

# An Introduction to Groundwater Issues at Mine Sites

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# Topic 9: Detecting and Monitoring Groundwater Contamination



# Types of Contamination

- Sources designed to discharge (septic systems)
- Sources designed to store (landfills, waste rock, ponds)
- Sources designed for transmission (pipelines)
- Discharge for other purposes (mine drainage)

# Monitoring Groundwater Contamination

- How to locate contamination?
- How to sample and map contamination
- Classical approach
  - Monitor wells / topography / hydrology Analysis to map groundwater flow directions
  - Additional monitoring wells to define plume(s)
  - Sampling from wells



# Site Specific / Modified Methods

- **Geophysics**
  - Electromagnetic methods
    - Rapid surface surveys identifies anomalies related to high conductance groundwater
    - Borehole methods for delineating vertical extent of plumes
- **Shallow coring – pore water extraction**
  - Examples of tailing sampling in top 1 – 1.5 m of tailings
    - Hand core (auger)
    - Incremental sampling in profile
    - Extract pore water
      - Squeeze(awkward)
      - rinse (simple)
    - Analyse for (pH, specific conductivity, others)



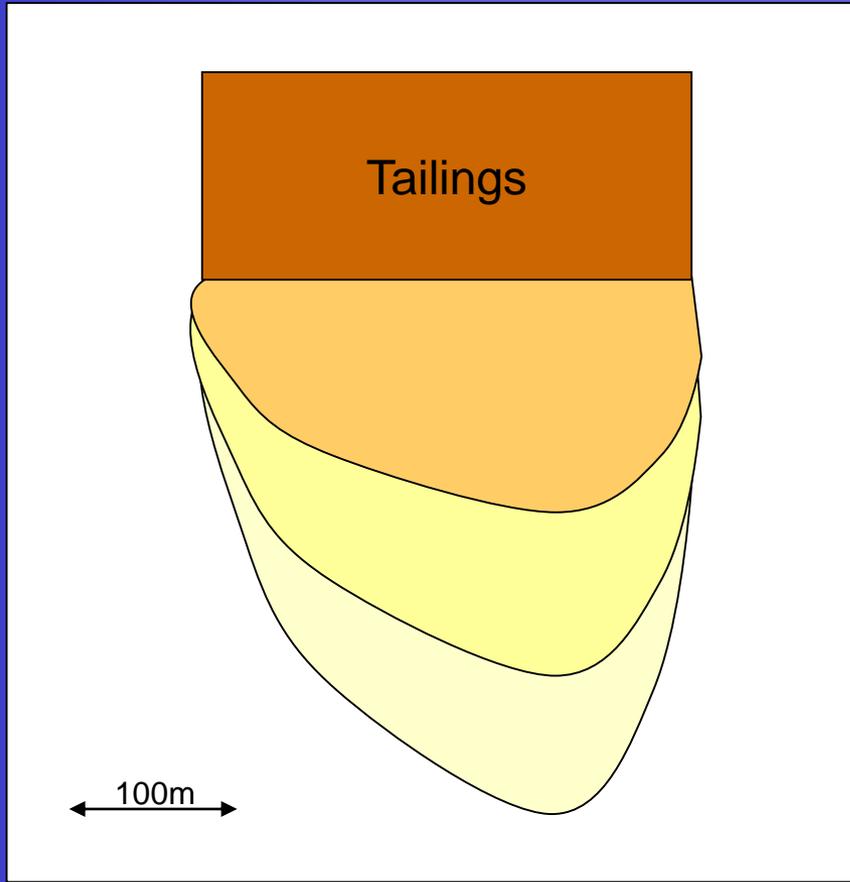
# Site Specific / Modified Methods (con't)

- **Mini piezometers**
  - Used for shallow groundwater and seepage zones (including stream beds and lake shore areas)
- **Seepage meters**
  - Measure and collect seepage in streams and lake shore areas

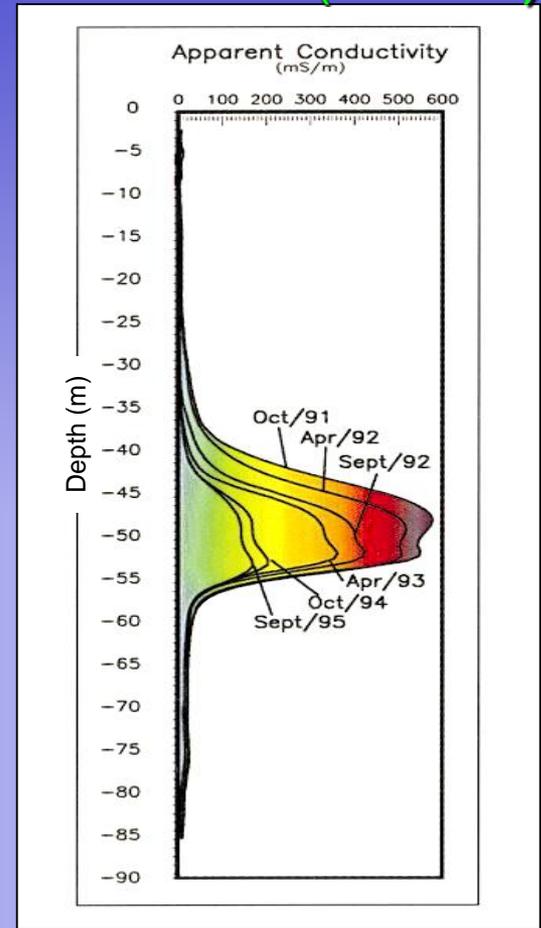


# Geophysics: Electromagnetic Measurements

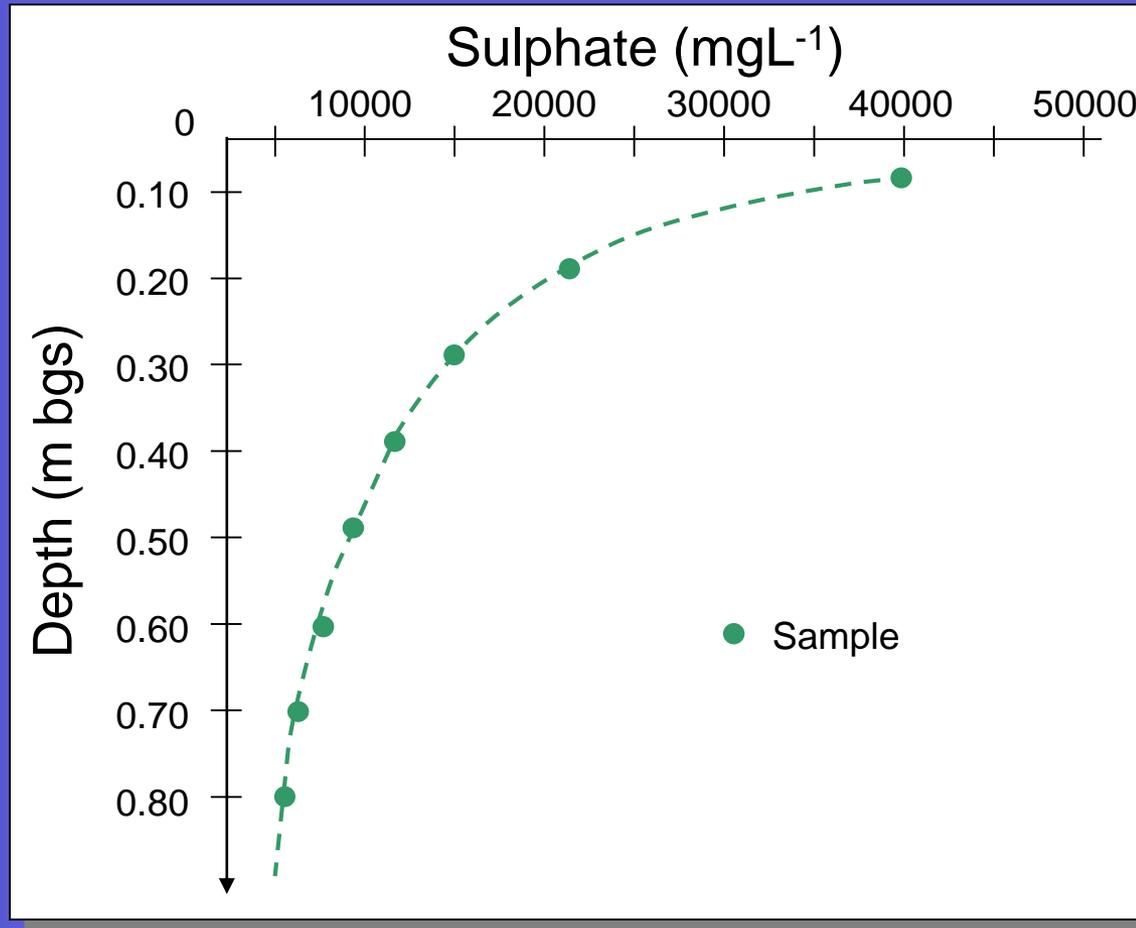
## On Surface (EM-31)



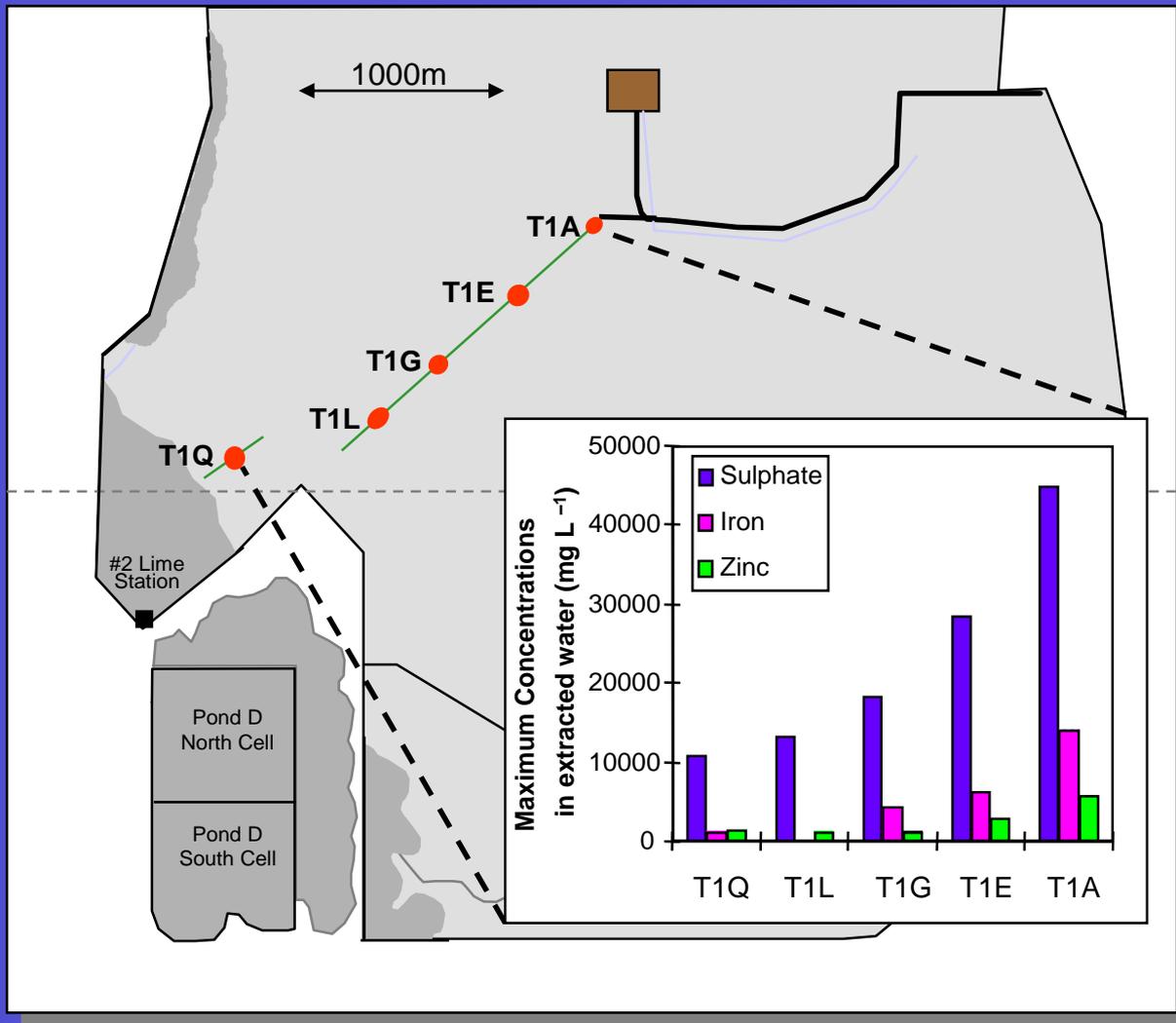
## Down Hole (EM-39)



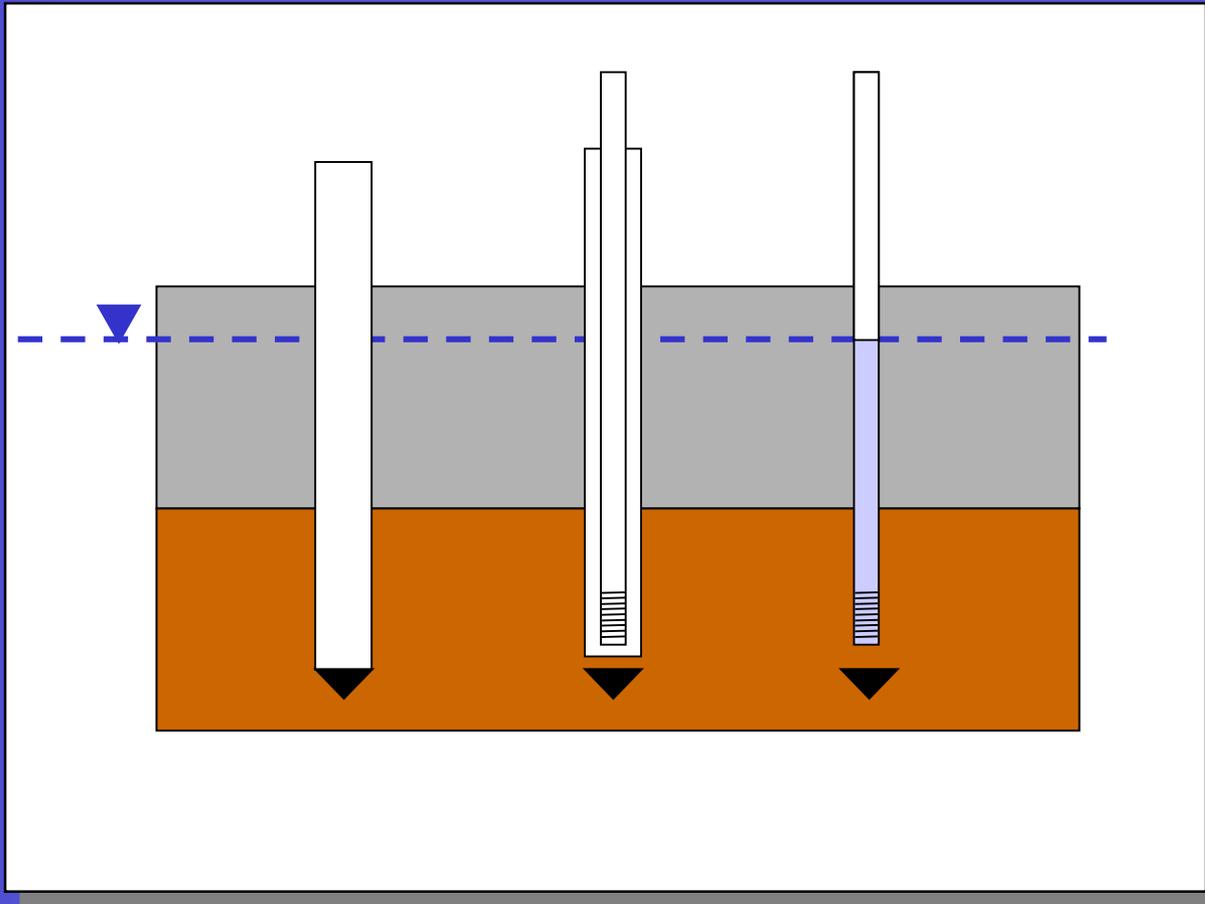
# Shallow Coring (Hand Auger)



# Shallow Coring (Hand Auger)



# Mini-piezometers / Drive Points



# Seepage Meters

