# Groundwater insight – a critical resource

Although groundwater is an essential component of the production cycle at most mines in Australia, demonstrating the viability of a water source is often seen as a 'regulatory tick box' rather than a critical factor in the feasibility of a project

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At least one quarter of mining projects in Australia encounter some type of groundwater challenge. As a mining hydrogeologist, I've seen projects go under as a result of having too much or too little water, or water that is contaminated.

In my experience, water often doesn't seem to be front of mind in the early stages of Australian mining projects. It is common to wait until the bankable phase of the project before investigating the project's water supply – often, that's too late.

When millions of dollars are on the line, complacency about groundwater can put the profitability of an entire project at risk. Too often, the task begins well into the mining project's development cycle and the opportunity to collect valuable groundwater data while exploration is underway is overlooked.

This article showcases some examples that demonstrate why it's both practical and prudent to include a hydrogeological assessment as early as possible – during the exploration phase of a project, ideally prior to the scoping study being commissioned. Given the inherent risk and huge costs associated with developing mining projects, reframing the understanding of the significance and timing related to gathering groundwater data is an essential contributor to a project's success.

## Drilling for resources and groundwater data

In my 20 years in the hydrogeology field, I've seen many projects fail, or nearly fail, due to unexpected complications related to water supply. These complications could have been anticipated, planned for and overcome if early investigations had been implemented during the project planning cycle.

In the early stages of project development, there is opportunity to collect hydrogeological data by making use of the drill holes already drilled for resource delineation – doing so saves time and money. Relative to the overall cost of an exploration campaign, the additional cost of recording hydrogeological information during exploration drilling, converting drill holes to monitoring bores and conducting preliminary hydraulic testing is minor.

Planning dual-purpose drill holes can usually be accomplished without impacting the exploration

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program, and as the cost of drilling holes is often the most expensive part of any hydrogeological investigation, taking advantage of exploration and/or resource drilling can save significant dollars.

## Groundwater data to improve forecasts

Early understanding of water supply requirements and the identification of potential groundwater issues can save money in the long term. This understanding can also provide valuable guidance on the scope and potential costs of future work. The groundwater data collected from exploration and resource drilling programs can be used to develop preliminary risk assessments for water supply and outline regulatory requirements. The information gathered – and properly interpreted by a professional hydrogeologist – can be invaluable in assessing risks and evaluating the level of detail of the groundwater investigations required for project development. In many lower risk cases, this data will preclude the necessity for additional, expensive groundwater studies.

Groundwater risks can be related to the dewatering that open-cut and underground operations frequently require, ensuring an adequate water supply to meet the requirements of the processing plant, and managing the impacts of seepage from waste rock landforms and tailings facilities on aquifers. The latter is often a critical component of the environmental assessments that are required in order to satisfy mining regulations.

Failing to adequately understand the groundwater system can result in reduced mill throughputs, higher drilling and blasting costs, and regulatory issues related to water disposal where dewatering involves excessive volumes of water.

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These factors can have a profound effect on project economics and have the potential to jeopardise a project’s success, resulting in operations coming perilously close to failure.

Traditionally, mine operators have viewed dewatering, sourcing sustainable water supplies and ensuring minimal environmental impacts on nearby water sources from runoff as manageable risks. In today’s mining industry, however, increased production rates and the push to mine deeper and further below the water table means that companies are moving towards placing a high priority on addressing these risks.

Despite this elevated groundwater-related risk profile, many companies still delay the effort required to address these risks until far too late in the project development cycle – and in some cases, don’t undertake the work at all.

## Case studies

One project I was involved in was located in an arid environment and therefore heavily reliant on groundwater to supply water requirements. Prior to SRK’s involvement, minimal groundwater data had been collected – enough to meet regulatory demands, but not enough to properly assess the long-term sustainability of the water supply system and to incorporate an adequate contingency for operations. SRK was contracted late in the process when it became apparent that the processing throughput was likely to be restricted due to a lack of water. Groundwater exploration commenced immediately, eventually finding sufficient water supply to avoid major throughput restrictions. However, due to the urgency of the situation, the costs associated with the groundwater exploration program were very high. The lack of groundwater also placed the operation at high risk.

In hindsight, the operators were focused on meeting regulatory requirements, in terms of the groundwater supply, rather than considering the overall risk to the project. Long-term throughput restrictions due to the water shortage were ultimately avoided by the slimmest of margins; however, the potential for project failure was real. In addition to undertaking comprehensive groundwater studies to address those risks, early collection of basic water-related data as part of the exploration program would have provided extremely valuable information for groundwater exploration drilling, and would have saved considerable time and money.

Another project I was recently involved in saw the company management team decide to accelerate the development of the mine to take advantage of an uptick in commodity prices. The project manager had previously been involved in a project where dewatering and water supply issues had resulted in delays with obtaining permitting and financing. As a result of this experience, the company decided to engage SRK early in the process to gather as much hydrogeological information as possible during the advanced exploration and resource delineation drilling programs.

Initially, SRK provided recommendations to the geology team on the type of water-related information that could be gathered during drilling. On completion of the drilling program, SRK reviewed the exploration data, conducted a brief site visit and, based on the data, recommended a number of diamond drill holes to be converted to monitoring bores. Additionally, SRK identified an opportunity to convert some larger diameter reverse circulation holes to production bores. These were then tested, constructed and used as a water supply for infill drilling – saving thousands of dollars in water carting costs. By taking advantage of the opportunities to build on the early drilling program, the company had developed a prefeasibility level understanding of the groundwater system without the need for dedicated water-bore drilling, and was also able to demonstrate a groundwater quality baseline for regulators, resulting in substantial cost savings.

## Conclusion

Very few companies accurately estimate the costs related to water supply and assess risks associated with groundwater – supply and environmental impact – before the development phase. Mining operators need to understand that water complications, and a lack of understanding of quality and quantity as well as water costs and consumption, can have significant economic impacts. Ultimately, the cost of acquiring this information later in the project will be much higher and will expend valuable time, so it pays to get in early.