

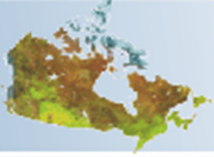
# *Update on MEND and NOAMI*

17<sup>th</sup> BC/MEND Workshop  
December 1 and 2, 2010



**Gilles Tremblay and Charlene Hogan**  
**MEND, NOAMI and GARD Guide**  
**Secretariats**





# MEND Program

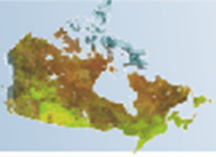


- 1989 – 2010
- Extensive national and international Network
- ~\$20M in 21 yrs
- Current research budget ~ \$125K/a
- Focused research work plan
- Information transfer



Whistle Mine



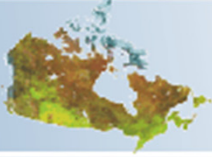


# MEND Mission

*Maintaining the momentum....*

*...to provide leadership and guidance on priority AD issues in Canada*





# MEND Steering Committee 2010

**Elizabeth Gardiner (Chair), MAC**

**Gilles Tremblay (Secretariat), NRCan**

**Mike Aziz, Goldcorp Canada Ltd.**

**Kim Bellefontaine, Province of BC**

**Linda Broughton, BHP Billiton Mines**

**Leslie Cooper, Province of Ontario**

**Johanne Cyr, Province of Quebec**

**Charles Dumaresq, Environment Canada**

**Joe Fyfe, Xstrata Nickel**

**Charlene Hogan (Secretariat), NRCan**

**Mike Nahir, Indian and Northern Affairs Canada**

**Bill Price, NRCan**

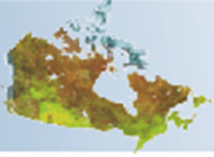
**Doina Priscu, Province of Manitoba**

**Maya Stano, Canadian Environmental Network**

**Wade Stogran, Pan American Silver Corp.**

**John Werring, Canadian Environmental  
Network**





# MEND Broad Research Themes

- Mine waste management practices
- Emerging challenges
- Prediction and post-closure management
- Case studies at Canadian mine sites
- Guidance documents
- Information transfer



# Mine Waste – Closure Management

## MEND 2.46.1 Evaluation of the Water Quality Benefits From Encapsulation of Acid-Generating Tailings by Acid-Consuming Tailings (EcoMetrix) **New!**

Acid-generating tailings encapsulated by acid-consuming tailings

- Neutral layers consumed acidity in low pH tailings to prevent ARD/ML
- Thickness of high NP layer impacts efficiency of technique
- As modelling – removal of As dependent on the amount of ferric oxyhydroxide in the bottom layer
- Pyrite oxidation modelling in top layer – residual sulphide of tailings acts as O<sub>2</sub> scavenger; while NP prevents acid generation



# Mine Waste – Closure Management

## MEND 2.12.2 Long-Term Performance of a Shallow Water Cover to Limit Oxidation of Reactive Tailings (NRCan)

Biofilm layer beneficial: prevented resuspension of tailings, maintained anoxic conditions, trapped mobilized dissolved metals

## MEND 2.12.2b Field Assessment of the Occurrence of Algal Biofilm on Submerged Tailings (NRCan) New!

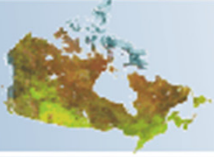
Preliminary study to: identify physico-chemical conditions for biofilm formation, and clarify effects of biofilm on metal mobilization

Five sites with submerged tailings examined

Continuous biofilm mat not observed

- Requirements for formation of mat:
  - shallow, oxygenated water cover
    - sufficient light and heat penetration
  - no active tailings movement
  - suitable substrates for biofilm growth





# Case Studies – Verification of Technologies

## MEND 9.2 Case Study Assessment (SNC-Lavalin)

Sponsored by Environment Canada

To assess and verify the effectiveness of AD pollution prevention and control techniques.

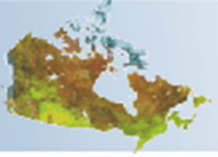
Phase I: Case studies for:

- Dona Lake, Placer Dome
- Heath Steele, Noranda-Falconbridge
- Mandy Lake, HBMS

Phase II: Field investigations completed at Heath Steele







# Cold Temperature Studies

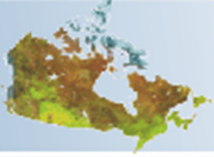
## MEND 1.61.5a Mine Waste Covers in Cold Regions – Phase I (SRK)

- Several dozen cold regions processes identified that could impact soil covers

## **New!** MEND 1.61.5b Cold Regions Cover Research – Phase II (SRK)

- An INAC Sponsored Project
- Phenomena characterized as to their possible role in soil cover performance
- Role of vegetation, evapotranspiration and rooting depth reviewed
- State-of-the-art computer modelling of cold regions soil covers
- Potential of insulating layers to limit freeze-thaw effects examined
- Recommendations for additional high-priority studies

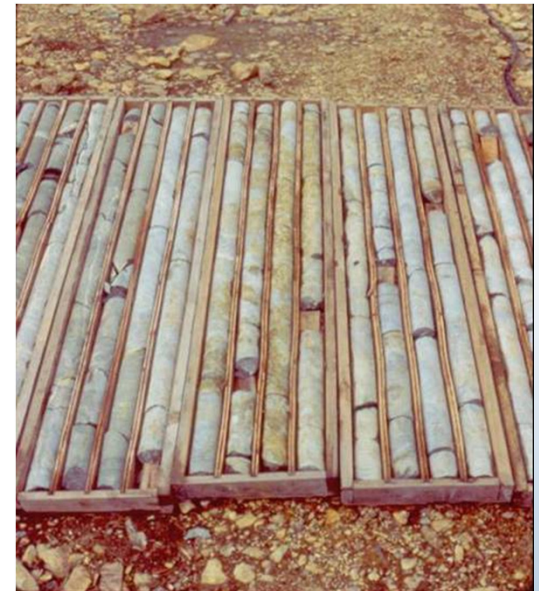


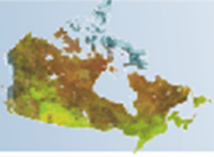


# Guidance Documents/ Manuals

## MEND 1.20.1 Prediction Manual for Drainage Chemistry from Sulphidic Geological Materials (NRCan)

- Accurate and timely prediction of ARD/ML are key to prevent potential environmental impacts and minimize the high costs of mitigation
- The objective of this Manual is to provide the comprehensive, in-depth level of understanding needed to conduct a prediction program and review the results.
- Electronic version available from the NOAMI web site [www.abandoned-mines.org](http://www.abandoned-mines.org)





# Projects on the Go

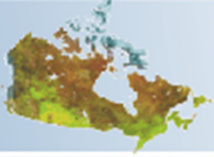
## Neutralization Sludge Characterization and Stability (Lorax)

- Investigate the geochemical stability of sludge disposed of in pit-lakes
- Detailed solid-phase characterization
- Links between acidic drainage chemistry and sludge metal-association highlighted for several sludge samples.

## Lime Treatment Plant Survey (NRCan)

- Over 100 surveys received – nationally and internationally.
- Review of information on-going





# Projects on the Go

## **In-Pit Disposal of Tailings and Waste Rock (SENES)**

- Update MEND 2.36.1 report completed in 1995
- 15 case studies detailed based on available information

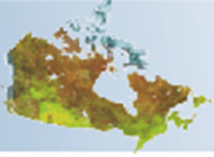
## **Diavik Diamond Mine Waste Rock Study**

- Scale-up study in cold climates
- To evaluate and prevent the possible ML/AD from waste rock

## **Cold Temperature Risk-Based Guidance Document**

- Sponsored by INAC





# New Projects in 2010

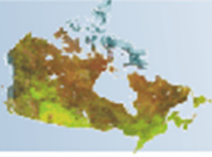
## Vegetative Covers in Canada (OKC)

- Enhance predictive modelling capability for the influence of vegetation on cover system performance
- Review water use by plant species and communities used for re-vegetation of mine waste dumps and tailing storage facilities
- Inputs into plant-atmosphere numerical models evaluation
- Guidelines developed

## Impact of Climate Change on Mining Operations (Stratos)

- Risk-based approach
- Develop scenarios to highlight potential impacts of climate change on the mining sector
- Focus on risks related to mine drainage
- Provide guidance for decision makers





# X-Cutting – Technology Transfer

## The MEND Monitor

### Workshops (>30)

- Annual BC/MEND ARD/ML Workshops
- Sudbury (2004); Halifax (2006); Winnipeg (2008)

### MEND Reports (>210)

### MEND Manual

### 9<sup>th</sup> ICARD (May 2012, Ottawa)

### Global Alliance

- GARD Guide



**The MEND Monitor**

**9<sup>th</sup> ICARD Comes to Canada**  
The 9<sup>th</sup> International Conference on Acid Rock Drainage will be held May 21 – 26, 2012 at the [Wynn \(Sheraton\) Hotel](#). The event will feature specialized short courses, three days of technical presentations, poster presentations, a trade show and field trips. The conference is hosted by the MEND program, with support from the [International Network for Acid Drainage Association of Canada](#), is the overall chair, with [Elisabeth Gardner](#), [Dale Atkinson](#), [Mendy Mendenhall](#), and [Craig Ford](#), [Mend Steering Committee](#), the technical co-chairs. The Request for Submission of Abstracts will be sent out in early 2011.

**MEND Steering Committee**  
Members of the MEND Steering Committee are gearing up for the 9<sup>th</sup> ICARD, and will play pivotal roles on the technical committees, and six session chairs and reviewers. Since its inception in 1989, MEND has been guided by a Steering Committee that brings together representatives from the Canadian mining industry, federal and provincial governments and non-government organizations. At present, MEND activities are funded by The Mining Association of Canada (MAC) and Natural Resources Canada (NRCAN), and administered by a secretariat at NRCAN. Funding for research projects has averaged \$125,000/year.

**MEND Steering Committee Members 2010**

- Elisabeth Gardner (Chair), MAC
- Mike Koc, Ontario Canada Ltd
- Kim Selsbach-Lewis, Province of British Columbia
- Leslie Douglas, DFP Billon Mines
- Leslie Cooper, Province of Ontario
- Johannes Cyr, Province of Quebec
- Charles Dumas, Environment Canada
- Joe Pyle, Kinross Nickel
- Charles Hagan (Secretariat), NRCAN
- Mike Nadeau, Indian and Northern Affairs Canada
- Ed Price, NRCAN
- Derek Price, Province of Manitoba
- Maya Davis, Canadian Environmental Network
- Mike Duggan, P.A. Resource Group Corp.
- Giles Trevisky (Secretariat), NRCAN
- John Hwang, Canadian Environmental Network

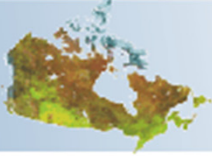
**Now Available – Free Online**  
BC Technical and Research Committee on Remediation Symposium (TRCS) Proceedings. Over 600 papers from 1977 to 2006, representing 23 years of successful BC Mine Remediation, are now online, courtesy of the UBC Library and the TRCS. Papers can be accessed by year, file or author. <http://www.library.ubc.ca/handle/2429/6934>

**Publications**  
MEND Report 1.26.1 - Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. Accurate and timely prediction of acidic drainage and metal loading are keys to preventing potential environmental impacts and minimizing the high costs of mitigation. Prediction of drainage chemistry is a notoriously challenging subject, involving a large number of methods, properties and processes. The Prediction Manual was developed to provide a comprehensive, in-depth level of understanding for use by industrial experts or practitioners to conduct a prediction program and/or review the results. It also serves as a reference document for members of the public, educators or students studying or reviewing drainage chemistry. An electronic version of the manual can be downloaded from the [ICARD web site](http://ICARD.mend.org). The report is available in paper copy from MEND for \$50 CDN, plus taxes. Contributor: CANMET – Mining and Mineral Sciences Laboratories

**Upcoming Events**  
17<sup>th</sup> Annual MEND-BC ARD/ML Workshop. The theme is Mine Development and Innovations in Drainage Treatment. December 1-2, 2010. Vancouver, BC.  
16<sup>th</sup> International Conference on Mercury as a Global Pollutant. July 24-26, 2011. Halifax, Nova Scotia. [www.mercury2011.org](http://www.mercury2011.org)  
6<sup>th</sup> International Symposium on Waste Processing in the Mineral and Metallurgical Industries. October 2-5, 2011. Montreal, Quebec. [www.6ISWI.org](http://www.6ISWI.org)  
SRMINING 2011. First International Seminar on Social Responsibility in Mining. October 18-21, 2011. Santiago, Chile. [www.srmining.org](http://www.srmining.org)

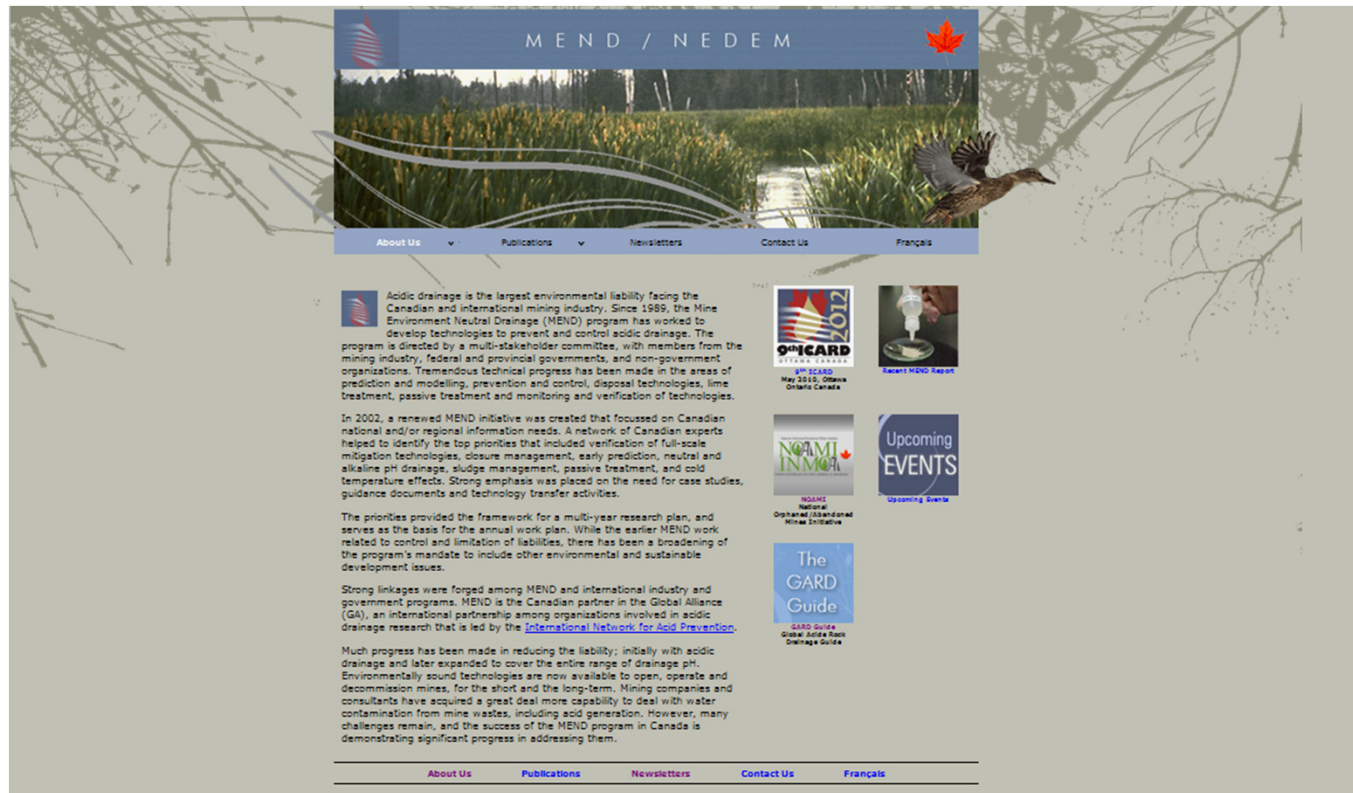
To obtain information on MEND or its publications, please send an e-mail to: [mend@canmet.nrcan.gc.ca](mailto:mend@canmet.nrcan.gc.ca)

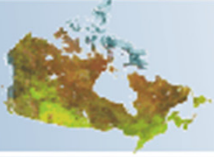




# New MEND Website

Website: [www.mend-nedem.org](http://www.mend-nedem.org)





# 9<sup>TH</sup> International Conference on Acid Rock Drainage

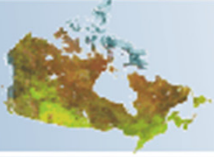
Ottawa, CANADA

**May 21-26, 2012**

**[www.ICARD2012.ca](http://www.ICARD2012.ca)**







# Conference Dates - May 21-26, 2012



Monday, May 21 – Short Courses



May 22 to 24 – Technical Program



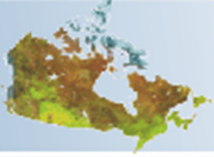
May 25 and 26 – Field Trips



Held at the Westin Hotel, Downtown Ottawa

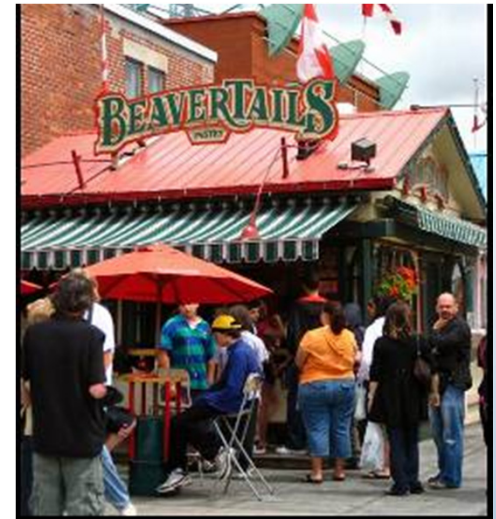
- 250 rooms per night
- Expect over 500 people

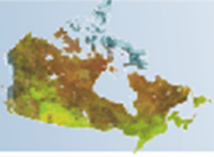




# Organizing Committee

- Elizabeth Gardiner – Conference Chair
- Craig Ford (INMET) and Gilles Tremblay – Technical Co-Chairs
- Populating the organizing committee has begun

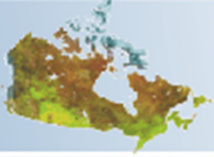




# Organizing Committee

- Conference Chair
- Technical Co-Chairs
- Technical Program Chair
- Short Courses Chair
- Trade Show/Exhibits Chair
- Field Trips Chair
- Sponsorship Chair
- Partner's Program Chair

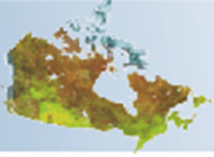




# Next Steps

- Formation of the Organizing Committee
- Finalizing Terms and Conditions with Unconventional Planning
- Web site – [www.ICARD2012.ca](http://www.ICARD2012.ca)
- Conference Schedule
  - ICARD Theme
  - Establishing Deadlines for Technical Program
  - Schedule



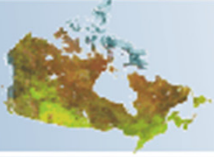


# Conference Web Site



[www.ICARD2012.ca](http://www.ICARD2012.ca)



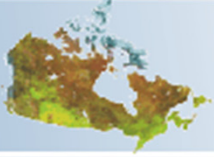


# National Orphaned / Abandoned Mines Initiative - (NOAMI)



**Brewery Creek – near Dawson Creek, Yukon**





# The Action Plan

The overarching goals of NOAMI are to provide tools to remediate existing orphaned and abandoned properties and to prevent the occurrence of new orphaned and abandoned mines in the future.

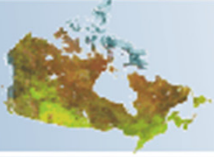
Task groups are formed to address key issues:

- Information Gathering Towards National Inventory
- Community Engagement
- Legislative Barriers to Collaboration
- Funding Approaches
- Jurisdictional Legislative Review
- Mine Closure and Long-Term Liabilities



Information Sharing is an integral part of NOAMI





# NOAMI Highlights

Working model of web-based National Inventory of OAMs

Guidelines and Toolkits:

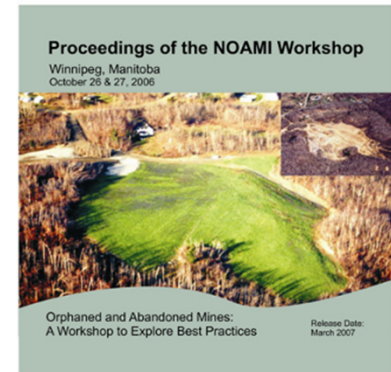
- Pamphlet on Guiding Principles in Community Involvement
- A Toolkit of Funding Options for Abandoned Mine Rehabilitation
- Toolkit on Community Engagement

Published Reports

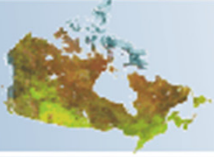
- Reviews of national and international inventories, funding models, and barriers to collaboration
- Community case studies
- Jurisdictional legislative review relating to OAMs.

Information Sharing

- Four workshops
- NOAMI website [www.abandoned-mines.org](http://www.abandoned-mines.org)
- Newsletters

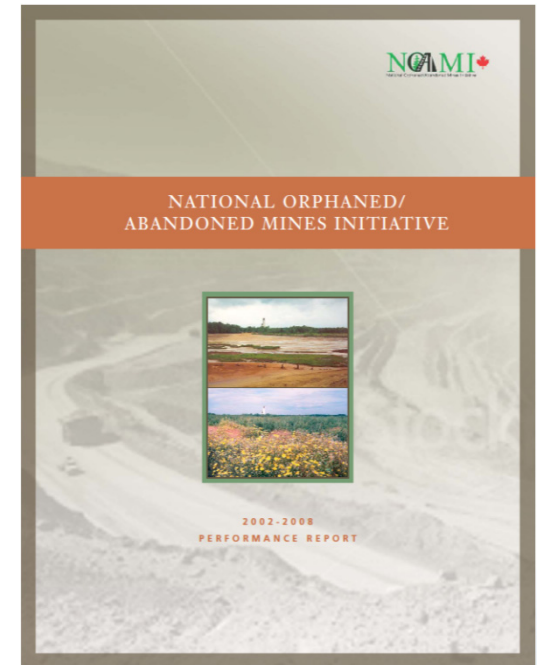


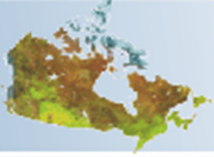




# Looking Ahead

- Performance Report (2002-2008) summarized the work of NOAMI since its inception, including publications and activities
- “Looking Ahead” section notes remaining challenges and future recommended activities

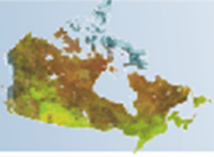




# Guidance Document for Mine Closure and Management of Long-term Liabilities

- NOAMI principle “*Work towards eliminating future abandonment must continue, including the strengthening of regulatory approaches*”
- Guidance document examines key components related to mine closure and post-closure management
- Issues examined include:
  - financial assurance and cost estimation
  - long-term monitoring and maintenance
  - corporate failure
  - emergency legislation
  - relinquishment
- Focussed workshop





Mine Environment Neutral Drainage (MEND)  
[www.mend-nedem.org](http://www.mend-nedem.org)



9<sup>th</sup> International Conference on Acid Rock Drainage  
[www.ICARD2012.ca](http://www.ICARD2012.ca)

National Orphaned/ Abandoned Mines  
Initiative (NOAMI)

[www.abandoned-mines.org](http://www.abandoned-mines.org)





# CANMET Mining and Mineral Sciences Laboratories



M E N D / N E D E M



English

FRANÇAIS

**Merci**  
**Thank you**



Natural Resources  
Canada

Ressources naturelles  
Canada

Canada 