Information and Design Requirements for Drainage Treatment in BC

Bill Price

Ministry of Energy and Mines

Use of Treatment to Reduce Metals in Drainage

- includes a diverse group of processes
- ranges from one-time treatment of mill process water at closure to perpetual treatment of ARD
- twelve sites where long-term lime treatment occurs now or will shortly
- three sites have or are using ferric sulphate to treat neutral pH drainage

- Treatment with lime and ferric sulphate can be very effective.
- However, costs are high and challenges may occur with sludge disposal.
- Consequently, a number of mines are considering biological and other less-expensive treatment measures.

Examples of the kinds of situations where alternative treatment methods are being considered include treating small ephemeral, acidic pH flows with elevated metals.

A number of sites are looking at biological treatment to lower concentrations in drainage from the mine workings.

Biological treatment is also seen as a potential mitigation measure for low S wastes, where a relatively small decrease in drainage metal levels is required to avoid impacts.

As a result of all the interest, there has been an increase in field-scale test-work. There are a great variety of treatment options and some innovative research tools.

MEM Information and Design Requirements

Site conditions play a major role in determining best management practices and each site and procedure must be assessed on its own merits. However, there are also a number of generic information and design requirements .

Location, Quality and Quantity of Contaminated Drainage

- Need to know the discharge locations, flow rate and drainage chemistry.
- Must predict both annual and long-term variability.

For which you must understand future site hydrology and geochemistry.

Drainage Collection/Storage System

- Effective drainage collection is a critical component of a treatment system.
- Drainage storage will depend on the hydrology, the treatment rate, resulting effluent quality and permissible discharge.
- If the treatment rate is limited, pre-treatment storage may be required to handle high flows.
- Post-treatment storage may be required for adequate dilution during discharge.

Treatment Process

A treatment proposal should:

- describe the proposed treatment process and required conditions, such as pH and redox,
- outline facilities, resource and management needs,
- predict post-treatment effluent quality and volumes over the range of predicted flows and input water quality, and
- indicate procedures for verifying the predicted performance (science-based).

The treatment process must be reliable and sustainable.

Site-specific field-scale testing and detailed, operational monitoring are likely to be required for technologies that are:

- more complex,
- lack previous use, or
- where there is no back-up.

An important component of treatment reliability is the degree of operator vigilance and control.

Monitoring should be adequate to guide management.

This includes monitoring key properties and processes, and the quality and quantity of the treated drainage and the resulting effluent.

Treated Effluent Discharge

- Requirements will depend on the effluent quality, quantity, discharge location(s) and authorized discharge limits and conditions.
- Proponents are advised to consult MWLAP for more assistance on this subject.

Disposal of Secondary Waste Products

The proponents needs:

- To predict the quality and quantity of any secondary wastes.
- A disposal plan which provides physical and geochemical stability, and considers future hydrological and ecological developments.
- To monitor the composition and volume of both the waste and drainage from the disposal site.

Need to identify and minimize risks.

Measures to minimize the likelihood of failure include an ability to perform under extreme climatic conditions, comprehensive monitoring, frequent maintenance, well prepared contingency measures and having sufficient financial capability.

Contingency plans typically include back-up power and pumps, spare parts, amendments in the event access is cut-off and excess storage for contaminated drainage.

Capital and Operating Costs

- As with all forms of mitigation, existing and projected future capital and operating costs must be provided.
- This information will be used to determine the liability and ensure the proponent has the required resources.

Cost Effectiveness and Compatibility with Other Resources

- Mine should compare the cost/benefits of treatment against those of alternate mitigation measures.
- In less developed parts of the Province, a potential land use issue arising from long-term collection and treatment is if it requires a permanent access road.

Conclusions

A number of sites are studying biological and other less-costly treatment alternatives as part of a package of mitigation measures to cost-effectively meet long-term discharge requirements.

Key Questions

1. At how high a metal load or flow rates can the system reliably meet permissible discharge concentrations, for how long and at what cost?
2. What is required in terms of process control, waste disposal, equipment, personnel, monitoring and maintenance, and discharge?

Like other forms of mitigation:

- A company proposing treatment must commit to implementing all necessary management, maintenance and repairs, and provide financial security commensurate with the liability and risk.

- Thorough monitoring is required to demonstrate effectiveness and sustainability, and to guide future management. This should include measurements that show the mechanism of contaminant attenuation and whether it is sustainable.

Adherence to these concepts should ensure biological and other lower cost treatment strategies are part of environmentally safe, future mining practices.