equilibrium

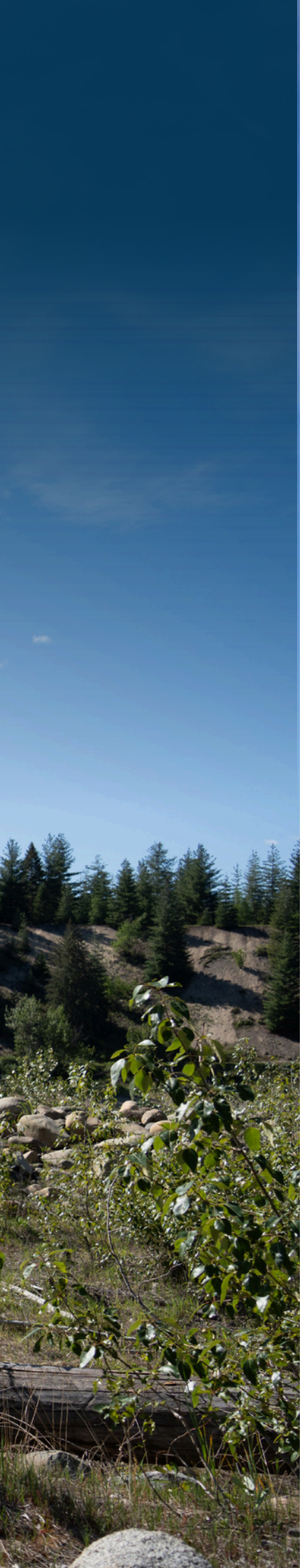
STATEMENT OF QUALIFICATIONS

Our mission

We cultivate a culture of excellence through equilibrium, balancing technical skill with practical expertise, hard work with a supportive culture, and growth with sustainability.

Our vision

We aim to set a new standard for engineering consulting firms, where a fulfilled and inspired team solve complex technical challenges while driving positive impact.



WELCOME TO EQUILIBRIUM

The new global alternative for rock mechanics and hydrogeology consulting

Equilibrium is a niche engineering consultancy delivering fully integrated geotechnical, structural geology, and hydrogeology solutions globally. With leadership and specialized resources based in Australia, Canada, Chile, and the USA, our team has contributed to some of the world's largest and most technically challenging mining projects across five continents.

We are called Equilibrium because balance is our foundational principle. In balancing technical skill with practical expertise, a strong work ethic with well-being, and economic prosperity with environmental considerations, we aim to be agents of positive impact for our clients, our team, and our planet. Balance guides our success in every aspect.

In projects, we blend deep technical and analytical skills with real-world operational experience, giving clients the resources of a seasoned company and the flexibility of a small firm. In our company culture, we foster a diverse, supportive, and dynamic environment where people feel respected, valued, and fulfilled, allowing everyone to thrive on and off the job. In our growth, we maintain exceptional standards and provide specialized, client-focused solutions with care and agility. And in our impact on the world, we leverage our expertise to advance sustainable mining practices and support the communities where we operate.

Women comprise 75% of our Board of Directors and over 50% of our workforce, highlighting our commitment to diversity, inclusivity, and industry leadership.

OUR CORE VALUES

We commit to excellence

We stand by the technical quality of the solutions we deliver and continuously strive to innovate, improve, and create value.

We prioritize transparency

We are honest and accountable, proactively sharing documentation and access to resources with our clients and each other.

We embrace diversity

We believe in the power of diverse perspectives and a collaborative team culture in achieving optimal outcomes.

We are mindful of our impact

We aim to apply our expertise to making responsible choices and positively impacting our communities and the planet.

WHY CHOOSE US?

Collaboration fosters results

Our clients count on us to deliver custom solutions to their toughest challenges, and the best solutions come from collaboration. As an Equilibrium client, you can expect responsive communication, transparent workflows, and continuous access to data. You'll also work with the same core team throughout your project, from the proposal phase to delivery. Receive hands-on support at every stage, with access to senior resources when needed.

A smarter way to work

Equilibrium's engineering team holds a wealth of skill in performing design assessments. Our innovative, automated processes improve QAQC in detailed 2D/3D analyses (kinematic, limit equilibrium, numerical analyses), and significantly reduce analysis set-up and post-processing effort. This allows more time to do what we do best – optimizing designs by applying our extensive experience to engineering interpretation of analysis results.

Strong safety culture

As a company that prioritizes our people, our Health and Safety Policy takes a proactive approach to workplace safety. Our objective is zero injuries – everyone comes home safe. Equilibrium holds Avetta certification, confirming our ongoing compliance with rigorous health and safety standards.

Operating responsibly

We have a critical role to play in minimizing the impact of our and our clients' operations on the environment. Our objective is to leave no trace, which includes maintaining a zero spill rate. Throughout our work, we apply responsible practices and initiatives, generating positive impact for our clients, our team, and our planet.

TECHNICAL LEADERSHIP TEAM

Our technical leadership team is supported by a global staff of experts operating in **Australia, Canada, Chile, and the USA.**

Senior Leadership

Karen Moffitt
Chief Executive Officer
Principal Geotechnical Engineer

Karen is a globally recognized leader in mining rock mechanics across a range of commodities and mining methods. Through a career spanning 30+ years, she has spearheaded cutting-edge work in some of the world's most complex mine environments. Karen is a dedicated advocate for women's representation in mining.

Karl Lawrence
Chief Technical Officer
Principal Consultant

Karl is a global technical lead in mining rock mechanics and numerical analysis. He specializes in advanced numerical modelling and optimization, with 15 years' experience in geotechnical and hydrogeological modelling of large-scale mining operations.

Karyn Gallant
Global Operations Lead
Principal Geotechnical Engineer

Karyn is a principal rock mechanics engineer with 20 years' international consulting and operational experience in open pit and underground mining. Her expertise ranges from rock mass characterization to ground support design.

Rita Tsai
Senior Geotechnical Engineer
Lead, Canada Operations

Rita is a senior rock mechanics engineer with 16+ years' experience in rock mechanics in open pit and underground hard rock mining. She specializes in operational support as well as open pit characterization and design.

Elsa Tasse
Senior Geotechnical Engineer
Lead, Australia Operations

Elsa is a senior rock mechanics engineer with over 13 years' experience in geological and geotechnical consulting. Her expertise spans geotechnical data collection, rock mass classification, and underground and open pit mine design.

Technical Leads

Scott Donald
Senior Principal Hydrogeologist

Scott holds 35 years' expertise in numerical groundwater analysis, specializing in mine hydrogeology, groundwater flow and solute transport modelling, CHM development, and third-party reviews.

Geneviève Marchand
Principal Hydrogeological Engineer

Geneviève has 25 years' experience and is recognized for technical leadership and expertise hydrogeological investigations. She specializes in the development of hydrogeological conceptual models for complex systems.

Jeff Randall
Senior Geological Engineer

Jeff is a geological engineer with 20 years' international consulting experience. His expertise lies in advanced groundwater modelling and hydrogeological analysis, supporting mining, infrastructure, and water supply projects.

Laura Wytrykush
Principal Hydrogeological Engineer

Laura leverages a 25-year background in hydrogeology, remediation, and environmental assessment. Her experience spans contaminated sites investigation and remediation, physical hydrogeology projects, and environmental impact assessments.

Anna Greve
Principal Hydrogeologist

Anna has 20 years' industry experience. Her specialties include operational mine water management, underground dewatering and inflow mitigation, as well as data interpretation and conceptual model development.

Yoann Hébert
Principal Geotechnical Engineer

Yoann is equipped with 15+ years of industry experience. His specialties include advanced numerical modelling for a wide range of mining methods including caving.

Crystal Poon
Principal Rock Mechanics Engineer

Crystal brings 18+ years' experience leading geotechnical assessments and design, demonstrating excellence in overseeing field investigations, advanced geotechnical modelling, and designing solutions for FEL studies and operational mines.

OUR SERVICES

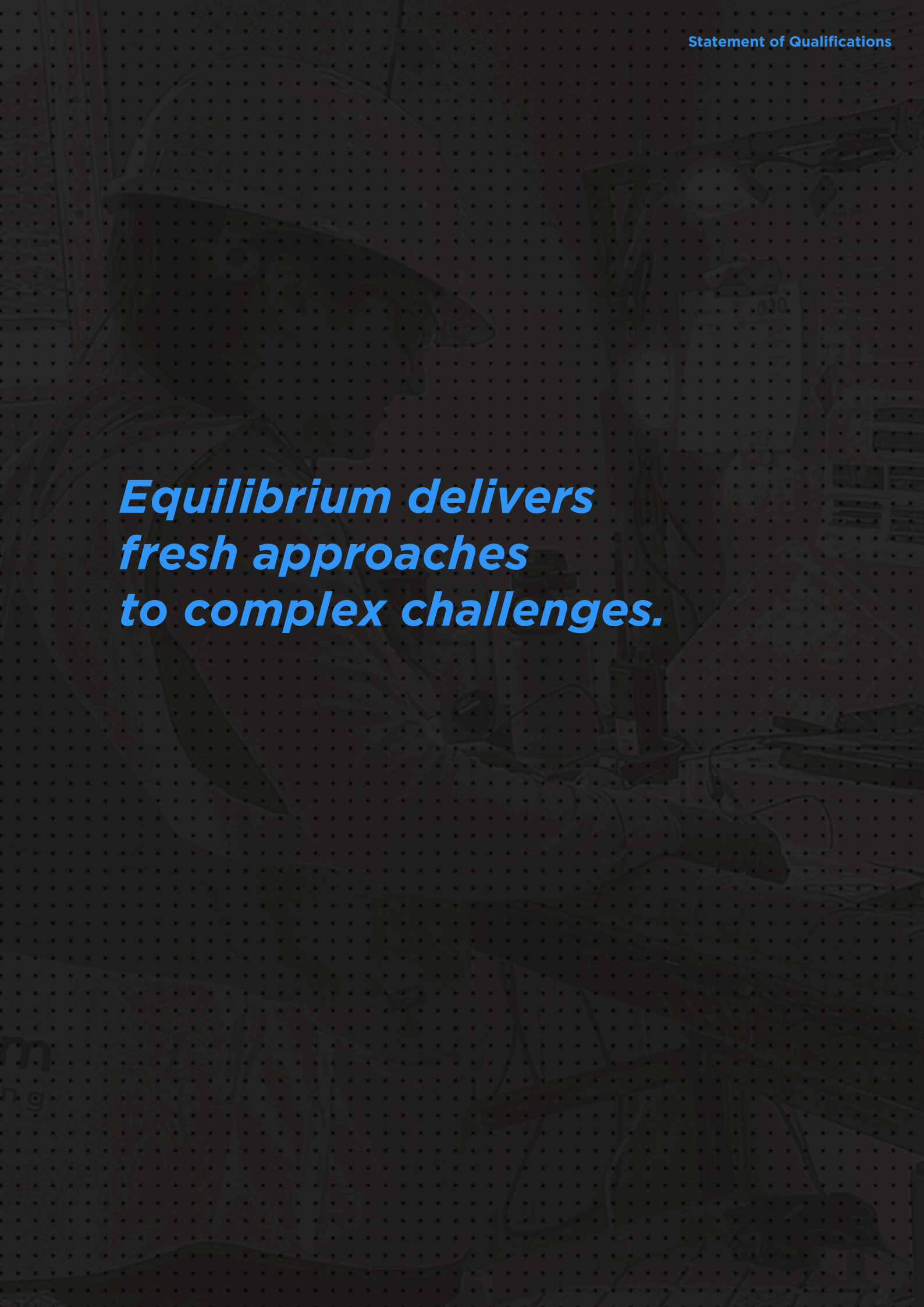
Whatever your objective, Equilibrium's skilled, proactive team can help you get there. We listen, take the time to understand your needs, and then bring together the people and processes necessary to deliver the right level of support.

Our strategic guidance is backed by many collective decades of technical and operational experience spanning a wide range of commodities, geologies, and deposit types in open pit and underground mining environments.

Equilibrium provides guidance at every stage of the mine life cycle, from scoping and prefeasibility to feasibility, optimization, operations, and mine closure.

Our technical expertise spans every stage. We provide what you need, when you need it.

- Scoping
- Prefeasibility
- Feasibility
- Optimization
- Operations
- Closure



Equilibrium delivers fresh approaches to complex challenges.

Field Data Collection

Access precise, actionable data, when and how you need it.

Efficient data collection and management provide a strong foundation for your project. Equilibrium uses robust, transparent workflows to seamlessly execute challenging field programs.

Services

- Field program planning and execution
- Geotechnical core logging
- Structural mapping
- Hydrogeologic testing
- Downhole instrumentation installation
- Data QAQC and database development
- Laboratory testing program management

Why choose Equilibrium

- Customized data collection and data management solutions
- Efficient and transparent workflows for quality assurance and control
- Near real-time access to the data
- Immediate feedback for continuous improvement
- Access to experienced Equilibrium resources
- Access to our network of industry specialists and laboratories, supplementing our team's expertise

How do we do it?

We mobilize teams with specific training and expertise tailored to the needs of the investigation. These same field personnel are involved in downstream data analysis, interpretation, and design, giving them valuable insights that improve the quality of the data collected. Our geotechnical and hydrogeological teams collaborate in real time to identify the optimum targets for packer testing, instrumentation installation, and sampling to achieve the best possible outcomes for your project.

Equilibrium has pioneered online dashboards that provide all stakeholders with near real-time access to field data throughout the field investigation. This online dashboard allows our clients to follow progress and our offsite teams the opportunity for frequent QAQC of field data and timely feedback to field personnel.

Characterization

Gain a comprehensive geotechnical and hydrogeological understanding of your site.

Expert characterization drives the success of each project. Equilibrium's technical leads are uniquely qualified to deliver efficient data analysis, interpretation, and characterization that is fit-for-purpose for the level of study and the area of interest.

Services

Hydrogeological characterization

- Data evaluation and interpretation
- Data gap analysis
- Conceptual hydrogeological model development

Geotechnical characterization

- Intact and rock mass strength estimation
- Estimation of strength of structures (e.g., veins, faults, joints)
- In-situ strength interpretation
- Geotechnical block modelling
- Geotechnical domaining

Why choose Equilibrium?

- **Expertise in diverse deposit types** (e.g., porphyry, skarn, epithermal, sedimentary, etc.) as well as varied structural settings and project stages
- **Automated data processing** to handle large datasets efficiently and identify trends
- **Expertise in geostatistics** for robust block model development
- **Extensive experience in geotechnical and hydrogeological characterization** using cutting-edge technology tempered by decades of practical experience
- **Innovative approaches** to extracting geotechnical and hydrogeological information from all available data sources

How do we do it?

We develop fit-for-purpose geotechnical models, reconciling data from a variety of sources. Using advanced software such as Vulcan and Leapfrog, along with custom algorithms and Python scripts, we manage large datasets efficiently, generating graphical outputs and statistical analyses to identify key trends within the rock mass. Our characterization approach is tailored to each project, considering the proposed mining methods and geological settings.

Our conceptual hydrogeological models (CHMs) integrate a wide range of disciplines to provide a comprehensive understanding of the groundwater flow system. We use Leapfrog to combine all elements of the CHM, enabling effective communication within the team, clear identification of data gaps and uncertainties, and an early assessment of potential project risks, such as high inflows or elevated pore pressures.

Equilibrium delivers high-quality, reliable models that support informed decision-making and contribute to the overall success of your project.

Structural Geology

Turn structural geology into practical, site-specific insights for data-driven mine design solutions.

Our structural geology expertise uncovers fault behaviour and geological controls that directly influence geotechnical and operational decisions.

Services

- Underground and open pit geological mapping, data management, and structural analysis
- Geological and structural 3D modelling
- Detailed fault characterization for geotechnical and hydrogeological assessments
- Discrete Fracture Network (DFN) modelling
- Onsite training in structural geology and data collection techniques
- Peer review of in-house structural models

Why choose Equilibrium?

- **Integrated solutions** tailored to your site's specific geotechnical conditions, using applied modelling workflows that seamlessly combine 2D and 3D datasets
- **Customized 3D models** designed to meet your needs for integration into downstream analysis
- **Extensive, diverse global experience** spanning epithermal systems, porphyries, coal, iron ore, uranium, and industrial minerals in both open pit and underground settings
- **Specialized training and workflow design to empower your team,** building in-house capability, from introductory to expert levels

How do we do it?

Equilibrium combines structural geology expertise with practical, data-driven solutions to enhance confidence in mine design and decision-making. By integrating geological, geotechnical, and hydrogeological data, we develop robust models that embed structural insights directly into geotechnical design.

We draw on global experience across a wide range of deposit types and mining methods to deliver practical, site-specific recommendations. Beyond delivering results, we strengthen your team's capability through collaborative interpretation, onsite training, and transparent, repeatable workflows.

Geotechnical Design

Optimize your project with a clear vision and expert geotechnical design.

Effective geotechnical design optimizes your future projects and existing operations. Equilibrium brings specialized expertise to understand the unique conditions of your site and plan accordingly.

Services

Open pit and waste rock storage

- Slope stability assessment and design
- As-built slope performance review
- Instrumentation and monitoring
- Assessment of geotechnical hazards

Underground

- Underground mining method selection, geotechnical design criteria and sequencing
- Stope stability and optimization
- Backfill design
- Ground support design and rehab forecasting
- Design of mine infrastructure (vertical raises, portal, shafts, decline)
- Instrumentation and monitoring
- Assessment of geotechnical hazards
- Surface subsidence/open pit/cave interaction/ fragmentation prediction

Numerical modelling capability

- Underground excavation modelling – stope and pillar design, sequencing, backfill behaviour, infrastructure stability, and interaction between adjacent excavations
- Caving analysis (block, panel, and SLC) – cave initiation, propagation, surface breakthrough, subsidence, and interaction with geology, structures, and mine sequencing
- Gravity flow and draw control – simulation of draw strategies, material recovery, dilution, fines migration, and multi-lift performance
- Mine-scale infrastructure and seismic response – assessment of stress redistribution, damage potential, rehabilitation needs, and seismic hazard associated with cave advance

Why choose Equilibrium?

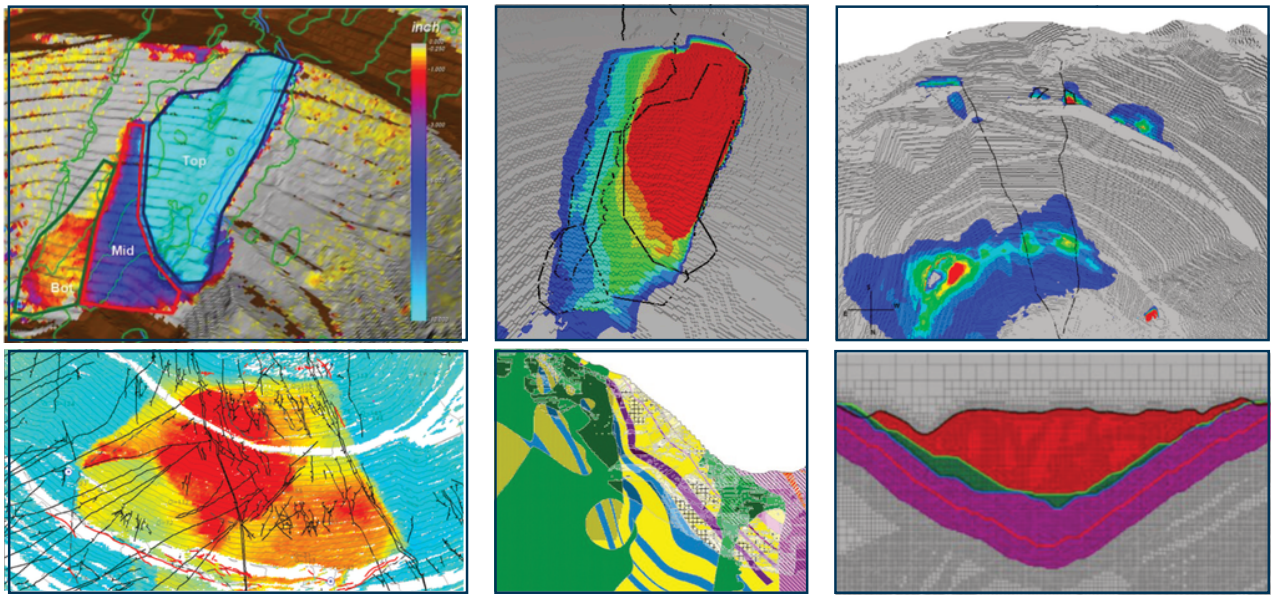
- **A fully integrated geotechnical, hydrogeological, and structural geology team**
- **Advanced numerical modelling expertise** that supports confident engineering decisions across open pit and underground (including caving) operations
  - Our modelling approach is built on three pillars: selecting the right level of complexity for the problem, embedding rigorous quality engineering throughout, and maintaining complete transparency with our clients at every step
- **Balanced team capabilities**, combining highly advanced modelling skills with practical operational experience, enabling development of pragmatic and optimized solutions
- **Industry benchmarking expertise**, gained through active engagement with large mining operations, providing insight into best practices and standards for comparison and improvement

- **Specialized knowledge across diverse deposits** spanning hard and soft rock mining, delivering innovative and practical solutions that address the unique challenges of different rock types

How do we do it?

We deliver pragmatic solutions that draw on the strong operational experience and the expert analytical skills of our team. Our fit-for-purpose designs are tailored to the study stage, operational urgency, and economic impact of design decisions.

- For underground mining, we identify optimal mining methods and develop efficient extraction sequences, considering geological conditions, safety, and economic factors to maximize productivity and manage risks.
- For open pit operations, we guide the design of open pit configurations, providing optimized designs for bench face angles, catch bench widths, inter-ramp, and overall slope angles.



Equilibrium's global leaders in numerical modelling deliver efficient, high-quality modelling solutions and practical model interpretations grounded in decades of practical experience. Our team has developed automated model-building procedures to significantly improve efficiency and detailed QAQC processes that mitigate risks and enhance communication of results. This approach equips key stakeholders with actionable guidance to optimize mine designs, identify underlying risks, and make informed geotechnical decisions that balance project risks and opportunities.

We work with a broad suite of industry-standard numerical modelling tools, including advanced 2D and 3D continuum simulators, distinct-element and hybrid computational methods, cellular automata-based flow simulation, custom Python-based modelling frameworks, and fully integrated hydro-mechanical analysis platforms. This diverse toolbox allows us to select the most appropriate tool for each challenge, ensuring the modelling approach is driven by the problem at hand rather than a one-size-fits-all solution.

Equilibrium delivers clearly defined, fully documented models with traceable inputs, high-quality visualizations of stress, deformation, and flow behaviour, and sensitivity analyses to quantify uncertainty.

Hydrogeology

Solve critical hydrogeological challenges with robust analysis.

A qualified, integrated team can guide you through the most complex hydrogeological challenges, helping to inform your planning and decision-making. The Equilibrium team has decades of collective experience in hydrogeology and groundwater modelling.

Services

- Development of conceptual hydrogeological models (CHMs)
- Hydrogeological site characterization and identification of optimal locations and depths for testing and instrumentation
- Field testing and instrumentation installation
- Numerical groundwater modelling
- Evaluation of inflows and pore pressures within pit walls and surrounding underground excavations
- Dewatering and depressurization plan configurations
- Impact assessment of project activities on groundwater, surface water interactions, and mass loadings from tailings and waste rock facilities to the receiving environment
- Optimization and uncertainty analyses, including parameter estimation

Why choose Equilibrium?

- **Extensive experience** with complex and deep hydrogeological testing and instrumentation
- **Expertise with industry tools and efficient workflows,** leveraging decades of collective experience in hydrogeological modelling
- **Fit-for-purpose models** tailored to your project's specific data requirements, supporting engineering design and addressing environmental risks
- **Seamless collaboration between our hydrogeological and geotechnical teams,** ensuring hydrogeological insights are fully integrated into mine design
- **Transparent communication** of uncertainties in the modelling process and results, empowering you to make informed, confident decisions

How do we do it?

Our team's skill set spans field testing, groundwater inflow management, dewatering campaign design, and conceptual and numerical groundwater model development. We integrate advanced technologies to provide complex modelling solutions, including MODFLOW in its various forms (since 1990); FEFLOW (since 1995); HydroGeoSphere (since 2012); and GoldSim (since its inception).

In addition to simulating saturated groundwater flow in porous media, our team also has extensive experience completing simulations that consider unsaturated flow (perched systems), solute transport, density dependent flow, fracture flow, and fully integrated groundwater–surface water interactions.

We use numerical optimization methods to find the most efficient solutions to complex problems and take multiple approaches to uncertainty analyses to assess and quantify the uncertainties in model predictions.

We fully integrate these learnings and areas of uncertainty into geotechnical design.

Operational support, expert reviews, and site audits

Reduce risk through site-specific action plans, supported by risk-informed guidance to drive confident operational decisions.

Equilibrium's operational support helps you manage risk, optimize performance, and enhance safety. Through site-specific action plans and mentoring, we provide the insights and guidance needed to drive confident operational decisions and maintain efficient, resilient operations.

Services

- Review of standard operating procedures (SOPs)
- Review of blasting standards and recommendations
- Risk assessments
- Secondments
- Technical guidance
- Geotechnical hazard control and monitoring strategies
- Ground Control Management Plan (GCMP) development and review
- Development of monitoring plans
- Development of site-specific Trigger Action Response Plans (TARPs)
- Third party/peer reviews
- Geotechnical Review Board (GRB) participation
- Independent audits

Why choose Equilibrium?

- **Proven expertise,** with Equilibrium technical leads performing independent audit and review studies, participating in review boards, and providing support for due diligence studies
- **Effective risk management,** leveraging experience from diverse mining operations to identify and mitigate potential issues
- **Global network access,** providing solutions and best practices that have been successfully implemented at other sites
- **Flexible data management,** implementing adaptable systems and monitoring processes to meet project needs
- **Innovative monitoring tools,** including dashboards capable of automated event notifications to ensure timely and informed responses

How do we do it?

Our team brings together experienced professionals who understand site-specific conditions, mining methods, geotechnical and hydrogeological factors, and industry best practices.

Overseen by experienced leaders, including CEO Karen Moffitt, who serves on multiple Geotechnical Review Boards for global mining operations, we empower onsite teams through training, collaborative interpretation, and clear documentation to implement guidance confidently and effectively.

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Get in touch to discuss your requirements.

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