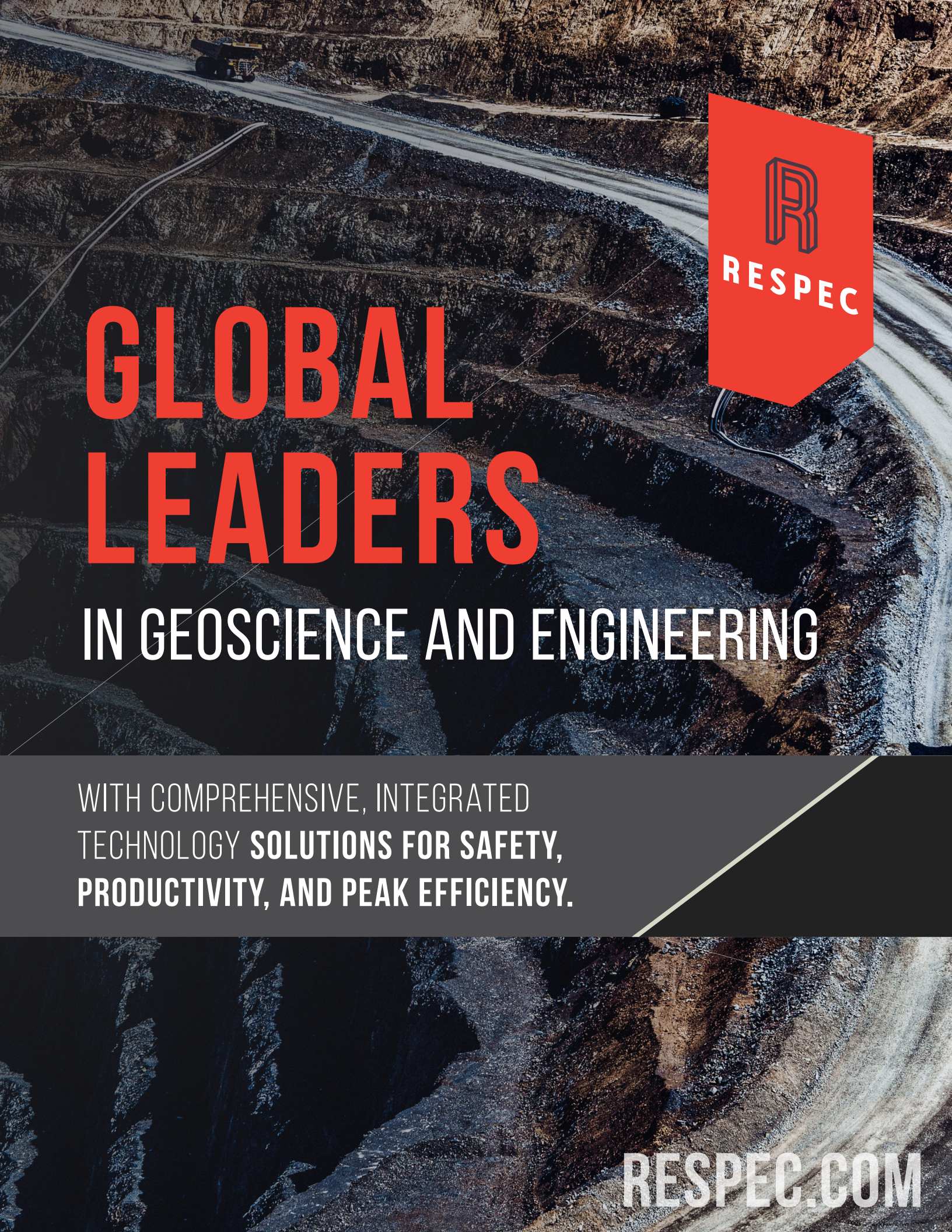


GLOBAL LEADERS

IN GEOSCIENCE AND ENGINEERING

WITH COMPREHENSIVE, INTEGRATED TECHNOLOGY **SOLUTIONS FOR SAFETY, PRODUCTIVITY, AND PEAK EFFICIENCY.**

RESPEC.COM

INTEGRATING FOR THE FUTURE

For 50 years, RESPEC has used our differentiating strength of integrating diverse disciplines to deliver the best combination of technologies for high-order solutions. Our worldwide clients choose RESPEC because we are global problem solvers. Our reputation for transforming and conquering client challenges and providing integrated solutions comes from our talented professionals.

RESPEC

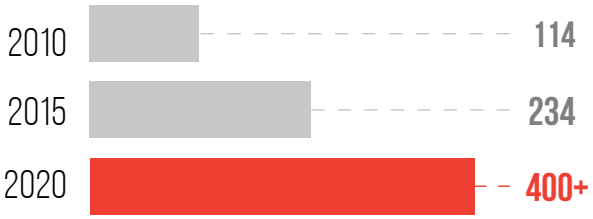
RESPEC BY THE NUMBERS

$75+ MILLION
Annual Revenues

400+
Our staff includes over 400 employees throughout the US and Canada.

OFFICE LOCATIONS

COMPANY EMPLOYEE GROWTH



26+
We are in 26+ offices throughout 12 US states and 2 Canadian provinces.

50+ YEARS
Founded in 1969 in Rapid City, South Dakota, our company has withstood the test of time. We have 50 years of experience in customizing our capabilities to meet client needs.

MARKETS SERVED:

COMMUNITY DESIGN SOLUTIONS | DATA & TECHNOLOGY | ENERGY | FACILITIES | MINING | TRANSPORTATION | WATER & ENVIRONMENT

In April 2020, RESPEC acquired PDC Engineers, an Alaska-based engineering firm of over 100 employees. Together, we have 110 years of combined industry experience and a revenue of $75+M.

94 PROFESSIONAL ENGINEERS

14 PROFESSIONAL GEOLOGISTS

15 DOCTORAL DEGREES

FIFTY COUNTRIES
We've worked in more than 50 countries globally.

100%
RESPEC is 100% employee-owned.

PARTNERING IS OUR LEGACY.

THE POWER OF PARTNERSHIP

RESPEC's long history shows that breakthroughs and best-fit solutions come through partnering with clients who share our mutual values. As a globally eminent science and engineering technology partner, our multidisciplined team creates a vast array of services that help businesses succeed and industries transform.

As your Integrated Solutions Partner, RESPEC delivers adaptive solutions for the ever-changing marketplace. Our team's style of partnering as a trusted advisor creates a legacy of positive results and a strong rapport that is built on definable, repeatable processes and reliable, detailed communication.

INTEGRATED

RESPEC integrates diverse technologies and draws from a wide array of cross-disciplined expert services to deliver world-class results. Our solutions feature the breadth and depth of expansive technical knowledge and experienced know-how to solve the world's most complex challenges.

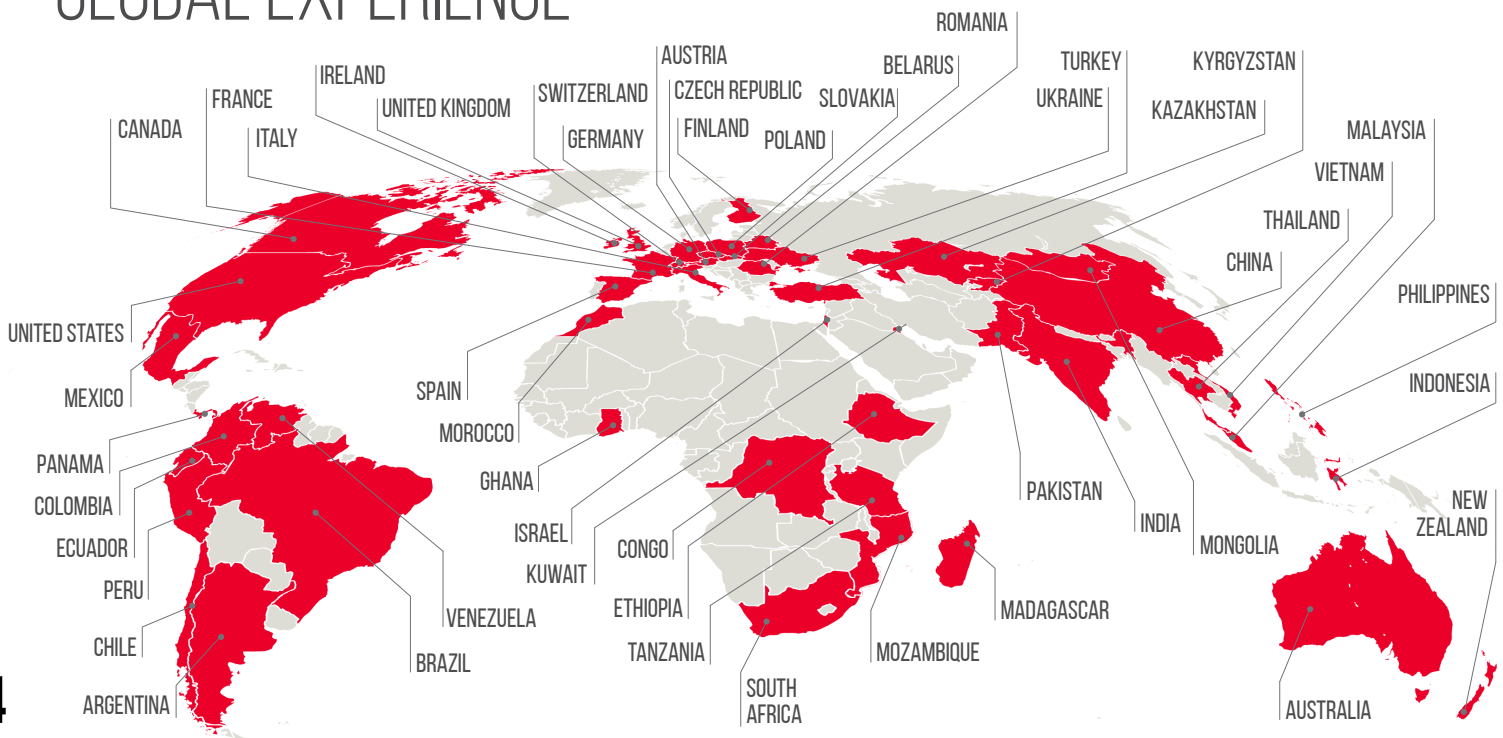
SOLUTIONS

RESPEC is solution-oriented. By leveraging technology and subject-matter expertise to serve major market sectors, our team creates real-time, decision-support solutions with broad applicability.

PARTNER

More than a service provider, RESPEC is your partner. Empowered by in-depth communication, we build strong client rapport to synergize problem-solving.

GLOBAL EXPERIENCE



MINING & ENERGY

UNDERSTANDING
THE MARKETPLACE

Ensuring that clients strike a balance between science, economics, and vision, RESPEC understands market cycles.

RAPID
MOBILIZATION

Because clients often require a rapid response to emergencies and changing conditions, we quickly assemble multidisciplinary teams and draw expertise from around the globe.

CLIENT
DIVERSITY

RESPEC's clients include mining companies, investment banks, and law firms, as well as US state and federal regulatory agencies and foreign governments.

INNOVATIVE
GROWTH

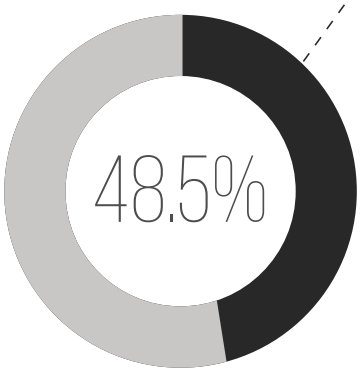
Over the past 50 years, we have expanded our services expertise to serve over 500 clients and strategic alliances worldwide.

WE MINE FOR SOLUTIONS...

SO YOU CAN MINE FOR THE REST.

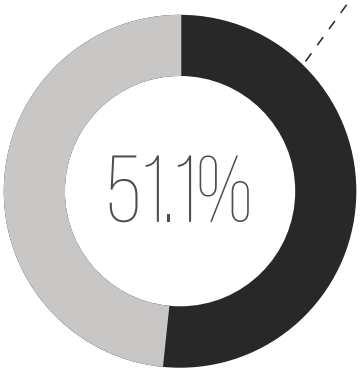
As world-renowned experts in engineering, geology, information systems, and technology, RESPEC is a global leader in integrated solutions for mining, minerals, and energy. In the spirit of stewardship, RESPEC's unique team of distinguished professionals offers mining and mineral clients the expertise to maximize project returns while respecting the economic, social, and environmental well-being of a community.

MINING & ENERGY CLIENTS – 266



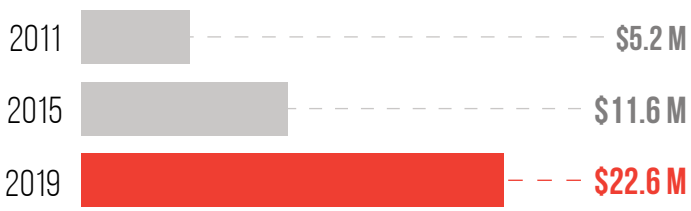
48.5% of RESPEC's total active clients (548) are Mining & Energy (266) clients.

MINING & ENERGY PROJECTS – 769



51.1% of RESPEC's total active projects (1,505) are Mining & Energy (769) projects.

MINING & ENERGY REVENUE GROWTH

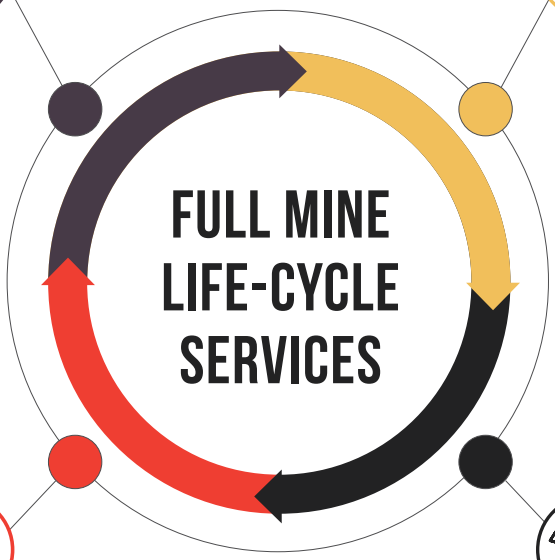


PROVIDING FULL MINE LIFE-CYCLE SERVICES

THE COMBINATION OF RESPEC'S PRAGMATIC APPROACH WITH TECHNICAL EXPERTISE ACHIEVES RESULTS-ORIENTED SOLUTIONS FOR OUR CLIENTS.

A MULTIDISCIPLINARY FORCE in geoscience, engineering, information systems, and technology, RESPEC offers life-of-mine services from greenfield assessments to operating mine settings. These services include:

- **Geology, Exploration, and Drilling**
- **Resource and Reserve Estimation and Reporting**
- **Rock and Materials Testing**
- **Spatial and Laboratory Data Management**
- **Mine Design, Planning, and Optimization**
- **Blasting and Explosives Engineering**
- **Rock and Soil Mechanics**
- **Hydrogeology and Groundwater Management**
- **Environmental Permitting and Remediation**
- **Instrumentation and Monitoring**
- **Asset Retirement and Reclamation**
- **Cavern Solution Mining, Storage, and Disposal**
- **Geothermal Exploration and Development**



EXPLORATION
FINDING AND DEFINING DEPOSITS

- Environmental and Drill Permitting
- Exploration Drilling Planning and Management
- Core Logging, Database Management, and Field Services
- NI 43-101, JORC Reporting, and SEC Rule S-K 1300
- Hydrologic Evaluation and Modeling
- Geomechanical Assessment

MINE DEVELOPMENT
PLANNING AND BUILDING

- Due-Diligence Investigations
- Prefeasibility and Feasibility Studies and Reserve Estimation
- Financial Modeling, Evaluations, and Risk Assessments
- Life-of-Mine and Strategic Planning
- Mine Plan Design and Optimization
- Project and Construction Management

CLOSURE & RECLAMATION
RESTORING AND MAINTAINING

- Mine Reclamation Planning and Engineering
- Water Quality Management and Restoration
- Reclamation Bonding Services
- Tailings Dam Design, Evaluation, and Support
- Long-Term Environmental Monitoring

OPERATIONS
EXTRACTING AND OPTIMIZING

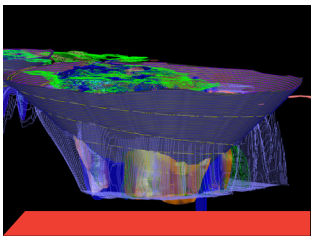
- Operational Assessments and Optimization
- Fleet Management
- Mine Plan Optimization and Support
- Drilling and Blasting Services
- Geotechnical and Rock-Mechanics Analyses
- Instrumentation and Monitoring
- Mine Inflow Control and Mitigation

RESPEC'S INTEGRATED GEOLOGY and engineering team serves the global mining industry with unsurpassed experience in commodity exploration and mining.

EXPLORATION | MINE DEVELOPMENT | OPERATIONS | CLOSURE/RECLAMATION

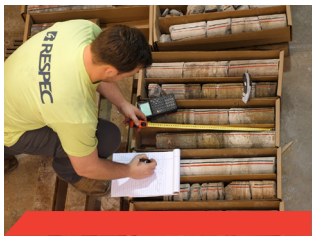
WELL-DESIGNED
WELL DESIGN

RESPEC develops well designs that reduce costs and achieve project objectives by collaborating closely with clients to meet all project requirements.



ADVANCED STUDIES
AND MODELING

RESPEC leads the mining industry in geology desktop studies and geological modeling and is an expert in creating computerized representations of the earth's surface and subsurface.



PREPARING FOR
MINEABILITY

A reliable geosciences and engineering expert, RESPEC provides clients with well-site support, core logging, and data analysis to determine resource potential and reduce exploration risks.

DRILLING
FOR INSIGHT

Industry experts in exploration, drill-program design, and drilling procurement, RESPEC's team creates valuable project insight by gathering, evaluating, and interpreting data.

EXPLORATION PROGRAM DESIGN AND MANAGEMENT

RESPEC is an expert in full-procurement drilling and efficiently budgets, manages, and operates projects in a variety of commodities. Our dynamic team works with national and international clients to design and manage exploration programs that range from grassroots exploration assessment to operating mine settings. Our experts understand reporting guidelines from NI 43-101 to SEC. We ensure that the data collected meet or exceed the industry standards, such as CIM.

CAPABILITIES:

- Site Investigation
- Exploration Planning
- Drilling Management and Full Procurement
- Permit and Well Licenses
- Well-Site Support and Core Logging
- Disposal Well Planning and Workovers
- Database Management
- Geological 3D Modeling
- Resource Modeling and Estimation
- Technical Reporting
- Due-Diligence and Litigation Support

30+
YEARS
of experience in potash and salt exploration geology and drilling

50+
drilling projects in evaporite basins

HIGH PERFORMANCE MODELING AND DRILLING IN POTASH

Maximizing CanPacific's potash resource with innovative engineering

Since Rio Tinto and North Atlantic Potash formed a joint venture on the Albany Potash project located in southern Saskatchewan in 2014, RESPEC has worked closely with CanPacific to maximize their potash resource with innovative engineering. RESPEC and CanPacific collaborated to collect drilling data and create a 3D geological resource and reserve model and to develop a new cavern solution-mining scheduling tool that assists with evaluating different mining scenarios to optimize future mining plans.

PROJECT DETAILS:

Client: CanPacific Potash

Location: East of Regina, Saskatchewan

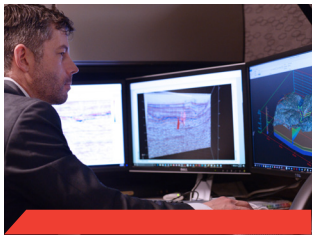
In 2016 and 2019, RESPEC was contracted by CanPacific to drill characterization boreholes for their greenfield potash project near Sedley, Saskatchewan. The RESPEC drilling team handled all aspects of the drilling process, including hole placement, permitting and land acquisition, a safety program, well-planning and program development, bid collection and cost estimate, subcontractor coordination, drill-program execution, and reclamation.

The drilling was successfully completed under budget, on schedule, and without any incidents. The geological work is ongoing and the end result will be a potash-reserve estimate for future mining considerations.

RESOURCE AND RESERVE ESTIMATION AND REPORTING

EMPHASIZING geologic basics for a sound project beginning, RESPEC's mineral resource and reserve estimation experts support your ultimate goal—to mine a deposit after a thorough de-risking process of drilling, mapping, and modeling.

EXPLORATION | MINE DEVELOPMENT | OPERATIONS | CLOSURE/RECLAMATION



GEOLOGY RULES
RESULT

For solid project beginnings, RESPEC emphasizes geology basics and highly accurate data that are necessary to conduct advanced engineering analyses.

FULL MINE
LIFE CYCLE

RESPEC knows both sides of mining—estimation and production. We're with you throughout all phases of the mine life cycle.

INDUSTRY
DE-RISKER

As an expert in regulations and permitting, RESPEC focuses on de-risking your project with unsurpassed experience in the geology and mining of industrial minerals and metals.

SMART
MINING

RESPEC's proven success formula includes state-of-the-art laboratories and a team of mining experts who perform reserve analyses and mine design and create operational efficiencies.

A GLOBAL FORCE IN MINING, METALS, AND MINERALS

RESPEC, a world-renowned integrated solutions partner with state-of-the-art laboratories, partners with international clients to perform reserve analyses and mine design. We assist clients in exploration management, underground and open-pit development, and continued advancement in understanding the geological and geotechnical data of current operations.

By using database validation, geostatistical analysis, block modeling, and interactive geological modeling, our professionals are adept at resource estimation and appraisal and regulatory compliance. Our 3D modeling services include solid, grid, and hybrid models. We also offer block modeling with geostatistical analyses, including variography, kriging, and simulation. Outcomes include resource estimation and classification, uncertainty quantification, and other geostatistically derived results.

CAPABILITIES:

- Site Investigation
- Exploration Management
- Data Assessment and Validation
- 3D Geological Modeling
- Resource Estimation and Classification
- Underground and Open-Pit Mine Optimization and Design
- Ore-Reserve Estimation
- Prefeasibility and Feasibility Reporting
- Qualified and Competent Persons in a Variety of Commodities
- NI 43-101/JORC Reporting Standards
- Due Diligence for Financial Groups

GEOLOGICAL AND ENGINEERING SERVICES IN SUPPORT OF THE DEVELOPING DELAMAR GOLD-SILVER PROJECT

Building drillhole databases and 3D modeling for a gold-silver mine

Working closely with Integra personnel, our team built comprehensive drillhole databases and then completed 3D modeling of late 1880s to early 1900s underground mine workings; open-pit, as-built topographies that reflect mining undertaken from the late 1970s to the late 1990s; and gold-silver resource estimates for the project. Most recently, our team contributed to a preliminary economic assessment of the project.

PROJECT DETAILS:

Client: Integra Resources Corp.

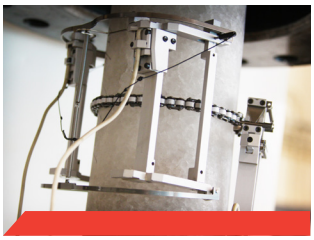
Location: Southwestern Idaho

AS THE FOUNDATION of RESPEC's Mining & Energy business unit, our rock-testing and research team gathers and provides the quality data necessary to conduct advanced engineering analyses.

EXPLORATION | MINE DEVELOPMENT | OPERATIONS | CLOSURE/RECLAMATION

RELIABLE DATA

RESPEC conducts standardized testing in accordance with ASTM, ISRM, and API standards to provide clients with the best-quality data. We develop customized test programs to simulate project-specific conditions.



STATE-OF-THE-ART EQUIPMENT

RESPEC supports advanced engineering analyses with sophisticated equipment that accurately simulates complex in situ stress and temperature conditions.

COMPREHENSIVE ROCK TESTING

As one of the world's leading geosciences and engineering experts, RESPEC offers standardized and customized testing capabilities to our clients' unique needs.

UNRIVALED EXPERIENCE

With 50 years of experience in advanced rock testing and research for various rock types, RESPEC has developed industry-standard failure criteria and constitutive models for salt and potash.

WORLD-CLASS TESTING SERVICES

RESPEC provides global clients with advanced rock-materials testing and core-logging services. Our environmentally controlled laboratory testing space with redundant power was built for comprehensive testing and logging programs for any type of rock. RESPEC's state-of-the-art equipment features 20 computer-controlled hydraulic load frames for multiaxial, thermocoupled, long-term creep tests.

CAPABILITIES:

- Long-Term and Cyclic Behavior
- Thermal Properties Measurements
- Mechanical and Hydrological Properties Measurements
- Rock/Fluid Interaction Studies
- Constitutive Model Development
- Specialty Specimen Preparation
- Customized Testing
- Brine Mineralogy Insoluble Content Analyses

10,000 FT^2
of environmentally controlled testing space with redundant power

20 computer-controlled hydraulic load frames for multiaxial, thermocoupled, long-term creep tests

TESTING SERVICES:

- Long-Term and Cyclic Creep Tests
- Direct Shear, Triaxal, Unconfined, and Tensile Strengths
- Thermal Expansion, Conductivity, Diffusivity, and Heat Capacity
- Water Content, Porosity, and Permeability
- Ultrasonic Velocity and Dynamic Elastic Constants
- Consolidation and Compaction

LOGGING SERVICES:

- Lithologic Characterization
- XRD and Mass-Spectrometry for Mineralogy
- Laser Particle Grain-Size Analysis
- Spectral Gamma Analysis
- Core Storage

IMPROVED STABILITY FOR BEDDED SALT STORAGE CAVERNS

Developing a design criterion to assess and prevent roof collapse in natural gas storage caverns in bedded salt

PROJECT DETAILS:

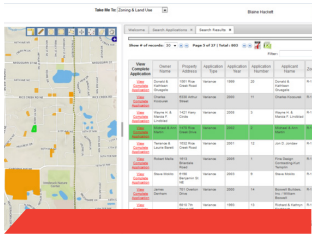
Client: US Department of Energy, National Energy Technology Laboratory

Location: Pittsburgh, Pennsylvania

For an industry reluctant to develop natural gas storage caverns in bedded salt, the most critical issues are predictability and preventing roof collapse. The National Energy Technology Laboratory sought an improved design criterion to assess the long-term geotechnical integrity of natural gas storage caverns in bedded salt. RESPEC's team provided the new design criterion and an improved method for evaluating the potential for salt failure over the range of possible stress states in the salt surrounding and overlying caverns. Our work included geologic analysis, laboratory testing, theoretical development, and numerical analysis. This successful project was the first time that triaxial-extension tests performed by RESPEC were used to help develop a salt-failure criterion.

FROM EXPLORATION TO RECLAMATION, RESPEC's data management team provides customized analytics solutions to help clients get the most out of their data.

EXPLORATION | MINE DEVELOPMENT | OPERATIONS | CLOSURE/RECLAMATION

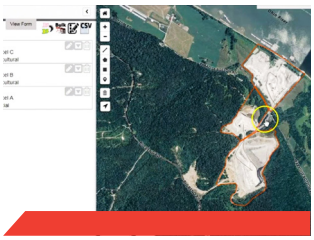


GEOMATICS AND GIS CONSULTANTS

As global experts in geographic data collection, integration, and management applied to mining optimization, RESPEC's geomatics team leads the industry in geospatial science and technology solutions.

COMPETITIVE ADVANTAGE

As the industry continues its digital transformation, RESPEC's team empowers clients to overcome barriers to adopting new technologies that provide benefits in creating a competitive advantage.



DATA FOR INVESTORS

By merging data technology and engineering for smart decision support in mining, we developed an interactive interface that allows clients to share information securely, easily, and effectively.

ESSENTIAL TO MINING

Our tools are used in land portfolio and asset management, permitting and environmental compliance, reporting land values, exploration and mine expansion analytics, land acquisition management, and reserve tracking and logistics analytics.

GEOMATICS AND GIS EXPERTISE TO MANAGE ASSETS

RESPEC's Geomatics and GIS group is on the leading edge of the mining industry with experience in geospatial science, engineering, and technology. We work together across diverse disciplines to help clients manage mining assets by developing advanced tools in spatial data management. Our creative, high-energy team makes every project technically accurate, informative, and aesthetic with a focus on highlighting priority information for the client. RESPEC's team has developed an interactive interface to store project data and allow clients to share information with technical teams or present their findings to investors.

ADVANCED TOOLS TO:

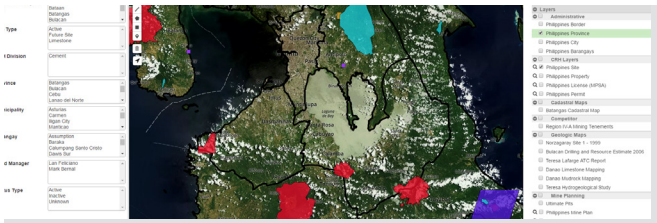
- Manage Land Portfolios and Assets
- Report Land Values and View Land Value Trends
- Conduct Exploration and Mine Expansion Analytics
- Manage Permitting and Environmental Compliance
- Manage Land Acquisitions
- Conduct Reserve Tracking and Logistics Analytics
- Capture Drill and Blast Information

PRODUCTS:

GEOSEQUEL — Drillhole and sample management software for exploration and mining

MAPFEEDER — Interactive mapping software comprising powerful user-driven database and map searching capabilities, historical data tracking, and reporting

BLASTFEEDER — Geospatial database management tool used to report and track blasts by capturing data in the field and syncing to the cloud



ACQUISITION PLANNING AND QUARRY OPTIMIZATION

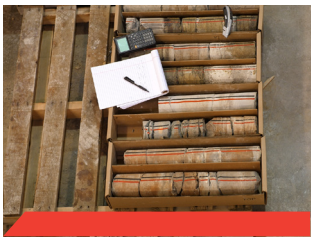
Using the new Land Information System (LIS) to efficiently manage all aspects of land control in mining

When a client purchased billions of dollars in land and mining assets, they had no accurate or efficient way to manage and quantify their assets. RESPEC designed the LIS—a management and analytics tool that is used to efficiently manage all aspects of land control that are needed for mining and asset management. The LIS serves as a link between the mine planning and block-model work completed by RESPEC and client-specific data on property and permitting. Instrumental in managing multibillion-dollar mining company mergers and asset divestures, LIS focuses on centralizing all land-related data (e.g., property boundaries, deeds, permit boundaries, permit documents, property values, and reserve values) into a cloud spatial database where data can be easily queried and analyzed. The LIS allows land and quarry managers to collaborate and develop the best solutions for long-term acquisition planning and quarry optimization.

MINE PLANNING AND OPERATIONAL EXCELLENCE

AS A GLOBAL LEADER in mine planning and operational excellence, RESPEC leverages our expertise with a comprehensive, detail-oriented approach to developing the best solutions to address our clients' needs.

EXPLORATION | MINE DEVELOPMENT | OPERATIONS | CLOSURE/RECLAMATION



UNDERSTANDING COMPLEXITY

RESPEC's geoscience and engineering experts appreciate complexity and emphasize the accuracy of our geologic and reserve modelling to develop mine plans that allow operators to maximize extraction profitably.

SITE-SPECIFIC SOLUTION

A successful operation starts with a robust mining plan that is tailored to site-specific challenges. RESPEC understands the importance of micro- and macro-economic factors that drive profitability.

OPERATIONAL EXPERTISE

RESPEC has wide-ranging operational expertise in equipment productivity, fleet management, operating costs evaluation, drilling and blasting services, reclamation design, and environmental permitting and compliance.

SAFETY AND COMPLIANCE

With a global reputation for integrated technology, safe mining solutions, and regulatory compliance, we respect the environment and other cultures in the diverse countries where we work.

EXCEEDING EXPECTATIONS

RESPEC's commitment to our clients is to provide high-quality mine plans that meet their financial and production requirements and exceed their expectations by optimizing resource recovery while maximizing economic returns for clients, we serve clients with all types of surface and underground operations across a spectrum of commodities around the world.

Following the same high standards, RESPEC's team prepares short, medium, long, and life-of-mine plans for international operations. Our approach is comprehensive and detail-oriented. Our expertise is broad and deep; from geology to equipment productivity and costs and from health and safety to environmental concerns, RESPEC's experts have the technical knowledge and operational experience to meet any challenge. We are sensitive to all facets of an operation and understand the intricacies of addressing a high-quality mine plan.

CAPABILITIES:

MINE DESIGN AND PLANNING

- Detailed Short- and Long-Term Mine Plans
- Mine Design and Layout
- Equipment Selection
- Production Sequencing
- Grade Controls and Optimization

OPTIMIZATION

- Fleet Management
- Operating Cost Evaluations
- Operational Audits
- Project Execution, Construction, and Contractor Management
- Health-and-Safety Audits

IMPROVED MINE PLANNING FOR LIMESTONE QUARRY

Developing a plan to optimize the deposit and extend plant life

With a global reputation for superior cement quarry mine planning, RESPEC collaborated with Eagle Materials, Inc. to improve its cement manufacturing facility in Fairborn, Ohio. RESPEC addressed opportunities related to the elemental rock chemistry in their limestone deposit and worked with them to produce a mining sequence to fit their requirements. Our plan optimized the limestone deposit and extended the life of the cement-plant facility. RESPEC identified geologic and chemical characteristics of the limestone rock layers and successfully developed a quality control "blending plan" to mix low-quality and high-quality stone to achieve the client's stringent quality control targets. The client can now use nearly 20 percent more limestone than previous mining practices.

PROJECT DETAILS:

Client: Eagle Materials, Inc.

Location: Fairborn, Ohio

EXPERTS IN PERFORMANCE monitoring and specialists in challenging blast scenarios, RESPEC's team consistently demonstrates proven auditing and optimization skills.

EXPLORATION | MINE DEVELOPMENT | OPERATIONS | CLOSURE/RECLAMATION

ENDURING
SAFETY RECORD

RESPEC's team specializes in solving critical issues safely and effectively and we are proud of our history of delivering unique, safe solutions to common and uncommon drilling-and-blasting problems.

PRECISION-MINING
HARDWARE

With an innovative line of Carlson Software's Precision Mining products, systems, and sensors, RESPEC uses and sells hardware to track and manage drilling patterns and blastholes.

REDUCED
MINING COSTS

RESPEC improves overall mining unit costs with proven skills in auditing and optimization, challenging blast scenarios, and performance monitoring.

PROFESSIONAL AND
ACADEMIC STRENGTH

Actively affiliated with educational institutions and professional societies, RESPEC ensures that our staff lead the next wave of technology and industry expertise.

SAFE AND EFFECTIVE SOLUTIONS

RESPEC's explosives engineering group combines advanced knowledge of drilling and blasting with experience in mine planning and operations to provide a unique turnkey approach to improving drill-and-blast operations.

RESPEC's drill-and-blast experts have specialized experience in all aspects of blast design and optimization for metal/nonmetal surface and underground blasting, including specialty projects such as equipment rescue, collapse blasting of voids and underground workings, explosive-storage design, blast vibration and proximity concerns, mine-to-mill studies, and forensic investigation and expert-witness testimony. RESPEC also provides management services with training, auditing, and contractor negotiations. Our services include vibration and airblast monitoring, pre- and postblast surveys, data evaluation, and data management.

CAPABILITIES:

- Blast Design and Guidance
- Blast Performance Monitoring and Auditing
- Drill-and-Blast Improvement and Optimization
- Data Collection and Interpretation
- Instrumentation
- Specialty Projects
- Safety and Training

Advising clients since 2017 on

30+ BLASTING PROJECTS

Blasting services provided in

7 COUNTRIES

5 CONTINENTS

COMPREHENSIVE BLAST REVIEW FOR GOLD MINE

Performing an effective comprehensive blast review to identify areas of improvement in the client's drilling-and-blasting process

PROJECT DETAILS:

Client: Private Client

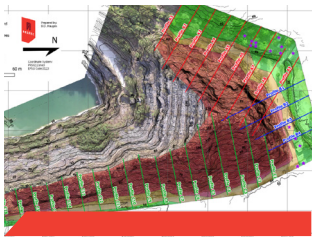
Location: US

While working with a private gold-mine operation that had problems with excessive backbreak and improper fragmentation on underground headings, RESPEC's team conducted a 10-day comprehensive blast review of the drill-and-blast operation and used Carlson Precision Mining instrumentation to pinpoint the cause of drill-and-blast problems. We aimed to minimize overbreak to optimize production.

Our team set up instrumentation to monitor multiple blasts on multiple days. In addition to collecting data on the drill-and-blast operation and auditing the blast design process, our review included investigating blast designs, drill-and-blast procedures, pattern layout, drill setup, drilling, shot timing, post-blasting results, and dilution, as well as explosives storage, loading, selection, application, and performance. Upon project completion, RESPEC's team made a final presentation, including findings, results, and recommendations.

KNOWN FOR RESPONSIVENESS in delivering underground and surface stability solutions, RESPEC provides services for rock and soil mechanics, numerical and analytical convergence and stability modeling, and salt-creep studies.

EXPLORATION | MINE DEVELOPMENT | OPERATIONS | CLOSURE/RECLAMATION



GLOBAL NEEDS
AND EXPERIENCE

RESPEC's geosciences and engineering experts offer comprehensive project coverage to meet the unique needs of diverse clients in 26 countries.

PRACTICAL
SAFETY SOLUTIONS

Using the industry's most advanced testing, modeling, and analysis methods, RESPEC delivers sustainable solutions and practical recommendations to identify and address any type of instability.

INTEGRATED
FIELD ANALYTICS

RESPEC's on-site teams focus on sophisticated analytics and are trusted advisors to measure and evaluate stability, analyze potential problems, and mitigate surface and subsurface hazards.

DEVELOPMENT
TO CLOSURE

With a history of creating the safest, most innovative solutions in mine geomechanics, RESPEC uses the highest levels of theory, observation, and expertise to solve the world's most challenging problems.

EXPERTS IN ROCK AND SOIL MECHANICS

As a global leader in rock and soil mechanics, RESPEC's integrated engineering team is comprised of geoscientists and engineers. Because successful designs start with an accurate understanding of ground conditions, our team focuses on providing detailed and robust geotechnical studies in even the most critical and high-stress environments. We are experts in field assessments, laboratory testing, empirical and theoretical correlations, numerical and analytical modeling, and practical and novel ground-support solutions.

RESPEC's foundation is built on advanced knowledge and expert understanding of rock and soil mechanics. With specialized skills, our world-renowned professionals have used their expertise to build a top-tier program in the field of earth materials mechanics. We pride ourselves on being able to solve the world's most challenging geotechnical problems by using the most advanced testing, analysis, and modeling methods.

CAPABILITIES:

- Underground Rock Mechanics
- Highwall Analysis and Design
- Ground-Support Design and Assessments
- Excavation Design and Sequencing
- Rockfall and Landslide Simulations
- Geologic Hazard Assessments and Testing
- Rapid-Response and Forensic Evaluations
- Monitoring and Instrumentation
- Applied LiDAR and Remote Sensing

SURFACE MINE SLOPE STABILITY ANALYSIS

Providing comprehensive field and analytical services

PROJECT DETAILS:

Client: Lhoist North America

Location: Florida

RESPEC provided comprehensive field and analytical services to assist Lhoist North America in defining safe operating conditions of a quarry wall under dragline loads. The purpose of the project was to evaluate what, if any, load conditions on the highwall slope could create instability, considering both the presence of natural karst features and the variability of dragline loads.

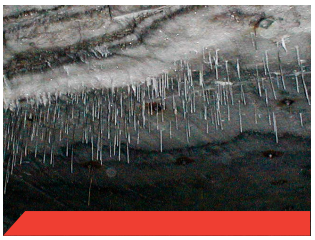
One of the most unique aspects of this project was the complex and variable ground conditions at site: numerous and extensive karst features comprising clay- and sand-filled voids are present at the site and had to be assessed and modeled in relationship to a continuously advancing submerged vertical highwall. Conducting safe mining operations was highly dependent on RESPEC's analysis, and we were able to define specific safe operating parameters using our unique combination of field services, rock testing, and numerical modeling expertise.

FEATURING OUR COLLECTIVE experience, educational background, and operational understanding, RESPEC provides unsurpassed knowledge of hydrogeologic systems and interpretation of data sets to support mining project solutions.

EXPLORATION | MINE DEVELOPMENT | OPERATIONS | CLOSURE/RECLAMATION

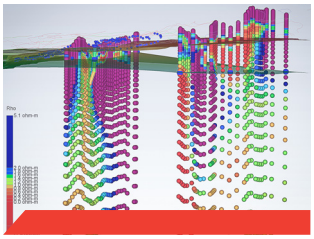
UNDERSTANDING COMPLEXITY

RESPEC's team has in-depth knowledge of applications for deep hydrogeologic systems for mining, storage caverns, disposal/injection wells, and many other types of mining and storage projects.



EVAPORITE EXPERIENCE

For more than 30 years, RESPEC's hydrogeology and groundwater group has specialized in evaporite mine inflow projects at over 26 mines around the world.



EXPERTS IN SUBSURFACE

With a prominent international presence for hydrogeologic and groundwater projects, RESPEC's subsurface geoscience and engineering group leads development projects in the US, Canada, and five other countries.

ACADEMIC AND OPERATIONAL

RESPEC's team delivers best-fit value, drawing from traditional or customized solutions that require developing new resource testing and modeling techniques.

HYDROGEOLOGY AND GROUNDWATER MANAGEMENT

RESPEC provides expertise in groundwater and reservoir fate and transport modeling, hydraulic test design, and implementation and interpretation. Our team is experienced in disposal and injection well services and hydrogeologic services for mines and storage caverns. We also perform data interpretation and modeling services. RESPEC has a global reputation for being unsurpassed in expertise and work related to mine inflows for evaporite mines. We have a long history of demonstrating our capability to analyze and interpret any complex dataset.

Serving mining and other environmental projects, our multidisciplined team performs groundwater modeling to evaluate impacts associated with stressors on groundwater systems.

CAPABILITIES:

MINE INFLOW SERVICES

- Mitigation and Remediation
- Contingency Plans
- Risk Analysis
- Multidisciplinary Data Interpretation, Including Hydrogeology, Rock Mechanics, Chemistry, and Geophysics

DATA ANALYSIS AND MODELING

- Machine Learning
- Univariate and Multivariate Statistics
- Signal Processing
- Wavelet Analysis
- 2D and 3D Temporal and Spatial Data Analysis and Modeling

CONTROLLING POTASH MINE WATER INFLOW

Controlling mine water inflow to ensure that a potash mine is protected against uncontrolled flooding

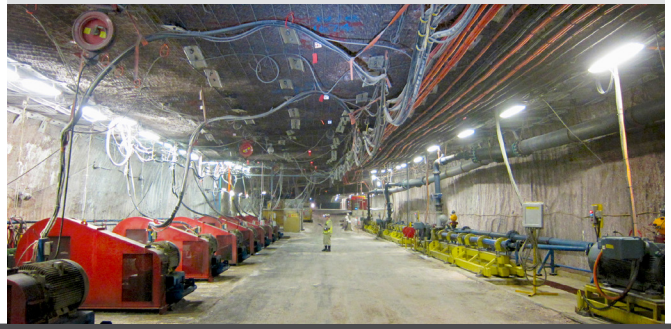
For more than 30 years, RESPEC has provided hydrogeologic and data analysis services to Mosaic. Throughout its history, Mosaic's potash K2 Mine has experienced large water inflows; RESPEC helps the company control mine water to protect the mine from flooding.

PROJECT DETAILS:

Client: Mosaic

Location: Esterhazy, Saskatchewan

Our multidisciplined team developed a Water Control Information System (WCIS) to consolidate, process, and summarize the large volume of manual and digital data collected, including water-level measurements in surface wells, water inflow rates, pumping volumes, and underground geotechnical data.



WITH DECADES OF PERMITTING and regulatory experience, RESPEC's wide-spectrum knowledge of the US' strict regulations feeds new solutions for agencies in different countries.

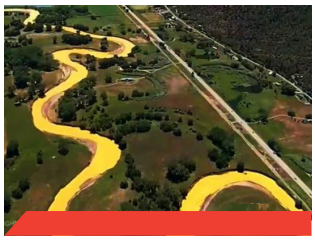
EXPLORATION | MINE DEVELOPMENT | OPERATIONS | CLOSURE/RECLAMATION

GLOBAL
PERMITTING

RESPEC's team serves clients in need of environmental permits and services. We have extensive knowledge about NEPA, SMCRA, WQA, environmental studies, permitting processes, and regulatory agencies in the US and abroad.

BRIDGING INDUSTRY
AND AGENCY

We specialize in many facets of permitting associated with mining operations and remediation projects, including subsidence control, surface-water control system design, stability analyses, water discharges, and groundwater and surface-water monitoring program design.



REGULATORY
HISTORY EXPERTS

Because many environmental regulations have been developed over time and we have worked in the mining industry for decades, RESPEC's thorough, historical understanding of the basis and intent of a regulation contributes to better solutions.

ENVIRONMENTAL
CONSULTING

Bridging private industry and public agencies, RESPEC's environmental team offers mining and remediation clients the highest-quality advice that dovetails with operational practices.

GLOBAL PERMITTING AND REMEDIATION EXPERTS

With extensive knowledge in environmental studies, permitting processes, and the SMCRA, RESPEC offers diverse environmental services that are vital to protecting natural resources. Our team has a long history of management, consulting, inventory, investigation, design, and construction management services for projects in remediation, reclamation, and restoration throughout the US and abroad.

We identify and secure permits from appropriate agencies, along with required biological assessments, geologic and hydrogeologic investigations, and wetland delineations to ensure project compliance with permit conditions. Under the NEPA, our team prepares Environmental Assessments and Environmental Impact Statements that evaluate the potential consequences associated with a proposed action. RESPEC compares reasonable alternatives to the proposed action to reach an environmentally acceptable and defensible action.

CAPABILITIES:

- Site Investigation
- SMCRA Expertise
- Obtaining Permits
- Permit Identification
- Permit Compliance
- NPDES and Section 404
- Environmental Studies
- Resource Characterization and Management Plans (Water Quality, Wetlands, Groundwater)
- Impact Assessments (NEPA, Biological, Threatened and Endangered Species)

EXPERTS IN ENVIRONMENTAL IMPACT STATEMENTS

Completing an Environmental Impact Statement (EIS) to expand a mine operation

PROJECT DETAILS:

Client: Montana Department of Environmental Quality

Location: Dillon, Montana

Having mined talc ore from Montana's Regal Mine since 1972, Barretts Minerals, Inc. (BMI) had plans to expand the mine's existing pit, increase the size of the waste rock disposal facility, and expand the water management system. To ensure compliance for BMI's expansion, RESPEC prepared an EIS for the proposed amendment to BMI's existing Mine Operating Permit. Our goal was to satisfy requirements of the Metal Mine Reclamation Act (MMRA), the Montana Environmental Policy Act (MEPA), and Montana Department of Environmental Quality (the lead regulatory agency).

By addressing key issues, including geotechnical resources, water rights, and surface-water and groundwater management, the RESPEC team was responsible for all aspects of the EIS, including project management, purpose and need development, alternative development and refinement, public scoping, preparing technical memoranda, maintaining the administrative record, writing and assembling the EIS text, compiling public comments, and analyzing impacts of alternatives. RESPEC's resource specialists included experts in geology and geochemistry, groundwater and surface-water resources, geotechnical engineering, land use, socioeconomics, soils and reclamation, transportation, noise, hydrogeology, and aquatic resources.

INSTRUMENTATION AND MONITORING

FOR MONITORING SOLUTIONS that are accurate, reliable, and easy to use, RESPEC specializes in measuring everything from stress and convergence in underground mines, to slope stability and subsidence, to water levels and flow rates.

EXPLORATION | MINE DEVELOPMENT | **OPERATIONS** | **CLOSURE/RECLAMATION**

SOLUTIONS FOR EVERY PHASE

In exploration, development, production, or reclamation, RESPEC gets the data you need when you need it. We also analyze, evaluate, and interpret the data.

WIRELESS FIELD SOLUTIONS

RESPEC's engineers use the most advanced data collection, communication, and delivery technologies to provide accurate, accessible, and actionable information.

MONITOR ANYWHERE

As a Campbell Scientific partner, RESPEC employs customizable instruments to achieve rugged, long-term, economical solutions for field and environmental data collection and automation.

EXTREME TEAM

We routinely overcome extreme installation challenges where harsh weather, severe terrain, and corrosive environments limit communication options and make access difficult.

INSTRUMENTATION SOLUTIONS

With a broad range of geoscience technologies and industry applications, RESPEC's instrument designs are tailored to address specific client needs. Our team develops and builds high-quality, customizable instrumentation and employs the latest in data collection, communication, and delivery technologies to provide our clients with the most accurate and actionable information possible. In RESPEC's state-of-the-art fabrication and development shop, we custom-build specialized equipment and tools and customize the software and hardware used for instrumentation and monitoring in diverse types of mines. For every phase of the mine life cycle, RESPEC gets the data you need when you need it.

CAPABILITIES:

- Underground Convergence and Tilt
- Landslide, Subsidence, and Slope-Stability Monitoring
- Real-Time Early-Warning Systems
- Surface-Water Measurements
- Inflow Monitoring and Control
- Cloud-Based Data Delivery and Visualization Options
- Integrated Custom Hardware and Software
- 3D Data Collection and Modeling
- High-Resolution Video Monitoring
- Blast and Vibration Monitoring

INSTALLED **200+** dataloggers in locations throughout the world.

8 YEARS as a Campbell Scientific Partner

Collecting, analyzing, and reporting more than

55,000

DATA POINTS PER DAY

LANDSLIDE EARLY-WARNING SYSTEM

Designing and installing a real-time monitoring system to protect a popular recreational lake and campground

Ten years after a massive failure on the southwestern slope of Wyoming's Cook Lake Recreation Area, survey data indicated that the landslide was still exhibiting some movement that threatened site access and forced closure of a popular campground. In 2016, the Black Hills National Forest Service selected RESPEC to design and install a long-term, low-maintenance solution for a real-time monitoring and early-warning system to help protect the recreation area, its visitors, and the downstream population.

PROJECT DETAILS:

Client: Black Hills National Forest Service

Location: Cook Lake Recreation Area, Wyoming

By using the latest in radio communications and web-interface technology, our technical solution allows the Black Hills National Forest Service to access tilt, precipitation, inclinometer, and piezometer data from anywhere in the world and triggers real-time notifications if any indicators of imminent danger are recorded.

ASSET RETIREMENT AND RECLAMATION

OUR WIDE GEOGRAPHIC BASE and global expertise strengthen our ability to analyze local regulations with respect to the mining and reclamation of reserves.

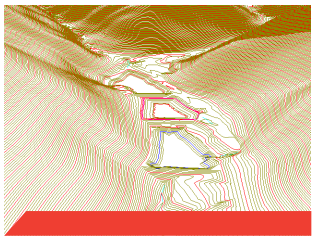
EXPLORATION | MINE DEVELOPMENT | OPERATIONS | **CLOSURE/RECLAMATION**

GLOBAL
EXPERIENCE

Clients benefit from RESPEC's global mining and accounting knowledge that are critical to asset retirement and site renewal, remediation, and restoration.

COMPLEX
ARO

RESPEC estimates complex Asset Retirement Obligations for clients considering multiple commodities mined by using multiple methods.



EXPLORATION
TO RECLAMATION

Experts in asset retirement and reclamation, RESPEC's team provides comprehensive services during every phase of the mine life cycle.

UNDERSTANDING
REGULATIONS

RESPEC has unsurpassed experience in mining regulations across a wide geographic base that includes complex levels of overlapping jurisdiction by multiple agencies.

ASSET RETIREMENT OBLIGATION

To ensure the proper estimation of the Asset Retirement Obligation, RESPEC's professional team fully grasps the mining operation, including site reclamation. We know that the process also requires understanding the regulations that limit or define the final reclamation plan and that these regulations may be imposed by federal, state, and/or local agencies. Multiple agencies also commonly have jurisdiction over the same mine. Our partners benefit from RESPEC's in-depth knowledge of the full mine life-cycle process. We consider factors such as current mine configurations, operational methods and costs, postmining land-use requirements, closure requirements, water monitoring and treatment, and bond-release requirements.

CAPABILITIES:

- Site Investigation
- Regulatory Knowledge
- Reclamation Design
- Cost Estimating

ALPHA NATURAL RESOURCES ASSET RETIREMENT OBLIGATION AUDIT

Conducting an audit of Asset Retirement Obligation financial estimates for multiple mines in two states

PROJECT DETAILS:

Client: Alpha Natural Resources

Location: Kentucky and West Virginia

Alpha Natural Resources (ANR) hired RESPEC to conduct an audit of ARO estimates with site investigations, a review of permitting requirements, a review of unit costs, and an estimate of ARO costs. RESPEC conducted a reclamation audit to verify ongoing reclamation costs and assumptions reported by ANR to each of the state regulatory agencies. The initial phase of the audit focused on permits with a "reclamation only" status. Our team developed a sample set to represent all of the client's permits across various states. The sample set included mines that represented varying degrees of reclamation, as well as designated mine types. RESPEC visited each site to verify reclamation requirements for the permit and validate reclamation estimates provided by ANR to each state. In addition to validating the anticipated reclamation plan, we reviewed unit costs and assumptions made by ANR for reasonableness and applicability to the currently approved reclamation plan. Our team developed a database to compare reclamation data provided by the client to internal reclamation calculations.

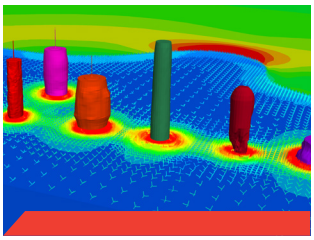
CAVERN SOLUTION MINING, STORAGE, AND DISPOSAL

AS THE CAVERN INDUSTRY'S PREMIER technical services provider, RESPEC provides expertise in storage, well design and waste disposal, and solution mining for projects all over the world.

EXPLORATION | **MINE DEVELOPMENT** | **OPERATIONS** | CLOSURE/RECLAMATION

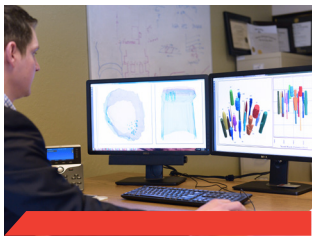
ONE-STOP
CONVENIENCE

RESPEC is fully equipped and staffed with field geologists, engineers and drilling-management experts, a rock-mechanics laboratory, core logging and storage, advanced modeling solutions, and monitoring instrumentation.



CAVERN
EXPERIENCE

By using advanced geomechanical knowledge, RESPEC has evaluated more than 1,000 caverns during 4 decades of applied cavern experience in nearly every major cavern-storage region in the world.



ENGINEERING
PROBLEM SOLVING

By building on decades of cavern engineering experience, RESPEC has developed five in-house software programs that were specifically tailored to the unique analysis requirements of solution-mined caverns.

OPTIMIZED
CAVERN ASSETS

Our award-winning interdisciplinary team helps cavern operators to optimize siting, design, and operation of their cavern assets through advanced analyses of structural and thermodynamic behavior.

CAVERN ENGINEERING WORLDWIDE

With more than 50 years of experience in the industry, RESPEC assists in nearly all areas of cavern operations, from initial greenfield geologic exploration to cavern plugging and abandonment. Serving both private- and public-sector clients across the globe, our professionals specialize in storage of liquid hydrocarbons, natural gas, compressed air and hydrogen; well design and waste disposal; and brine, potash and trona production. Our engineers and scientists have a dedicated focus on the geological, hydrological, geomechanical, and thermodynamic aspects of cavern operations. By combining our diverse capabilities of geologic studies, rock-core testing, computer modeling, and field testing, RESPEC helps cavern operators to plan new cavern developments, optimize existing caverns, comply with regulatory requirements, and ensure the continued safety and successful operation of cavern facilities.

Cavern Facilities Assessed by RESPEC

60+ GULF COAST
More than 60 cavern facilities assessed in Texas, Louisiana, Mississippi, Alabama, and Veracruz, Mexico.

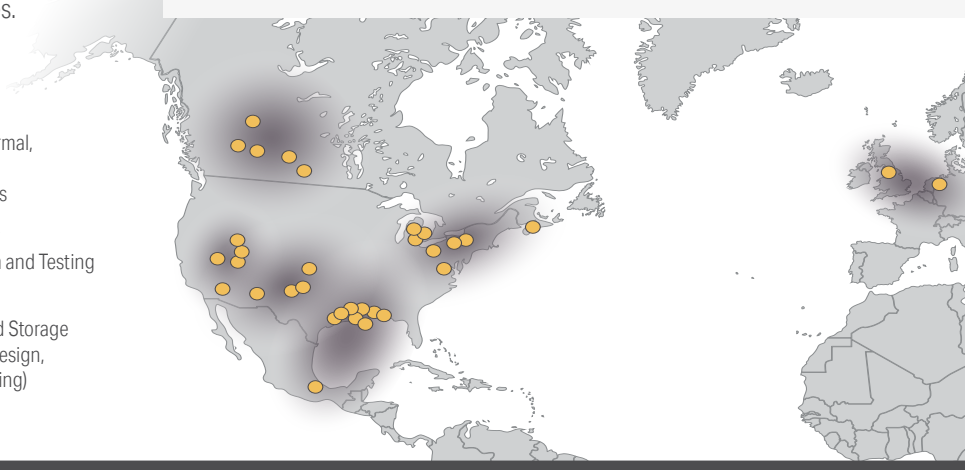
20+ ELK POINT
More than 20 cavern facilities assessed in Alberta and Saskatchewan.

15+ PERMIAN
More than 15 cavern facilities assessed in Kansas, Oklahoma, Texas, and New Mexico.

10+ APPALACHIAN, MICHIGAN, AND MARITIMES
More than 10 cavern facilities assessed in Ontario, Nova Scotia, Michigan, Ohio, New York, and Virginia.

5+ BASIN AND RANGE
More than 5 cavern facilities assessed in Arizona, Utah, Colorado, and Wyoming.

3 EUROPEAN
Three cavern facilities assessed in the United Kingdom and The Netherlands.



CAPABILITIES:

- Drilling Management and Procurement
- Geologic Coring and Characterization
- Rock Testing
- Hydrologic Characterization
- Solution-Mine Design and Scheduling
- Geomechanical, Thermal, Thermodynamic, and Hydrological Analyses
- Subsidence Analyses
- Field Instrumentation and Testing
- Disposal Well Design
- Conventionally Mined Storage (Mine Design, Blast Design, Ground Control, Costing)

AS A MULTIDISCIPLINARY subsurface team, RESPEC professionals are fully trained in all core sciences to deliver applied knowledge in geophysics, geochemistry, reservoir modeling, rock mechanics, and data analytics.

SUBSURFACE CHALLENGES

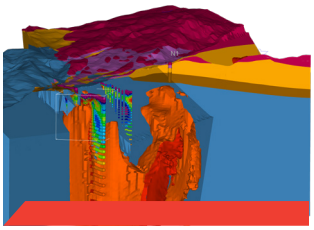
RESPEC's geothermal experts address a broad range of subsurface-resource development challenges that cover many geothermal resource play types, from high to low enthalpy in traditional volcanic settings to sedimentary basins.

GLOBAL EXPERTS

A a key technical consultant on international projects with various geothermal resource types, RESPEC plays an active role in most of Canada's prominent geothermal development projects.

APPLIED CORE SCIENCES

Highly educated and experienced in applications across related scientific and engineering fields, RESPEC's team de-risks geothermal projects and creates in-depth understanding of geothermal resources.



UNRIVALED DATA SOLUTIONS

RESPEC features state-of-the-art modeling capabilities and new techniques to provide mining and geothermal clients with advanced testing and modeling solutions that reduce resource development risks and costs.

GEOTHERMAL EXPLORATION AND DEVELOPMENT

With thorough characterization and assessment of a resource, RESPEC helps clients to understand the economic risks and production potential of developing specific geothermal resource types and sites. Our geothermal services cover a broad range of subsurface-resource development challenges. Our technical services include many geothermal resource play types, including low, medium, and high enthalpy. RESPEC provides early-phase exploration and teams with industry experts in geochemistry and geophysics to minimize exploration drilling risk through expert subsurface data analytics and well targeting. We integrate complex disparate datasets into cohesive conceptual, analytical, and numerical simulations of client resources. Our team will then design your drilling programs, along with well-test design and implementation and final wellfield configurations.

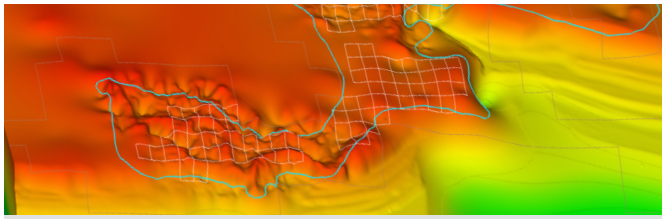
CAPABILITIES:

RESOURCE ANALYSIS

- Geology
- Geochemistry
- Geophysics
- Integrated 3D Conceptual Models
- Exploration Drilling
- Well-Test Design and Analysis
- Risk Analysis

RESOURCE DEVELOPMENT

- Well Targeting
- Drilling Program Design
- Numerical Reservoir Simulation
- Analytical Resource Models
- Machine Learning
- Development Process Management



CANADIAN GEOTHERMAL DEVELOPMENT

Assessing a potential site for British Columbia's first geothermal power plant

PROJECT DETAILS:

Client: Clarke Lake Geothermal Partnership

Location: British Columbia

As British Columbia seeks alternative energy solutions for electricity and heat, geothermal resources play a significant role in the province's future renewable energy strategy. Clarke Lake, which is a depleted natural gas reservoir, is being assessed by RESPEC as a potential site for the first geothermal power plant in British Columbia. The project was developed under a joint initiative with local Indigenous groups, RESPEC, Barkley Project Group, and Power Engineers. RESPEC aims to site a characterization well doublet and develop the reservoir models needed for a bankable feasibility report, feasibility forecasting, and engineering design work.

RESPEC's geothermal team compiled available geoscience data and conducted a comprehensive temperature data correction and interpolation analysis integrated into a 3D geothermal resource conceptual model. By using the resource model, RESPEC performed analytical well performance modeling, numerical reservoir simulation, thermal breakthrough analysis, and the reservoir characterization doublet-drilling plan and testing.

RESPEC.COM

LEARN MORE ABOUT OUR

MINING & ENERGY SERVICES

CONTACT US TODAY!

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