The International Network for Acid Prevention
An organization of international mining companies that seeks the prevention of acid rock drainage (ARD) and metal leaching in support of responsible mineral development.

1. Summary
2. GARD Guide Update
3. 10th ICARD
4. Sulfate Treatment Workshop/Short Course
5. Case Studies
6. Global Alliance
7. Global Cover Guidance Document
8. Technical Director’s Report
9. Upcoming Events

INAP Members

Samantha Hoe-Richardson
Caius Priscu

Stephen Foot

Bill Upton
Claudio Andrade
Johnny Zhan

Richard Marton

Dan Ramey
Brett Waterman

Blair Sands

Scott Miller
Cynthia Parnow
Gregg Wagner
Stephanie Stoeberl

Ros Green
Rich Borden

Anne Williamson
Dennis Schubbe
Jay Vanlandingham

Dean Williams

Technical Director - Terrence Chatwin
terrence.chatwin@inap.com.au
(801) 485-2279
1. **Summary**

The first half of 2015 has been stimulating for INAP. SANAP and GECAMIN hosted the very successful joint 10th ICARD/IMWA, April 20-25, 2015. We are pleased that the International Mine Water Association (IMWA) joined with us to co-sponsor the 10th ICARD/IMWA 2015 conference. IMWA also joined the Global Alliance (GA).

At INAP’s OpCom meeting prior to the ICARD, Richard Marton announced that BHP Billiton has officially committed to rejoin INAP. WELCOME BACK! Another news flash related to INAP growth, Bruce Kelley has agreed to assist the INAP Technical Director in promoting INAP to other mining companies and to support INAP activities in the Australasia area. INAP believes that the most effective way to engage new members is through conversations between mining leaders who have faced similar water and closure issues, and identifying how INAP creates value for their company and the mining industry as a whole.

INAP continues to support projects relating to mine waste and water. We are funding a Global Cover Design Guidance Document, which we believe will have significant value to the mining industry. With the support of the Global Alliance, INAP continues to be actively involved in promoting the GARD Guide with short courses, presentations and workshops on the Guide and other related topics. INAP continues to focus its GARD Guide education and promotion on developing regions, such as South America, Africa and Asia. Prior to the 10th ICARD, the INAP Technical Director was invited to participate and contribute to the review of the mine closure document being developed by Fundacion Chile for the Chilean government.

2. **GARD Guide Update**

INAP appreciates the continued support of the Global Alliance (GA) in the promotion of the GARD Guide. INAP has decided **NOT** to officially translate the entire GARD Guide into other languages. After vetting a draft Spanish translation, INAP decided that the integrity of the document could be compromised, and it was not a cost-effective use of our limited funds to perform multiple translations. Instead, our focus will be to regularly update the Guide to keep the English version at the forefront of ARD issues. As reported previously, the executive summary of the GARD Guide has been translated into Spanish and French with a possible Turkish version in the works, thanks to GA members ADTI and MEND. Groups are welcome to translate sections to meet their needs for their own use.

The GARD Guide Secretariat continues to get requests for a hard copy of the GARD Guide. Consequently, a PDF version of the GARD Guide has been created which enables easier printing for those who are interested. INAP is committed to maintaining the Guide as an updated web-based document free to all users.

INAP is pleased by the acceptance of the GARD Guide by numerous stakeholders. In 2011, the US EPA had the Executive Summary of the GARD Guide translated into Spanish and
added it as an appendix to the mining guidance document they prepared for Central American countries under the Central American Free Trade Act (CAFTA).

The need for broader adoption of the GARD Guide best practices within the mining industry has also been recognized by the International Finance Corporation (IFC). Jon Middleton stated that the GARD Guide would be referenced in future mining guidance documents. INAP has also been requested to participate in the review of the IFC Mining Guidance Document update.

At the INAP OpCom meeting on April 2015, Ross Hamilton, Director of Environment and Climate Change for the International Council of Mining and Metals (ICMM) presented information on the ICMM water stewardship program. From our discussions, ICMM is becoming more fully aware of INAP’s technical expertise and experience in water and waste management. Ross stated that we should jointly assess ways that we can partner in the future. Most INAP members are also members of ICMM. Whereas, ICMM is more engaged in policy, INAP focuses on the technical issues of water and waste management, so we could join our strengths to the advantage of both partners.

3. 10th ICARD

The historical and current development of mining in South America has generated important environmental impacts. As a result, both local communities and authorities are enforcing stricter environmental requirements on new and existing projects. Among the environmental impacts caused by mining activities, mine water management and acid mine drainage are major challenges and concerns.

In an effort to address these issues, Gecamin and SANAP hosted the 10th ICARD jointly with IMWA in Santiago, Chile on April 20-25, 2015 at the Grand Hyatt Hotel. Short courses and workshops were held on Monday and Tuesday. A Welcome Reception was held on Tuesday evening. English was the language of the conference with simultaneous translation available for the sessions on Wednesday through Friday. Saturday included a one day trip (flight) to the Los Pelambres site.

The 10th ICARD was outstanding with over 400 participants from 32 different countries attending. The technical program was excellent. Three members of INAP (Dean Williams, Kinross, Carlos Tamayo, Pueblo Viejo JV and Terrence Chatwin, INAP) gave presentations during the plenary sessions. Many GA members gave oral or poster presentations at the conference. Papers from the proceedings can be accessed through the following link: http://www.icard2015.com/. The joint ICARD/IMWA conference was very successful because of the shared focus of the two groups on mine water and its issues. Thursday evening a lovely dinner and folkloric presentation of regional dances and music were enjoyed by all. Following the performance, we were entertained by a Salsa band and many took to the dance floor.
The 11th ICARD will again be in conjunction with IMWA. It will be hosted by the Water Research Commission, IMWA and Tshwane University of Technology near Pretoria, South Africa.

4. **Sulphate Treatment Workshop/Short Course**

On February 27-28, 2014, INAP hosted a successful Sulphate Treatment Workshop in Salt Lake City. Over 120 participants from 5 different countries gathered for the 2-day event. Because of the interest and relevance of the topic, INAP was requested to present a similar program focusing on sulphate issues in South America as a short course at the 10th ICARD. The one-day course was taught by four of the planners of the original workshop (global alliance members from ADTI). Over 60 people attended in Santiago, Chile. Veolia Water and MWH Global sponsored and presented at the short course.

5. **Case Studies**

INAP is working with the Global Alliance to develop ARD prevention and mitigation case studies that demonstrate industry actions in a positive light. These case studies would illustrate the methods and principles presented in the GARD Guide and other best practice documents. INAP believes that these case studies are great teaching tools and that they illustrate commitment of mining companies to sustainable mining. Hence, they are useful tools in communicating with communities, regulators and NGOs. Thus, they will be useful additions to the INAP website and future presentations. Many of the Global Alliance members have already indicated that they are willing to participate in supporting this activity. Several case study posters prepared by GA members were displayed at the 10th ICARD.

INAP has also instituted a practice for member companies to present relevant case studies at each of our OpCom meetings. We believe that these examples may ultimately be used within the INAP case study compendia. Case studies that have been recently presented include “Lessons learned from the Rain Waste Repository” by Newmont Mining, “Design of the Goldstrike Soil Cover” by Johnny Zhan, Barrick Gold, and the “Sierrita Pilot Plant Facility” by Brett Waterman and others on the Freeport McMoRan Copper and Gold staff. Carlos Tamayo of Pueblo Viejo Joint Venture presented on “Dramatic Improvements at Margajita River, Pueblo Viejo Gold Mine, Dominican Republic. He was also asked to make this same presentation as a plenary presentation at the 10th ICARD where it was very well received.

6. **Global Alliance**

INAP’s profile continues to grow internationally. The Global Alliance (GA) is an important part of this growth. INAP is pleased to report that two new members have joined the GA, IMWA and CRC CARE. IMWA with a global membership of 700 is a very welcome addition, and CRC CARE is a robust academic and research organization in Australia with strong ties to the Australian regulatory community. The GA is vital to having INAP objectives and the GARD
Guide promoted in their areas of the world. INAP reiterates that the success of the GARD Guide is dependent on its being used on the local level.

Countries throughout the world are developing and mandating more stringent regulations and mine closure criteria. Chile and Peru are examples of this. The question raised was how to engage regulators in understanding and using the GARD Guide information without making them feel compromised by using material developed by mining companies. We believe that the GARD Guide has met that objective.

The Global Alliance expressed interest in the development of a less technical, shorter GARD Guide for use with stakeholders who do not have the level of expertise required to understand the document adequately. Several of the groups already have outreach educational programs for use with schools.

**Global Alliance Activities and Areas of Focus** (as reported at the April 2015 GA meeting at the 10th ICARD in Santiago, Chile and December 2014 conference call.)

- **ADTI (USA)** - Over the past four years, the major effort of Acid Drainage Technical Initiative has been the preparation, editing and publication of a set of 6 workbooks, which are being published by SME (the Society of Mining, Metallurgy & Exploration), which are listed below:
  - Basics of Metal Mining Influenced Water – Volume 1
  - Mitigation of Metal Mining Influenced Water – Volume 2
  - Mine Pit Lakes: Characteristics, Predictive Modeling and Sustainability – Volume 3
  - Sampling & Monitoring of the Mine Life Cycle – Volume 4
  - Techniques for Predicting Metal Mining Influenced Water – Volume 5
  - Geochemical Modeling for Characterization and Remediation of Mine Wastes–Volume 6

  The first five volumes have been published and are available from SME. ADTI is presently in the process of finalizing the sixth volume. It was suggested on the latest GA conference call that the ADTI workbooks be promoted on the INAP website.

- **CNAMD (CHINA)** – The Chinese Network for Acid and Metalliferous Drainage is one of the newest members of Global Alliance. In the short time they have been a member of the Global Alliance they have developed an excellent website. A number of CNAMD members participated in the IMWA 2014 Conference held in Xuzhou, China on August 18-22, 2014.

- **IMWA (Global)** – The International Mine Water Association (IMWA) is the newest member of the Global Alliance. It joins the GA with 700 active and committed members, and a quarterly published journal, *Mine Water and the Environment*, which publishes about 100 technical paper annually. IWMA co-sponsored the 10th ICARD/IMWA 2015 Conference. IWMA’s next annual meeting will be held in Leipzig, Germany on July 10 – 15, 2016. As a member of IMWA, I recommend joining the association for both their outstanding technical
journal and high quality conferences. Their annual dues are quite reasonable at approximately $50 USD per year.

- **INAD (Indonesia)** – The Indonesian Network for Acid Drainage hosted the very successful 5th annual Acid Drainage Conference on October 27-28, 2014 with over 150 participants. They are coordinating with various stakeholders including government agencies such as the Ministry of Energy and Minerals as well as the Ministry of Environment and Forestry. They also became a partner of the Mining Companies Environmental Managers’ Forum. While representatives from INAD were able to attend the 9th ICARD in Ottawa, with the financial assistance of INAP and mining companies with operations in Indonesia. Due to the down-turn in the mining industry, they were unable to attend the 10th ICARD, which was a disappointment to all.

- **MEND (Canada)** – MEND is one of the older organizations in the Global Alliance being founded in 1989. A brief history of the Mine Environmental Neutral Drainage was presented at the GA meeting in Santiago, Chile. During MEND’s storied history, they have been able to expend approximately $21 million CND on ARD related research and information transfer. MEND is directed by a multi-faceted steering committee composed of industry, federal, province, aboriginal and NGO representatives. Their research has been focused on broad management theme including mine waste management, emerging challenges, ARD prediction, case studies, guidance documents and knowledge transfer.

- **SANAP (South America)** – The South American Network for Acid Prevention helped host the 10th ICARD and IMWA 2015 Conference in Santiago, Chile on May 20 – 26, 2015. During the conference SANAP met with many of the South American attendees to engage them into their organization and create a viable core group to maintain the momentum generated during the ICARD.

- **SMIKT (Australia)** – The Sustainable Minerals Institute – Knowledge Transfer is located at the University of Queensland. SMIKT continues to organize mining workshops across Australia and helping to promote the GARD Guide. INAP is also discussing issues of common interest with the SMI Centre for Mined Land Rehabilitation. A Center of Excellence was recently organized between the University of Queensland and several universities in Santiago, Chile.

- **WRC (South Africa)** – The Water Research Commission actively contributes to South Africa’s water knowledge base by funding fundamental water research, growing scientific capacity and disseminating knowledge to a broad range of stakeholders through focused workshops and relevant guidance documents. The WRC has many reports and documents which would be useful to GA and INAP members. A few of these reports and documents are listed below in recent GA publications. In 2018, WRC in collaboration with Tshwane University of Technology will host the 11th ICARD/IMWA Conference.
• **Recent Global Alliance Publications** (These MEND documents and many others reports are found on the MEND website ([http://mend-nedem.org/category/uncategorized/](http://mend-nedem.org/category/uncategorized/)). The links to the WRC documents are found on the attached WRC flyer.

MEND Report 2.21.6 Modelling the Critical Interactions Between Cover Systems and Vegetation (OKC)

MEND Report 100.3 Roll of Nitrate in the remobilization and Attenuation of Selenium in Coal Mine Waste (Lorax and SRK)

MEND 3.50.1 Study to Identify Best Available Techniques Economically Achievable (BATEA) to Manage and Control Effluent from Mines (Hatch)

Feasibility study on the use of irrigation as part of a long-term acid mine water management strategy in the Vaal Basin - 2014/12/01; WRC Research Report No. 2233/1/14

Development of a toolkit to enable quantitative microbial ecology studies of sulphate reducing and sulphide oxidising systems - 2014/11/01; WRC Research Report No. 2109/1/14

Addressing the Challenges Facing Biological Sulphate Reduction as a Strategy for AMD Treatment: Reactor stage - raw materials, products and process kinetics - WRC Research Report No. 2110/1/14

A detailed acid base accounting study of the coal-bearing Karoo formations in the Waterberg coalfield - WRC Research Report No. 2142/1/14

Removal of metal ions from industrial effluents and acid mine drainage by metal sulphide precipitation - WRC Research Report No. 2108/1/14


Application of emulsion liquid membranes in the extraction of rhodium from mining and metal refinery effluent - WRC Research Report No. 2139/1/13

Preparation of magnetic nano composite beads and their application to remediation of mine wastewaters - ; WRC Research Report No. 2014/1/13

Is there a way to eliminate acid mine drainage on the Witwatersrand? - 2015/03/24; WRC Brief - Policy Brief
Global Cover Guidance Document

The emphasis on mitigating risks in mine-waste management at international meetings reflects the need to develop best practice in waste-management repositories including soil-cover system design guidance. In response to this issue, INAP has contracted with O'Kane Consulting (OKC) to prepare a guidance document for cover systems covering the full range of climatic, geochemical and hydrological conditions. In early April, INAP representatives discussed the most recent review of the draft document. The issues raised were discussed and a path forward was developed. The document should be ready for rollout by fall of 2015.

In addition to the staff of OKC, eight international mine-closure experts are participating as a technical advisory group (TAG) to assure the quality and breadth of this guidance document. Significant use of case studies will be applied and generic case studies will be used to illustrate various design techniques that apply to the diverse climatic regions.
8. Technical Director’s Report – Terrence Chatwin

• Discussions and Presentations from the most recent OpCom meeting
  o The focus was on how we might work with potential partners to build capacity of mining stakeholders
    ▪ Partnering with ICMM – Ross Hamilton (ICMM Director for Environment and Climate Change)
    ▪ Partnering with IMWA – John Waterhouse (IMWA President)
    ▪ Update on the Soil Covers Guidance Document project – Mike O’Kane
    ▪ Update on the Diavik Country Rock Study – David Blowes and his team
    ▪ South African Proposal for the 11th ICARD – Water Research Commission and Tshwane University of Technology
    ▪ Question – What is the mining industry doing right and where do we go from here?
  o Richard Marton, BHP Billiton Principal Geo-Environmental Advisor, announced that he had received approval for BHP to rejoin INAP
  o INAP has engaged Bruce Kelley to assist the INAP Technical Director in promoting INAP to other mining companies and to support INAP activities in the Australasia area.

• Current Projects
  o INAP is partially funding an ADTI Workbook on Modeling.
  o This is the last year of the current phase of the Diavik Country Rock Test Pile Program.
  o INAP is funding a Global Cover System Design Guidance Document being prepared by O’Kane Consultants

9. Up-Coming Events

Don’t miss the following upcoming meetings that relate to acid drainage:

• **Tailings and Mine Waste ‘15**
  July 27-28, 2015. Sydney, NSW, Australia

• **WISA Mine Water Division 2015 Symposium: Management Options in Mine Water**
  October 22 – 23, 2015, Pretoria, Gauteng, South Africa

• **Tailings and Mine Waste ‘15**
  October 27-28, 2015, Vancouver, BC, Canada

• **INAP OpCom Meeting**
  November 30 and December 1, 2015, Vancouver, BC, Canada

• **21st BC/MEND ARD Workshop**
  December 2-3, 2015. Vancouver, BC, Canada
• **2016 SME Annual Meeting and Exhibition**
  February 21-24, 2016. Phoenix, Arizona, USA

• **11th International Conference on Mine Closure**
  March 15-17, 2016. Perth, WA, Australia

• **ASMR Annual Meeting**
  June 4-10, 2016. Spokane, Washington, USA

• **IMWA 2016**
  July 10-15, 2016. Leipzig, Germany

• **11th ICARD/IMWA 2018**
  September 3-9, 2018. Johannesburg (Midrand), South Africa