

Overview of the *Metal Mining Environmental Effects Monitoring (EEM) Program*



Outline

- What is EEM?
- Background on EEM program
- Schedule 5 - EEM Provisions
- Frequency of EEM studies
- Implementation
- MMER EEM - Ontario



What is EEM?

- Scientific evaluations of fish, fish habitat, and use of fisheries resources
- 2 to 6 year sequence of design, monitoring, interpreting, and reporting phases
- Tiered approach
 - frequency and type of monitoring dependent upon results from previous studies
- Flexible
 - study designs adjusted for site-specific conditions
- Based on consensus agreement - Metal Mining EEM

Working Group (June 1999)



Objective of EEM

“to evaluate the effects of mine effluent on the aquatic environment, specifically fish, fish habitat and the use of fisheries resources as defined in the *Fisheries Act*”

What is an “Effect”?

- a statistically significant difference in fish or benthic invertebrate community measurements taken in an exposure area and reference area (or along a gradient of effluent exposure)
- measurements of total mercury that exceed 0.45 $\mu\text{g/g}$ wet weight in fish tissue in the exposure area and that are statistically different from the reference area

MMER - EEM Provisions

S. 7 obligates the mine to:

- conduct monitoring studies
- submit reports within prescribed timelines
- use standards of good scientific practice



MMER - EEM Provisions

Schedule 5

□ Part 1: Effluent and Water Quality Monitoring

- Effluent chemical characterization
 - Al, Cd, Fe, Hg, Mo, NH₃, NO₃⁺, hardness, alkalinity; + Schedule 4
- Effluent sublethal toxicity testing
 - fish, invertebrate, plant, and algae tests
- Receiving water quality monitoring

□ Part 2: Biological Monitoring

- Division 1 - First Study
- Division 2 - Subsequent Studies
- Division 3 - Final Study



Part 2 - Biological Monitoring

□ **Objective:**

- determine if there are effects
- determine magnitude, geographic extent, and cause of effects, when mine related effects are found

□ **Studies consist of:**

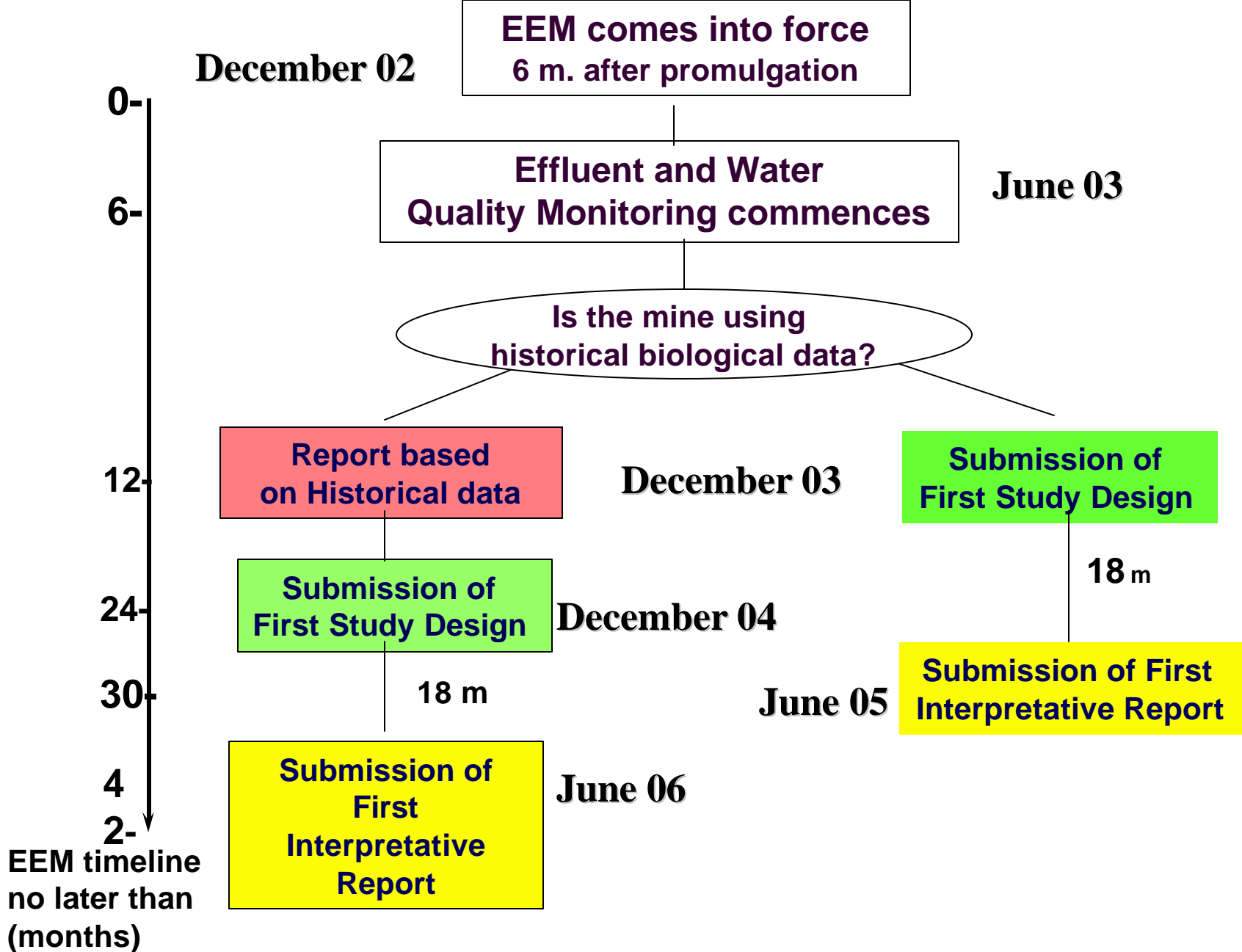
- a fish survey (if concentration of effluent >1% within 250 m of final discharge point)
- a fish tissue survey (if Hg present in effluent)
- a benthic invertebrate community survey



Part 2 - Biological Monitoring

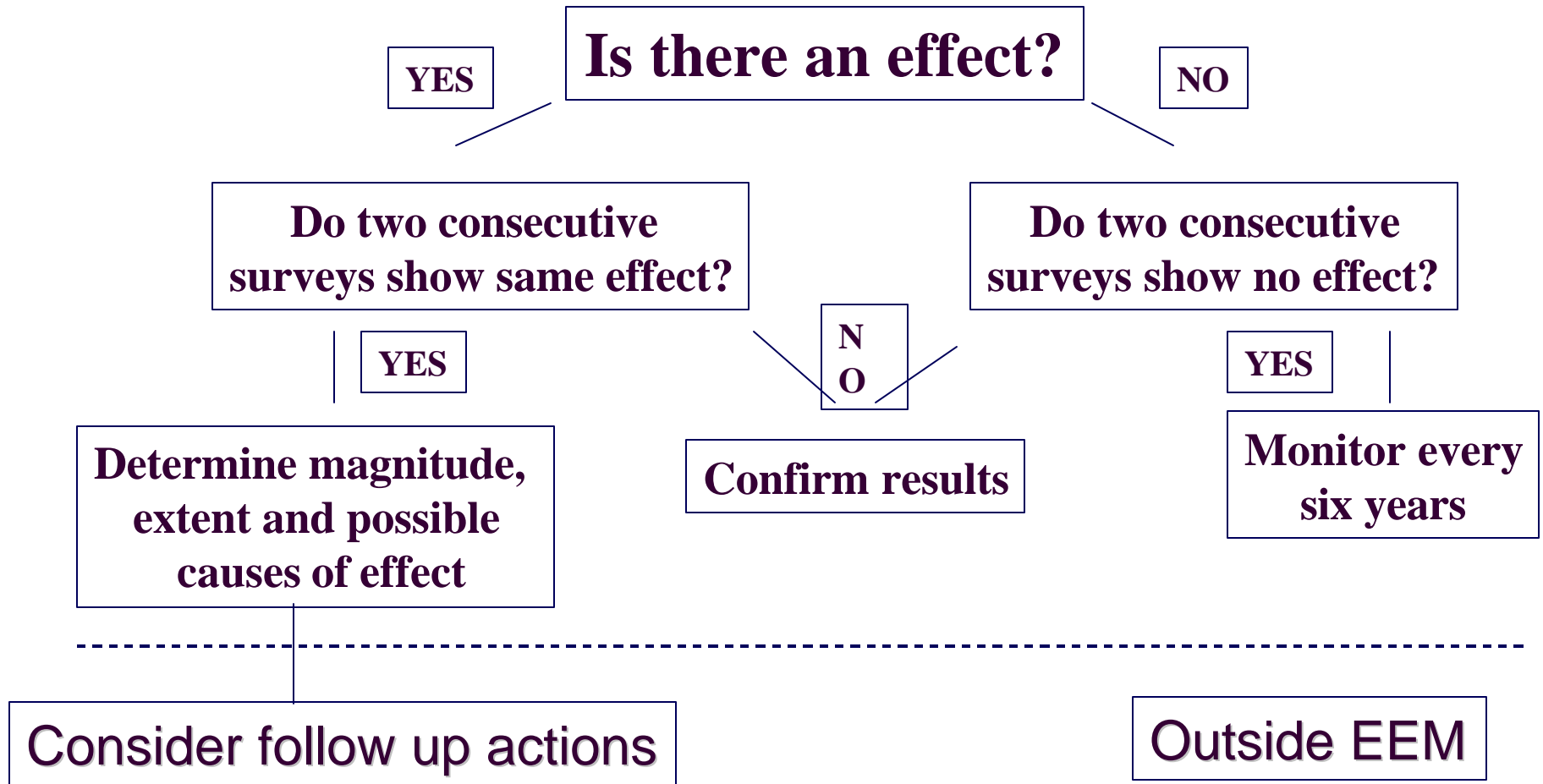
- **Submit Study Design**
 - describe HOW, WHEN, and WHERE biological monitoring studies will be conducted and scientific rationale
- **Conduct field monitoring**
 - not less than six months following submission of study design
- **Assess and interpret data**
- **Submit Interpretive Report**
 - Approximately 12 months after the Study Design was submitted





EEM Studies Frequency

How does it work?



Implementation: Government

- Review reports and verify requirements are met and studies are scientifically sound
 - Authorization Officer and Regional EEM coordinators
 - Technical Advisory Panel - may include representatives from other federal departments, provincial, other jurisdictions
- update guidance documents as science evolves and ensure national consistency
- conduct national and regional reviews of results, national database
- conduct supporting research to improve EEM

Implementation: Industry

Required to:

- Conduct effluent characterization, sublethal toxicity and water quality monitoring and submit yearly report
- Submit to EC study designs prior to field monitoring
- Conduct field monitoring
- Prepare and submit interpretive reports; both electronic and paper

Encouraged to:

- Use EEM guidance document
- Participate in national review of results



Metal Mines in the Ontario Region

- ~ **27 EEM studies are expected for about 36 regulated facilities**
 - about half of the facilities discharge continuously, half intermittently
 - Intermittent discharge due to temp., ice cover, etc.
 - 60% discharge to river systems, 40% to lakes
 - 70% of mines have one discharge point, 25% have two or three



Confounders and Issues in the Ontario Region

- **most common confounders:** historical tailings deposits, nearby mine discharges, municipal sewage treatment plants

- **difficult to locate suitable reference locations in the immediate area of the mine due to problems of access, confounders, etc.**

