# Added Value to an Indonesian Client

**PT** Indo Tambangraya Megah Tbk recently commissioned SRK to conduct an independent review of the resources, reserves and mining operations of all the company's coal mining assets in Indonesia, to support an initial public offering of shares on the Jakarta Stock Exchange.

This is the latest step in SRK's continuous involvement with the parent company, Banpu Public Company Limited, based in Thailand.

Beginning in 2001, SRK assisted in evaluating the acquisition of several major concessions in Indonesia; the company that resulted is now ranked third in Indonesia in terms of coal production. Subsequently, SRK has carried out various audits and independent reviews of the resources and reserves for several of their coal producing projects.

Previous estimates, which were carried out to meet various international classification systems, were not consistent from mine to mine. This has resulted from asset acquisitions from different companies.

However, the geological and engineering staffs are professionally qualified and trained and use methods of data gathering, modeling and assessment that are well established and accepted internationally within the coal industry. Under SRK's guidance, the company is now standardizing internal procedures to provide a consistent base of information to international standards, upon which senior management and investors can thoroughly rely, based on the principles and definitions of the Australian Code for reporting Mineral Resources and Ore Reserves (the JORC coal reporting code).

SRK reviewed the quantity and quality of the underlying data and the methodologies used by the company to derive its previous resource and reserve estimates and made adjustments as appropriate. Full account was taken of current best international practice; projected future operating costs; capital expenditure and reserve depletion schedules; and socio-economic and environmental issues that must be addressed both during the life of the coal operations and after closure.

SRK has an established and proven track record in providing evaluations to bankable standards within the mining finance sector world-wide, and will hopefully continue to assist with the standardization of reporting of information for Banpu as it does for all its clients.

Sean Cremin: scremin@srk.co.uk

## Danielle Kyan

**D**anielle has been working as a GIS and geological consultant for the past 6 years. She is experienced in a number of GIS packages including MapInfo, ArcView, ArcGIS, GPInfo and GoCad. Danielle has a background in geology, having completed an honours degree on "The use of HyMap to map regolith materials at the Challenger Deposit, Gawler Craton, SA" in 2000. She also has experience in image processing, graphic design, research, data management and GIS tutorials. Danielle provides GIS, image processing and geological support on large scale projects like the structural framework and risk analysis studies of Sydney Basin and Bowen-Surat Basin and on project-scale geological compilation and interpretive studies. She has experience with a range of remote sensing data including Landsat, ASTER, SPOT and HyMap.

Danielle Kyan: dkyan@srk.com.au

*Danielle Kyan*

## Gerry McCaughan

**G**erry has more than 9 years of experience as a Geologist, including 3 years in the coal and mineral industries in Australia, in both exploration and mining. Before arriving in Australia, Gerry completed a PhD at Trinity College, Dublin, completing a thesis on anomalous heating rates of Jurassic hydrocarbon source rocks in Scotland and Ireland, for the petroleum industry. Since joining SRK in 2006, Gerry has been involved in work on the Bowen-Surat Basin structural framework study, exploration targeting and structural geology risk-analysis for the coal industry, and coal resource estimation.

Gerry McCaughan: gmccaughan@srk.com.au

*Gerry McCaughan*

# Exploration and GIS

**SRK** is often asked to provide geological expertise in the early stages of a coal exploration program. In identifying new opportunities and areas for exploration, typically SRK recommends that the first stage in any greenfields exploration should involve a collation of all relevant open-file data, integrating it into a GIS-based work platform or equivalent, followed by an assessment of the data and the construction of a preliminary geological model.

To better understand the geology of a prospect area and develop new, at times high risk, exploration targets, particularly in an area of extensive activity, it is useful (arguably critical) to place the area in its regional geological context. To do this effectively, we recommend that data collation and interpretation extend more broadly than the confines of the exploration tenements themselves.

Collecting data not only from historical coal exploration (borehole data, seismic line data, geological maps) and the geophysics of the region (magnetics & gravity, etc) but also from waterbore or minerals exploration work can be valuable.

The model to be developed may need to consider the depth of economic cover, depth to the containing basement in addition to a preliminary structural framework. The



model may also need to identify likely active basement or early forming basin faults, if the targeted coal-bearing sequences occur early in a basin's depositional history.

In most cases, a robust sub-regional geological model can be constructed from regional geophysical and coal geological datasets of variable detail and reliability. The model and supporting datasets then provide:

- a context for placing and assessing a lease's exploration potential
- a solid platform for exploration to build a lease-scale structural model and reduce geological uncertainty

By creating a single work platform of information, new data can be evaluated rapidly against the existing model and datasets and interpretations can be refined. Where this approach is adopted, ongoing exploration will likely demonstrate noticeable benefits including more cost effective and efficient exploration targeting and prospectivity ranking of target areas.

While the approach can be applied at any stage of an exploration program, it can help avoid wasted exploration focus and expenditure if adopted in the early stages of lease exploration work.

SRK has recently helped Excel Coal (now Peabody Energy Australia) and Conarco in their joint-venture to construct an accessible GIS platform and geological model for the area containing their coal exploration tenements along the margins of the Permian-aged Bowen Basin, in Central Queensland, Australia. The GIS and geological model were constructed soon after acquiring the leases, before field visits and the start of exploratory drilling. Target coal-bearing sequences included early Permian depo-centres, which involve more locally developed, higher risk exploration plays.

Bryce Healy: bhealy@srk.com.au
Danielle Kyan: dkyan@srk.com.au
Gerry McCaughan: gmccaughan@srk.com.au
Chris Woodfull: cwoodfull@srk.com.au

# Griffin Coal – Geological Modeling and Resource Estimation

**S**ince Griffin Coal commenced operations in the Collie Coalfields of Western Australia in 1927, it has evolved into a major open cut mining operation, producing 4 million tonnes a year of predominantly low ash, high volatile thermal coal, from its Muja and Ewington mining operations.

SRK has been involved with Griffin Coal since 2005, and most recently was commissioned to:

• Conduct a full and comprehensive review of the existing geological models

• Develop new audited and robust geological models in Minex

• Provide JORC Coal Resource estimates for two of the Collie Basin deposits

The Collie Basin is a bilobate Permian fault-bounded sedimentary basin, its two lobes trending northwest-southeast, lying over Archaean basement rocks of the Yilgarn Craton. Griffin's coal resources are located in two separate areas of the basin: Ewington in the north and Muja/Buckingham in the south. Resources are contained in the Permian-aged Collie Group, consisting of five formations, three of which are coal-bearing. The oldest of these coal-bearing sequences is the Ewington Coal Measures, followed by the Premier Coal Measures, with the younger Muja Coal Measures sitting on top of the Collie Group. The deposits are complex, with multiple seams of varying quality and thickness (1m – 13m), complex seam splitting, large faults (50m – 250m), rapid changes in dip, and

thick barren zones (>50m) between coal measure sequences.

Dr. Gerry McCaughan, SRK Maitland, Pat Hanna, SRK Brisbane and other team members took on the project of reviewing and estimating the coal resources for the Buckingham and Ewington deposits. The first step in the work program involved a full and thorough data validation check of all of the borehole data from the existing Minescape (Mincom) database. The team cross-checked the original data, such as the coal seam intervals, downhole geophysical logs and the laboratory reports, with the data stored in Minescape from which the existing geological models were derived.

When the validation phase was completed, they built new databases in Minex for the Buckingham and Ewington resource areas. The structure was checked and modified, consistent with borehole data. They then redeveloped five previously independent Minescape geological models into a single integrated Minex geological model for each of the Buckingham and Ewington Resource areas.

SRK provided an independent JORC Resources statement for the integrated Buckingham Resource in April 2007. A JORC Resource statement for the Ewington Coal Deposit was completed in July 2007.

Pat Hanna: phanna@srk.com.au
Gerry McCaughan: gmccaughan@srk.com.au

## Sean Cremin

**S**ean Cremin is a Principal Mining Engineer with over 26 years of practical production and mine evaluation experience. Before joining SRK in 2000, he spent 14 years with a major international mining contractor, responsible for evaluating, engineering and planning international open pit coal and metalliferous projects, and for mining contracts within the UK. Experienced with both surface and underground hard-rock mining, he specializes in operational assistance, planning and design for open pit coal mining. He has consulted in many countries worldwide.

*Sean Cremin*

More recently, his SRK assignments include practical assistance for Jamaican bauxite, expert witness and operational audits in the UK, strategic financial analysis in Ghana, due diligence in Indonesia and technical auditing in Brazil.

Sean Cremin: scremin@srk.co.uk
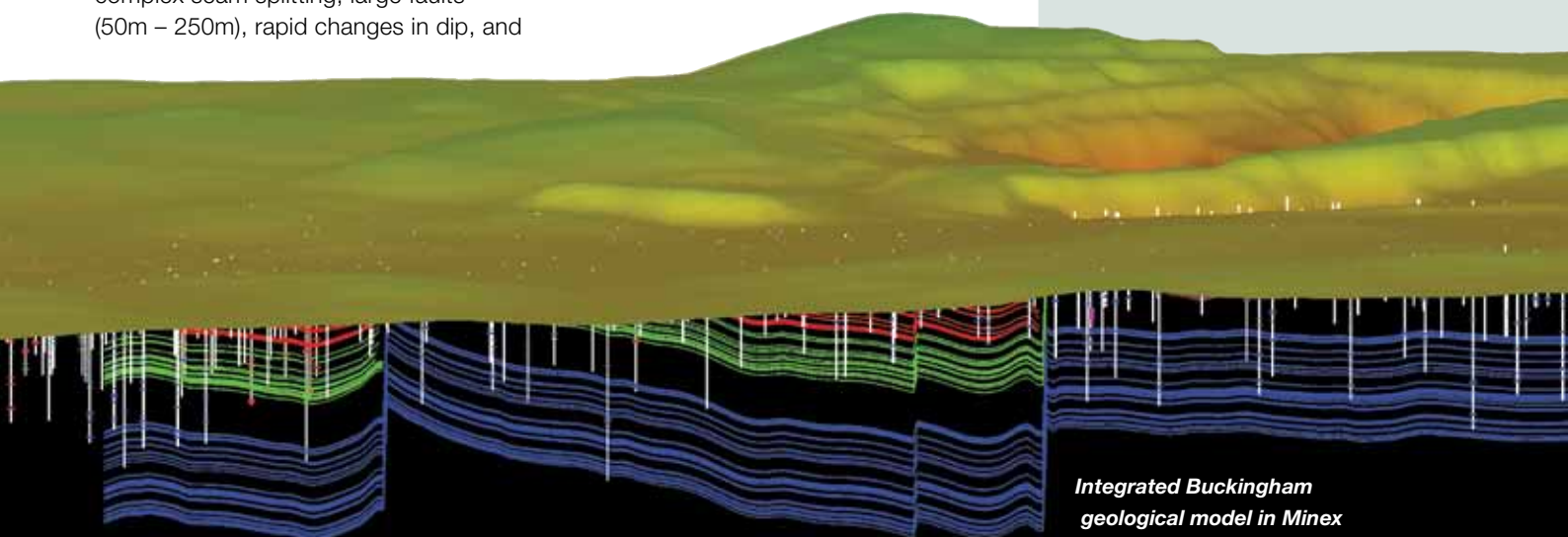
*Integrated Buckingham geological model in Minex*

## Pat Hanna

**P**at has over 25 years' experience as a Coal Geologist in exploration management and resource evaluation for both open cut and underground mining projects. As a Company Director of ECS International, he was directly involved

*Pat Hanna*

in software development, training, support and consulting for the Minex suite of software. Pat's international experience extends to the US, South Africa, India, Ukraine, Thailand, Japan, Philippines, New Zealand, and Indonesia, where he recently spent two years as a Coal Consultant. Pat's capabilities include: coal resource evaluation in accordance with the JORC Code, exploration project management, geological contribution to feasibility studies and bankable documentation, technical auditing and due diligence studies, and advice on coal products for mining and marketing purposes.

Pat Hanna: phanna@srk.com.au

## Brian Connolly

**B**rian Connolly, a Principal Mining Engineer in SRK's Toronto office, has 30 years of diversified experience in open pit coal, base and precious metal, diamond, oil sand, and mineral sand projects. His broad background

*Brian Connolly*

ranges from mine planning, blasting, equipment studies, and cost estimating to, feasibility studies, due diligence audits, permit applications, and economic evaluations.

Brian's experience with coal includes 14 years in engineering and management at a multi-pit metallurgical coal operation in BC; feasibility studies for BC's Bullmoose coal project; scoping analysis of a US lignite coal deposit; due diligence for a western Canadian coal project; and technical review and reserve estimation for thermal coal mines in Kazakhstan.

Brian Connolly: bconnolly@srk.com

# Caledon's Revolutionary Cook Colliery



**Flexiveyor Intermediate Cars**

**Flexiveyor Loading Car**

**Prairie Machine & Parts Flexiveyor**

**Flexiveyor Discharge Car**

**Flexiveyor Fan Car**

Fan
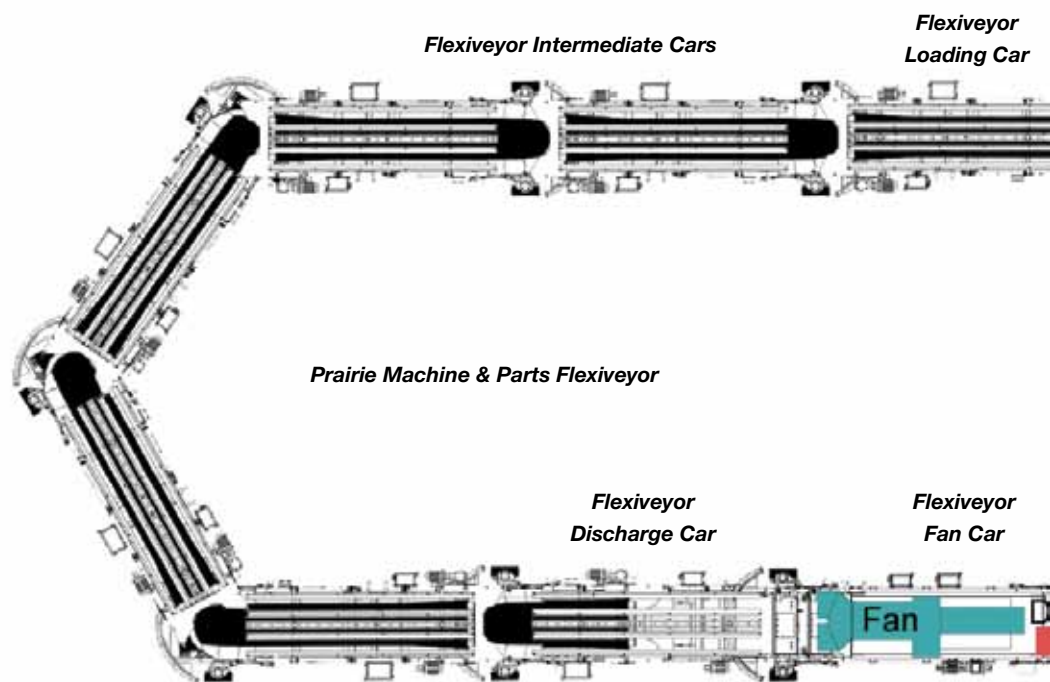
*Schematic diagram of*

**C**aledon Coal Pty Limited acquired Cook Colliery, situated 30 kilometres south of Blackwater in Central Queensland, Australia, from Xstrata Coal Australia in 2006. SRK Consulting (Australasia) supported Caledon's acquisition by completing a due diligence and compiling a Competent Person's Report to list and raise equity finance on AIM in London.

Using the mining method dubbed "Linear Mining" is a first for Australia although variations have been used extensively in South Africa and the US (SRK in South Africa completed a technical due diligence on the mining system in early 2006). The method uses a totally automated system, known as "Magatar" with Prairie Mining's "Flexiveyor" continuous haulage system, a belt storage magazine, mobile tail-end and expandable belt support cartridges. Cook Colliery is employing Voest-Alpine ABM25 bolter-miners to simultaneously cut and bolt ahead of the continuous haulage system. The separate units are based on proven technology, for example, the Flexiveyor system has been used in potash operations in Canada.

Caledon Coal expects in the order of about 1 million tonnes a year for each operating

system – a breakthrough production level for continuous miners in Australia.

This revolutionary mining method lends itself to increased production capacities with the flexibility of underground continuous miner operations in more faulted reserve areas. The Magatar mining system and linear mining approach are highly applicable to Cook Colliery, where attempts to effectively implement longwall methods have failed in the past. Panel layouts are designed to maximize extraction with minimum tramming and relocation of equipment. Preliminary investigative work by SRK Australasia further indicates that pillar extraction is a possibility, which can significantly increase extraction factors – although this is a topic for further investigation.

Magatar Mining carried out extensive simulation exercises in South Africa with a comparative underground bord-and-pillar panel and claims the following improvements:

- Doubling or tripling production rates depending on mining height

- Decrease of 15% to 33% in operating cost

- Reduction of manpower requirements between 25% and 30%
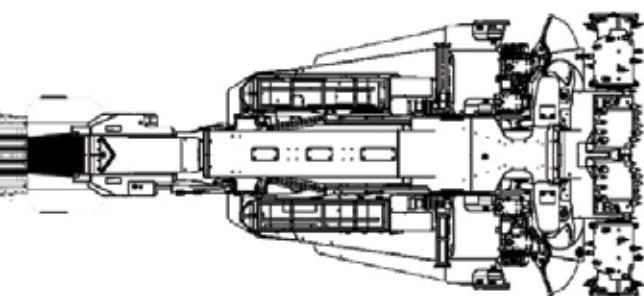
*Voest Alpine Bolter Miner ABM25*
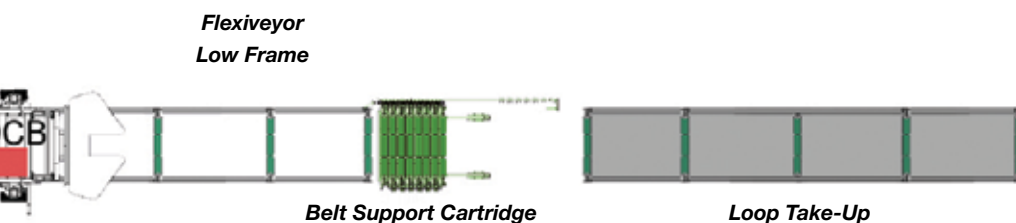
**Flexiveyor**
**Low Frame**



*Belt Support Cartridge*                    *Loop Take-Up*

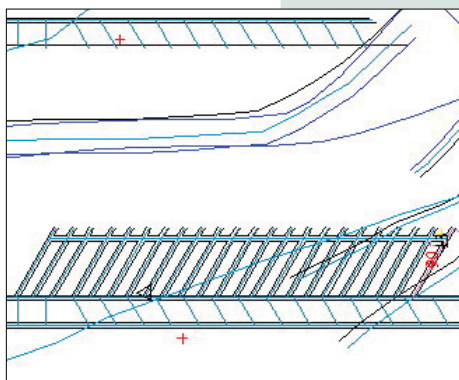*Magatar Mining System*

## Dino Pilotto



*Dino Pilotto*

**D**ino is a Senior Mining Consultant in our Saskatoon office with over 18 years of experience. After completing his B.A.Sc. degree in Mining and Mineral Processing from the University of British Columbia, he gained experience with Quintette Coal, and then worked underground for the Giant Yellowknife gold mine on drilling, blasting, mine design and planning. He spent a year with a geologic consulting firm conducting scoping and feasibility work before joining Elk Valley Coal for nine years where his work covered drilling, blasting, dispatch, long range planning, pit design and optimization.

For SRK, he has returned to Elk Valley Coal in a consulting capacity, preparing a life-of-mine plan for one of their operations; and he has taken on short range mine planning as well as a prefeasibility project for Sherwood Copper at their Minto Project in the Yukon. Dino specializes in mine design and planning, pit optimization, as well as short range planning. His strengths are based on actual operational and design experience in open pit coal mining scenarios.

Dino Pilotto: dpilotto@srk.com

• Decrease of equipment maneuvering by approximately 60%

As a new entrant to the coal industry, Caledon Coal's progressive thinking is designed to minimize risk and reduce cost, but also to secure access to well-established services on site from within the industry. A sub-lease agreement with Cook Resource Mining Pty Ltd and Xstrata (the former owner and parent company of Cook) gives Caledon exclusive rights to produce coal from the Cook Mining sub-lease area and exclusive rights to use the established Cook Resource Mining coal preparation plant on a unit-rate basis.

Under the agreement, Xstrata is responsible for any environmental liabilities that arise in relation to their operations before the acquisition, while Caledon Coal assumes responsibility for any potential environmental liabilities of its operations after the acquisition. Caledon Coal also entered into a water lease agreement with Cook Resource Mining for right of access to water supply for mining activities.

Through a marketing services agreement, Xstrata markets and sells Cook Colliery coal on behalf of Caledon Coal; Xstrata is expected to secure the best possible sales price considering product quality and current market conditions, and it retains the right to acquire the coal if required. The marketing services agreement continues for the term of the mining sub-lease agreement.

A logistics agreement with Xstrata provides for cooperation in securing rail and port capacity for the Cook Colliery's coal production over the term of the sub-lease.

Caledon Coal also owns rights to the Minyango deposit adjacent to Cook Colliery, which offers significant reserve potential and a synergistic opportunity for using infrastructure and other facilities.

SRK Brisbane: brisbane@srk.com.au



*Typical Linear Mining panel layouts within structural constraints*

5

# Roger Howell

**R**oger worked for Hydrologic Consultants Inc. of Colorado for 13 years and prior to that spent 10 years as a mineral exploration geologist. Roger applies analytical hydrogeology, economic geology, geochemistry, and extensive field

*Roger Howell*

experience to the design and management of mine-dewatering, mine-water supply, water-disposal, and environmental-impact studies. Major projects have included multi-year investigations to design, secure permits, and construct a perimeter-well dewatering system for a diamond mine in Northern Ontario; development of grouting and water-handling strategies for an underground platinum mine in Montana; analysis of the stratigraphy and mineralogy of alluvial-pyroclastic basins in Nevada; and coal-mine dewatering and coal-bed methane studies in Wyoming and Utah.

Roger Howell: rhowell@srk.com

# Vladimir Ugorets

**V**ladimir worked for Hydrologic Consultants Inc. of Colorado for 12 years, and at HYDEC in Moscow; he has 17 years of hydrogeological experience in Russia. Vladimir's expertise includes mining hydrogeology, water supply, numerical

*Vladimir Ugorets*

groundwater flow and solute–transport modeling, optimizing dewatering systems, designing extraction/injection wellfields, remediating ground-water contamination, and ground-water management. Major projects include conceptual and numerical modeling of dewatering requirements and environmental impacts of two underground coal mines in the US and five diamond and gold mines in Canada; modeling the complex hydrology of open-pit and underground block cave operations in Indonesia; developing an integrated model to optimize an ISL project and modeling optimal yield for numerous water-supply projects in Russia.

Vladimir Ugorets: vugorets@srk.com

# Coal Mine Dewatering



*Unstable highwall due to saturated overburden in the Fort Union Fm., Powder River Basin, Wyoming*

**R**oger Howell and Vladimir Ugorets recently joined SRK (US) bringing with them significant experience in the fields of coal hydrogeology and coal mine dewatering. At the Skyline longwall coal mine in Utah, the two teamed up to determine the source of large, persistent groundwater inflows emanating from fracture intersections. Using forensic hydrology, geochemistry, and heuristic groundwater flow modeling, they showed that the origin of the inflows was within a thick stack of shoreface sandstones underlying estuarine and lagoonal coals and interbedded shales of the Cretaceous Blackhawk Formation.

The Skyline project included the installation of large diameter interception wells, modeling of existing hydrogeological conditions, and prediction of long term dewatering requirements for mine expansion. The project included a numerical assessment of the probable hydrologic consequences for surface resources resulting from the mine's expansion.

At an open pit coal mine in the Powder River Basin, Wyoming, the problem was too little drainage of water from the channel and crevasse-splay sands and overbank mudstones, which lie over the coal seams. Groundwater in overburden was not draining ahead of mine advancement, and the residual moisture impeded excavation, caused combustion hazards in the coal, and left unstable working faces and spoil slopes. A program of field testing and groundwater modeling provided the necessary data

to optimize the number and sequence of pumping wells in the coal, and to design a pattern of pumpless, passive drainwells to remove additional water from the overburden. The project included recommendations to significantly cut costs of drilling and well installation, monitoring and assessing the effects of nearby coal bed methane development, and the design of deep, large capacity water supply wells.

Other coal hydrogeology projects that Roger Howell and Vladimir Ugorets have directed include:

- An audit and risk analysis of a room and pillar mine in Colorado as part of due diligence for conversion to longwall mining

- Water chemistry and structural analyses to fingerprint the source of groundwater inflows, predict future inflow durations, and identify mitigation options for an Illinois mine

- Numerical modeling of dewatering requirements at a West Virginia mine, and assessment of the impacts of dewatering on local groundwater resources

- Development of a comprehensive Basin Water Management Plan for an extensive coal bed methane (CBM) development in Wyoming, including predicting the water chemistry in multiple mixing zones, and evaluating water disposal and mitigation options

Roger Howell: rhowell@srk.com
Vladimir Ugorets: vugorets@srk.com

# Greenfields Coal Exploration in Southern Africa

**M**ining exploration came to a halt in Mozambique in southern Africa when civil war broke out in the seventies. Only since 2002 have companies started to conduct exploration work again. Last year, SRK began evaluating coal deposits east of the town of Tete, in the Tete province in Mozambique.

Tete, which lies just southwest of the Cahorra Bassa Dam on the Zambezi River, boasts summer temperatures that often exceed 50ºC with 90% humidity. The rainy season, which runs from November to March, limits exploration work, particularly drilling. As a result, the majority of work can only be undertaken from the end of March to October.

SRK has completed a regional geological evaluation, coal geology evaluation and the scoping of further exploration studies for its client, Black Gold Mining Lda. This undertaking, which required an evaluation of previous exploration work, leading to an interpretation of potential target areas for further exploration, was used by the client for marketing purposes.

Another similar project, also situated in Tete – Strata Capital Plc's Ncondezi coal project – required an evaluation of previous exploration work leading to an interpretation of potential target areas for further work and the design of a suitable exploration program.

Landsat and Aeromagnetic interpretations, as well as aerial photography interpretations, have been done to determine the extent of coal-bearing strata and the structural regime. The team has designed a drilling program based on the results of the interpretations. When drilling is completed, a 3D geological model and coal resource evaluation will be done.

Also, the Osho Group of Companies has 33 prospects and concessions throughout the country, of which the majority are for coal. They stretch from just south of Maputo to the Tanzanian border, to as far east as the top of Crook's Corner of Kruger Park and Tete, through to the coast of Mozambique. This exciting project requires evaluation and recommendations for further work. It is truly a greenfields project, carried out in extremely remote areas with virtually no infrastructure.

Andy Birtles: abirtles@srk.co.za
Grant van Heerden: gvanheerden@srk.co.za

*Ncondezi village which is situated on the concession area*

# Andy Birtles

**A**ndy Birtles holds a BSc Hons (Mining Engineering) from Nottingham University, England. He is a Principal Mining Engineer in the Mining Business Unit at SRK Consulting in Johannesburg, South Africa, and heads the Coal Mining Section of the Unit.



*Andy Birtles*

Andy is involved in the management and performance of multi-disciplinary teams that carry out due diligence evaluations of opencast and underground mines, develop competent persons' reports, mine planning and feasibility studies, as well as mining method selection studies and technical evaluations. He has experience working on projects in many countries, including the Republic of South Africa, the UK, Russia, Australia, Nigeria, Mozambique, Namibia, and Botswana, Zambia and Zimbabwe.

Andy has professional registrations as a Chartered Engineer with the Engineering Council (UK), and as a registered Professional Engineer with the Engineering Council of South Africa. He holds a South African Mine Manager's Certificate and a First Class Certificate of Competency for coal (fiery) mines in the UK. His memberships include those of the SA Colliery Managers Association, the SA Institute of Mining and Metallurgy and the Fossil Fuel Foundation of Africa.

Andy Birtles: abirtles@srk.co.za

# The Coal Team in South Africa

**T**he SRK Coal Team has a well-established track record in the industry, with a collective 57 years of experience in this industry sector.

*Andy Birtles* is an Associate and Principal Mining Engineer and is registered with The Engineering Council of South Africa (ECSA). He has specialised in the field of coal mining since 1979 and heavy minerals since 1999, and is involved in the management and coordination of multi-disciplinary teams for due diligence exercises, competent persons' reports (CPRs), valuations and feasibility studies. Andy has worked on projects in South Africa, Africa and internationally.

*Grant van Heerden*, is a Senior Coal Geologist and is registered with 'South African Council for Natural Scientific Professions (SACNASP). He works on various coal resource and coal reserve estimation and evaluation projects and develops coal exploration

programs locally, in Botswana, other African countries and internationally. He also undertakes due diligence exercises, technical reviews of CPRs and the compilation of CPRs.



*Chris Wray*

*Philip van Vuuren*, a Mining Engineer, is an independent consultant with a wide range of experience in all types of mining operations, with special emphasis on computer based mine design and scheduling, and strategic and operational mine planning and budgeting. He has worked on projects in South Africa, Africa and internationally.

*Sello Mnisi*, a Senior Technical Consultant, is a recent addition to the coal team and is currently involved with company reviews for investment purposes. He also specialises in mining work programs, prospecting work programs and due diligence studies. He has a strong background in health and safety as well as mine economics and previously worked for the South African Department of Minerals and Energy.

Assisting 'Team Coal' on the GIS side is *Chris Wray*, a GIS consultant. With over 10 years of GIS experience to his name, his expertise includes GIS project management; spatial analysis, editing and detailed mapping using ESRI ArcMap packages; ArcIMS Internet GIS website and Enterprise Geodatabase development.

Andy Birtles: abirtles@srk.co.za
Grant van Heerden: gvanheerden@srk.co.za
Sello Mnisi: smnisi@srk.co.za
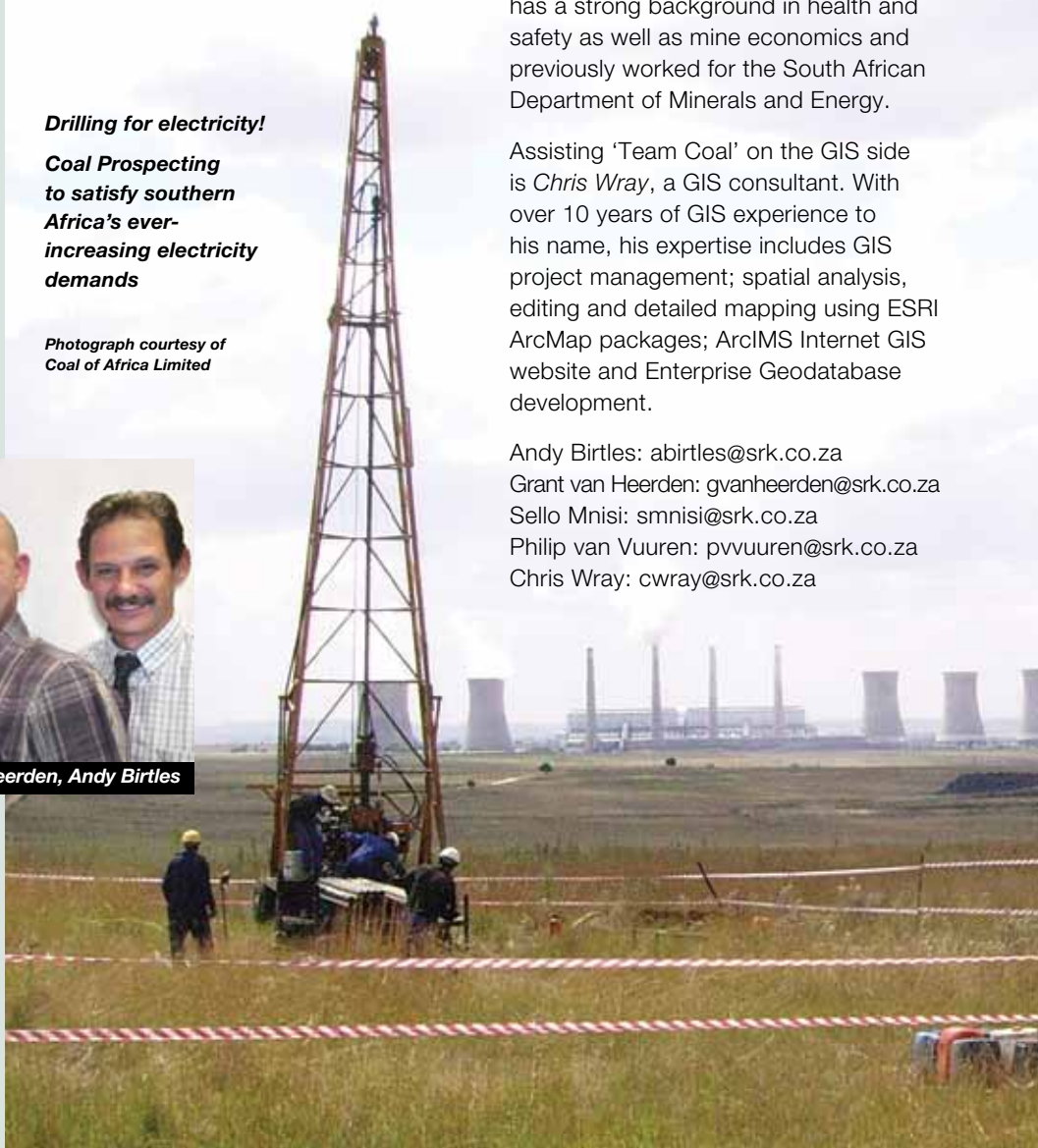Philip van Vuuren: pvvuuren@srk.co.za
Chris Wray: cwray@srk.co.za

**Drilling for electricity!**

**Coal Prospecting to satisfy southern Africa's ever-increasing electricity demands**

*Photograph courtesy of Coal of Africa Limited*



*L-R: Philip van Vuuren, Sello Mnisi, Grant van Heerden, Andy Birtles*

# Mining Prefeasibility Study for Morupule Power Station, Botswana



*Grant van Heerden with samples*

**W**ith energy demands rising sharply worldwide, Morupule Colliery Limited (MCL) in Botswana, a division of Debswana, is planning to increase its coal production to satisfy the proposed expansion of its Morupule power station, as well as to meet the needs of the local and cross-border markets.

In May this year, SRK began a mining prefeasibility study to address this proposed expansion. The study will take place over a three-to-four month period. This is the latest in a number of projects SRK has undertaken involving Morupule.

In 2005, MCL asked SRK to take existing coal data for the Kgaswe Prospecting Lease, located in the Morupule Coalfield, and examine the geology and coal quality. The main target is the Morupule seam, which is currently mined at MCL.

In early 2006, SRK assisted in determining the quantity of the coal resource available at MCL to support the proposed expansion of the Morupule power station. To allow a greater understanding of the coal deposit, the structure and the extent of the coal resource, the team created a 3D computer model of the deposit in Minescape – a software tool particularly effective in modelling coal deposits.

The 3D model was also used to determine an exploration program. It allowed SRK to recommend the siting of 3 additional boreholes, which allowed for 50% of the Morupule seam resource at MCL to be classified as a Measured Coal Resource.

To date, drilling has been completed with SRK responsible for the supervision, logging and coal sampling. Currently, the analysed results are being built into the 3D computer model. Re-estimation of the resource is being carried out to meet an internationally recognised mineral reporting code.

This particular phase of the project is almost complete.

Andy Birtles: abirtles@srk.co.za
Grant van Heerden: gvanheerden@srk.co.za

# Grant van Heerden



*Grant van Heerden*

**G**rant van Heerden is a Coal Geologist with SRK Consulting SA (Pty) Ltd, Johannesburg. He holds a B.Sc Geology and a B.Sc Hons Chemistry from the University of Natal, Pietermaritzburg. In 2001 he completed the Intermediate Management Development Programme at the University of Stellenbosch Graduate School of Business, and in 2004 the GDE Mining Engineering course at the University of the Witwatersrand.

As a registered geological scientist, Grant is a member of the Geological Society of SA; he was a Council Member from 1997 to 2004. He is currently a Council Member of the Fossil Fuel Foundation of Africa.

Since 1996, coal has been his specialty. Grant joined SRK Consulting in July 2005 and currently works on projects relating to coal exploration, geological modeling, coal resource classification and estimation, technical reviews and due diligence audits, preparing and compiling Competent Persons' Reports, Independent Technical Reports and Independent Engineering Reports for major organizations.

Grant van Heerden: gvanheerden@srk.co.za
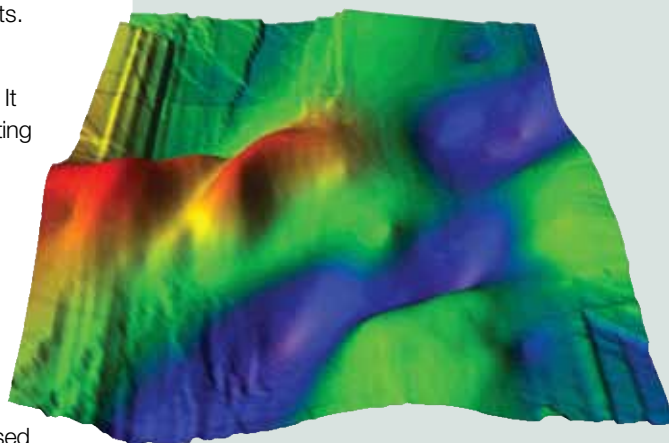
*3D view of coal seam topography*

9

# Subrato Ghosh

**S**ubrato manages SRK's new office in Kolkata, India. With over 17 years of experience working with software applications, he specializes in resource geology and computerized deposit modelling.

*Subrato Ghosh*

Subrato graduated from the Indian School of Mines in 1990, then spent a couple of years working as an exploration geologist with Hindustan Copper Limited, a copper mining organization in India. He is presently developing a core team of geologists and mining engineers with the aim of providing services for the exploration industry in India and neighbouring countries, including Indonesia.

Before joining SRK in August 2006, Subrato spent a major part of his time in mining IT consulting, including the promotion of mine planning software, software implementation and consulting projects that ranged from database management to geological report preparation and tactical mine planning. Subrato has participated in country-wide capacity building projects on behalf of DANIDA, assisting the Bhutan Geological Survey in computerized data and project management, including mine planning and GIS integration. Subrato gained experience with GIS at an IT company after leaving HCL.

Subrato has worked with multiple commodities: copper, iron, chromite, coal and lignite, gypsum and limestone. He is presently working on his PhD topic, which revolves around using geospatial systems in sustainable mine management.

Subrato Ghosh: sghosh@srk.com

# Mine Planning Software in the Coal Sector
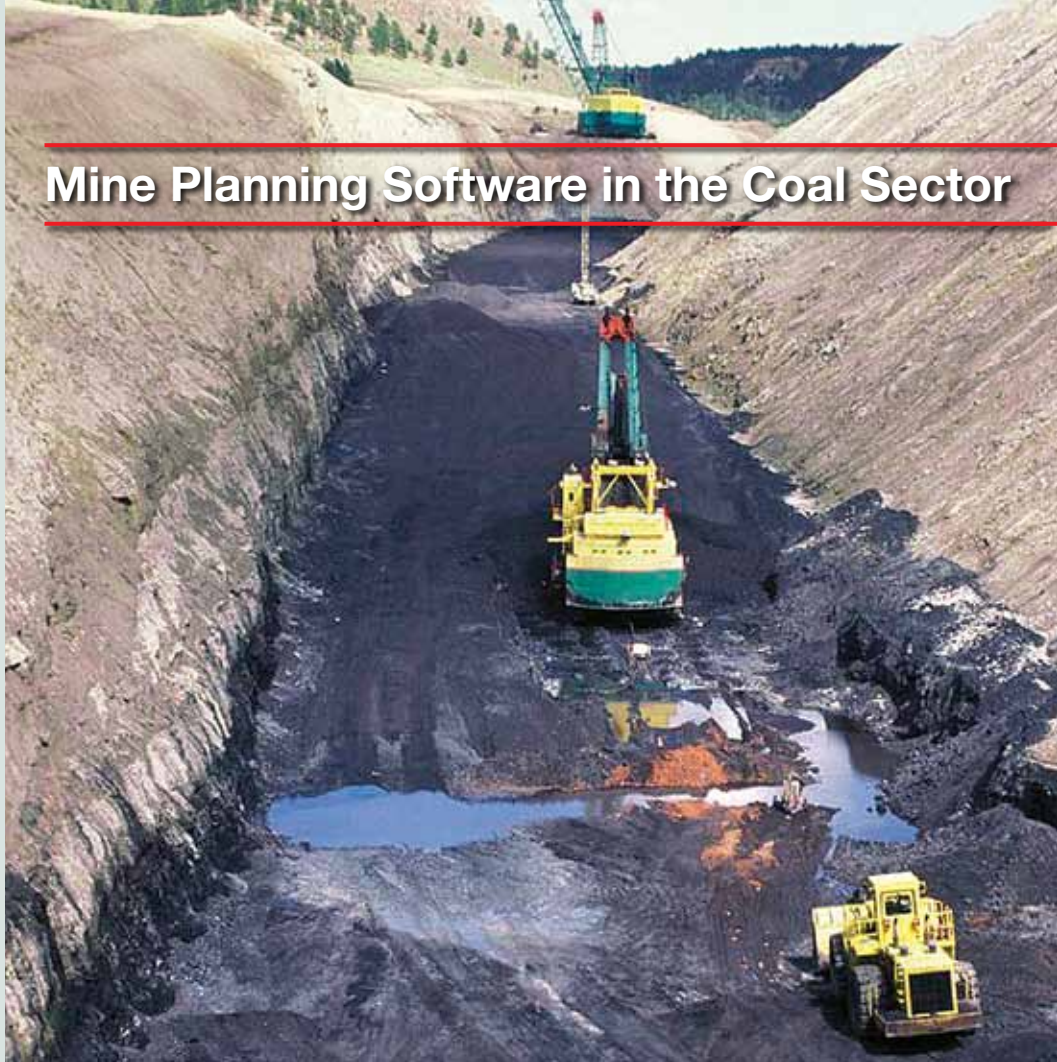


*Coal mining at Peabody Coal, Big Sky Mine, using the strip mine method*

**O**ne of the oldest industries in the history of man, mining has evolved over the centuries. Gone are the days of canaries in cages, pick-axes, and candle-lit headlamps. With Global Positioning Systems (GPS) and automated machinery, today's operating mines are at the cutting edge of technology – taking the best of space-age advances to drive the industry. The role of the engineer in mining operations has evolved along with the industry. Today's mining engineer is the link between production and technical services, determining the direction the project will take, and how it will get there.

The mining engineer looks for processes, not independent solutions that link the computer model of the geology to the production crews who recover the reserve. These processes are integrated with each other in a flow – Geological Model to Mine Design to Mine Plan to Production Schedule to Mine Reconciliation. A well-integrated process flow allows the engineer to mesh and sequence steps in the process, maintaining the consistency of data that leads to meaningful results.

The engineer employs the software systems that are most in demand in the industry. Historically, geological modeling and mine design and planning have been packaged together, while scheduling, reporting, and costing were often done using spreadsheets or a separate package. Many packages attempted to bridge this division, but due to their inability to effectively meet the requirements of mining operations, no clear leader has emerged in scheduling software. However, as scheduling software developers delve into mine design, while modelling companies increase their scheduling capabilities and expertise, the playing field levels out.

The typical requirements for planning and scheduling a mine include:

1. The Resource and Geological Model as a starting point for engineering design and planning work. It is a geologist's interpretation of drill hole information, and allows the engineer to visualize and suitably design access to the ore and decide on the methodology to extract it. In particular, SRK's in-house expertise can provide 3D geological models on nearly every computer system used around the world.
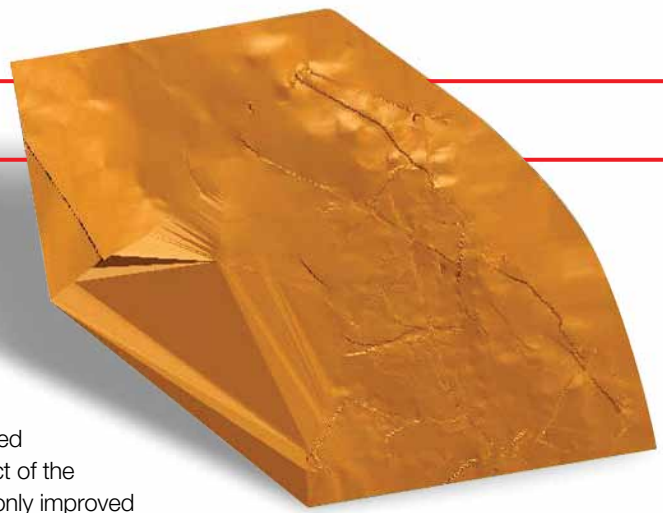
2. The Engineering Model is the key component in the planning and scheduling process. It uses engineering parameters to determine the extent of the deposit and assess the mineable quantities and qualities of ore. It provides the practical, mineable interpretation of the geological model.

3. The Scheduling Model is the tool used to determine the rate, quantity, and sustainability of the engineering model. Adding this "time" component allows the engineer to calculate what practical production can be generated and maintained over the course of the mine's life. It pinpoints periods of stress, where parameters may need to be modified to continue effective operations, and alerts the engineer to make adjustments to designs and plans to accommodate deficiencies in mine production before they become operational or contractual problems.

SRK is proficient in using proven geological modeling and design packages. SRK Australia has demonstrated its expertise in using the following packages:

- Gemcom
- Minescape
- Surpac
- Minesight
- Vulcan
- Minex
- Xpac

The most commonly used software packages in geological modeling for coal are MineScape and Minex. SRK Australia's coal group adds Surpac to the mix to calculate the reserves and conduct mine planning and scheduling of mining activities.

With these resources available in-house, the SRK coal group can provide a full range of services to the mining industry that cover geological modeling, mine planning and scheduling, for both open pit and underground coal mining projects and operations.

## Underground Mining

Underground mining is the oldest method of mining coal. From the late 1970s to early 1980s open pit operations increased, achieving high quantities of production and lower production costs. However, today, with environmental considerations and the greater depth of coal seam deposits, underground mining is proving to be the more viable alternative.

Underground mining technology has experienced a revolution in the last few centuries, from pick-and-shovel mining to fully automated systems in every aspect of the process. This has not only improved productivity by leaps and bounds but, more importantly, has significantly improved safety standards. Modern underground mines are highly mechanized as new technology continues to evolve.

This high level of mechanization must be accompanied by a high level of monitoring and reporting, as the investment in these systems is extremely costly. For example, the cost of a typical longwall installation could vary between A$100 million and A$300 million. Investments at that level must be supported by accurate geological data, resource and reserve estimation, mine planning and economic projections. The application of mine planning software systems contribute significantly to proving the economic viability of the mine, by handling large data sets with flexibility and speed. Using these tools engineers can assess the geological information, prepare 3D models of the seam, develop quality parameters and conduct structural interpretation. In turn, data is available for engineering and mine planning using specific modules for underground and open pit respectively. Engineers use these packages to calculate resources and reserves within mining parameters, such as method of mining, presence of structural interferences, quality parameters and seam extraction height.

Following the mine plan, the development and production quality parameters and seam extraction height can be scheduled to identify the achievable production rates and the optimum utilization of the available resources. These software packages and mechanized mining methods have improved the economics of underground coal mining operations, despite high capital investments.

## Open Pit Mining

The old adage that "bigger is better" manifests itself in open cut mining for



*Coal Seam in 3D for a typical underground mine*

coal. In the last decade, open pit mining equipment has exploded in size and productivity. Coal mines have benefited greatly from the technology boom, as previously "unmineable" resources are now well within the capabilities of the new generation of equipment. Open pit coal mines are typically large, table-like, flat-lying deposits with minimal cover. Since coal is extremely susceptible to oxidation, the deposit must be thick enough to absorb a degree of oxidation without losing its economic value. The equipment used to mine the overburden must maintain a high level of productivity to ensure that such deposits can be mined economically.

Typically, it was assumed that open pit coal mines required dragline excavators – the massive slow moving machines that compensate for their ungainly movements with the sheer size of the bucket that moves waste material. Today, advances in truck and shovel technology allow quick-moving, extremely mobile fleets of hydraulic excavators, shovels, and haul trucks to reach, and even exceed, the productivity levels of draglines. Instead of tying up tens of millions of dollars in a single piece of excavating equipment, it is possible to obtain three or more excavators for the same price as a single dragline – and still maintain production levels, while increasing the availability and utilization of the fleet. Continued advances in technology successfully provide operators the tools to monitor fleet productivity and equipment performance that prevent breakdowns before they happen, ensuring that the open pit operations will continue to produce for years to come.

SRK Brisbane: brisbane@srk.com.au

# Pat Hillsdon

**P**at has been involved in the geophysical industry for over 30 years. Pat spent 11 years in mineral exploration with BHP Mineral Exploration around Australia before moving to Engineering Computer Services and providing another 25 years in airborne geophysical processing and coal geophysics (seismic, gravity and borehole methodologies) as well as software sales and support. Pat has worked on projects in Australia, Thailand, Canada, USA, South Africa and Colombia. Pat is currently based in SRK's Sydney office.

*Pat Hillsdon*

Pat Hillsdon: phillsdon@srk.com.au

# Bin Guo

**B**in is a Geophysicist with 7 years industrial and academic experience in applied geophysics and structural geology. He is skilled in gravity/magnetic data processing and image enhancement, 2D and 3D potential field modelling and interpretation, and electrical geophysics. Bin is also familiar with the processing and interpretation of seismic data and remote sensing data. Since joining SRK in early 2006 after completing his PhD study at Macquarie University, Australia, Bin has worked extensively on the Bowen-Surat and Sydney basin regional studies as well as being involved in processing and modelling work for smaller scale exploration targeting and mine-scale structural risk project work.

*Bin Guo*

Bin Guo: bguo@srk.com.au

# Using Magnetic and Gravity Data in Basin and Coal-related Geology Studies



**Main NNW - N Structural Zones (Yellow)**

**Main NW Structural Zones (Blue)**

**Main NE Structural Zones (Red)**
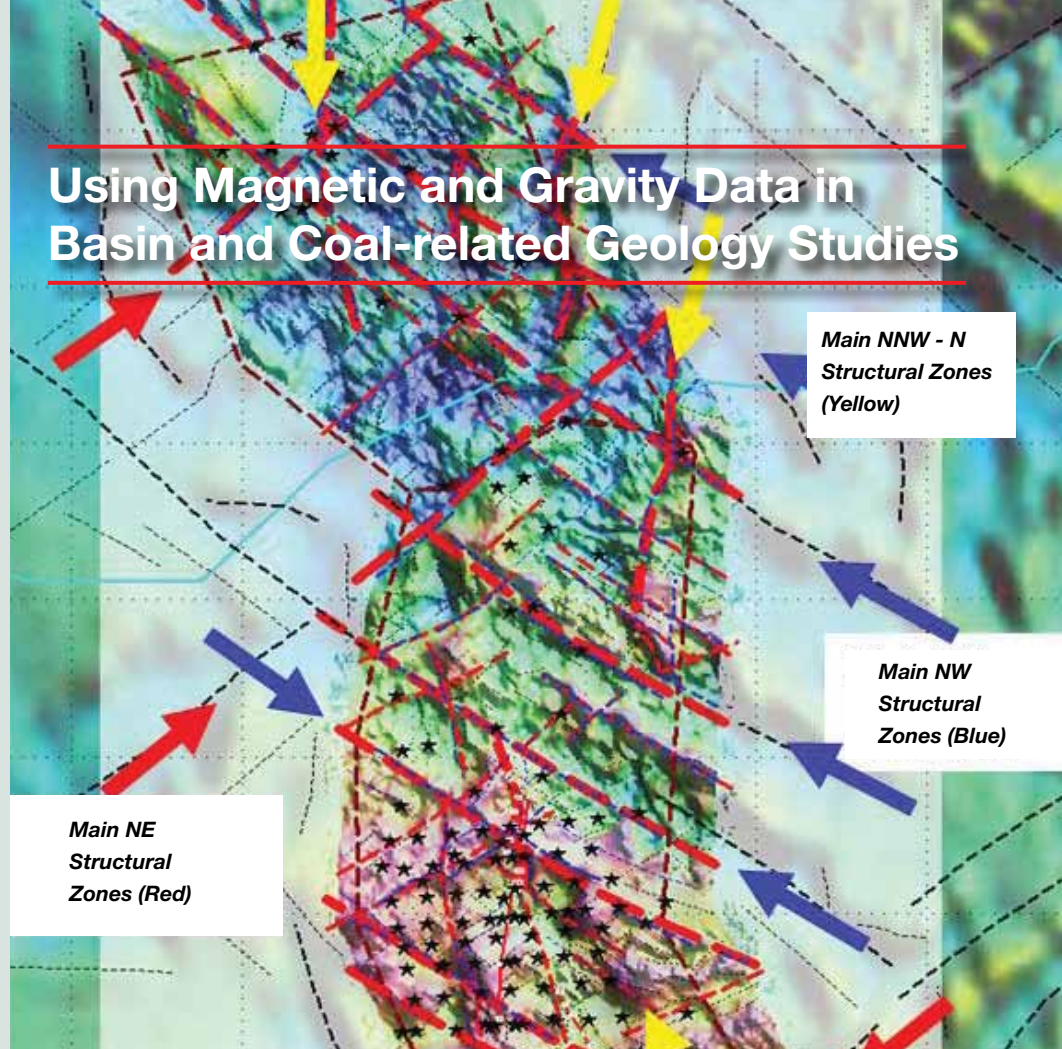
*Regional magnetics overlain by the detailed magnetic survey data*

**G**eophysical data plays an important role in basin studies. In particular, gravity and magnetic data can provide a cost-effective means to assist in interpreting basin to lease-scale structural geology and depth to basement studies.

Magnetite is a very minor constituent of sediments, which makes magnetic data valuable for determining the distribution of magnetic sources within the sediments, ranging from heavy minerals deposits (e.g. fans) to basalts.

Gravity and magnetic data provide vital information on the structure and composition of the basin basement. Major basement structures can be interpreted from the presence of consistent discontinuities and/or pattern breaks in the gravity and magnetic data. They permit the determination and definition of structural breaks in areas where the basement composition is not known.

Where the source of the gravity and magnetic signal is very deep and not resolvable by common data processing algorithms, enhancement techniques can be applied to reveal information about the geometry and structure of the basement at depth.

SRK strives to use all available data sets to provide an up-to-date structural interpretation. The image above illustrates the combination of detailed and regional surveys with other information, such as drill hole data and photo/satellite interpretation to provide a structural interpretation.

SRK's state-of-the-art depth to basement interpretation uses the 2D Werner Deconvolution magnetic inversion algorithm, 3D UBC-GIF magnetic inversion technique and individual 2.5D forward modelling of gravity and magnetic profile data. Except for the seismic data, interpreting the results provides an alternative check on the basement depth and thickness of the target stratigraphy. Companies have discovered that using these tools can be most effective in reducing the costs of new seismic acquisitions.

These geophysical skills complement our structural and coal resource geology capabilities.

Bin Guo: bguo@srk.com.au
Pat Hillsdon: phillsdon@srk.com.au

# Enterprise Risk Management at Work

As regulators, investors and other stakeholders place increasing demands on companies to provide assurance on managing business risk, they face a growing need for effective, auditable methodologies for Enterprise Risk Management (ERM). While an ERM process must satisfy prescribed minimum requirements, it should be designed to complement existing decision making and management activities without placing onerous demands on the time of the organization's most valuable resource – its people.

The system should answer the following question with an emphatic YES: Are you managing business risk effectively; is the answer auditable; are you achieving this efficiently?

An effective ERM program should consider these factors:

- Contextualizing the ERM program within existing corporate governance, due diligence and compliance strategies and processes
- Integrating ERM activities into existing business processes such as strategic planning and budgeting cycles
- Ensuring that ERM activities work for – and not against – the organization
- Taking ERM beyond compliance – to use it as a growth tool

To satisfy the requirements of existing regulatory and international standards, an ERM process should be developed around certain generic activities:

- Defining the functional or operational **context** within the organization to determine their critical relevance
- Identifying, defining and categorizing **risks** within each context
- **Exploring** each risk in terms of causes and consequences as well as the efficacy of existing controls
- **Evaluating** each risk according to a matrix or methodology that is pertinent to the organization

- Designing and implementing relevant risk management strategies and additional controls
- Assessing the **effectiveness and efficiency** of risk management strategies and controls
- Employing strategies and processes for **communicating, disclosing** and **reporting** risk



*Framework for ERM Excellence*

*Leadership Commitment and Example*

*"Your leadership example is the foundation of your risk management competence"*

SRK Australasia has recently expanded its skills base with the appointment of Greg Trivett as Principal Consultant (Enterprise Risk Management) based in Brisbane. Greg was instrumental in establishing a corporate ERM process within a global mining and petrochemical organization. The service SRK offers to clients entails assessing their existing competencies for ERM and then guiding the organization in researching, developing and implementing an ERM management approach that is customized, effective and efficient and that complements and adds value to existing business planning processes.

Greg Trivett: gtrivett@srk.com.au

# Greg Trivett

Greg Trivett (Principal Consultant – ERM) BTech (Mining), NHDip (Coal Mining), MDP joined SRK Consulting Australia in May 2007. He has worked in coal mining since 1985, and in the petrochemical industry since 2003. Greg has had various production supervisory roles in underground and surface coal mines in South Africa and has managed underground construction projects and multi-million ZAR shaft-sinking projects from concept and pre-feasibility phase through to commissioning for operations. He has also led or been involved in studies to establish new infrastructure and mines. Beginning in 2003, Greg focussed on developing approaches and methodologies that improve health and safety management and the management of business risk. He has served on the Occupational Health and Safety Policy Committee of the South African Chamber of Mines and on the South African Safety in Mines Research Advisory Committee. In May 2006, representing South Africa's mining industry Employers, he led the Employer group at the International Labour Organization meeting of experts revising the ILO Code of Practice on Health and Safety in underground coal mines. As Safety Advisor to a global coal mining and petrochemical group, Greg specifically addressed the cultural and behavioural aspects of managing Safety, Health, Environmental and Sustainable Development (SHE&SD) and developed group minimum standards for the identification, appointment and management of contractors.

He led the development and implementation of Enterprise Risk Management processes and methodologies at global Coal Mining, Petroleum and Synthetic Fuel Company's to provide assurance of compliance to various national and international corporate governance guidelines, statutory standards and requirements. Greg's experience in guiding leadership, line management and engineers towards achieving "zero harm" safety performance and "no surprises" in managing business risk marks his area of expertise.

Greg Trivett: gtrivett@srk.com.au

# Chris Woodfull

**C**hris has 20 years' experience in exploration, mining geology and environmental management, in industry or as a consultant. This experience has given him a broad technical

*Chris Woodfull*

background and strong project management skills. Chris joined SRK in 2001 and since then, he has been mainly involved in studies focused on structural geology, assisting gold copper and coal-related projects and contributing geological expertise to independent technical review studies. This work includes interpreting geophysical and satellite data as part of structural geology and prospectivity studies.

He is also the project manager and a lead consultant on 2 major, multi-client studies developing a regional structural framework and 3D basin model to assist coal, CBM and petroleum companies operating and exploring in the Sydney-Gunnedah Basin in New South Wales and the Bowen-Surat Basins in Queensland, Australia.

Chris Woodfull: cwoodfull@srk.com.au

# Bringing Coal Basins into Focus



*Location and distribution of faults (red) and igneous rocks (yellow) that have been mapped at the seam for a number of coal leases within the Newcastle Coalfield compared with a grey-scale RTP magnetic image*
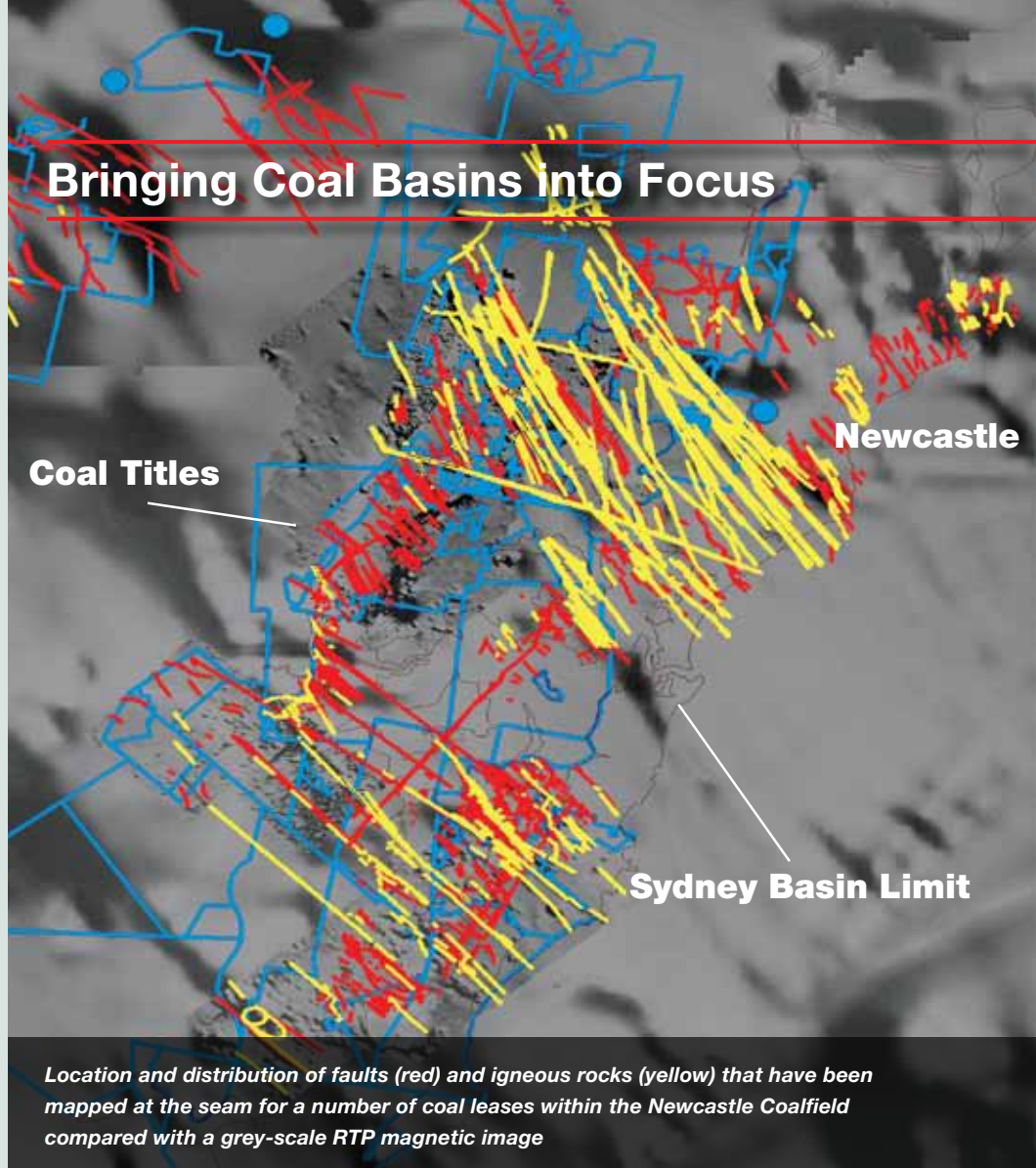
**I**n 2003, SRK initiated a major study of the structural framework for the region that covers the Sydney Basin and the eastern part of Gunnedah Basin. Initially, four coal mining companies supported the study, with release slated for early 2004. In the latter part of 2003 and 2004, interest in the study increased and sponsorship more than doubled, allowing SRK to undertake a major update of the initial work. The updated study has been available for general purchase since November 2005.

Since the initial release of the Sydney Basin Study in January 2004, SRK has continued to make advances in the field of 4D regional basin interpretations. As a result, the evolving regional study continues to attract a broader audience and the study results enjoy wider use.

SRK is currently well advanced towards completing a second major study that encompasses the Bowen and Surat Basins. This study is currently being finalised and is due for release in January 2008.

The studies were designed to develop a structural model of the basin to assist companies in assessing and managing a range of issues concerned with geological risks that affect their existing leases, or in evaluating such risks when looking at acquiring new ground. SRK has received substantive comments from professionals using the studies, which suggest that sponsor companies are beginning to reap dividends through this unique opportunity to optimize exploration and minimize risks related to mining. See **'Sponsors have their Say'**, facing page.

## Bryce Healy

### Expertise

The SRK study team includes a core group of five consultants from our Maitland, Sydney and Brisbane offices with more than 40 years of combined experience. An additional six in-house consultants provide periodic support and two specialist associates contribute technical guidance and peer review.

### Sponsors have their Say

*"We have found both the Sydney and Bowen Basin studies very useful not only in regional assessments but also in interpreting and assessing localized mine based issues. The application of regional datasets to individual mine based problems has enabled a broader perspective to be used, which in turn has provided solutions and interpretations that otherwise would not have been available to mine management."* – Michael Creech, Manager Geology & Resources, Peabody Coal (formerly Chief Geologist with Excel Coal Pty Ltd).

*"The Queensland Department of Mines and Energy supports the Structural Synthesis project as it will assist coal and petroleum exploration and development in the State's major energy province. The project will add value to existing data and provide a framework for future geological studies in the Bowen and Surat Basins. The Department encourages other companies to join in on this practical research project."* – Dave Mason, Director, Geological Survey of Queensland & Natural Resource Information and John Draper, Geoscience Manager, Coal and Petroleum, Geological Survey of Queensland.

*"Anglo Coal Australia is very satisfied with our participation in SRK's Sydney Basin Structural Synthesis Study. We have used the project database on a number of occasions to date, both for general information purposes, and in specific geological projects. We believe the data package to be a good compilation of applicable information, and with it having been provided in a format easily integrated into our existing geological databases, it has been very easy to utilise."* – Dr Peter Jorgensen, Project Geologist (Growth & Strategy), Anglo Coal Australia Pty Ltd.

*"The Sydney Basin Regional Structure Synthesis has been very useful in understanding geological structures, fracture zones and basement controls of deposition in our coal seam gas systems and CO natural analogue studies in the basin."* – Dr Mohinudeen Faiz, Research Scientist (Coal Seam Gas and Organic Petrology, CSIRO Division of Petroleum Resources.

Bryce Healy: bhealy@srk.com.au
Chris Woodfull: cwoodfull@srk.com.au

**B**ryce joined SRK in early 2005 following the completion of his PhD studies through the University of Newcastle, where his thesis focused on granite genesis at the Lachlan Fold Belt. With over nine years in the field, *Bryce Healy*

Bryce is experienced in geological mapping, exploration targeting, interpretation of geology and structure from remote sensing and geophysical data sets, advanced geochemical sampling and analysis. Bryce has concentrated predominantly on Eastern Australia including the Lachlan Fold Belt and the coal bearing Permo-Triassic Sydney, Gunnedah and Bowen Basins.

Since joining SRK, he has taken on a lead consultant role in the structural framework and risk analysis studies of Sydney Basin and Bowen-Surat Basin as well as broader scale exploration targeting and structural risk analysis studies for coal and iron ore.

Bryce Healy: bhealy@srk.com.au

15

# Keith Philpott

**K**eith has worked in the coal industry for 33 years, spending the first 17 years with the state owned coal industry in the UK as an exploration geologist and manager. He was responsible for managing exploration teams and contractors, and for site assessments and reporting. Since leaving British Coal he has worked as a consultant and has been with SRK as a Principal Geologist since 1996. He is responsible for the coal group in the UK office and has extensive experience in managing due diligence commissions in coal projects across the world. He has been responsible for many JORC (and other international codes) resource and reserve assessments particularly in Russia, Mongolia and Indonesia. The UK team work for clients at all levels of study – scoping through to feasibility and operational assistance – utilising both "in house" expertise and experienced associates as part of a multidiscipline team.

Keith Philpott: kphilpott@srk.co.uk

*Keith Philpott*

# Relating Resource and Reserve Assessments

**I**n the current boom time for coal mining, SRK frequently receives requests from clients to undertake resource and reserve estimations in line with various internationally recognized codes such as JORC – probably the most widely utilized code within the coal industry. These requests come from a variety of sources – from companies wishing to adhere to IFRS standards, to float on international stock exchanges, or to purchase other companies or licences; from financial institutions lending money for the purchase of new equipment, and so on. These codes require an examination not only of exploration, geology and mining, but also of other modifying factors, such as economic, environmental, geotechnical and licensing issues.

SRK can mobilize experienced multidisciplined teams to visit greenfield sites, open pit or underground coal operations and assess working conditions first hand, collect data and hold discussions with managers and technical specialists, before providing an independent report and statement of resources and reserves.

This process does not usually involve reworking geological data and models from first principles, although this can be done where necessary. Instead, it requires a critical examination of data collected and assessed by other professionals.

Often, these previous assessments of resources and reserves have been carried out to the standards of the country in which the deposit is located. In recent years SRK has carried out numerous such assessments in Russia and the former CIS countries, in China and Mongolia as well as elsewhere in the world. In SRK's experience, exploration and resource/reserve assessments carried out in these countries have been done in line with strict standards by well-trained professionals and the process was comprehensive. Often, far more drilling and analytical testing was carried out under the various state systems than would be undertaken by a privately owned enterprise in the Western world. However, this testing was not always confined to high recovery coal cores and critical analysis of the results by a geologist was often lacking. Most of the

# to International Code Standards

drilling in Russia, though, is backed up by extensive downhole geophysical logging.

Assessments are usually based on hand-drawn plans and manual calculations, without recourse to computer modelling. This doesn't make the findings wrong, but it does take a long time to examine alternative options or modify constraints, such as a minimum thickness, quality parameters or working limits. Where the State assessments fall short of current international standards is in the application of truly economic and other modifying factors. The State decreed that reserves should not be wasted and current economics weren't always an issue to be taken into account. Re-assessments were only done after major new exploration programmes had been completed or when a new mine plan was to be introduced. This has led to the inclusion of coal under the category of mineable reserves (the Industrial Reserves of the Russian GKZ system), which cannot now be considered a Proved or Probable Reserve, for example, under JORC guidelines. Seams may be too thin to

work economically underground, they may contain so much dirt that washing costs become prohibitive, the sulphur contents may be higher than can be readily marketed, or open pit cut-off stripping ratios may be set at unprofitable levels.

At one open pit, overburden was being placed on future reserves in another seam, thus drastically increasing stripping ratios and decreasing profits. At another, SRK found an element of double accounting of reserves between an open pit and an adjacent underground operation working the same seam from inclines driven into the highwall of the open pit.

When carrying out these assessments, SRK would like to think that our geologists and engineers not only carry out a thorough investigation of the available data but are also able to assist the client and mine owner to get added value from SRK's observations and advice. For example, it may be possible for a licence holder to relinquish one area of the licence, say, with

an unfavourable seam section or faulting which will preclude economic longwall mining, in favour of an adjacent area with more favourable geology. At other operations, SRK can act as a facilitator and encourage a consistency of approach from a diverse group of geologists and engineers working for a single company but on a number of different pits or mines. On greenfield sites or relatively new operations, SRK can advise on the introduction of suitable software packages, build geological models, and carry out mine planning and pit optimization on these models in order to improve working methods, make monitoring more visible and increase profitability. Above all, SRK can encourage well qualified, capable and hard working professionals who have rigidly followed 'the rules' throughout their career to think more freely and consider a wider range of scenarios and issues.

Keith Philpott: kphilpott@srk.co.uk



*Kharanorsky Open Pit,*
*Chita Region of Russia*

# Managing Risks to Safety, Health, Environment and Sustainable Development Effectively

Today, society expects organizations to address the protection of people and the environment from harm in pursuing their operational strategies and demands assurance that they will take effective action in responding to risk. Consequently, incidents that result in personal harm or environmental damage are often broadly condemned and invariably exert a negative impact on the business.

Whilst the management of SHE&SD risk is a well documented concept, Regulators, Workers and Employers as well as lay observers express widely varying perceptions or opinions on the degree of understanding of risks as well as the effectiveness of controls designed to manage them.

A perceived "Profit vs Safety dilemma" results, and must be resolved if tensions among the different groups "pulling the levers", "controlling the budget" and "policing the rules" are to be reduced so that all parties share the common goal of effective and efficient management of risk in pursuit of Zero Harm.

Standardized or Regulated approaches, however rigorously applied, are subject to human fallibility and while a one-size-fits-all solution remains distant, the 12 elements of the **SRK Integrated Framework for Health & Safety Excellence** © offers a practical approach to compliance based Regulatory and Standardized requirements through values based organizational and cultural development.

As with all other services we provide, SRK's framework for managing SHE&SD risk employs practical, workable solutions for the challenges our clients identify.
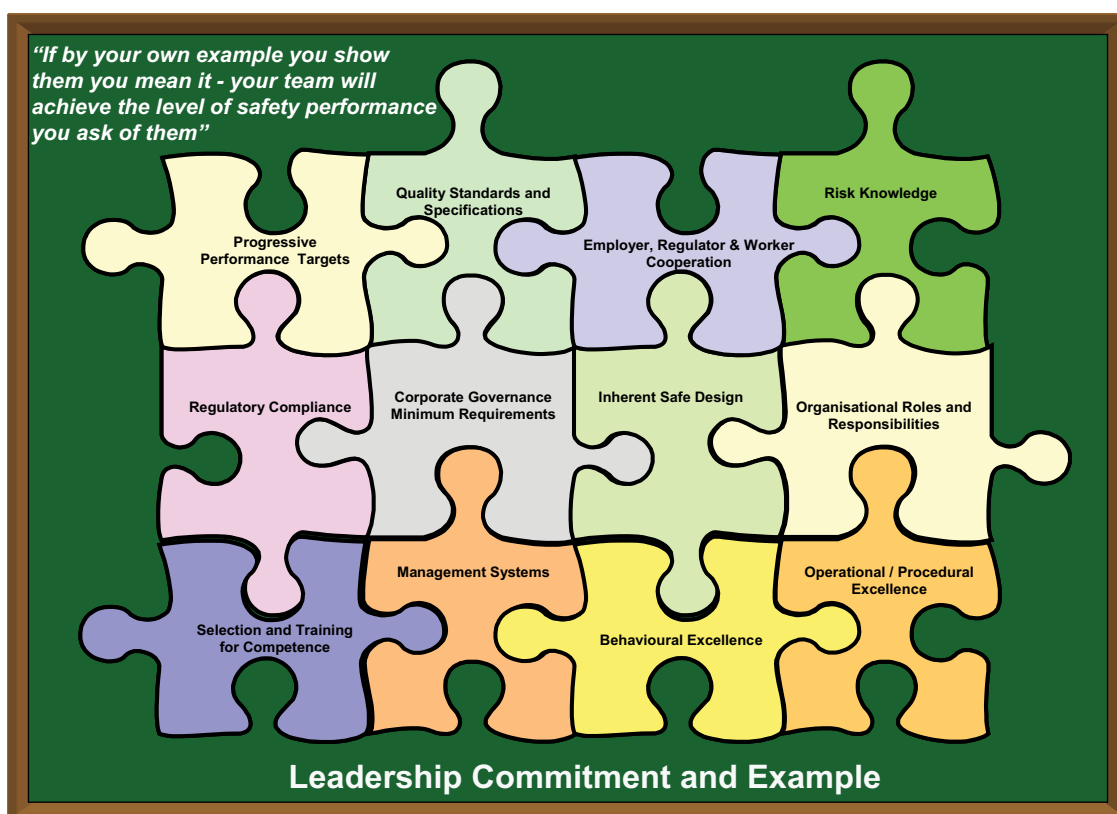
## Services:

- Review the company's SHE&SD performance and benchmark it against global measures for best-in-class.

- Review and assess the organization, its culture and activities against the SRK benchmarked performance levels for each of the 12 Framework elements

- Recommend improvement plans, with referrals to subject specialists if pertinent, to address identified gaps.

- Coach and train managers and leaders in these 12 Elements:

  - Setting Progressive and Challenging Performance Targets
  - Quality Standards and Specifications (overview)
  - Employer, Regulator and Worker Cooperation
  - Risk Knowledge
  - Regulatory Compliance (overview)
  - Corporate Governance Minimum Requirements
  - Inherent Safe Design
  - Organisational Roles and Responsibilities
  - Selection and Training for Competence
  - Pertinent Management Systems
  - Behavioral Excellence
  - Operational/Procedural Excellence

Bringing the elements together = The Integrated Organisation. In other words, taking the management of SHE&SD risk beyond compliance and good practice to global excellence.

What is SHE&SD risk?: "The possibility that persons or the environment could be harmed as a result of activities associated with an operation".

Greg Trivett: gtrivett@srk.com.au



*"If by your own example you show them you mean it - your team will achieve the level of safety performance you ask of them"*

Quality Standards and Specifications

Progressive Performance Targets

Employer, Regulator & Worker Cooperation

Risk Knowledge

Regulatory Compliance

Corporate Governance Minimum Requirements

Inherent Safe Design

Organisational Roles and Responsibilities

Management Systems

Operational / Procedural Excellence

Selection and Training for Competence

Behavioural Excellence

**Leadership Commitment and Example**

# Assisting an Emerging Coal Producer in Colombia

*Pit A, La Francia Mine, Cesar Colombia*

**C**oalcorp Mining Inc (Coalcorp) is a Canadian mining company listed on the Toronto Stock Exchange (TSX), with two producing open pit coal mines in northern Colombia: La Francia and La Caypa, in the Cesar and Guajira departments, respectively. SRK assisted Coalcorp in acquiring the properties and has had an ongoing involvement with both. With an annual production of 1.2Mt from La Caypa and 2Mt from La Francia, Coalcorp is well on its way to achieving its aim of becoming a medium-tier producer in Colombia, bridging the gap between the very large coal producers, Cerrejon and Drummond, both with annual production of in excess of 20Mtpa, and the numerous smaller-scale producers in Colombia.

SRK has been working with Coalcorp, originally trading as Adobe Ventures, since it first took an interest in acquiring coal properties in Colombia in late 2004. Since then, SRK has visited numerous properties in the country's coalfields on Coalcorp's behalf. The properties have ranged from small-scale underground mines to larger, open pit operations with potential for later high wall or auger mining, and coal types, ranging from thermal to metallurgical.

From those visited, Coalcorp selected two thermal coal sites as being of further interest. They are primarily open pit operations in the Cesar – Rancheria valley, La Francia and La Caypa. The deposits are Palaeocene in age and limited in extent by regional thrust faulting. Both properties were in production at the time of acquisition. However, production levels were low, previous development had been haphazard, and, in the case of La Caypa, they were constrained by a lack of investment and, to some extent, by a lack of available tipping space. SRK prepared Competent Persons Reports (CPR) for both properties to comply with the Canadian National Instrument 43-101 Standards of Disclosure for Mineral Projects for publication on the TSX to raise finances for the acquisitions. Proven reserves at La Caypa were signed off at 8.76Mt and at La Francia at 26.75Mt.

The reserves at La Francia were measured from a single pit, Pit AB, in the southeast of the property. The pit was limited by a thrust fault, which repeated the succession to the northwest in an area designated Block C. Exploration had been carried out on this area, but no mine planning. SRK recognized that the potential in this block was limited by several factors, including the licence boundary, and recommended that Coalcorp approach the owners of the neighbouring properties. SRK did not provide estimates of resources for Block C at the time of reporting, but previous resource estimates were approximately 20Mt to a depth of 150m. Subsequently, Coalcorp came to an agreement with the owners of the adjacent property, to acquire the property. Once again, SRK produced a NI 43-101 CPR to support the acquisition and was able to sign off on measured and indicated resources of 41.7Mt on the new property. A separate report updated the resources on the existing La Francia Block C to 52.6Mt, resulting in total resources for the combined La Francia Block C - El Triangulo of 94.3Mt. Mine planning is now underway to bring this area into production and to derive reserve estimates for the combined block.

Ongoing involvement for SRK at Coalcorp's Colombian coal mines includes further mine planning, planning for a boundary agreement with the neighbouring producer to the southwest, which will release batter coal at the boundary, operational support including reconciliation, and further resource/reserve reporting.

Paul Bright: pbright@srk.co.uk

## Paul Bright



*Paul Bright*

**P**aul Bright has 30 years geological experience in mining and exploration and is also a Chartered Engineer. He worked for British Coal Opencast in South Wales on exploration, resource and reserve estimates and contracts for coal mines in areas of complex geological structure. He undertook geotechnical site investigations to BS5930, using computer systems and software, data bases, CAD and 3-D modeling – with particular responsibility for down-hole geophysical logging. Previously, as a Geologist, he worked on exploration projects for gold, uranium, nickel, copper and coal in Australia, from grass roots exploration to development.

Since joining SRK in 1996, Paul has undertaken due diligence, expert witness and geological project work, including resource and reserve audits, pre-feasibility studies and Competent Persons Reports for mineral assets, as well as providing oversight for the CAD department.

Paul Bright: pbright@srk.co.uk

# Andrey Melnikov

**A**ndrey Melnikov is a Principal Mineral Economist with more than 8 years of experience leading due diligence audits of Russian coal mining companies and contributing towards the financial

*Andrey Melnikov*

evaluation of projects. He has visited all of the Russian coal basins including the biggest ones of the Kuzbass (Kemerovo region in West Siberia), Donbass (Rostov area, towards the Black Sea), Pechora in the Komi Republic, Elegest in Tyva and Elga in Yakutia. Among his clients Andrey includes all of the largest Russian coal mining companies, such as SUEK (leading international steam coal producer), Severstal-Resurs (owner of Vorkutaugol and Kuzbassugol), Raspadskaya mine and Yuzkuzbassugol (biggest coking coal producer in Russia). He has a wide knowledge of the Russian market and infrastructure issues, as well as experience managing the construction of a new mine funded by an international client.

Andrey Melnikov: amelnikov@srk.ru.com



*Loading steam coal in Chita, Russia*

# The Russian Coal Industry

**C**ompared to other Russian fuel sources, the coal industry has the best raw material base. Resources are concentrated in 22 coal basins and 118 individual deposits, spread unevenly across the country. Total resources are approximately 200 billion tons (bt); reserves under development, about 105.2bt, with open pit mineable reserves at 74.9bt.

**Production:** Since 2001, production has risen steadily, except for 2002, when Siberian hydroelectric power abruptly increased and demand for coal decreased. Abnormally warm climate conditions affected consumption. However, for the last five years, coal production increased by 12.7%.

**Companies:** SUEK is a leading exporter of thermal coals with surface and underground mines from the west of Siberia to the Far East; annual production approaches 90Mt; another, Kuzbassrezrezugol, produces about 45Mtpa of coal.

Several big producers, Raspadskaya, Yuzhkuzbassugol, Yuzhny Kuzbass, Kuzbassugol, Vorkutaugol, Yakutugol and Sibuglemet, share the coking coal market. Two large new deposits planned in Yakutia and the Republic of Tyva require several billion USD to develop infrastructure before implementation.

**Transport:** Russia's coal travels vast distances by rail to the nearest seaport. Growing railway tariffs and the strengthening ruble may make it uneconomical to export steam coal by 2010. One possible solution is to adopt flexible market-based railroad tariffs. During the first half of 2007 coal exported from ports in Russia, Ukraine and Eastland (Baltic states) increased by 5.1% over 2006 levels.

**The move from Gas to Coal:** Russia's main energy source is gas at 43%; coal 23%; hydroelectric power stations 18%; and nuclear power 16%. However, this balance will change. The Government has approved new allocations for power stations through 2020. Gas will drop from 68% to 50-57% and coal will increase from 25% to 38-39%.

According to the RAO Unified Energy System of Russia, coal consumption will increase 2.5 times. To achieve this, RAO will build many new coal power stations, with half of them located in Siberia. Price weighting determines the increase in coal's power generation, because coal generation costs will fall compared with gas.

**Safety:** In spring 2007 in the Kuzbass, accidents killed about 150 miners, revealing serious safety problems. Closer attention is now being paid to degasifying and ventilating underground mines. Employees are working at improving their own safety actions.

**SRK Experience:** In Russia, SRK is assessing reserves and resources of coal mining companies to meet international accounting standards; improving efficiency with practical advice; geology modeling and long-term planning; working with Russian mining institutes (giproshakht) on detailed design issues; helping attract foreign partners and advising them on investments.

Andrey Melnikov: amelnikov@srk.ru.com
Keith Philpott: kphilpott@srk.co.uk

## For more information, visit us at: www.srk.com

*Issue No. 37*