

Mining Expertise



“Working together to turn challenges into advantages”

OTEK is a member of the
ARCADIS Alliance Partner Program



Corporate Overview

OTEK & ARCADIS

Leading consulting companies, OTEK Australia and ARCADIS provide engineering, environmental, and project management services to the top tiered private and public sector clients.

ARCADIS global mining clients with presence in Australia/ New Zealand have seen historic growth and have desired an ARCADIS quality approach to their growing environmental and engineering needs. OTEK Australia a local consultancy with a 20 year history in Australia/New Zealand has been engaged as ARCADIS strategic partner to supplement and support the demands for superior expert service.

Through this new partnership, OTEK and ARCADIS will share their capabilities and expertise to the Australian and New Zealand marketplace.

With more than 15,000 employees worldwide and \$2.4 billion in revenue, ARCADIS has an extensive international network that is supported by strong local market positions.

Together, OTEK and ARCADIS embrace all aspects of the engineering and environmental consultancy solutions sector with an innovative and dynamic team in strategically located offices around Australia to ensure the ability to provide efficient service to clients in Australia, New Zealand and adjacent countries.

Together, we possess extensive experience with employees who pride themselves in offering quality and practical environmental solutions to the petroleum, chemical, agricultural, communication, utility, defense, aviation, transport, marine, manufacturing and mining industries.



Expert Capabilities

The diverse experience of our scientists, engineers and managers has given us a broad perspective on the unique issues and problems facing our clients in matters of health, safety and the environment.

Our management, staff and selected advisors assist in having some of the most extensive worldwide practical environmental experience in the mining industry. Our advisors and senior technical associates are recognised experts in petroleum engineering and environmental risk management services worldwide.

We have performed thousands of projects within the industrial sector including mining, chemical, automotive, pharmaceutical, and oil and gas throughout Australia and internationally.

Our ability to provide practical, cost effective, expert consulting services has resulted in many years of long-term client relationships.

Together, we have demonstrated world's best practice in environmental projects utilising innovative technologies not used previously in Australia. This has led to defining benchmarks for environmental regulators throughout Australia.

ARCADIS is ranked among the top 10 management and engineering consultancies in the world. In Europe, Brazil and Chile they have a top 5 position. In the global environmental market they are positioned in the top 3. Likewise, OTEK is recognised as one of the top consultancies in Australia and the Asia Pacific region. ARCADIS and OTEK combine a deep knowledge of the local conditions where they work with fresh global perspectives for unique, integrated solutions.



Global Mining



The challenges faced by the mining industry in today's global business environment are increasing in scope and complexity.

By combining specialised expertise in the environmental and engineering fields with a working knowledge of mining processes, OTEK and ARCADIS delivers tailored solutions that address the specific needs of the mining industry and that make solid business sense.

We offer an in depth understanding of the mining industry with:

- sustainable development practices built into our mining services to improve your triple bottom line - financial success, environmental protection, and corporate social responsibility.
- proven innovative mining technologies that minimise costs and maximise profits.
- cost-effective solutions supported by scientists and engineers focused on reducing risk and improving our client's mining results.
- former mining industry professionals that understand the importance of planning for the entire life of the mine and beyond.

We serve as true partners in addressing important environmental issues that impact and shape the mining sector. A working knowledge of the regulatory environments of each country, combined with a close working relationship established with our clients and the quality of professional services and innovate solutions, have positioned us to be a catalyst in successful mine development and closure.

Strategic Sustainable Focus

Sustainable development is a core element of our business strategy – we recognise that every mining project is directly linked to the global environment. As such, we continually invest in state-of-the-art mining related technologies, processes, products, and services that enable us to best serve future markets and create a sustainable environment. We help our clients develop and operate mining projects today without compromising the future of generations.

Innovative Mining Waste Management Technologies

Both OTEK and ARCADIS are industry leaders in developing, using and implementing mine waste management and treatment technologies. Our unique understanding and application of bioremediation, in-situ treatments, and preventative acid mine drainage (AMD) technologies has allowed us to solve our mining clients' problems while saving millions of dollars in operation, closure, and post-closure monitoring.

Cost-Effective Mining Solutions

We are a cost-effective mining solutions provider. We strive to partner with you, align with your goals, strategise to achieve them, and then go beyond your expectations in delivering value. Your problems are our challenges! Our team approach has allowed us to develop cost-effective solutions in concert with our combined technical expertise.

Specifically for the mining industry, we have developed mining services that either reduce costs or enhance mineral recoveries during the mining process such as Opti-Leach Program as well as legacy services such as Guaranteed Remediation (GRiP®).

Our cost-effective mining solutions span the entire mining lifecycle helping our clients to reduce risks, free up capital, reduce reclamation costs, and maximise resource recovery and profits.

Comprehensive Mining Services

As a true partnership we provide comprehensive mining services. Whether your company is exploring new mining opportunities, an operating mining entity, or whether you're dealing with mined land closure liability, our professionals have a proven history for providing innovative, common-sense solutions through the entire mine lifecycle. From exploration and mine planning through operation and restoration, we help you plan your project for closure. Beyond closure, our personnel have the experience and skill set to examine the potential for post-closure land use and sustainability. Our approach to mining services is to include innovative remedial and sustainability techniques in every aspect of our service offerings. The results minimise costs and reduce delays, provide closures that are acceptable to regulatory agencies, and create redevelopment opportunities for our clients.



Responsible Exploration and Mining Lifecycle Planning

We understand that the development of a mine consists of related steps that systematically build upon one another. We can help develop exploration and mine plans at the beginning of the project that recognises the potential adverse effects that mining can have on the environment. We help assess and document the pre-mining site characteristics and work with the mine engineers to design mine facilities to reduce their environmental footprint and implement planning and permitting with the post-mining redevelopment/land reuse in mind.

Strong Regulatory Alignment Strategies

Our aggressive regulatory alignment activities have resulted in a strong track record of successes in influencing positive interpretation of regulations and in altering the regulatory direction of specific projects to the benefit our clients. One way that the OTEK and ARCADIS partnership represents our clients' interests is by getting actively involved in reviewing and commenting on environmental regulations around the world.



Built-In Risk Assessment

The magnitude of mining environmental regulations places an enormous burden on the mining industry to effectively assess the risks associated throughout the mining lifecycle. Key to mitigating risks and avoiding costly risk factors is building in preventative measures within the mining lifecycle. OTEK and ARCADIS has over 50 years experience building risk mitigation into the mining development plan. Our team understands the complex impact associated with a mine and work in tandem with our clients to ensure and protect the clients "social license to operate".

Seamless Transition into Mining Operations

Together, we have the ability to easily transfer from exploration and mine planning to implementation of the plan during construction and operations. Because we have the experts to provide services throughout the entire mine lifecycle, we can assist with all phases of mining.

Mine Closure with Sustainability at the Forefront

Completing the mining lifecycle, the final process is closure. With the combination of technically experienced staff and innovative tools, we provide closure planning for mines at all stages, keeping post-mining sustainable land use at the forefront. We provide site-specific solutions to complex systems and through upfront and/or continually updated planning combined with progressive planning and implementation of closure measures reduce costs.



Exploration and Lifecycle Planning Services



Development of a mine is an arduous, long, and expensive process. The process is comprised of many inter-related steps that build upon one another.

Because the mine development process is very capital-intensive in the initial stages and profits do not accrue until late in the process, mine development is inherently risky for developers and investors.

We understand the risk and has the tools in place to maximise information that can be gathered during exploration taking in every minute detail to provide precise results and ensure client confidence as the mine planning process moves forward.

The foundation of the lifecycle planning is the detailed understanding of the mineralogy of the ore body and how the minerals will be altered by physical and chemical means during operations.

We also understand that once an exploration target has been quantified and approved for development, the risks of failure can still prevail.

It is only with continued attention to preventative measures and systematic building of a lifecycle plan that risks can be understood and mitigated at every step of the mining lifecycle.

Both OTEK and ARCADIS have more than 20 years experience serving the mining industry (many of our staff have even more experience individually) and is able to assist with the successful planning of every phase of the project.

We understand the issues related to mine development and therefore know how to formulate effective plans at the beginning of your project to optimise mining operations, waste management, and site closure.

We plan with closure in mind, which results in reduced risk and long-term environmental liabilities.

Mining Operations Services

The partnership can optimise the mining operation by meeting regulatory requirements which compliment our exploration and mining planning capabilities.

We have diverse staff including geologists, hydrogeologists, geochemists, specialty engineers, and regulatory specialists that can assist with mining operations ranging from developing operation, mine plans, and regulatory compliance, to construction management.

We provide overall project management and construction management (PM/CM) which affords our clients with maximum control of the project's design and construction of new sites as well as for capital expansion projects at current mining sites.

PM/CM includes expertise in technology, design, construction methods, cost appraisals, schedules, and management systems.

We bring organisation, proven systems, design and operating expertise, and a proven management process to complicated projects.

We also bring to the mining operations sustainable design features that address needs such as energy efficiency, alternative energy sources, environmentally-friendly materials, resource conservation, lean manufacturing, recycling, treatment and other restorative process, worker and public safety, alternative transportation, socially responsible investing (SRI), and greenhouse gas (GHG) management.

Our combined staff have the expertise to provide sustainable solutions that suit current needs and your future goals while improving your triple bottom line – financial success, environmental protection, and corporate social responsibility.



Reclamation/Closure Services



Generally the final steps of a mining project are achieving acceptable site closure suitable for the anticipated post closure land use.

The OTEK and ARCADIS partnership provides experts that have the experience to assist mining companies to achieve this goal; but regulatory closure may not define the final and best use of the land and water holdings.

We offer our clients practical business solutions for the efficient and cost-effective closure of contaminated sites and forward thinking ideas for post closure land use and sustainability.

Together, the OTEK and ARCADIS partnership are industry leaders in developing innovative mine waste treatment technologies.

We use bio-remediation technology that allows for in-situ treatment of a wide variety of constituents. In-situ reactive walls and reactive zones (IRZ) are often used to remediate groundwater beneath and down-gradient from tailings impoundments, waste rock dumps, leach pads or process solution ponds at mines, mills or smelters, or down-gradient of pit lakes. In-situ treatment is also used to avoid a hazardous waste classification by successfully reclassifying wastes.

The application of our mining technologies results in not only cost savings to our mining clients, but also freedom from future remediation responsibilities and regulatory uncertainty.

We provide solutions that save our clients money, reduce environmental liabilities, and that help to successfully obtain closure without lengthy post-closure monitoring requirements.

Once the business plan is in place and the strategy for regulatory closure is laid out, we think to the future for sustainable use of the land and water holdings.

The current business climate as well as the driver for green energy alternatives will prove to be very viable alternatives



Environmental Impact Assessments

Our Environmental Impact Assessment (EIA) team is a consortium of leading EIA consultants including OTEK and ARCADIS and provides EIA and Environmental Impact Statement (EIS) services around the globe to help clients with approvals needed where regulatory legislation requires an assessment to be completed.

We provide these services to all industries, with a team of leading consultants in each specific field, using project management processes that ensure either large or smaller EIAs are run smoothly with up-front planning.

The partnership works with professional leaders to perform a range of EIA activities and assessments, to find solutions to meet your company's development needs, and combine professional services with well developed relationships with regulators in many jurisdictions.

Where specific expertise is needed, we are able to outsource to leading experts who are engaged through a quality selection process.

Hydrogeology

The partnership of OTEK and ARCADIS provide hydrogeological consulting services to the mining, exploration and construction industries from the deepest mines, large open pits and remote projects all around the world.

Some of our key expertise includes:

- Mine Dewatering/Mine Water Control Programs (Underground and surface mines)
- Environmental Assessment and Remediation
- Closure and Post Closure
- Water Supply
- Baseline Studies
- Slope Dewatering/Slope Depressurisation
- Borehole Monitoring
- Hydrogeochemistry (instrument installation and programs)
- Pit lake chemistry
- Constant Discharge – Constant Head Tests
- Packer Tests – Wireline Packer Tests
- Tracer Tests
- Airlift Recovery Tests
- Modelling (FeFlow/Modflow)
- Waste Water Management

Water Treatment Technologies

Water management is essential to mining activities, and crucial to development approvals, operation and production, and mine closure. It is vital that a consultant is used in EIA's that can ensure your plans and development adheres to relevant policies and practices in each jurisdiction, and satisfying regulators that water is well managed.

We offer an integrated approach to mine water management, combining specialist expertise in hydrology, hydraulics and hydrogeology with geotechnical, environmental and mining skills.

Experience in mine water assessment, management and treatment, including:

- Baseline studies
- Hydrologic studies linked to flood prediction
- Integrated environmental planning
- Water balance modelling
- Waste characterisation and management
- Water supply and mine dewatering
- Water management plans
- Seepage control and contamination assessment
- Quantitative contaminant modelling
- ARD, water quality and geochemistry
- Diversion (or catchment) structures and spillways
- Engineering design and procurement
- Contract management and QA/QC
- Coal de-watering technologies
- Pit dewatering and treatment
- Sludge treatment
- Groundwater modelling, and extraction and treatment
- Innovative water treatment technologies



Mining Services

Together, we offer all aspects of quality services to the mining industry in a diverse range of areas.

Exploration

- Exploration permitting and economic analysis
- Bond acquisition/release
- Drillhole abandonment
- Site characterisation
- Mineralogical models
- Baseline environmental studies
- Regulatory strategy development

Field Studies

- Aesthetic resources (visual and noise)
- Air quality
- Aquatic, terrestrial, and cultural ecology
- Ecological risk assessment
- Environmental audit and compliance services
- Endangered and special status species surveys
- Hydrology/water quality and hydrogeology investigation
- Geochemical characterisation
- Waste classification, management and disposal
- Environmental monitoring programs, including routine groundwater monitoring

Other Mine Development Services

- Agency coordination
- Mining permit application preparation
- Mine rehabilitation

- Revegetation design
- Aesthetic resource evaluation
- Surface and groundwater modeling
- Storage and packaging for compressed flammable gases
- Design for chemical storage and handling facilities
- Archaeological baseline studies
- Ecological assessments
- Environmental/due diligence audits
- Bond calculations
- Facility layout and design
- Environmental studies (baseline, monitoring)
- Air and water modeling
- Natural resource damage assessment
- Socioeconomics and land use

Risk Assessment

- Risk assessment of dangerous goods storage and handling facilities
- Site investigations
- Risk management
- Human health and ecological risk assessment
- Ecosystem restoration
- Asset/liability management
- Community relations and risk communication
- Emergency/Incident response
- Product stewardship



Planning

- Site Environmental Management Plans (SEMPs)
- Plans of operation
- Reclamation/revegetation plans
- Erosion/sediment control plans
- Spill prevention plans
- Stormwater management plans
- Weed management plans
- Fugitive dust control plans
- Habitat conservation/management plans
- Visual management plans
- Landscape plans
- Archaeological recovery
- Continuously monitored secondary contained systems for enhanced pollution control

Permitting

- Mining permits
- Air permits
- Water permits
- Siting permits
- Rights-of-way
- Stormwater permits
- Waste permits
- Land use permits

Regulatory Compliance

- Due diligence assessments
- Local environmental regulatory accredited statutory auditing
- Permit and legal compliance audits
- Environmental performance auditing
- Environmental Impact Assessment (EIA)
- Environmental Site Assessments (ESA)
- Environmental management systems implementation and auditing, including gap analysis system audits
- Expert witness
- Corporate reporting
- Stormwater control design

Natural Resource Damage

- Habitat Equivalency Analysis (HEA) and Resource Equivalency Analysis (REA)
- Sustainability auditing
- Greenhouse gas consulting
- Economic valuation/modeling
- Injury and damage assessments
- Oily water treatment systems and pollution control systems for vehicle washes, workshops fuel storage systems etc.
- Storm water management and control
- Natural resource trustee negotiations
- Design and implementation of restoration projects



Mine Waste Technology

- Waste water recycling and reuse
- Mine pit lake treatment
- Acid mine drainage prevention
- In-situ reactive wall and reactive zones
- In-situ bioremediation and intrinsic bio-attenuation
- Phyto-remediation
- Soil washing/stabilisation/fixation
- Dewatering systems
- Multi-phase extraction (MPE)
- Air sparging
- Chemical injection, including oxidation and reduction methodologies
- pH Adjustment

These technologies have been successfully implemented on sites with the following contaminants:

- Hydrocarbons
- Solvents
- Heavy metals
- Pesticides
- Sediment-laden waters
- Energetic materials
- Acid sulphate soils

Closure/Reclamation

- Reclamation planning/monitoring
- Waste reclamation
- GRiP®
- Demolition/decommissioning
- Dewatering/groundwater control
- Drainage analysis
- Geochemistry and geophysics
- Geology/hydrogeology
- Geostatistical modeling

- Geotechnical investigations/ analysis
- Metallurgy
- Soil and groundwater remediation
- Liquid waste treatment
- Water treatment

EIA Services

- Due Diligence Assessment
- EIA & EIS
- Regulatory Liaison
- Mine Closure and Rehabilitation
- General Petroleum Geology and Basin Analysis
- Petroleum Systems Analysis
- Thermochronology and Thermal History Modelling
- Reservoir and Source Rock Characterisation
- Oil and Gas Geochemistry
- Geophysics and Petrophysics
- Provenance Studies
- Reserves and Resources
- Basin Studies
- Mine Water and Groundwater Management and Treatment Technologies
- Ecological Assessment and
- Groundwater Extraction and Treatment
- Marine Impact Assessments
- Social Impact Assessment and Community Liaison Plans
- Indigenous Impact and Archaeological Impact Assessment and Plans
- Sustainability Reporting
- Flora and Fauna Assessment
- Coal Drying Technology
- Noise Modelling
- Low Energy Water Treatment and Extraction of Organic and Inorganic Species



Case Histories



Development of a Closure Strategy for an Abandoned Mine Site Producing Acid Mine Drainage (AMD)

THE CHALLENGE: A very large unlined tailings impoundment was producing significant AMD impacting surface and groundwater.

THE APPROACH: A review of existing data was conducted, data gaps identified, and field work was conducted to fill the gaps. A preliminary Conceptual Site Model was developed based on the data and used for development of the final closure strategy.

THE RESULT: Using the Conceptual Site Model, we assisted the client to understand the alternative water management options allowing reduction of costs and minimal impacts from AMD.



Due Diligence - Risk Evaluation of Storage/Handling/Management of Fuel(s) and other Dangerous Goods at Mines Sites Worldwide; inclusive of physical facility competency and waste management procedures.

THE CHALLENGE: Major exposure to pollution events existed at numerous operating mine sites associated with transport (truck, pipelines, rail, shipping), storage (tank facilities – aboveground; underground storage tanks; temporary systems), handling (transfer processes), management (procedures, competency testing, training) of large quantity of liquid fuels associated with the operation of the mine or product processing areas. This project was highlighted as the result of a major fuel loss incident (> 2 million litres diesel product)) into the subsurface.

THE APPROACH: We developed a comprehensive interactive risk evaluation program over an extensive period in consultation with senior management. This program worked through the numerous and variable scenarios associated with the mine sites and operations owned and managed. Staged interaction and working to populate the data required for this risk program was conducted in close consultation with the senior management at the mine sites specifically.

THE RESULT: Thirty-eight (38) mine sites Worldwide were evaluated; for each mine sites an extensive list of action items were developed to define priority stages and focus for minimisation of risks of pollution and impacts to the eco-system management associated with fuel(s) used at these locations. Future capital and expense budgets to limit these pollution risks were defined relative to this program.



Preliminary Site Investigation

THE CHALLENGE: To conduct a Preliminary Site Investigation at a mine operation in accordance with DEC guidelines (Contaminated Sites Management Series) to identify potential sources of soil and groundwater contamination, if any, probable contaminants, probable locations of contamination and if required to make recommendations for further investigation and/or any remediation work that may be required.

THE APPROACH: Together, in accordance with DEC guidelines undertook: Detailed site history investigation including desk top review and interviews; Review of previous environmental investigations; and Detailed site reconnaissance.

THE RESULT: Review of available information and a site reconnaissance identified a number of potential sources of contamination arising from the site's land use as an operational gold mine and processing facility. We have developed a risk ranking system for all facilities investigated.





Opti-Leach Program

THE CHALLENGE: The existing dormant leaching facility at the mine needed to be re-started.

THE APPROACH: We applied their opt-leach program in which we optimize heap leach operation for a fixed price. Our activities included evaluation, design, and implementation of an improved operational program.



THE RESULT: The dormant facility produces 10 tons Cu/day, up from an initial 4.4 tons cu/day, extraction rate represents 3% per month of the recoverable copper, and net revenues to the client are nearly \$0.9 million per month from a facility once believed non-leachable.



Environmental Due Diligence associated with the purchase of an operating Coal Mine

THE CHALLENGE: To qualify and quantify in a limited period of time the environmental exposures associated with the purchase of a specific operating Coal Mine.

THE APPROACH: We conducted a desk top study of all available environmental information associated with the historic operations of the coal mine. A two day site reconnaissance was conducted of the operations to develop an understanding of present operating procedures and programs and to determine the reliability of the desktop information reviewed.



THE RESULT: The works and report were delivered in a two week period that provided the client a reasonable comprehensive evaluation of the sites past and present environmental risk exposures should the property be purchased. The company decided to not purchase the coal mine asset.



Decommissioning Program

THE CHALLENGE: Iron ore deposits were exhausted and the area required interventions for its stabilisation under the geotechnical, hydraulic, biological and social-economic optics, with the aim for sustainable development of land occupation.

THE APPROACH: We evaluated aquatic ecosystem and site specific water quality, studied surface water and sediments, and conducted studies of resident trout and mountain white fish and semi-aquatic mammals, including mink, otter, and raccoon.



THE RESULT: From conducting a very complex and thorough analysis, we were able to gain a favorable settlement for our client.



Cleanup of Sodium Xanthate Material at Mine site

THE CHALLENGE: Sodium Xanthate is a material used in separation process of metals, as a product it degrades to become a gaseous product that is dangerous for humans to inhale. Numerous spillage had occurred at a former operating mine facility, which required cleanup. A health and safety issue had occurred previously at this location.



THE APPROACH: Sodium Xanthate is not listed in regards to appropriate levels of exposure and associated clean up criteria. We evaluated and defined a risk level appropriate to clean up of the contamination issues. Approvals and education of the regulator was conducted relative to the risk aspects associated with this clean up.

THE RESULT: We conducted the clean up and obtained closure on the site.



Application of In-situ Technology

THE CHALLENGE: Groundwater concerns at an inactive Uranium Mine needed to be examined.

THE APPROACH: We designed a bench-scale uranium treatability tests.



THE RESULT: The test results allowed us to replace the existing ineffective pump and treat system with an in-situ remediation system. The in-situ remediation system significantly reduced the amount of equipment required, operation and maintenance costs, and production of hazardous waste.



Permitting a Coal Mine

THE CHALLENGE: We conducted an environmental baseline monitoring program for a new underground coal mine.

THE APPROACH: We prepared a permit application in accordance with the state and federal guidance to describe operations and present mitigation measures for minimising potential environmental impacts of the mine operations and disturbance.



THE RESULT: We assembled a complete and technically adequate permit document that was accepted by the agencies with minor revisions. We also completed extensive groundwater modeling and developed appropriate mitigation to reduce impacts on water resources. This approach rapidly moved the project forward to issuance of the permit.



Environmental evaluation of 7 mine sites – 5 operating; in preparation for sale.

THE CHALLENGE: Mine sites under consideration produced or had produced silver, gold, lead and other base metals. Numerous processes were used on these sites for separation, smelting and other processing purposes. Waste, leachate ponds, tailings dams & processing areas at the sites had, had numerous spillages (ie. Mercury, etc), leakages and buried materials (such as drums of cyanide). The long history of these sites and variable unknowns added to the challenge of environmental evaluation.



THE APPROACH: We developed a comprehensive program for the evaluation of areas of impact; and conducted a program of assessment that was extensive. A full understanding (qualification/quantification) of the impacts were provided in a number of reports.

THE RESULT: Reports were provided to the client to utilise in the sale program on the mine sites. We assisted on the cleanup and specific issues and worked with the client to ensure a competent interaction with the regulator for closure of issues.



Environmental Management System Audits

THE CHALLENGE: We were contracted by our client to conduct Environmental Performance and EMS Auditing of Gold, Copper and Bulk Commodities Mining Operations at their 5 operations, combination of underground and open pit mining.



THE APPROACH: The audit program included a systematic approach in: Identifying current and potential environmental issues and liabilities; Assessing each site's conformance with the Company's EMS; Evaluating legal compliance with environmental legislation and site-specific legal requirements, such as ministerial conditions and licence conditions; Recommendation of corrective measures for non-compliances and non-conformances; and Provision of an action plan for each site.

THE RESULT: Through the conduct of these audits, the Client was able to improve their environmental performance through the adoption and implementation of several best practice environmental initiatives.



Baseline Environmental Audit in Transport of Mineral Concentrate

THE CHALLENGE: Copper Concentrate is a product that is commonly produced by copper mines after crushing and concentrating mine ore. The Concentrate is hazardous to human health and pose a long term effect to environment in an event of an uncontrolled escape or spillage. A baseline investigation for the transport corridor was required to determine the benchmark for any future potential escape of product along the route.



THE APPROACH: We developed a risk based sampling strategy and a program along the 200km transport corridor in consultation with the best practice, West Australian Contaminated Land Assessment Guidelines and in consultation with Department of Environment and Conservation.

THE RESULT: Soil samples were obtained along the transport route at regular intervals to set up a baseline data set of the background levels of potential contamination.



Diversion of a Major Drainage, Copper Mine

THE CHALLENGE: Permanent diversion of a major drainage (US waterway) around the open pit is needed to access valuable copper ore while replacing riparian habitat.

THE APPROACH: A lined channel with 18,000 cfs carrying capacity was designed with innovative grade control structures to facilitate vegetation.



THE RESULT: Construction of the channel began in Spring 2009. The channel includes cut-off walls on both ends and a textured High Density Polyethylene (HDPE) geomembrane liner to minimize infiltration and assure pit slope stability. Articulated Concrete Block (ACB) armors the side-slopes of the channel. Five feet of natural alluvium is placed over the liner between the grade control structures to make up the streambed and facilitate growth of riparian habitat.

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This Alliance is an association of cooperating independent companies established to network services world-wide for the benefit of its Clients and no legal association is expressed, except through written agreements with such Clients.