Total mine water management solutions
Resource infrastructure
Environmental consultation

COAL SERVICES
AUSTRALASIA

ENGINEERING, GEOSCIENCE AND
ENVIRONMENTAL SERVICES
ABOUT US

Klohn Crippen Berger Ltd. (KCB) is an international engineering, geoscience and environmental consulting firm with its head office in Vancouver and nine offices in strategic locations in Australia, Canada, Peru and Brazil. We have a strong reputation for quality service and technical expertise in a range of services including: Mining, Environmental, Water, Power, Transportation, and Oil and Gas. Since forming in 1951, we have a long history of participation in local projects, as well as a strong international reputation. We are working on some of the largest, most challenging engineering projects, both nationally and internationally.
Our Australasian operation services a wide variety of clients within Australia and across the Pacific Rim. We are based in two offices, Brisbane and Perth, which operate under a triple-certified integrated management system consisting of quality, health and safety and environmental procedures. A large proportion of our work is conducted in geographically remote and logistically challenging environments, domestically and internationally. We have a strong record of project delivery under extreme conditions from the wet humid tropics of equatorial Asia to arid remote mining areas within Australia. We pride ourselves on being a high-end technically strong consultancy with mature service delivery practices including inter-office and inter-group project collaboration. This latter element of our business is particularly advantageous as it permits us to efficiently provide multi-disciplinary services including mechanical, electrical and structural engineering from other offices to our local clients.

Key services applicable for Australia's coal industry are based around three core technical streams:

**Geoscience** (includes: hydrogeology, geochemistry and geology). Through this group we specialise in whole of site water and water quality management solutions, and have advanced capability and experience in modelling, mitigation design and field implementation of testing programs and system commissioning. Key aspects of water management undertaken by geoscience group include water supply development, mine dewatering, project water balance simulations (operational and post-closure) and water disposal.

**Engineering** services focus on geotechnical and civil services for mining environments. We have a particularly strong reputation for complex and large-scale tailings and waste rock facility design, often coupled with sediment and water infrastructure designs for severe climatic conditions. Our engineering experience extends beyond design and includes construction, QA / QC and third party review roles; and, integrated water management solutions with our geosciences group.

Our **Environmental** services are distributed across baseline and impact environmental sciences, and operational support through project development and maturation, supported by risk-based approaches to environmental assessment and management.

Routine and specialised monitoring, regulatory reporting, document submission and application support form part of our experience. Although our operations are based around three core technical streams, the value-add that we provide is the ability to incorporate and understand each technical stream during project delivery. Many of our projects are multi-disciplinary, and often involve collaboration with external parties.
EXPERIENCE

TOTAL WATER MANAGEMENT SOLUTIONS
- Field campaign design, implementation and management
- Baseline, impact and mitigation assessments
- Permitting, licensing and approvals
- Monitoring and compliance reporting
- Whole of project water balance investigations
- System conceptualisation and modelling
- Infrastructure design, construction support and monitoring

MIN CLOSURE AND REHABILITATION
- Local to regional hydrological and hydrogeological studies
- Post-closure groundwater modelling, saturated / unsaturated, 2D / 3D – cover design, groundwater rebound, pit lake recovery
- Contaminant fate and transport assessments
- Geochemical integration
- Mitigation selection processes, design and commissioning
- Analytical and empirical water quality models
- Risk assessment and management of residual risks
- Cover design

DATA COLLECTION AND CHARACTERISATION
- Geotechnical core logging and televiewer data analysis
- Laboratory testing programs
- Field mapping, including photogrammetry
- Rock-mass classification studies and geotechnical model domain development
- Groundwater / pore-pressure investigations – hydraulic testing, pore-pressure instrumentation
- Systems conceptualisation

PLANNING AND ENGINEERING
- Environmental Impact Statement
- Scoping, feasibility and detailed design
- Tailings, waste and water planning
- Access, mine industrial area and haul road design
- Contract management
- Cost estimation
- Quality assurance, as-constructed review and RPEQ certification
- Tender and construction packages including scope of works, design and drawings

SURFACE WATER MANAGEMENT
- Hydrology and watercourse mapping
- Water management structures, diversion drainage, raw water storage, sedimentation basins and contaminated water management
- Site wide water balance modelling
- Erosion and sediment control plans, audits and construction team capacity building programs
- Dam failure assessment and flood inundation modelling

PROJECT WATER BALANCE
- Site wide or facility specific water balances
- Deterministic and probabilistic predictions
- Coupled water balance and geochemical studies
- Fully integrated water balance and water quality models
- Option analysis, compliance assessment, water treatment costs
- Stochastic modelling and monte carlo simulations

CLIENTS

QLD Coal Investments, QLD
Quintette Coal Project, BC
Tampakan Project, Philippines
Namosi Gold Project, Fiji
Ok Tedi Gold Mine, PNG
Grasberg Mine, Indonesia

Glencore Coal, QLD
Quintette Coal Project, BC
Mt Isa Mines, QLD
Tampakan Project, Philippines
Ok Tedi Mine, PNG
Lihir Gold Mine, PNG
McArthur River Mine, NT
Browns Range Project, WA

Hidden Valley Gold Mine, PNG
Brockman Syncline 4MM, WA
Silvergrass Project, WA
Beal Mountain Mine, USA
Endako Mine, BC
Rovina Valley Project, Romania
Bell-Granisle Project, BC

Hidden Valley, PNG
Ok Tedi, PNG
FMG, WA
Collingwood Mine, North QLD
Lady Annie Copper Project, QLD
Koniombo, NC
Nullagine, WA

Quintette Coal Project, BC
Handlebar Hill and Mount Isa Mines, QLD
Wafi Golpu Project, PNG
Lady Annie Copper Project, QLD
Namosi Gold Project, Fiji
Mt Oxide Project, QLD
Koniombo, NC

Mt Isa Mines, QLD
Namosi, Fiji
Lihir, PNG
Antamina, Peru
Nullagine, WA

2010 Consult Australia Award
water quality model in GoldSim
<table>
<thead>
<tr>
<th>EXPERIENCE</th>
<th>SERVICES</th>
<th>CLIENTS</th>
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<tbody>
<tr>
<td>GEOCHEMISTRY AND DISCHARGE WATER QUALITY PREDICTION</td>
<td>• Acid rock drainage/neutral mine drainage assessment</td>
<td>Glencore Coal, QLD</td>
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<td></td>
<td>• Geochemical input for design-operation of waste facilities</td>
<td>Quintette Coal Project, BC</td>
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<td>• Mitigation of mine water impacts</td>
<td>Mt Isa Mines, QLD</td>
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<td></td>
<td>• EIS/EIA/ESIA support and Input to closure planning</td>
<td>Tampakan Project, Philippines</td>
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<td>• Geochemical water quality modeling</td>
<td>Ok Tedi Gold Mine, PNG</td>
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<td></td>
<td>• Prediction of mobility/attenuation of metals and salinity</td>
<td>Antamina Mine, Peru</td>
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<td>• Integrated water balance/water quality models</td>
<td>Balranald Project, NSW</td>
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<td>MINE OPERATIONS SUPPORT</td>
<td>• Open pit slope management program development and review</td>
<td>McArthur River Mine, NT</td>
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<td>• Geotechnical domain model and pit slope design development, update and review</td>
<td>Hidden Valley Gold Mine, PNG</td>
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<td>• Ground control and geotechnical hazard management plan development and review</td>
<td>Brockman Syncline 4MM, WA</td>
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<td>• Pit slope monitoring requirement planning and augmentation</td>
<td>Silvergrass Project, WA</td>
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<td>STABILITY ASSESSMENT AND DESIGN</td>
<td>• Pit slope stability analyses – bench, inter-ramp and overall slope scale</td>
<td>Beal Mountain Mine, USA</td>
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<td>• Reconciliation studies – cut-back slopes for pit design optimisation</td>
<td>Endako Mine, BC</td>
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<td>• Slope assessment and failure back-analysis</td>
<td>Bell-Granisile Project, BC</td>
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<td>• Kinematic, probabilistic and numerical stability analysis (SlopeW, Dips</td>
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<td>SWedge, RocPlane, Slide, Flac3D, UDEC)</td>
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<tr>
<td></td>
<td>• Pit dewatering / depressurisation systems development and implementation for slope stability</td>
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<td>• Surface water management controls</td>
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<td>• Geotechnical review of open studies – scoping to feasibility level</td>
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<td>WATER SUPPLY</td>
<td>• Groundwater supply target development and exploration</td>
<td>QLD Coal Investments, QLD</td>
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<td>• Borefield design, optimisation, impact management planning,</td>
<td>Lady Annie Copper Project, QLD</td>
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<td>commissioning and operations</td>
<td>Mt Isa Mines, QLD</td>
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<td>• Surface water reliability assessments, quality assessment and weir design</td>
<td>Lihir Gold Mine, PNG</td>
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<td>• Water quality assessments, treatment advice</td>
<td>Browns Range Project, WA</td>
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<td>• Monitoring network design, installation and commissioning</td>
<td>Nullagine Gold Project, WA</td>
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<td>• Bore performance assessment and rehabilitation</td>
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<td>• Reticulation design, pumping and power requirements</td>
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<td>• Pipeline corridor design and construction support</td>
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<td>MINE DEWATERING / DEPRESSURISATION</td>
<td>• Mine plan and geological model integration</td>
<td>QLD Coal Investments, QLD</td>
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<td>• System design, scheduling and optimisation</td>
<td>Quintette Coal Project, BC</td>
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<td>• Pumping and reticulation design and commissioning</td>
<td>Mt Isa Mines, QLD</td>
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<td></td>
<td>• System performance monitoring and operations advice</td>
<td>Vale Coro Nickel, NC</td>
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<td>• Pit slope design integration</td>
<td>Namosi Gold Project, Fiji</td>
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<td></td>
<td>• Groundwater modelling – inflow assessment, pore pressure simulation</td>
<td>Lihir Gold Mine, PNG</td>
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<td></td>
<td>(2D / 3D models)</td>
<td>Hon Chong, Vietnam</td>
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<td></td>
<td>• Post mining groundwater (underground / pit lake) recovery</td>
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<td></td>
<td>• Long term void water quality and water balance assessment</td>
<td>Nullagine Gold Project, WA</td>
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Chris Langton, General Manager, Australasia, has over 28 years of groundwater and environmental project experience in the oil and gas, mining and infrastructure sectors in Australia, Canada, Africa, Asia and the Pacific.

Chris Dickinson, Australasia, Principal Hydrogeologist, has over 23 years of experience as a geologist, with almost 20 years as a consulting hydrogeologist working in Australia, Asia, Canada and the Pacific.

Steve Flynn, Manager – Engineering, has over 20 years of international geotechnical engineering experience for mining and construction industries.

Brent Usher, Manager – Geosciences, has over 19 years of international experience in the field of hydrogeology and aqueous geochemistry in Australia, Africa, South America and the Pacific.

Chris Strachotta, Manager Growth and Expansion, Senior Hydrogeologist, has over 19 years of experience in Australia, South America, Asia, Europe and the Pacific.

Matthew Ind, Senior Civil Engineer, has over 17 years of experience in managing and leading civil engineering and surface water engineering projects in Australia and overseas.

Jan Van Rensburg, Senior Geotechnical Engineer, has over 16 years of experience in managing and leading open pit geotechnical projects in Australia, Africa, Asia and the Pacific.

OUR MISSION

To attract, develop, and retain talented staff and quality clients who thrive on challenging projects

OUR VALUES

- People First
- Health & Safety
- Sustainability
- A respectful, satisfying and fun workplace
- Professionalism
- Quality
- Innovation
- Technical Excellence

OUR VISION

Excellence, teamwork, and innovation building a better world

OUR CLIENTS INCLUDE:

Anglo Coal, QLD
BHP Billiton, QLD
Billiton Mitsubishi Alliance, QLD
Cockatoo Coal Ltd, QLD
Glencore Coal, QLD
QLD Coal Investments, QLD
Rio Tinto, QLD
QWC, QLD
Xstrata Coal, QLD
TECK Coal, Canada
Vista Coal Project, Canada