**Routing & Characterization**

BGC is an industry leader in pipeline routing services. We integrate our pipeline expertise with our comprehensive range of engineering and applied geoscience services to deliver essential services for pipeline routing and FEED (front-end engineering and design) projects. We develop solid technical solutions for protecting environmentally sensitive areas, and identify and propose measures to avoid potential risks to a pipeline’s safety.

At the core of our pipeline services is specialized terrain characterization and terrain stability mapping for building geohazard inventories that support optimal route selection and environmental permitting. We also conduct geotechnical site and geohazard characterization for foundation designs and infrastructure development assistance. Other BGC routing services include:

- Watercourse characterization for trenched and aerial crossings
- Seismic hazard assessments for liquefaction, lateral spreading and fault crossings
- Organic soil delineation and characterization for buoyancy control
- Permafrost delineation and characterization
- Development of geotechnical soils spring constants
- Bedrock characterization for evaluation of ease of excavation and acid rock drainage potential

By providing prefeasibility and feasibility assessments, as well as basic and detailed engineering, BGC’s pipeline experts become an integral part of our client’s team and a key element of successful pipeline construction.

**Geotechnical Design**

BGC is recognized around the globe for providing superior geotechnical designs and services. For pipeline projects, we combine our geotechnical expertise with a strong understanding of geology, geohazards, and pipeline practices to provide a comprehensive variety of services, including:

- Landslide and deformation assessments and slope stabilization designs
- Rock fall and debris flow barrier design
- Site grading specifications and design
- Design of erosion control measures
- Feasibility assessments for HDD (horizontal directional drilling) and full range of other trenchless technologies
- Shallow, deep and anchored foundation designs
- Geotechnical instrumentation and monitoring

BGC also provides design, construction support and operations services specific to hydraulic issues that have the potential to impact pipelines. Our watercourse characterization and design services include depth of cover surveys, scour surveys, scour analyses, and channel stabilization designs.

**Geohazards Management Programs**

Terrain hazard and risk assessment are a common thread through all of BGC’s service areas, helping our clients to effectively identify, evaluate and mitigate geohazards on projects worldwide. For the pipeline industry, BGC designs and implements hydrotechnical and geotechnical hazard management programs to assist operators in identifying and efficiently managing hazards resulting from ground movement and river erosion. The programs use a risk management framework to quantify the probability of pipeline failure or impact from geohazards. Like corrosion programs, these geohazard management programs prioritize sites for further inspection, monitoring and mitigation and are developed in a defensible and systematic manner. Our management programs are currently active on over 50,000 kilometers of operating and discontinued pipeline in North and South America, providing our clients with systematic and effective geohazard management solutions.