our expertise with the communities surrounding us."

- Carly Schultz





#### **EDUCATION AND OUTREACH**

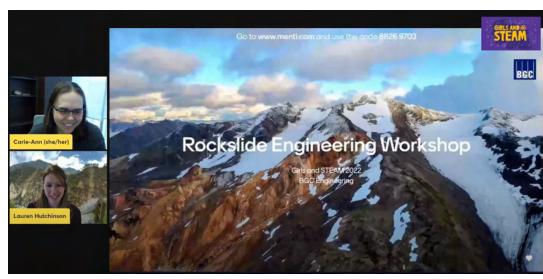
BGC employees provide educational programming and mentorship to students of all ages. Through sharing our knowledge in earth sciences and engineering, we aim to ignite and foster interest in STEM (Science, Technology, Engineering, and Math) fields, and support the next generation of STEM leaders.

#### **GIRLS AND STEAM**

#### Science World | British Columbia, Canada

BGC Project Team: Andrea Lougheed, Carie-Ann Lau, Daniella Douglas, Emily Mee, Kathryn Franklin, Lauren Hutchinson, Natalie Pederson, Olina Meaker, and Pam Twerdy

Hosted by Science World, the annual Girls and STEAM events provide opportunities for girls ages 11 to 16 across British Columbia to explore a variety of scientific topics and careers in STEAM (science, technology, engineering, arts and design, and math). As part of the event in February 2022, BGCers Carie-Ann Lau and Lauren Hutchinson hosted an interactive workshop about site investigation and engineering mitigation for a large rockslide. Andrea Lougheed and Kathryn Franklin were mentors for the event and participated in panel discussions with other engineers and scientists from different disciplines. Natalie Pederson, Olina Chang, Daniella Douglas, Pam Twerdy, and others helped prepare workshop materials and participated in a virtual career fair.

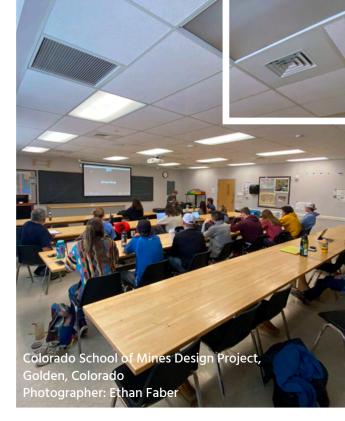


# UNIVERSITY DESIGN PROJECT - EVALUATION OF DEBRIS-FLOOD MITIGATION MEASURES AT JURA CREEK

Durham University | Durham, England, UK

BGC Project Team: Kathleen Horita, Lauren Hutchinson, and Sophia Zubrycky

In 2022, BGC expanded our education and outreach partnerships to the United Kingdom. BGC partnered with Durham University in England, UK to support a student vocational dissertation project on Jura Creek debrisfloods, located near Canmore, Alberta. BGC provided the Durham student with a project scope, data package, and ongoing mentorship through the project. The student's project was to develop and evaluate debris-flood mitigation measures for a proposed residential and mixed-use development on Jura Creek. Jura Creek is prone to debris floods and a debris flood occurred on the creek in June 2013. The student was responsible for reviewing the data package and completing a research proposal, risk assessment, and final dissertation. BGC is looking forward to continuing project support with Durham University in future years as well as developing additional international education and outreach partnerships.



#### **GEERING UP SUMMER CAMPS**

University of British Columbia | Vancouver and Maple Ridge, BC, Canada

BGC Project Team: Jadyn Jeanson, Joshua Nicholas, Karsten Shein, Kathryn Franklin, Lekszi Nagy, Teagan Larsen, and Zeneca Kubota

Understanding climate change will help us tackle the most critical challenges facing society today, yet this topic is largely excluded from the BC curriculum. Since December 2021, the climate change education and outreach team has been visiting classrooms in Greater Vancouver to provide comprehensive workshops on the state of our climate and to inspire curiosity in the topic. In partnership with the University of British Columbia's Geering Up Engineering Outreach organization, we visited six summer camps and worked with 120 children from grades 4-12. This partnership allowed our team to continue outreach work during the summer break and increase the number of youth participants in our workshops. In 2022, we reached over 250 children across five classrooms and six camps. We are excited to continue growing this program in 2023 by connecting with children in communities across Canada.

Grade 4/5 Students Presenting Their Sustainable
Communities at Geering Up
Photographer: Geering Up
What would perfectly sustainable

"The opportunity to take part in the educational outreach program that BGC Squared offers has been so rewarding. BGC was able to reach many students to teach them about climate change in the last year through various classroom visits and summer camps. The creators of the curriculum offered up their knowledge, wisdom, and skills, composing a program that can be modified to be inclusive of all age groups. Education is such an important part of kids' lives, and I'm so excited to see the interest in this initiative increasing in demand, and even expanding outside of Vancouver, BC." – Jadyn Jeanson



#### **EMPLOYEE-DRIVEN DONATIONS**

We are dedicated to supporting the communities where we live and work. BGC Squared supports causes and charitable organizations that are championed by BGC employees through fundraising and donation matching. Since BGC Squared was formed in 2014, we have donated over \$850,000 CAD.

#### SUPPORT FOR UKRAINIAN REFUGEES

#### Korczowa, Poland

#### BGC Project Team: Willy Zawadzki

Early stages of the Russian invasion of Ukraine resulted in the mass migration of refugees west towards the Polish border. The majority of these refugees were women and children, along with elderly men who were not able to join the fight. Many of them lost all their possessions and often walked for days to escape the front lines. At the peak of migration in March 2022, hundreds of thousands of refugees reported weekly to a handful of border crossings, including the Korczowa Crossing where the Polish government set up a large reception center. In March, BGCer Willy Zawadzki, spent four weeks volunteering at Korczowa, shuttling refugees from the border west to major cities in a rented minibus, and working with countless volunteers and aid groups to organize much-needed help. This was made possible through BGC support for flights and time-off, and by generous donations from many BGCers, others from Willy's and his wife's professional networks and friends. Overall, they raised nearly \$50,000 CAD which directly helped the refugees that Willy encountered.

BGC Squared and BGCers also raised funds for the Canadian Red Cross for the Ukraine Humanitarian Crisis Appeal and donated the winnings of our March Madness bracket to the World Central Kitchen to help feed refugees at the Ukrainian border. We would also like to acknowledge the numerous BGCers who opened their homes to Ukrainian refugees when the war broke out.

# Willy Zawadzki with his Shuttle Bus, Supporting Ukrainian Refugees REPARTS REPARTS

#### LEPPARD TRAIL MOUNTAIN BIKE TRAIL REHABILITATION

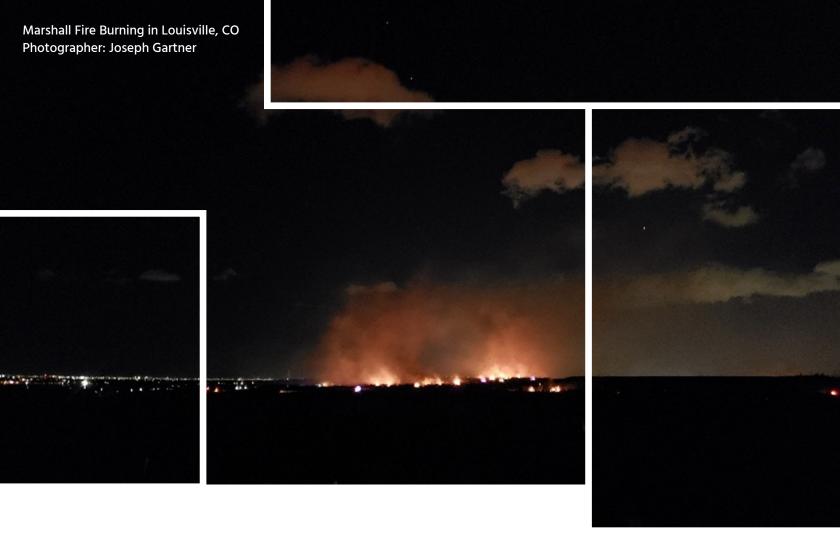
North Shore Mountain Bike Association | North Vancouver, BC, Canada

BGC Project Team: Andrea Walsh, Angus McPhail, Evelyn Moorhouse, Grant Mitchell, Janet Brehaut, Sophia Zubrycky, Steve Rintoul

In November 2021, BGCers joined the North Shore Mountain Bike Association (NSMBA) trail-building legend Peter Morin for a day of trail work on Mt. Fromme's Leppard mountain bike trail. BGC sponsors this trail through the NSMBA's trail adoption program, which involves a monetary donation to the NSMBA for ongoing trail maintenance, as well as BGC participation in trail days. There were nine builders between BGC employees and partners that repaired the upper section of the trail. Although it was a wet and cold day, morale was high knowing that the riding experience on the Leppard trail had been improved for riders of all abilities.

"Organizing trail days for the Leppard trail with the North Shore Mountain Bike Association (NSMBA) has been a great way for me to give back to my community and connect with other BGCers. As an active user of the trail network, I feel very privileged to work for a company that supports trail maintenance and the NSMBA through BGC Squared. I've been able to meet lots of new BGCers through our trail days, and my favourite part of the day is when we all get to ride out on the newly refurbished trail and enjoy our hard work as a team." – Evelyn Moorhouse





#### MARSHALL FIRE RELIEF SUPPORT

#### Boulder County Office of Emergency Management | Colorado, USA

In December 2021 a fire, fueled by drought and extreme winds, ravaged the towns of Marshall, Louisville, and Superior, Colorado, which are located just a half-hour north of BGC's Golden office. Shortly after the fire ignited, evacuation orders were sent out to thousands of people who had little time (in some cases just minutes) to collect treasured belongings and pets. By the next morning, over a thousand homes and businesses had been damaged or destroyed and the Marshall Fire became the most destructive wildfire in Colorado history. Many of the staff in the Golden, Colorado office live near the burn area and have friends and family that were directly impacted. Some watched the fires from their homes and stayed up through the night to monitor the fire perimeter, wind direction, and evacuation orders. The Boulder County Wildfire Fund has been set up to support the Boulder County Office of Emergency Management's disaster assistance center by distributing funds to people whose homes have been destroyed or damaged and supporting the needs of evacuees. BGC Squared matched the generous donation of BGC Employees, raising a total of over \$6,000 USD for the Boulder County Wildfire Fund.





## Thank You

2022 was a turbulent year across the globe. The BGC Squared team focused our efforts through in-kind donations and monetary funding, bringing stability, mitigating disasters, and improving livelihoods. We have been humbled through our experiences working with our partner communities and organizations to better understand problems and participate in efforts to achieve their goals. It is through these partnerships that we learn to do better, evaluate where our efforts are most needed, and increase our impact.

To all who have worked with us this past year, we send our most sincere thanks. Our project success relies on our relationships, our communication, and our aligned efforts.

If you would like to collaborate or are interested in hearing more about us, you can find us on LinkedIn, our website (bgcengineering.ca/bgc-squared), or contact us at BGCSquared@bgcengineering.ca.

Sincerely,

Ethan Faber and Christy Rouault, BGC Squared Co-Leads





# Partner Organizations Include:

















































# 2022 BGC Squared Project Catalogue

APPLIED EARTH SCIENCE	EDUCATION AND OUTREACH
2021 Western European Flooding Damage Assessment	Colorado School of Mines Design Projects
ARISE Canada Participation	Dalhousie University Design Project
BC Flood Inundation Remote Sensing	Durham University Design Project
First Nations Hololens Hazard Model	Geering Up Camps
Geohazards International Bhutan Landslide Susceptibility Maps	Geohazards Infographics
Guatemala City Landslide Collaboration and Workshop	Girls and STEAM
Holocaust Archeology Geophysics	K-12 Climate Change Education
Hurricane Fiona Disaster Charter	K-12 Outreach
Sebim Beach Coastal Erosion Study	Operation Minerva
Training and Technical Support for Unmarked Grave Mapping for the Saddle Lake Cree Nation	Post Secondary Education Support at Simon Fraser University
Tranquil Creek Sedimentation Study	Post Secondary Education Support at the University of Alberta
WaterAid Colombia Hydrogeologic Data Review	Queen's University Design Project
	Simon Fraser University Support
	University of Alberta Design Project

This list does not include confidential projects.







# 2022 BGC Squared Project Catalogue

EMPLOYEE-DRIVEN DONATIONS	
Alternating Hemiplegia of Childhood Foundation	Howe Sound Biosphere Region Initiative
AWSN WinSTEM Week	IWK Foundation
Banff to Jasper Relay Fundraiser for the Brain Tumour Foundation of Canada	Kamloops Local Literacy Outreach Awareness Event
BC Cancer Foundation	Mental Health Resiliency Award
BC Society for the Prevention of Cruelty to Animals	Nanaimo Hospital Foundation
Boulder County Wildfire Fund	New Afton New Gold Charity Drive
Brad Nadjiwon Memorial Scholarship	North Shore Mountain Bike Association
Brain Tumour Foundation of Canada	Ottawa Food Bank
Bryony House	Pembina United Way Auction
Calgary Food Bank	Poppy Fund
Canadian Women's Foundation	Queen's University Teaching Assistant Fund
Capital City Ringette	Regents of the University of California Workshop
Covenant House Vancouver	Southern Great Bear Rainforest
Edmonton Food Bank	Special Olympics BC Paul Lake Swim Fundraiser
EGBC Northern Branch Scholarship Fund	Stollery Children's Hospital
Enderby and District Museum	The Gathering Place Inc.
First Nations House of Learning	UBC Memorial Fund
Flin Flon Scholarships	UBC Solar Decathlon
Fredericton Youth Hockey Association	Ukraine Humanitarian Crisis Appeal
Fredericton Youth Ringette Association	Ukraine Refugee Aid
Geo Engineering Seminar Series Pledge	UN Trust Fund to End Violence Against Women
Girls and STEAM	Victoria High School Robotics Team
Greater Vancouver Food Bank	World Central Kitchen
Hockey Helps the Homeless	Youth in Transition Fredericton Inc.

This list does not include confidential projects.

Hospital Activity Book for Children





# BGC

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