SRK News
Waste Geochemistry

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SRK Consulting's
International
Newsletter

Are your environmental data defensible?

As international environmental standards grow in complexity and corporations become more aware of their responsibilities, regulators and special interest groups are closely scrutinising sample selection and analytical methods, and quality assurance results for data used to predict environmental impacts.

SRK recommends careful design of data collection to ensure that the end product is representative and can be defended. Consider the following key aspects needed to produce a defensible dataset.

Involve regulators in program design: Before data collection begins, you should consider the final end use of the data and the audience to which it will be distributed. Usually, regulators will make management decisions based on your data so it is important to involve them in the planning process. That way they can also have ownership of the dataset obtained.

Consider site specific conditions: You should determine site specific conditions and the data collection goals before any data are collected because these will affect sampling requirements. For example, the site geology and mineralogy will dictate the number, type and spacing of waste rock samples.

Consistently apply sampling methods: Sampling methods should be site-specific and consistently applied. Sampling and analysis methods applied may be standard methods or may be specified by the regulators, but you might require additional or modified methods to meet the needs of the project. Normally, published methods are most defensible, but modifications may be appropriate for certain site conditions.

Validate your data: You should carefully validate your data before you use it. Otherwise, the analysis may be flawed, costing you both time and money. Each dataset should be reviewed for internal consistency and evaluated to ensure accuracy and reproducibility. You should check that the results make sense with respect to field observations.

Did you meet your objectives? Finally, you should evaluate your data in the context of the sampling plan, field observations, sampling procedures and analytical methods to ensure that the data collected have achieved the project goals in a defensible manner. If you have anomalous data, additional samples may be needed.

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Kelly Sexsmith


Kelly Sexsmith

Kelly is a principal geochemist in our Vancouver office with over 13 years experience. She holds a B.Sc. in geological sciences from the University of British Columbia and a M.Sc. from the Colorado School of Mines. Kelly specialises in the geochemical characterisation of mine wastes. Her experience includes design and supervision of geochemical test programs, geochemical modelling, development of conceptual waste management plans, and prediction and monitoring of water quality from tailings, waste rock and pit walls.

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... and one last thing – avoid shortcuts: The temptation to take shortcuts when designing and implementing environmental data collection programs in an attempt to accelerate project schedules can have exactly the opposite effect. The result may be a dataset that cannot provide scientifically defensible conclusions.

Jeffrey Parshley: jparshley@srk.com


Jeff Parshley

Jeff Parshley has over 25 years of project experience throughout North America, Latin America, and Europe. He holds a degree in geology from Dartmouth College, Hanover, New Hampshire. Jeff's expertise includes mine closure and remediation, mine environmental studies, mine permitting, and environmental geochemistry.

Improve reliability of post-closure water quality predictions


Faro Mine, Yukon Territory

Long-term water quality predictions are essential for innovative closure planning at mine sites. From years of experience, SRK has found that data from seepage monitoring programs can be a reliable indication of water quality when combined with careful characterisation of the wastes.

Regular seepage surveys can be easily incorporated into routine water quality monitoring programs. They are one of the many contributions that the site environmental staff can contribute to the closure planning process.

SRK has frequently made use of seepage data from sites where environmental staff have initiated sampling. Such opportunities have allowed us to fast-track projects and save money, without compromising the quality of the predictive modelling.

What is seepage monitoring?

The main difference between seepage monitoring and routine water quality monitoring is often the proximity of the seeps to the source materials. Routine monitoring stations usually measure water quality changes from a large catchment area. Seeps instead reflect individual flow paths through the waste material and show local effects of rock type, age of deposition, and differences in flow conditions.

For an information sheet on implementing a seepage sampling program at your mine site contact Kelly Sexsmith in SRK's Vancouver, Canada office at +1 604 681 4196.

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New porphyry copper mine approval

The sharp rise in commodity prices and a favourable political climate have sparked a strong interest in developing mineral properties in western Canada and the US. The rebirth of mining in these areas after years of absence is an exciting and positive occurrence for miners, operators, and the business community.

The intervening years, however, have seen several key operational changes. In particular, scrutiny of the potential effects of new mines has increased. This change has caused a need for transparent and defensible water quality predictions for mine facilities.

An enviable record of accomplishment

Since the 1980s, SRK has provided clients with detailed evaluations regarding the environmental effects of their mine sites. During this time, new equipment and reporting procedures have increased efficiency and client benefits.

Most recently, this combination of experience and advanced testing procedures rewarded clients in Alaska and British Columbia when our water quality predictions led to the acceptance of proposals for new mine sites.

In 2004, Teck Pogo Inc. began construction of the underground Pogo Mine, a gold mine near Fairbanks, Alaska. To secure the needed approvals, SRK prepared water chemistry predictions for the underground mine, waste rock disposal area, and dry-stacked tailings. Operations at this mine are now underway.

New approvals

Success was also achieved in British Columbia, where several copper porphyry properties are being re-examined. SRK contributed to the approval of the undeveloped Red Chris Project operated by bcMetals and the mining of new zones at the Mount Polley Mine owned by Imperial Metals.

Aware of the need to respond quickly to market forces, SRK helped companies NEMI and Western Canadian Coal begin small mining operations and assisted Falls Mountain Coal start a full-scale mine. These mines are located in British Columbia's major coalfields in the northeastern sector of the province.

The development of a profitable mining operation requires the desire to succeed, good people, and access to the best information.

With offices on six continents, our team of geochemists is near at hand.

Stephen Day: sday@srk.com

Stephen Day

bcMetals' Red Chris porphyry copper mine

John Harman


John Harman

John is a Principal Groundwater/ Environmental engineer with over 25 years experience. He has an M.Sc. in Hydrogeology from Birmingham University and originally qualified in Mining Engineering at the Royal School of Mines in London.

During his career John has been extensively involved in all aspects of water management in mining, from water supply wellfield development through to mine dewatering and water management, environmental management and remediation. He has worked throughout the world in the extremes of both wet and arid environments. John currently heads up the Water Group in our Santiago, Chile office.

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James Lake


James Lake

James is a member of the Water department in Johannesburg. He has a M.Sc. in Environmental Geochemistry from the University of Cape Town. He has 9 years experience working on a variety of geochemical projects, with the main focus being on mine residue management. This has included waste characterisation and environmental impact assessment.

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South America: Offices bring full power of SRK to their clients' door

Photo kindly authorised by Xstrata Tintaya SA

As in other parts of the world the Mining Industry in South America is expanding at astonishing speed. As a consequence the need for high-level expertise in all aspects of the mining industry has never been greater and SRK in South America has been playing a key role in support to its clients. Our scientists and engineers in our well-established Santiago, Chile and new Belo Horizonte, Brazil offices are using their extensive international experience to help our clients meet the challenges of rapid growth. SRK is currently providing a diverse range of geochemical services including characterisation and management planning for tailings impoundments, specialist studies for particular contaminants, input to due diligence assessments as part of mergers and acquisitions, geochemical assessments for mine closure planning and baseline studies for new mines.

New obligations

With few exceptions, new mining legislation in Chile, Peru, and other South American countries requires that new projects incorporate closure planning into their Environmental Impact Assessment (EIA) and mine planning stage. Increasingly, existing operations must also produce closure plans that clearly define long-term liabilities.

As a recognised leader in regulatory issues, SRK is actively involved in helping our clients attain the approvals they need to operate. As each new project is rarely the same as the previous one, our team in South America uses the latest in technologies and its network of scientists and engineers around the globe to ensure it presents clients with the best solution to their problem.

For more information call John Harman at +56 2 269 0353 or info@srk.cl

In Memoriam: Ingrid Rozas Valenzuela


Ingrid Rozas Valenzuela

This newsletter is dedicated to our friend and colleague, Ingrid Rozas Valenzuela, of Santiago, Chile who died suddenly in July of this year. Ingrid joined SRK in September 2005. Initially, she spent seven months in Vancouver working with Stephen Day, Kelly Sexsmith and others in the GeoEnvironmental Department. She then returned to Santiago to develop this business area in Chile and South America; she embarked on the project with great enthusiasm and had begun to see the rewards of her effort by way of a number of interesting project leads.

Her delightful personality was always evident and her contribution to the team in Santiago, both professionally and personally, was a great inspiration. She will be missed by all of us - her friends in Santiago and in Vancouver - and by other members of the SRK group with whom she was building strong working relationships. We are privileged to have had her on our team, if only for a fleeting moment.

Solving mining challenges in Africa & the Middle East

SRK's geochemists are involved in solving wide-ranging waste management challenges faced by mine operators throughout Africa and the Middle East. Our offices in the region are located in South Africa, Turkey and Zimbabwe. We provide expertise in a number of areas including:

Development of baseline and waste management strategies: For example, the Geita Gold Mine in Tanzania, where SRK established the baseline in 1997 which involved risk based site selection, liaison with relevant regulatory bodies, training of sampling personnel and development of a time-series database. Subsequent monitoring and data interpretation has enabled SRK to demonstrate the impact of artisan workings and the occurrence of naturally elevated metal levels in surface and groundwater. As a result, a site specific baseline was established that reflects these processes that are not related to mining. This approach has allowed the regulators and mining company to understand the processes affecting water quality and the allocation of potential liabilities.

Evaluation of waste re-processing: At the South Deep Mine in South Africa, SRK comprehensively assessed historic and modern waste rock facilities, which resulted in re-evaluation of historic waste rock as potential ore material. We also developed a more efficient waste rock disposal program.

Development and design of mine water management strategies: For example, at Grootvlei in southern Africa, high density sludge settlement was implemented to improve water discharge to an important river catchment north of Johannesburg.

Assessment of closure liabilities: At the Bulyanhulu mine, in Tanzania, SRK geochemists were part of a multidisciplinary team that assessed potential future closure liabilities.

Mineral processing assessment: During the design of the sulphuric acid leach process for the Skorpion project in Namibia, SRK studied process chemistry and mineralogy of the feed and tailings to assist in optimisation of the process. In the DRC, SRK has evaluated process chemistry for copper and cobalt oxide, and sulfide ores.

Regional water studies: In 1999 SRK participated in the review of impacts to the Zambezi River from industrial extraction and discharge of water.

Groundwater remediation: At the Sukhaybarat mine, Saudi Arabia, SRK identified sources of groundwater contamination, which led to better site waste management and to recommendations for mitigation of present contamination.

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Rob Bowell

James Lake

Copper rich tailings at Kolewezi, Zambia

Stephen Day


Stephen Day

Steve leads a group of five geochemists in the Vancouver office. Steve has a M.Sc. in geology and geochemistry from the University of British Columbia, and 17 years of experience working on mine waste geochemistry. He specialises in waste disposal facilities at proposed, operating, and closed mines, and has experience at numerous sites where commodities have included metals, coal, diamonds, and rare earths.

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Robert J. Bowell


Rob Bowell

Rob is a principal geochemist with 18-years experience and is head of the geo-environmental department in Cardiff, Wales. He holds an honours degree in geochemistry, and a Ph.D. Rob is the current president of the International Association of Applied Geochemists. He specialises in mineral processing and the geochemical treatment of arsenic-rich waste, mine waste, and water including waste cyanide solutions, acid rock drainage and saline water.

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The United Kingdom has thousands of abandoned metal mines

The United Kingdom has thousands of abandoned metal mines stretching from base metal mines in Scotland to gold and copper mines in the Cambrian mountains of Wales to tin mines in Cornwall. Metal mining has occurred since 500 BC or over 2500 years.

Mining in the UK peaked in the 18th and 19th centuries with more than 2000 active mines, all of which are now abandoned. The mines have left a legacy of derelict land and contamination of surface water by metals.

SRK has completed several commissions to develop risk assessment criteria and reclamation plans for metal and coal mines in Cornwall, Ireland, and Wales and for coal mines in Scotland. In some cases these plans involve removal of mine waste, recontouring topography and water management techniques such as drainage control, adit plugs and installation of passive treatment schemes.

At other mines, little or no surface reclamation is required. Remediation strategies were based on identification of various contaminant sources, minimisation of water movement through source areas and treatment of residual contaminated flows.

SRK has also worked with tourist and archaeological specialists and with local stakeholders to ensure the cultural value of former mining areas is maintained.

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The Ale and Cake mine began operation in the 1490s and produced ore for over 400 years

Selective handling of wastes can reduce future treatment costs

SRK has helped numerous mining clients limit non-compliant discharge of contaminants by identifying major sources of contamination. This work enables selective handling of specific wastes, and equally important, lowers future costs substantially.

For modern mine operators, the possibility of environmental impact is a primary consideration. Very often, the greatest environmental risks are posed by the leaching of heavy elements, the generation of Acid Rock Drainage (ARD) and discharge to the surrounding environment, and the possibility of land contamination.

Finding a better course of action

Historically, mine operators waited until impact occurred and then designed remediation. In addition to the high costs of retro-active waste management, this approach often resulted in an incomplete mitigation that was not satisfactory.

In recent years, laboratory test work has been used to estimate waste reactivity. This information was then used to predict the chemistry of mine discharges. Unfortunately, in many instances, the predictions do not match reality. As a consequence, unnecessary costs were incurred at a range of levels and the project risked delays and additional regulatory consultation.

Getting it right from the start

What is missing? The key to solving this puzzle is in understanding the types of minerals occurring in the ore and waste. Major advances in other scientific disciplines now allow us to characterise mineralogy at a level not available until recently. This knowledge allows mine operators to identify mineable rock units and segregate potentially problematic rocks from those that are benign. As a result, the overall volume of waste rock that requires special handling or storage is greatly reduced.

Reduced expenditures

SRK's method begins with a detailed geological and geochemical assessment at an early stage in development of ore deposits.

At Turquoise Ridge in Nevada, SRK used this technique to estimate the proportions of different waste rock types to be mined. Our geochemists worked with the project geologists to develop a resource block model for waste rock.

This process enabled us to determine which waste rock was likely to cause metal leaching. It also allowed the company to put in place appropriate preventative measures.

SRK helped to create an operational strategy to segregate the waste rock that was predicted to cause ARD. The company then effectively disposed of this rock.

Benefits you can build on

These actions substantially reduced the overall cost of monitoring and disposal of ARD generating waste. Equally important, the mine operators could confidently use non-ARD generating waste rock for construction of structures at the site.

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John T. Chapman


John Chapman

John is a principal in our Brisbane office with over 15 years experience throughout North America, Latin America, Africa, Australasia, and Europe. He holds a M.Sc. in chemical engineering from the University of Cape Town and specialises in acid drainage assessment, water quality prediction, and water management. John has been the project principal for several reclamation projects and the lead geochemist for impact assessment and permitting projects.

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SRK expands its geochemical services in Australia


Andrew Garvie and Claire Linklater

Two senior staff members of ANSTO, Andrew Garvie and Claire Linklater, have joined our Sydney office. Their specific expertise centres on ARD assessment, waste rock and stockpile management planning. Both have experience in the measurement and modelling of relevant processes and will expand SRK's ability to predict the behaviour of waste rock dumps and heap leach piles.

Andrew has been responsible for numerous innovative developments. These include a proof of concept instrument for rapidly measuring the intrinsic oxidation rate of small waste rock samples, such as drill core, and the development of a technique to measure the in situ diffusion coefficient of waste rock and cover materials at mine sites. He has extensive experience in determining physical parameters of sulfidic piles, e.g. oxygen and heat distribution. This information is determined via field measurements and used to estimate the overall rates of sulfide oxidation.

Claire has applied the numerical code, SULFIDOX, to help with interpretation of field data and to predict the future behaviour of sulphide-bearing piles. SULFIDOX was developed at ANSTO to model sulfide oxidation, heat, gas and water transport and incorporates an equilibrium chemistry module for calculating effluent quality. SRK will be acquiring the rights to SULFIDOX. Claire also has considerable experience in assessing the geochemical behaviour of aqueous contaminants, mineral-water interactions and dissolution of waste forms.

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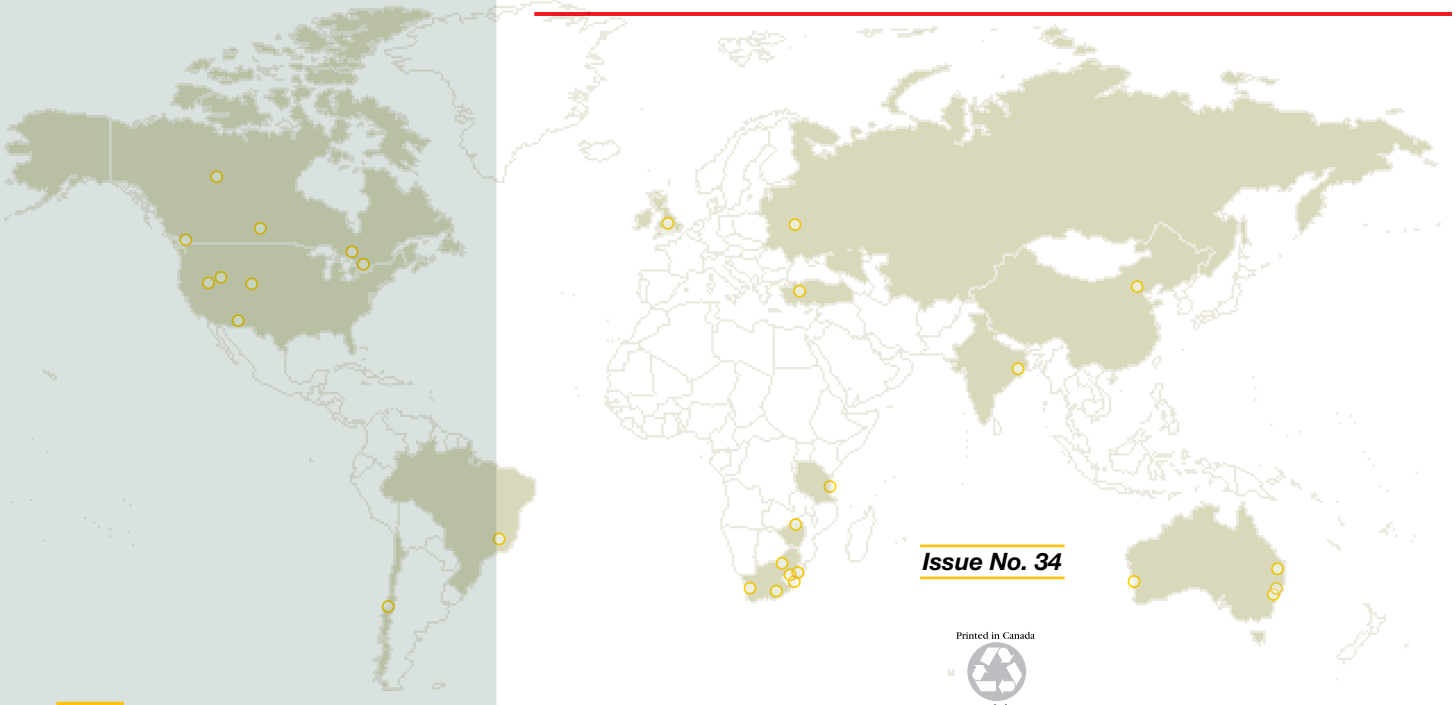
For more information, visit us at: www.srk.com



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