
Report to ICARD 2009 on South African Activities

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Water Research Commission**



The South African Water Research Commission

- ◆ Statutory body established in 1970
- ◆ Mandate to promote coordination, cooperation and communication in water related R&D
- ◆ Establish water research needs and priorities, which are then encouraged and funded
- ◆ Expand and promote existing research infrastructure, rather than its own. Outsource rather than own research
- ◆ Research initiatives cover whole spectrum of water related research
- ◆ Joined Global Alliance in 2006 on behalf of all SA activities. Special links with Mine Water Division of WISA



TOPICS TO BE COVERED

1. Improved Predictive Ability

- 💧 Generation of ARD
- 💧 Tailings facilities
- 💧 Rising water levels and decant

2. Minimise Production and Impact of ARD

- 💧 Being implemented
- 💧 Being investigated

3. Treatment Technologies

- 💧 Rationale
- 💧 Implementation

4. Technology Transfer



1. IMPROVED PREDICTIVE ABILITY

- GENERATION OF ARD

- ◆ 1999 – 2004 conducted research to standardise techniques to quantify potential and magnitude of ARD
- ◆ Developed an easy to use spreadsheet tool (ABACUS) to standardise the interpretation of ABA data
- ◆ Coined the acronym ABATE (**A**cid -**B**ase **A**ccounting **T**echniques and **E**valuation) for the approach that integrates a range of tools to predict the potential for acid generation
- ◆ Research is in progress to use geochemical modelling techniques to predict evolution of ARD over time



1. IMPROVED PREDICTIVE ABILITY

- TAILINGS FACILITIES

- 💧 SA has about 270 gold mine tailings covering 180 km²
- 💧 Continued efforts to re-mine tailings and consolidate them into mega-dumps
- 💧 Research into contamination and reclamation of footprint
- 💧 Research into degree to which tailings properties and time affect the depth and rate of weathering
- 💧 Current efforts to facilitate transparent and effective regulatory decision making regarding the sustainable design, operation and closure of tailings facilities
- 💧 A preliminary DSS already published, while a refinement is nearing completion



1. IMPROVED PREDICTIVE ABILITY

- RISING WATER LEVELS AND DECANT

- 💧 With cessation of mining activities it is increasingly important to predict rising water levels and position of decant
- 💧 Scott reported on pioneering research for Central and E-Rand gold mines that became largely interconnected through mining activities
- 💧 Collaborative research with Coaltech captured mine plans and coal seams in 3-D GIS enabling mines to determine decant points and extent of inter-mine flow



2. MINIMISE PRODUCTION AND IMPACT OF ARD – being implemented

- ◆ A regional closure strategy was developed to ensure the orderly and responsible closing of mines exploiting the same ore body. This represents a fundamental change from the dispensation of closing individual mines
- ◆ While soil covers were effective under experimental conditions to reduce volume and strength of ARD percolate, less so under field conditions
- ◆ Modelling and evaluation of effects, resulted in a scheme to release accumulated saline neutral ARD during high flow conditions in years of above average runoff
- ◆ DME started with a multimillion Rand project to identify and close points on surface through which water ingress into mines



2. MINIMISE PRODUCTION AND IMPACT OF ARD – being investigated

- ◆ Assess the viability of extracting good quality GW in aquifers overlying deep mines to reduce percolation to mines, thereby preventing their subsequent contamination with ARD in mine
- ◆ Investigate the feasibility of either removing or accelerating the oxidation of pyrites associated with mining – thereby dealing with ARD problems during the lifespan of a mine



3. TREATMENT TECHNOLOGIES

- rationale

- ◆ Being water poor, SA faces **salinity** in addition to acidity and metal problems associated with ARD
- ◆ E.g. Gold mines contribute 35% of salt load in 6% of water flow at Vaal Barrage
- ◆ Research focused on removal of salinity (sulphate) in addition to acidity and metals



3. TREATMENT TECHNOLOGIES

- implementation

- ◆ Anglo Coal and BHP Billiton operating a 20ML/d reverse osmosis plant at 99% recovery to produce potable water from ARD. Two similar plants planned
- ◆ 10 ML/d plant biologically removing sulphate using BioSure process with sewage sludge as energy source
- ◆ WUC plan to treat 75ML/d of ARD from Witwatersrand gold mines using CSIR technology
- ◆ Constructing degrading packed bed reactor for passive treatment of ARD
- ◆ Demonstrated cost savings and effectiveness of technology to use limestone rather than lime for neutralisation of ARD
- ◆ Identified novel means of dealing with brines



4. TECHNOLOGY TRANSFER

- ◆ Regular WRC workshops on completed projects
- ◆ Special initiatives e.g. Workshop to discuss GARD Guide
- ◆ Twice a year WISA MWD hosts a Symposium with invited speakers on topic of concern. Most recent dealt with *Best Practice Guidelines for Resource Protection*
- ◆ Biennial Conference of the Water Institute of Southern Africa hosts a special session on mine water management; mostly also mine water workshops. WISA MWD awards a R7 500 prize for best student paper on mine water at conference
- ◆ International Conferences, e.g. Mineclosure2008 (400 attendees from 28 countries)



International Mine Water Conference

19 to 23 October 2009, Pretoria

- ◆ Hosted by Mine Water Division of WISA together with IMWA
- ◆ Four specialised workshops (DSS Tailings Disposal, GARD Guide, BMP Guidelines, Innovative brine disposal options)
- ◆ 11 Technical Themes, Three parallel sessions, Six Keynote, 84 Technical and 70 Poster Papers
- ◆ Technical Tours (Mine water treatment & Water management on a Platinum mine)
- ◆ <http://www.wisa.org.za/minewater2009.htm>

