

D.1. Getting the Acronyms Straight:
AETE and MMEEM

by
Derek Riehm
Teck Corporation



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Derek Riehm
Teck Corporation
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Acronyms in the world of the Fisheries Act

- (MM)EEM
- MMLERs
- NLE
- AETE
- EEMWG
- MAG
- RAO
- MDL
- TI/RE
- AQUAMIN
- MAC
- CEN
- BATEA
- ERP
- TA
- NPRI
- MISA
- QA/QC
- SEM/AVS
- DQOs
- LC50
- EC25
- NOEC/LOEC
- SOP
- SRM
- PPER
- TGD

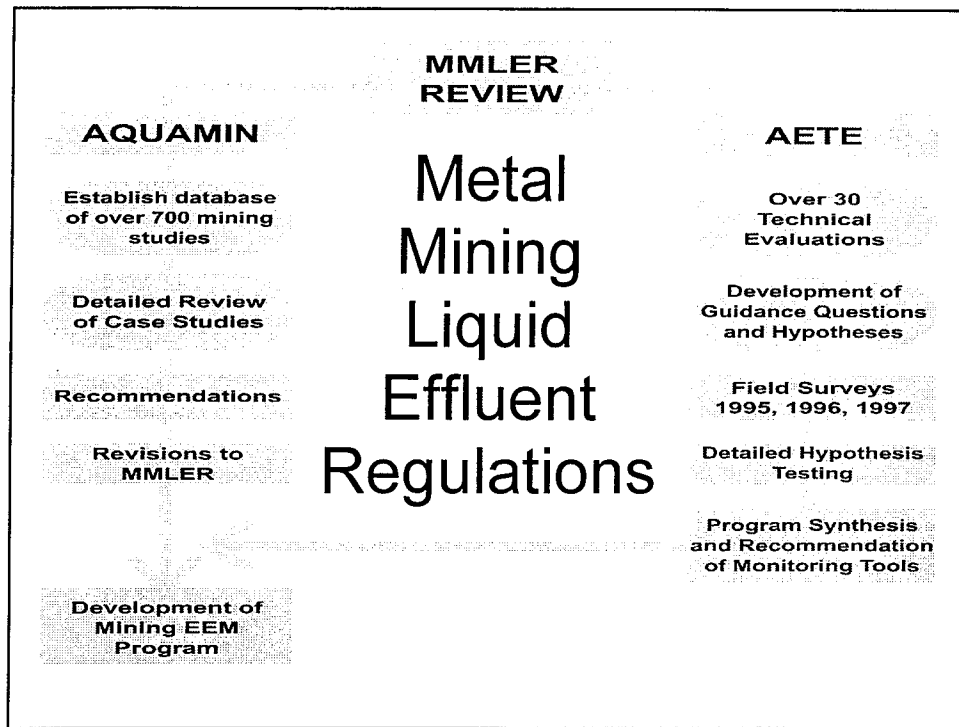
AQUAMIN Assessment of the Aquatic
Effects of Mining in Canada

AETE Aquatic Effects Technology
Evaluation Program

(MM)EEM (Metal Mining) Environmental
Effects Monitoring

Background

- Aquamin process (1993–6)
 - Initiated by EC to update and strengthen MMLERs under *Fisheries Act*
 - Recommendation: develop EEM for all Canadian metal mines
- AETE (1995–8)
 - Evaluation of EEM technologies ⇒ “Toolbox”
- EEM Working Group (1997–9)
 - EEM requirements & technical guidance



Scope of the AETE Program

- \$3.4M program; four years (1994-8)
- Government / industry joint initiative

Objective:

Evaluate the cost-effectiveness of environmental monitoring technologies for the mining industry

AETE Participants

- Mining Association of Canada
- Environment Canada
- Dept. of Fisheries & Oceans
- Indian & Northern Affairs
- Natural Resources Canada
- Provincial governments (7)
- Academia

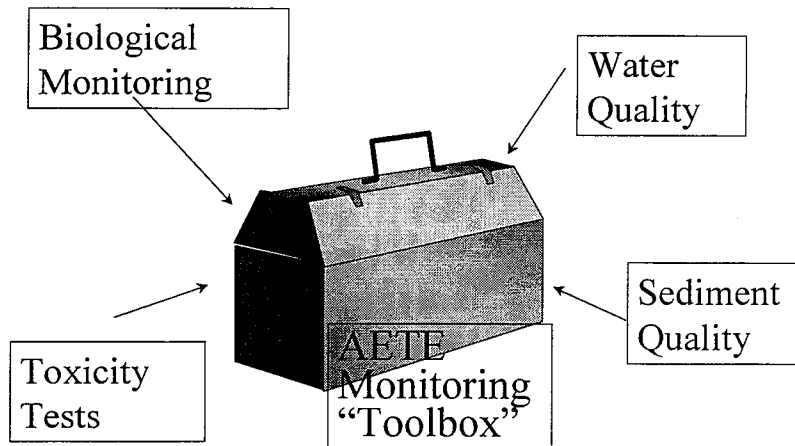
AETE Program Products

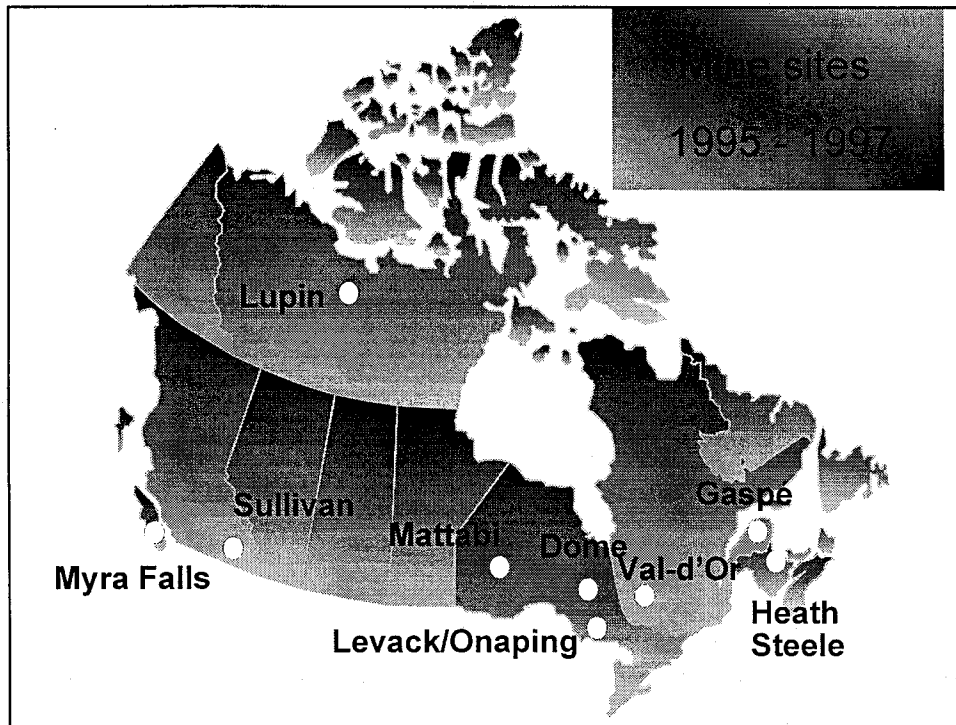
- Technical evaluations (> 30)
- Laboratory testing (> 300 toxicity tests)
- Field case studies (12 field surveys)

Tool Evaluation Criteria

- Ecological relevance
- Ability to demonstrate and effect
- Cost
- Practical considerations
- Contribution to hypothesis testing
- Availability of standardized protocols

Technical Areas





AETE Outcomes

- Cooperation and consensus between government & industry stakeholders
- Cost-effectiveness often key driver for choice of tools
- Results and recommendations for consideration in EEM program design
 - Determined “which tool to use” and not “how to use tool”

Environmental Effects Monitoring

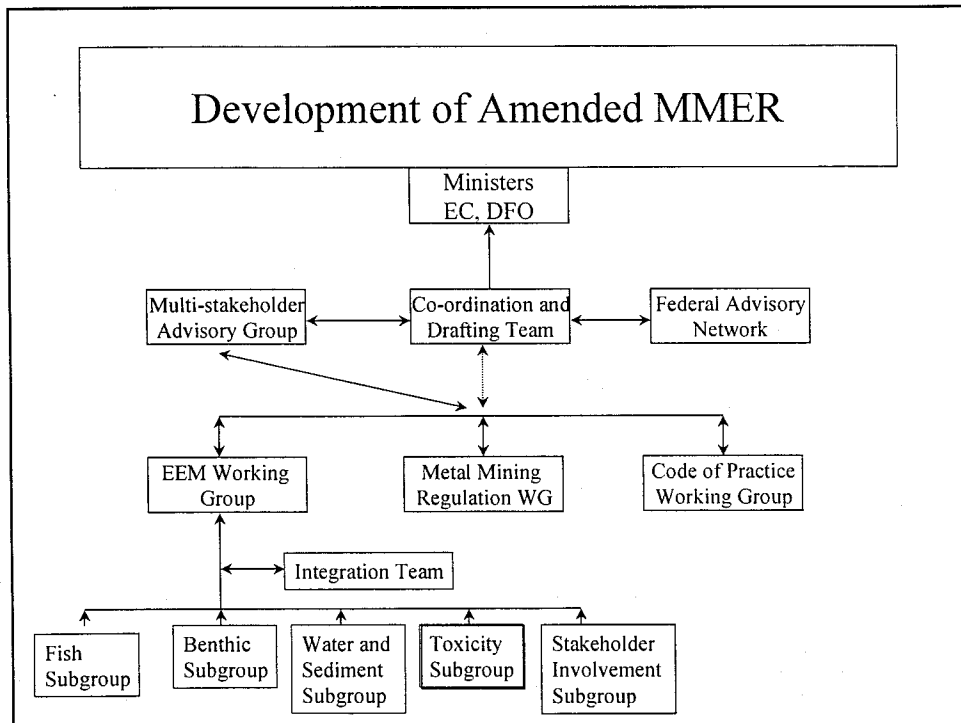
- Who is required to do EEM?
 - All metal mines in Canada regulated under the amended MMERs
- Timetable for implementation
 - Gazette I late 1999
 - Gazette II mid-2000
 - Study design 2001
 - Field work 2002

EEM Working Group

- Mandate: to develop an EEM program for the amended MMERs
- Process: consensus
- Products:
 - Requirements Document
 - describes legally what must be done
 - Technical Guidance
 - provides detailed advice on how to do it

EEM Working Group

- Formed in fall 1997
- Co-chaired by EC and MAC
- Includes members from other federal departments, the provinces, Cree Regional Authority and Canadian Environmental Network
- Consensus reached on requirements, June 1999



Objective of EEM

- *“to evaluate the effects of mining effluent on the aquatic environment, specifically fish, fish habitat and the use of fisheries resources”*

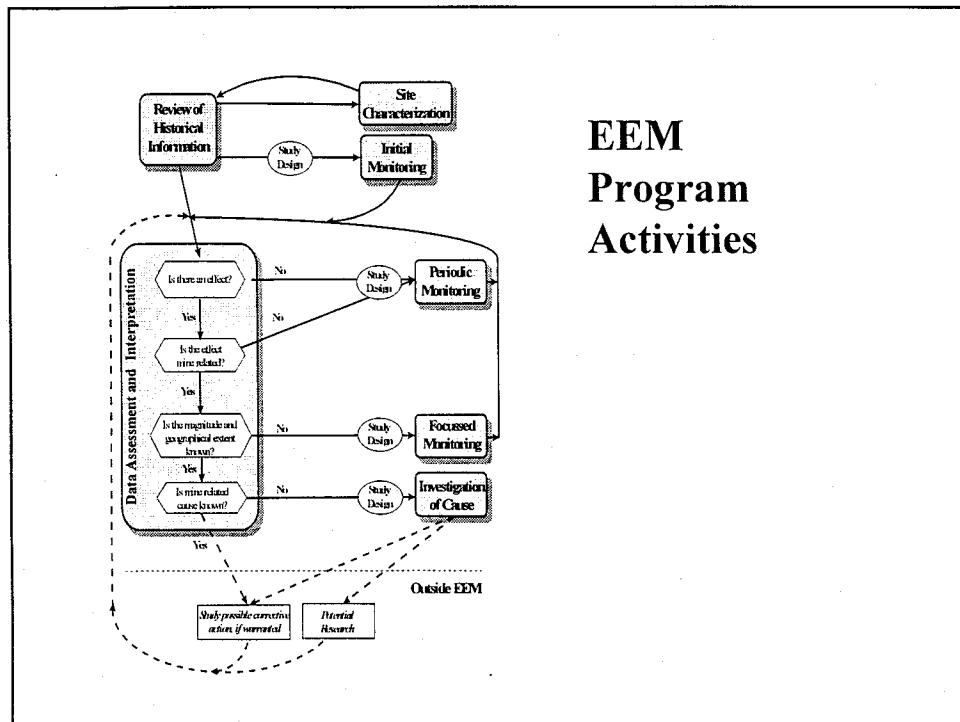
where “effluent” is defined (per MMERs) as mine water effluent, mill process effluent, tailings impoundment effluent, treatment pond or treatment facility effluent, and seepage and surface drainage

Definition of an effect:

“a statistically significant biological difference in fish or benthic invertebrates between an exposed and reference area”

Features of the Program

- tiered program based on results of previous monitoring study
- limited allowance for use of historic data and data from EEM programs required by other regulatory agencies
- balance of site-specific requirements and need for national consistency
- based on guiding principles of cost-effectiveness and scientific defensibility



EEM Program Activities

Initial Monitoring

- Study design to be approved by RAO
- Provide data for effects determination
 - fill in gaps in historical information
- Elements to be monitored
 - fish
 - benthos
 - water & sediment
 - sublethal effluent toxicity

Initial Monitoring

- Structured around “key questions”, e.g. for fish,
 - Has the mine effluent caused changes to:
 - fish community?
 - fish population?
 - fish useability?

Data Assessment and Interpretation

- Questions to address:
 - Is there an effect?
 - Is the effect mine-related?
 - Are the magnitude and geographical extent known?
 - Is the mine-related cause known?
- Answers lead to
 - Periodic monitoring,
 - Focussed monitoring,
 - Investigation of cause, and/or
 - Further work outside of EEM, including possible corrective action.

Periodic Monitoring

- Fish & benthos
 - three year cycle
 - but depends on results of previous monitoring
- Water & effluent
 - minimum 4X yearly
- Sublethal effluent toxicity
 - 2X per year for three years, then annually
- RAO discretionary authority
 - frequency and parameters for water and effluent monitoring
 - frequency and tests for sublethal effluent toxicity

Focussed Monitoring & Investigation of Cause

- Initiate once a mine-related effect is identified
- Flexibility in tools selection
 - RAO authority
 - \$\$\$????
 - May lead to further work outside of EEM, including corrective action

Key Controversial Issues

- Role of effluent sublethal toxicity testing in EEM
- Stakeholder involvement (CEN)
- Flexibility, harmonization (MAC, provincial agencies)

AETE & EEM

Tool	AETE	EEM
Metallothionein	Not in core toolbox	Not a required tool
Sublethal toxicity	Four <i>recommended</i> tests	Four <i>required</i> tests
Water quality	TM \approx DM	TM req'd, DM no
Benthic invertebrates	Level of taxonomic ID & mesh size	Recommendations in TG document

Acknowledgements

- AETE
 - Joanne Papineau, NRCan / Health Canada
- MMEEM
 - Kathleen Hedley, Environment Canada
 - Bob Michelutti

Want to Know More?

- AETE:
 - AETE Synthesis Report
 - contact Jennifer Nadeau, NRCan Ottawa
 - (613)992-1762
 - jenadeau@NRCan.gc.ca
- MMEEM:
 - contact Kathleen Hedley, EC Hull
 - (819)953-1553
 - kathleen.hedley@ec.gc.ca

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