EXCERPTS FROM …… LIST OF POTENTIAL INFORMATION REQUIREMENTS IN METAL LEACHING AND ACID ROCK DRAINAGE ASSESSMENT AND MITIGATION WORK

William A. Price
Mine Effluents Program
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MITIGATION MEASURES

General Features

- Design objectives, including extent to which contaminant loadings are or will be reduced, how environmental objectives will be achieved, compatibility with mine plan, complementary mitigation measures, reclamation plan and relevant biogeoclimatic features of the site
- Construction details and operating history, including waste handling, modifications, upgrades, maintenance and monitoring results
- Water management, including drainage input and discharge location(s), flows and drainage chemistry
- Areas of significant uncertainty, including potential changes, their management implications, contingency plans and studies aimed at reducing uncertainty and guiding or improving future management
- Regulatory requirements

The environmental objectives will play a major role in the selection of mitigation measures and their design.

Dealing with future changes in site hydrology and waste geochemistry is an important aspect of mitigation. Where sulphidic wastes will become increasingly more oxidized or changes in site hydrology may increase leaching, potential increases in metals and acidity and the possible need for additional environmental protection measures should be assessed.

Provision of adequate resources is important because of the potentially large costs. Where possible provide existing and estimated future capital and long-term operating costs for each aspect of the mitigation system, including facilities, operating costs (e.g., lime, power, personnel, pumps, maintenance, monitoring, secondary waste disposal and contingencies in the event of upset conditions).

Measures to Reduce Infiltration of Drainage and/or Oxygen Entry

This includes dry covers and other measures, such as ditches, designed to divert drainage inputs.

Overall Mitigation Objectives

- Performance target (e.g., limit leaching)
- Required reduction in contaminant loading (e.g., 100 times reduction in Zn loadings)

Design Principles

- Physical features (e.g., soil cover)
- Mechanism(s) by which strategy will achieve the mitigation objectives (e.g., reduced hydraulic conductivity)
- Assumed leakage and deterioration

Cover Design and Construction Materials

- Components of the cover and their characteristics
- Source of materials
- Design and construction constraints, such as standards for coarse fragment and moisture content of soil

Cover Construction Methods

- Description of cover construction, including thickness of lifts, number of passes for compaction, equipment used for construction, and QA/QC on material quality, depth and compaction
- Duration of cover construction and cost ($/ha)

Upstream Interception Structures

- Location
- Relevant geotechnical, hydrogeological and geomorphological conditions
- Design and construction methods

Water Management

- Contaminated drainage output from the waste
- Clean water diverted by the cover or upstream interception structures
- Associated monitoring and maintenance

Vegetation

- Impact of vegetation on cover performance (e.g., evapotranspiration and erosion control)
- Species selection and compatibility with long-term cover performance
- Required monitoring and maintenance
- Measures to limit damage from tree-throw, roots or associated wildlife
- Species longevity
- Management of natural plant colonization

Resulting Performance of Contaminant Source

- Total contaminated drainage and individual seep chemistry, rate of flow, loadings and location from underlying waste
- Changes in composition of waste and pore water (weathering)

- Variation in height of water table, thermal properties and composition of gas

The assessment needs to consider the issue of timing and the lag times that will be associated with weathering processes and the slow flow of water in the subsurface.

Performance of Cover

- Potential drainage inputs (snow and rainfall) and volume of diverted runoff and evapotranspiration
- Monitoring results for cover, including measurements of hydraulic conductivity, moisture content, suction, small-scale infiltration into lysimeters, vegetative cover and root growth

Maintenance

- Maintenance of vegetative cover (e.g., fertilization) and management of natural plant invasion
- Measures to detect, prevent and repair deterioration from settling of waste, chemical precipitation, chemical weathering, desiccation, freeze thaw, erosion, root penetration, tree-throw, burrowing animals and human activity (e.g., ATVs)
- Equipment use to clear/repair diversion ditches and sections of cover.
- Proposed contingency measures