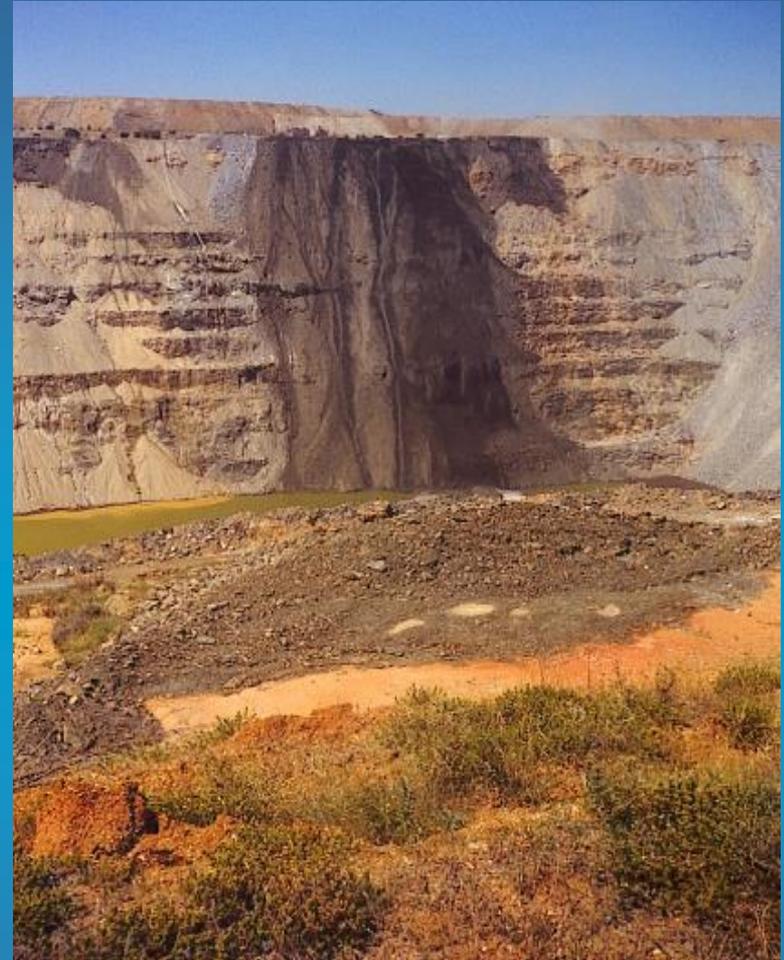


INAP and The Global Acid Rock Drainage Guide (GARD Guide)

Presentation to
Elko Roundtable 2012
15 March 2012

Presented by Terrence Chatwin (INAP)



Mining Industry Mandate

- Meet the current and future mineral needs
- Create jobs and value without adversely impacting future generation's opportunities
 - Prevent, minimize, and mitigate potential environmental risks
- Maintain “social license to mine”
- ARD frequently represents greatest challenge
 - ARD impacts can be very long lasting
 - ARD remediation is very costly (US: \$5-50 billion)



International Network for Acid Prevention (INAP)

An organization of international mining companies that seeks the prevention of acid rock drainage (ARD) and metal leaching in support of responsible mineral development

- Information Transfer
- Collaborative Research
- Organizing Conferences and Workshops
- Supporting Regional ARD Organizations
- Peer Review



INAP

Members:



Supported by the Global Alliance



The Global Alliance

Acid Drainage Technology Initiative



CNAMD

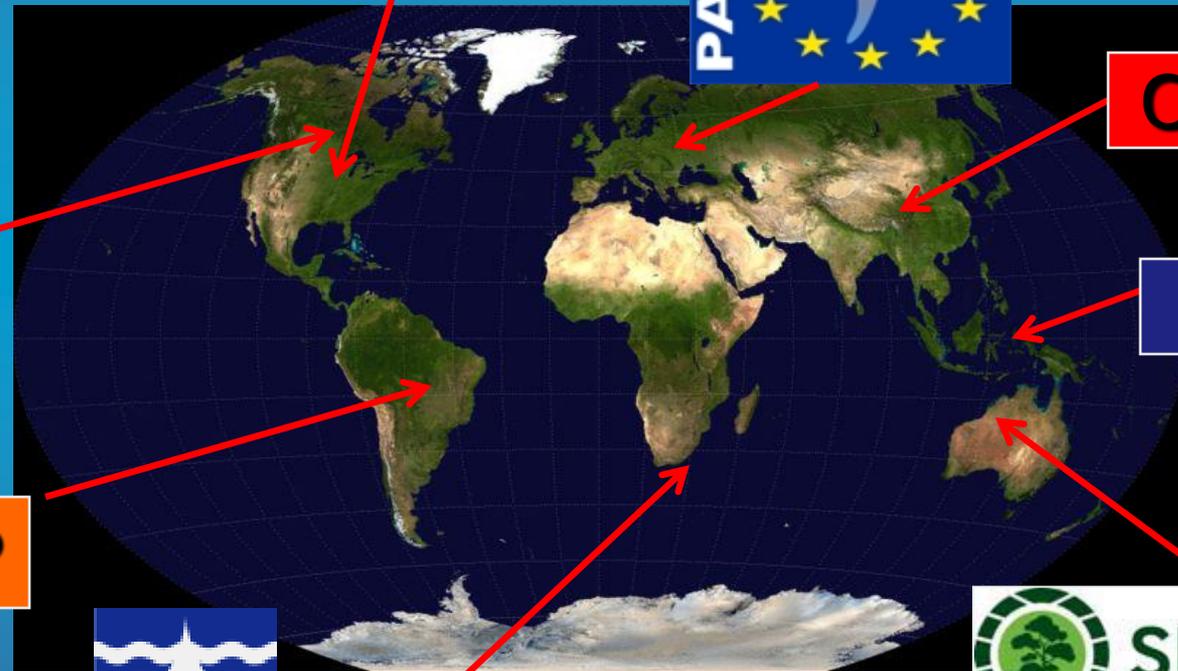
INAD



SANAP



Water Research Commission



ARD Issues Recognized by INAP

- International Network for Acid Prevention (www.inap.com.au)
- Consortium of mining companies that “...exists to fill the need for an international body which mobilizes acid drainage information and experience.”
 - Networking and information-sharing
 - Technology transfer
 - Gap-driven research
- Recognized the need for global approach to ARD management
 - Gravity of impacts (duration, cost)
 - Increase awareness that current techniques can prevent and mitigate ARD
 - Focus on prevention: techniques are less effective after ARD generation (legacy sites)



Global ARD Guide (GARD Guide)



“An international guide for facilitating world-wide best practice in prediction, control, and mitigation of acid rock drainage.”

“The guide will become a reference document for all stakeholders involved in ARD and waste management issues.”



GARD Guide Characteristics

- 2-year effort, awarded to Golder by INAP
- Rolled out in Summer 2009 (ICARD, Sweden)
- Flexible to accommodate site-specific issues
- Avoids duplication and builds on existing guidelines and compendia
- Consistent and promotes a systematic approach
- Founded on a risk-based approach
- Endorses a pro-active approach and encourages reduction and control at the source
- A “how to” guide and not a regulatory tool or a design manual
- Based on proven, field-tested technologies
- Encompasses the life cycle of a mine (cradle to cradle)



Scope of GARD Guide

1. **All Mine Phases** – Exploration through Post-Closure
2. **All Mine Facilities** - tailing, waste rock, underground mine, pit walls, pit lakes, spent ore heaps and low-grade stockpiles
3. **All Commodities** - base metals, precious metals, coal, diamonds, iron ore and uranium

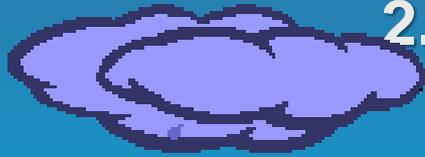
4. **Global perspective** -

Pit Walls

Pit Lake

Tailing

Waste Rock



Target Audience

- Companies, governments, consultants, researchers, educators, communities, bankers, and NGOs
- Primary target audience is a scientist or engineer with a reasonable background in chemistry and the basics of civil engineering, but not necessarily specifically related to acidic drainage



GARD Guide Features

- Web based
- Navigate within the Guide via internal links
- Connect to relevant references via external links
- Opportunity to provide comments
- Continual improvement and updates
- Presently no hard copy
- Translations anticipated

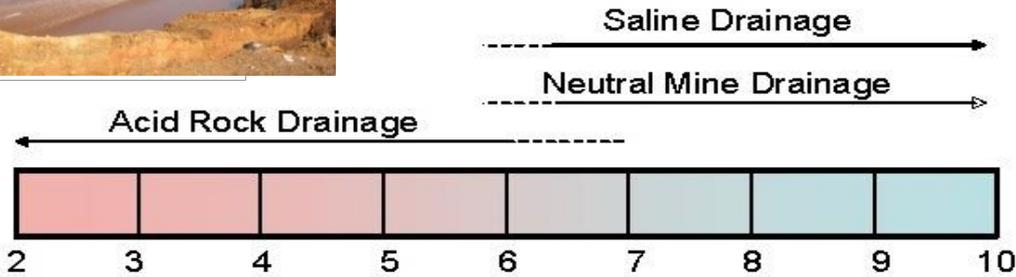


GARD Guide Structure and Authors

1. GARD Guide (INAP)



average pH:



Typical drainage characteristics:

Rock Drainage:

- acidic pH
- moderate to elevated metals
- elevated sulphate
- treat for acid neutralization, metal and sulphate removal

Neutral Mine Drainage:

- near neutral to alkaline pH
- low to moderate metals. May have elevated zinc, cadmium, manganese, antimony, arsenic or selenium.
- low to moderate sulphate
- treat for metal and sometimes sulphate removal

Saline Drainage:

- neutral to alkaline pH
- low metals. May have moderate iron.
- moderate sulphate, magnesium and calcium
- treat for sulphate and sometimes metal removal

Latitudinal
Polar
Sub-polar
Boreal
Cool Temp
Warm Temp
Sub-tropical
Tropical



arid



— Dr. Ward Wilson (Univ. Alberta, Edmonton),
Dr. Ben Wickland (Golder, Vancouver)

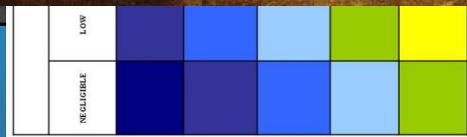
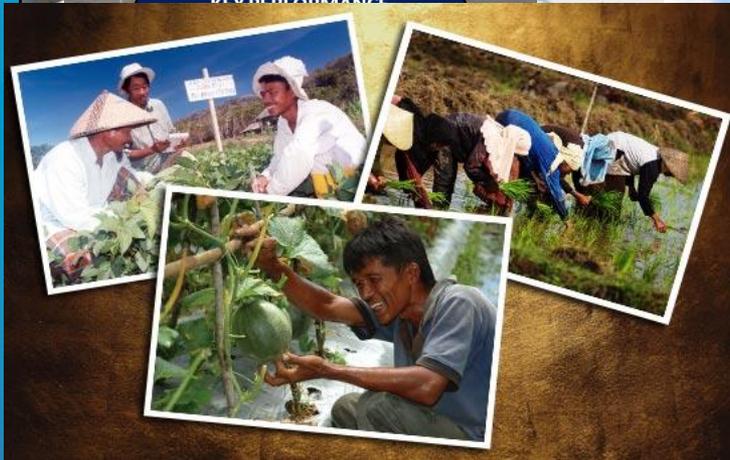
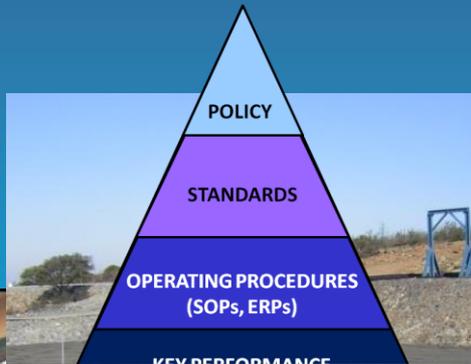
GARD Guide Structure and Authors

7. Treatment

- Dr. Andre van Niekerk (Golder, Jo'burg)

8. Monitoring

- Dr. Peter Chapman (Golder, Vancouver),
Ms. Cheryl Ross



nt
er, Jo'burg)
n the

Future

- Keith Ferguson (Sustainability Engineering)



Application of GARD Guide within the Industry



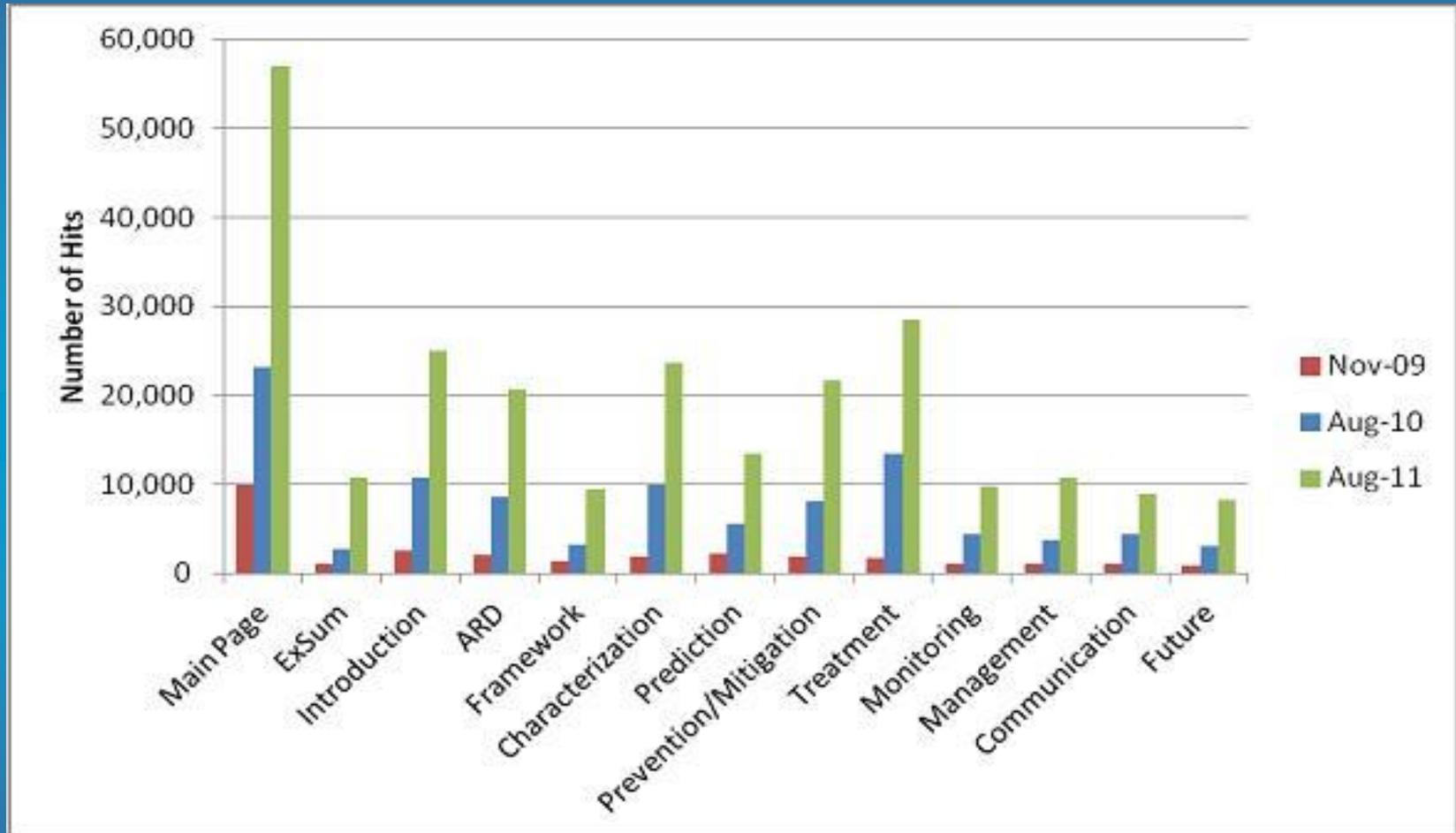
- Benchmark for ARD Management Plans
- Use as a Baseline for Internal ARD Audits
- Promote Integration of ARD Prevention into Mine Plans and Operations
- Use as a Text for ARD Training
- Focus Future ARD Research
- Raise Management's Awareness of ARD Issues

GARD Guide Roll Out



- Develop working relationship with ICMM, IFC and others to exchange ARD technical support
- Work with Mining Associations to promote Guide usage
- Add new INAP members
- Facilitate new members of Global Alliance in Developing Countries
- Facilitate translation to other languages with technical review
- Assist regulatory agencies with Guide training
- Work with companies to integrate the Guide into their EMS programs

Growth of GARD Guide Usage



GARD Guide Updates

- On-line at www.gardguide.com
- Internet Classes – EduMine & Possibly SME
- Workshops & Presentations with support from GA
 - AMD Workshop (June 2011, Darwin)
 - SME MN (Aug 2011, Duluth)
 - IMWA 2011 (Sept 2011, Aachen)
 - Enviromine 2011 (Nov 2011, Santiago)
 - NWMA (Nov 2011, Reno)
 - Indonesia (Feb 2012, Bandung)
 - ICMM (May 2012, London)
 - Twin Metals (June 2012, St Paul)
 - Brazil (July 2012, Belo Horizonte)
 - China (Nov 2012, Beijing)
- Next milestone – Summer 2012 (ICARD, Ottawa)
- Next update – 1th quarter 2012



Thank you

www.gardguide.com

