



Anglo American

WATER

MANAGEMENT FOR TODAY AND TOMORROW

PENNY BRADFORD AND DAVE SALMON

Getting the scale of Anglo American's water challenges across in a graphic presentation being made at the start of the WaterWays Summit held in Johannesburg in November 2007. (See full graphic on fold-out following page 42)





THE MUNICIPALITY of Mogalakwena in the Greater Limpopo River Basin is proud of its heritage and attractions; it is counted among the most important archaeological areas in South Africa. The town's council chambers bear a coat of arms with the motto *A Place for Prosperity*. But it is a prosperity that has been won from a dry land, the short rainy season producing a semi-arid climate. It is a land where water management is crucial to prosperity.

Anglo Platinum is the largest industry in the Mogalakwena municipal district and uses the sewage effluent from the waste water treatment plants of the towns of Mokopane and Polokwane (respectively, some 35 kilometres and 64 kilometres from the operation) as process water in its concentrating operations. But inadequate water supply threatened to limit the company's expansion plans as the town of Mokopane was unable to provide additional treated effluent. Realising partnership was the way forward, Anglo Platinum committed to assisting with the development of various water supply, treatment and storage facilities, and the construction of a new pipeline from the town of Polokwane.

Once complete, the \$64 million project will deliver 14 megalitres of treated effluent each day to the operation via a 64-kilometre underground pipeline. It will also increase the water supply to the town of Polokwane by 25 megalitres per day, create additional reservoir capacity, upgrade potable water treatment capacity and provide

infrastructure for waste water management to around 1,300 families.

Mining, Anglo American acknowledges, must balance its need for water against the requirements of other users in local communities, find innovative solutions that will help preserve the fragile environments in which it operates and mitigate its environmental impact. The company also understands that the efficient use and sound custodianship of water are critical for its operations today and for future growth.

Meeting the demands of supply

Anglo American is a significant user of water and, across the Group, there are many places where water demand exceeds supply. During 2007, the Group used 251 million cubic metres of water, of which 131 million cubic metres were used in businesses that are considered core to the company's future strategy.

Put another way, each year the company requires the amount of water it would take to fill more than 100,000 Olympic-sized swimming pools, each containing 2,500 cubic metres of water, to keep its operations functioning. The problem is, however, not simply one of demand. Many of Anglo American's facilities and projects are located in water-scarce areas such as the Atacama Desert in Chile – the world's driest – the western side of southern Africa and Australia. In such places, the conflicting pressure on water resources is acutest and the obligation on Anglo American to manage water resources wisely and sustainably the greatest.

The tension between too much demand and inadequacy of supply is already having consequences and looks set to worsen. Climate change, population increase, water resource over-use and increased pollution are changing the status of many water-rich areas to water-scarce. Some Anglo American operations reliant on groundwater sources, such as Kumba Iron Ore's Sishen (see panel page 44) and Thabazimbi mines in South Africa and Orapa diamond mine (owned equally by the Botswana government and De Beers) in Botswana, are experiencing the effects of this change of water status.

Paradoxically, in some parts of the world where Anglo American operates, the issue is not too little



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water but rather water excess. After the recent long and intense period of drought (categorised as a 1-in-200-year occurrence) in Northern Queensland, Australia, operations in the Bowen Basin coalfields, including Anglo Coal's, were completely inundated by intense rainfall, accompanied by dams overflowing.

In these cases, mines have to be 'dewatered' and the excess water stored, processes which have their own associated health and safety hazards, before re-use or treatment.

In response to the challenges of water management and its rising cost – the price can vary tremendously from 6 US cents to more than \$8 per cubic metre, and everywhere prices are increasing, sometimes steeply – Anglo American has focused increasingly on adopting a holistic approach to water management which is fully integrated into continuous improvement programmes and into

models being developed to monitor and report energy and carbon dioxide (CO₂). This has involved the company working to establish the full and true costs of water to each of its operations, designing facilities to meet the particular climatic conditions in which they operate and continuously exploring new opportunities to reduce the amount of water used at each stage of the operational cycle. This process has begun and will remain central to Anglo American's strategy as it strives to become an industry leader in water management.

A model of innovation

Technical innovation, much of it initiated in-house, is allowing Anglo American to better calculate the 'water footprint' of each business unit, an important first step in cutting water use. The footprint model works by measuring the efficiency of energy and water use and is capable of computing data to

Washing of copper sheets at Mantos Blancos in Chile. The mine uses only 0.3 cubic metres of water per tonne of ore treated. This remarkable saving of water has now become the benchmark for the rest of the Anglo American Group



measure total incoming, recycled, re-used and discharged water. Anglo American's business units are currently piloting the model and agreeing common water definitions so that examples of best practice can be gathered and applied more widely.

Similarly, computer software models of water balances (analysing the flow of water into and out of a system) in different environments are being used to predict where water shortages could occur. Models have been developed, for instance, for Sishen, Anglo Platinum's Amandelbult mine, Anglo Coal South Africa, and some operations in Chile by Anglo Technical Division and specialist consultants.

By modelling seasonal climatic variations and the possible implications for the water balance, Anglo American will be better placed to deliver a

“There has never been a time when water-resource challenges have been more evident or urgent. Water is inherent in everything we are and everything we do. It is fundamental to our business.”

Cynthia Carroll, chief executive, Anglo American
Anglo American WaterWays Summit 2007

reliable water supply to its operations. Predictability of supply is everything, especially at those sites where water storage is restricted and significant expansion is under way, such as at the Los Bronces copper mine in Chile. Soon after Anglo American Chile acquired the mine in late 2002, work began to determine the best way of handling the pit water inflow. Initially, a conceptual model was created which was used as the basis for a field investigation to measure values of permeability in the 'basement' material of the pit and to carry out an analysis of the water. From all this information, a model was created to help predict how underground water supplies might be affected under different conditions.

Currently, a series of simulations is being undertaken to evaluate different alternatives to dewatering and depressurisation. Geophysical studies are also being conducted of the Infiernillo Rock Glacier, an important source area for water flowing into the open pit.

At the same time, to maintain the critical water balance, a water treatment plant is planned at the mine to treat tailings water. This involves building large pumping stations to move the water at 700 metres to the mine at 3,500 metres above sea level. But such creative solutions can have a lumpy price tag. The cost of re-circulating water from the valley to the mine is about \$1.10 per cubic metre. But as clean water costs rise, engineering solutions which focus on recycling used water, like those at Los Bronces, may offer the way forward.

Reduce, recycle and re-use

Water is indeed 'fundamental' to Anglo American's business; it is the lifeblood of its operations. For this reason, the company is committed to minimising the use of new water, reducing waste and promoting re-use and recycling projects. This commitment is aligned with Anglo American's policy of zero harm to the environment and its Group-wide water management performance standards. These standards require the separation of clean and dirty water and also cover practices around the discharge of dirty water.

Mantos Blancos copper mine in Chile uses only 0.3 cubic metres of water per tonne of ore treated (figures for comparable processes elsewhere in the world are nearly three times as high), providing a benchmark for the rest of the Group on water use.

At Anglo Coal Australia (ACA), where most water used underground is 'new' water, water minimisation has been pushed to the top of the 'to do' list. Dust suppression in open-cut operations and make-up water in coal processing are focus areas for improvement. ACA is also turning worked water – water which has already been in contact with coal, rocks or mine waste – into a resource to be re-used or recycled.

Similarly, at Kumba Iron Ore's Sishen mine in South Africa (a region where annual evaporation is five times greater than annual rainfall) improvements have included the construction of a new return-water dam and a new slimes-handling process to cut water loss through evaporation and seepage. The treatment of permanent roads with a chemical dust suppressant instead of water has also resulted in reduced water usage.

There is no question that such improvements are costly. But investment can, in the longer term, begin to pay for itself. At Anglo Base Metals' El Soldado mine in Chile, optimised fresh water consumption at the sulphur plant and replacement of the grinding and refrigeration system led to a saving of 350,000 cubic metres of water per annum. El Soldado also re-uses water to flush pit equipment.

Working with local communities

Investment for Anglo American does not simply mean investment in mining. It also means supporting a range of activities that help develop sustainable communities for the long term, such as promoting access to clean water, water conservation and water restoration projects. Communities expect to share in the benefits of mining and Anglo American's Socio-Economic Assessment Toolbox (SEAT) (see article on page 8) provides the agenda to achieve this.

In China, Anglo Coal's Xiwan project is working with PLAN (an NGO focused on community development) to increase access to potable water and sanitation infrastructure in three local villages. The project will result in hundreds of families being provided with access to reliable and safe water supply systems.

Anglo American Brazil is working with local environmental and education agencies on a WaterAction, or Aguação, project. This project aims to protect and revitalise the riparian forests in the catchment area of the Extrema Creek, source of the water supply for the town of Barro Alto close to which Anglo American is undertaking a big nickel expansion project, and control pollution sources, particularly those upstream of the catchment.

Healthy investment and adroit implementation of the company's water management strategy can offer benefits for both Anglo American and the communities in which it operates. The Emalaheni water treatment plant in the Mpumalanga coalfields of South Africa is an interesting example of where the interests of industry and the local population intersect. While the underground and opencast coal mines face an excess of water, which can restrict operations, surface water in the region



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Mantoverde mist traps

At Chañaral, a community close to Anglo Base Metals' Mantoverde copper mine in Chile's Atacama desert, ingenuity is helping to overcome water poverty. Water is currently piped 180 kilometres from the city of Copiapó to the area.

A project was started in 1998 to harvest water from mist traps which could be used for growing vegetables and providing purified water to promote tourism in this arid area.

Working with a local anthropologist, environmental organisations and the local council, employees from Mantoverde studied the mist and the potential to harvest it to grow produce.

The mist is caught in a series of vertical mesh curtains and the droplets of water are collected in catch-troughs and pipes.

Members of the community built the mist traps and access roads. Additional traps were constructed in 2007. ♦

River restoration at Dartbrook

In 2006, the Dartbrook mine in Australia, which had closed its underground operations, committed to a major river restoration project designed to benefit the community and the local environment.

This project sought to address damage caused not by mining, but by years of agricultural degradation. Around 4,000 seedlings of the endangered River Red Gum tree were planted and biodiversity areas along the banks of the Dart Brook and the Hunter River were established.

Woody debris structures and large logs were then sunk to increase the stability of the streams' beds and create new fish habitats. ♦



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Impacts of dewatering at Sishen

At Kumba Iron Ore's Sishen mine in South Africa, farmers surrounding the operations alleged that the mine's dewatering activity affected their water supplies and the ability to water their livestock. Formations of swallets (similar to sinkholes) were also visible in the banks of the Gamagara River near the mine. Studies have been conducted to determine the impact of dewatering on neighbouring farms. In the meantime, the mine is providing water to affected farmers as well as additional grazing. The mine has also backfilled the swallets to re-establish the normal path of the river. ♦

is scarce (Emalahleni Municipality overdraws 11 megalitres per day of surface water).

A joint initiative was therefore set up between Anglo Coal, BHP Billiton and the Emalahleni Municipality to treat mine water to potable quality and sell it to the municipality. This joint initiative is capable of producing 25 megalitres of potable water daily, of which 20 megalitres will be supplied to the Emalahleni Municipality, to be consumed by in excess of 80,000 people, and the rest used by the collieries for their own consumption.

Twenty-five full-time jobs have been created to operate the \$42 million treatment plant, which last year won a *Mail & Guardian's* Greening the Future Award ('innovative environmental strategy that improves business performance' category) and the sustainability category of Nedbank Capital's Green Mining Awards.

THE AUTHORS

Penny Bradford is a freelance writer specialising in sustainable development and a content editor for theSource, Anglo American's enterprise information portal

Dave Salmon was formerly the principal specialist in water affairs at Anglo American and now works for Golder Associates in Australia

Preventing pollution and caring for the environment

The major river restoration project at Dartbrook mine in Australia shows how water management is increasingly being linked to biodiversity initiatives that benefit the communities in which Anglo American operates. In this way, the company is working with local people at Isibonelo, one of Anglo Coal South Africa's newest operations, to protect wetlands adjacent to the mining area, returning as much land as possible to the flood plain wetland and sealing the post-mining wetland from mining spoils.

The company understands that issues like water management cannot stop at the mine gates but must be made part of a broader responsibility to preserve and enhance the environment. At the Las Tortolas tailings management facility in Chile, a number of improvements have been put in place to control seepage and an impermeable wall barrier has been established. A set of wells is maintained downstream from the seepage control system for monitoring purposes.

To protect fish habitat located five kilometres downstream of Anglo Coal's joint venture operations in Canada, Peace River Coal's Trend mine has developed an effective method for mitigating total suspended solids in water affected by mine activities. This method has attracted the interest of other mines in the area owing to its simplicity and effectiveness.

In July 2007, Anglo American announced a staged investment of c.\$1.4 billion to acquire a 50% stake from Canadian company Northern Dynasty to form the Pebble Partnership, which is planning to develop a copper mine in Alaska. After news broke of the venture, there has been a well-funded and vigorous campaign by opposition groups which claim the potential mine could damage local salmon fisheries. Hugh Elliott, international government relations manager for Anglo American, said: "It has been clear from the outset that preserving water quality is a critical issue for all Alaskans, particularly the communities around Pebble which depend on the salmon fishery for their livelihoods. This is a concern that is repeatedly stressed to us by

Pebble Partnership, Alaska

The project in south-western Alaska offers some of the world's most important concentrations of copper, gold and molybdenum.

Ongoing geological exploration and socio-economic studies will support a proposed mine development plan that could include a mix of open-pit and underground mining. The development plan and permitting applications are due to be submitted in 2009.

In a speech to Alaskans, Cynthia Carroll, Anglo American's chief executive, said water quality will not be affected and called for an independent panel of experts to be established to scrutinise the project's work, with a particular focus on water quality.

In the permitting process for the mine, the project will have to fully demonstrate that water quality standards will be preserved to protect the fisheries. The company is also establishing the Bristol Bay Sustainable Fisheries Fund to do just that and will design the fund in consultation with stakeholders to be effective and fully fit for purpose. ◆



Still Pictures

many stakeholders, from native Alaskans to commercial and sports fishing groups. As the Pebble Partnership works to put together a mine plan to submit to permitting, addressing these issues in a comprehensive manner will be a top priority.”

Taking a strategic approach

The high-profile debate at Pebble will be seen as a touchstone for Anglo American's water management strategy and commitment to competent custodianship of natural resources. It will not be the first time the company will have delivered innovation and best practice in water management, but the eyes of the world will be on the company as the project moves forward. There is no doubt that the issues at Pebble represent a huge challenge. But they also offer a platform for Anglo American to continue to work at a strategic level with governments, regulators, licensing authorities and campaign groups to tackle the range of issues linked to water.

Examples of global co-operation already exist. Anglo American is working with the International Network for Acid Prevention (INAP), a group of international mining houses dedicated to reducing liabilities associated with sulphide mine materials, to develop a Guideline for Acid Rock Drainage. The company has assisted with funding for this project as well as technical input.

Anglo American has also contributed to a Global Water Inventory Tool, recently developed by the World Business Council for Sustainable Development, to help companies map their water needs and assess the risks associated with their global operations and supply chain.

It will be through such collaborative water management initiatives and by integrating water and energy considerations into its business decision-making that Anglo American can help set the standards in water management.

But innovation, new technology and knowledge sharing will only go so far in tackling water-related issues. The key will be to understand the true value of water. Anglo American recognises the value of water, which is why the company will continue to strive to use water efficiently and sustainably throughout the mining cycle today, tomorrow and in the future. ◆