Natural Resources Canada | Ressources naturelles Canada

Sustainable Development in the Mining Industry

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Sustainable Development

- Environmental Protection
- Social Responsibility
- Economic Considerations

Mining and the Environment

- **Key Considerations:**
  - **Not a renewable resource**
  - **Temporary use of the land**
  - **Impacts during operation and post closure**
    - ***water courses; landscape and visual agriculture; forests, land subsidence, air pollution, noise, truck, traffic, etc...***

Environmental Issues of Mine Wastes

- Land disturbance
  - Negative visual images
- Health and safety
- Waste management
  - Impact on water, soil and air
- Abandoned mines

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Environmental Management - Simplified Future View

A mine is a waste management project, whatever revenue remains after paying for waste management is profit

Technical Challenges

- Waste reduction
  - emphasis on underground mining
  - less surface disturbance
  - use of underground (paste backfill)
- Pollution prevention
  - metals, cyanide, acidic drainage, TSS

Acidic Drainage

Originates from:

- Sulphidic minerals
- Exposure to oxygen and water
- Inadequate acid neutralizing capacity

Exacerbated by:

- Naturally occurring bacteria
- Rainfall, snow melt

Acidic Drainage

Can Generate:

- Low pH
- Increased concentrations of dissolved metals
- Elevated levels of dissolved salts

Can Affect:

- Ground and surface waters

Acidic Drainage: Impacts

Health:

- Plants
- Fish
- Wildlife
- People

Financial:

- Canada: 2 billion tons (tailings)
  800 million tons (waste rock)
  Liability $2-5 billion
- Other: Australia: $900 million (97)
  Sweden: $300 million (97)
  U.S.: 〉$30 billion (98)
- Overall: Up to $100 billion (guestimate)

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Mine Environment Neutral Drainage (MEND) Program 1989 - 2001

- Participants
  - Federal government
  - 5 provincial governments
  - Mining companies
  - Non-governmental organizations
  - Volunteer participation
  - 13 years $18.5M
- Scope
  - Prediction
  - Prevention and Control
  - Treatment
  - Monitoring
  - Technology Transfer

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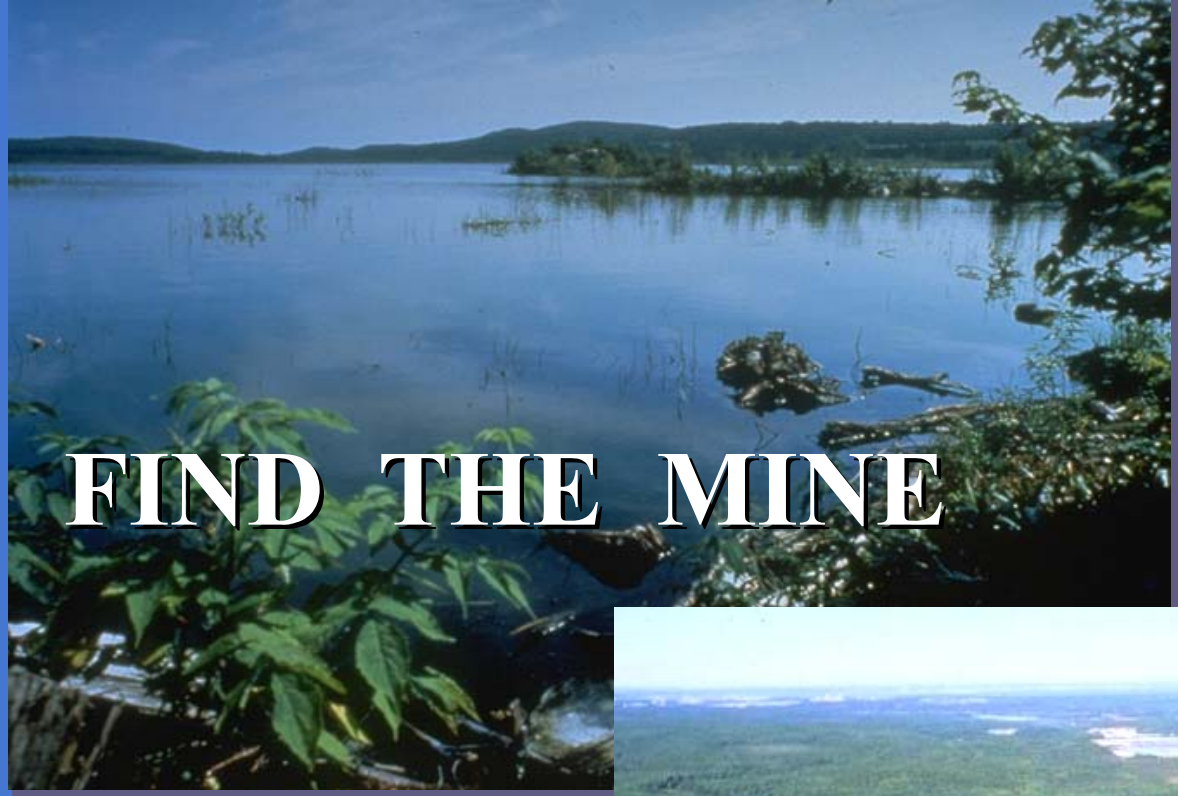
Denison TMA 1 & 2

May 1992

June 1998

Canada



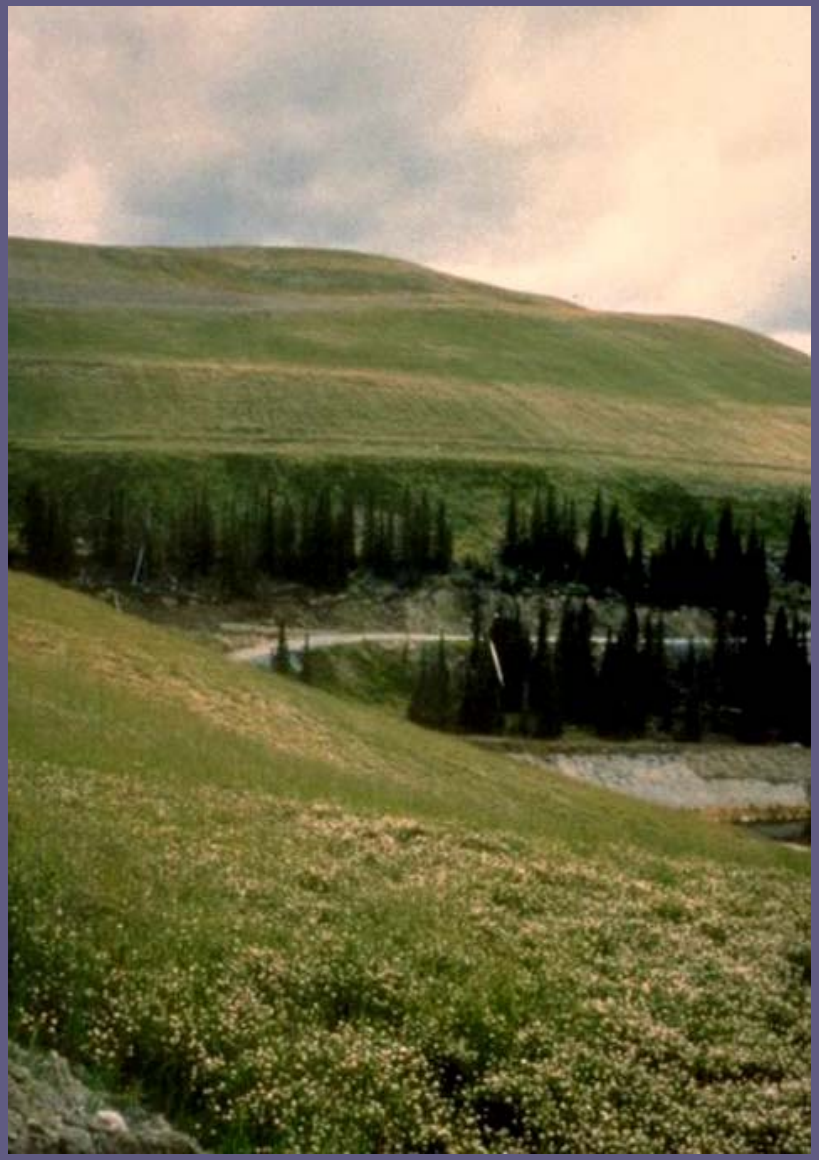
FIND THE MINE

Solbec,
Cambior

Louvicourt,
Aur

Canada

Equity Silver, Placer Dome



Canada

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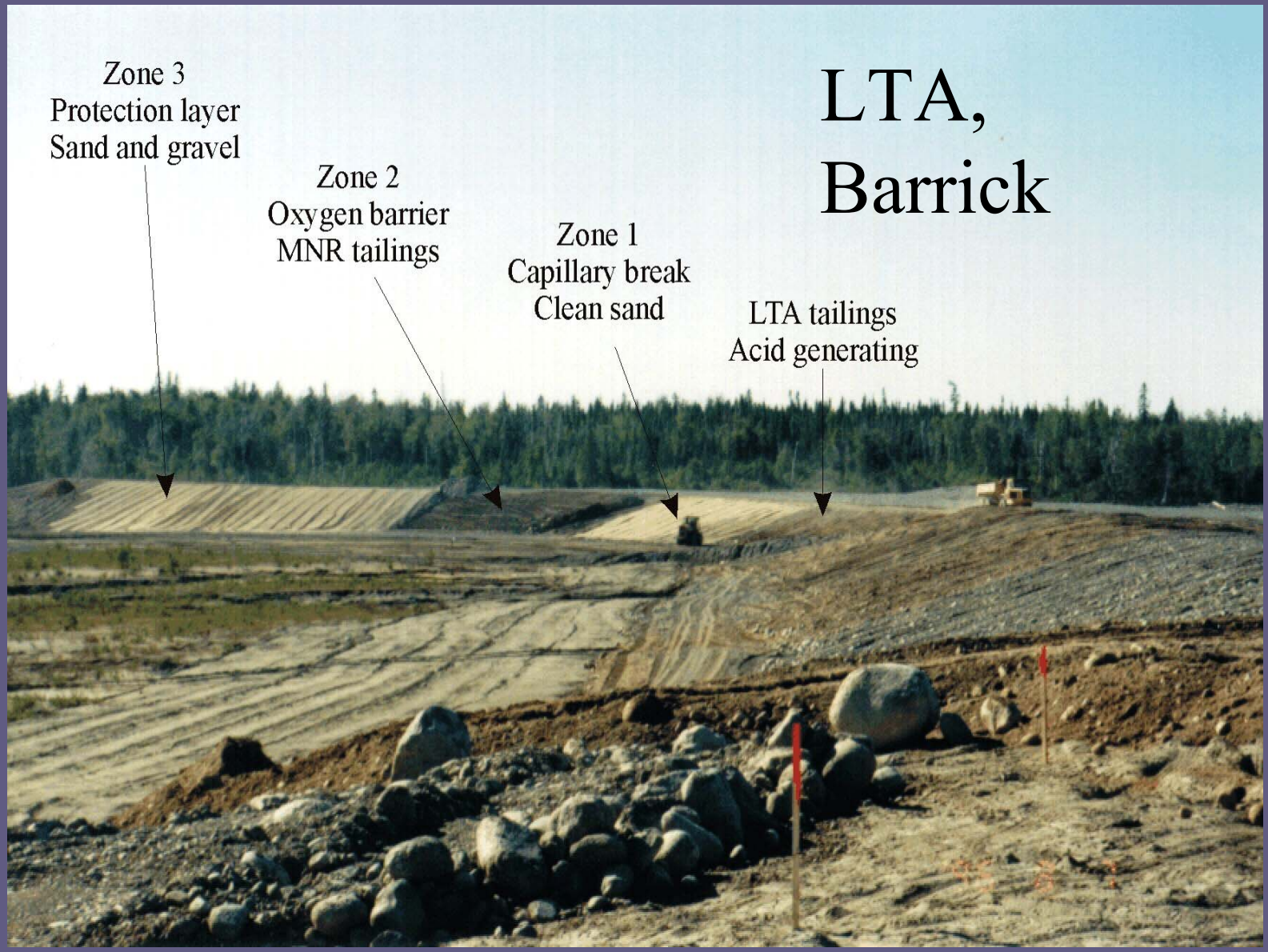
LTA, Barrick



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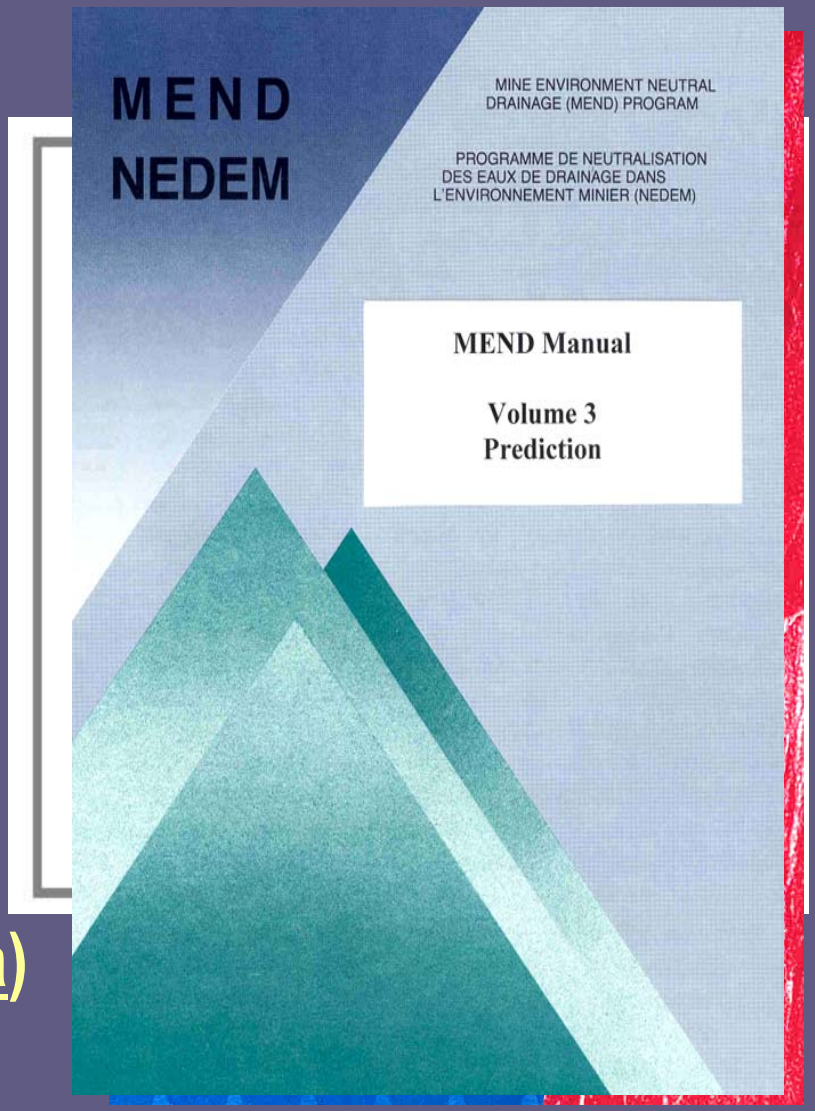
Technology Transfer

- 200 reports
- 3 CD's with over 150 reports
- 4th ICARD on CD
- Video in 4 languages
- Workshops
- MEND Manual
- Internet site:
  (http://mend2000.nrcan.gc.ca)



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MEND Results

- Toolbox of methods to reduce environmental impacts of mining
  - Prevention best strategy
- Reduction in liability of between $400M and $1 billion
- Increased understanding of AD
- Consensus building between government, industry and NGOs
- Recognition for Canada's leadership role in addressing AD for metal mines

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Abandoned Mine Sites

- Ontario - 6,500 historic sites, many in public domain (Cowan, 2002)
- Canada - over 10,000 sites (Mining Watch, 2000)
- Nova Scotia - over 6,000 mine openings
- Quebec - 89 sites for $67M (Bienvenu 2002)
- BC - 1,898 sites (Stewart, 2002)
- Manitoba - 290 sites (2002)
- Unites States - > 200,000 sites

Abandoned Mine Sites

- Six key issues:
  - Environmental
  - Public Health and Safety
  - Reclamation and re-use of abandoned mine lands
  - Responsibilities (fiscal, moral), technical standards
  - First Nations issues
  - Government policy and administration

Abandoned Mine Sites

- Environmental issues include:
  - Underground workings
  - Open pit mine faces and pit workings
  - Waste rock piles
  - Tailings deposits (collapse of structures)
  - Ore stockpiles and spent ore piles from heap leach
- Most serious issue is acidic drainage and metal leaching

Realities & Mining Wastes

- Healthy mining industry needed to fix current problems
- Global opportunities
  - international companies being responsible
  - no place to hide bad practices
- Public demands jobs and clean environment
- No walkaway

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Current Trends in Canada

- Mining recognized as a sustainable industry
  - environmental problems can be prevented
  - no public $
- Cooperative problem solving
- Site - specific solutions
- Water covers/ underwater disposal for reactive wastes

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What have we Learned

- Reclamation should start when mining begins
- The public is a partner in the process of planning and implementing mine closure
- Must change from attempting to isolate contaminant sources to engineering reclamation that harmonizes with natural environment

General Conclusion

- Whereas in the past successful mining was strictly a technical and financial pursuit, it now requires additional "soft skills" such as communication, conflict resolution, and an awareness of the changing environment.

Louvicourt, Aur

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