

Answers to Online Questions

Day 1: Tuesday, December 2 - 8:20 am to 4:30 pm

9:30-10:00 ML/ARD Management for Pipeline Projects. Paul Wilson (Thurber Engineering)

1. You mentioned in the presentation that there are some locations with ongoing monitoring, I'm wondering in general what this monitoring looks like (groundwater? nearby surface water bodies? or other types of monitoring? and what kind of results in this monitor would trigger more attention?

The post-construction monitoring consists of two parts including: 1) visual observations of the apparent state of applied mitigations, such as the physical state of soil caps including looking for any stability issues or significant erosion, exposed liners, condition of shotcrete on cut slopes and effectiveness of drainage controls etc. and 2) environmental monitoring of nearby drainages and surface water bodies through a program of environmental surface water sample collection and analyses. New data would be compared to background and/or previous construction-phase data at the same location. Action could be taken if the physical condition of the applied mitigations was poor and ineffective, and/or if there was a clear signal of decreasing water quality exceeding applicable guidelines over time, and evidence that the poor water quality was moving away from the pipeline right-of-way.

2. Question for Paul Wilson with Thurber. Do you have experience using EQUIS for ML/ARD data management, including interpretation of static laboratory test results? If yes, what are the benefits of VBA vs. EQUIS and vice versa in your experience. Thank you.

I personally do not have any experience with EQUIS but we do use ESdat at Thurber in BC for our Contaminated Sites environmental data management projects. We developed our ML/ARD data management system for pipelines in-house and had to initially develop it on the fly as it was being implemented.

3:30-4:00 Passive Water Treatment of Acid Rock Drainage at High Elevation Highway Site in British Columbia. Timmis A and A Campbell (Jacobs)

1. What are the drivers to have two different designs of BCRs?

Two distinct water chemistries/water types are captured from two locations: the PWTS captures shallow groundwater/seepage collected in a pipe from the area of exposed bedrock and then drained to the inlet of the PWTS. This water has high ferric iron and moderate aluminum; the EW captures local GW – without a single point source and has distinctly different chemistry – mostly aluminum and relatively low iron. With the PWTS we wanted to remove trace metals with a BCR but we needed to neutralize acidity and remove ferric iron and aluminum in a pretreatment step, otherwise the BCR would have failed, so we installed the ANC as our preferred pretreatment option. For the EWTS, we had a low pH, high aluminium, shallow groundwater plume at the base of the highway PAG fill to treat. Further downgradient, where this water is captured in the EWTS, the pH was still impacted but aluminum was not as high. Pre-treatment in an ANC was not required for the EWTS. Site topography, the location of Highway Creek and the footprint available for the construction of the systems also factored into the different designs.

2. Mr. Campbell, you said the ANC media is replaced every 5-10 years. The ANC is a key component of the PWTS, since it reduces Fe and Al load, and pre-neutralizes upstream of the BCR. The ANC reduces clogging in the BCR. Can you provide an example of the feed chemistry that allows the media to last 5-10 years? Many ARD waters are high in Fe and Al so the media tends to clog with these hydroxides.

While the ANC media as a whole is intended to last 3-5 years, we have found that regular maintenance is required at this site to keep the ANC unit functioning. This maintenance typically involved using a vac-truck to remove the top layer of iron and aluminum sludge as well as removing the top layer of media. Periodically the media has been “top-dressed” with fresh media to maintain design HRT within the unit. We have made design modifications and implemented routine maintenance protocols as part of the ANC design moving forward at other projects. Further details regarding ANC media behavior in aluminum-rich, ferric iron dominated AMD can be found in:

Thomas, R.C. (2002) Passive Treatment of Low pH, Ferric Iron-Dominated Acid Rock Drainage. Ph.D. Thesis, University of Georgia, Athens, GA

8:30-9:00 Investigating the Evolution of Cover Systems After Vegetation Colonization. Marie Guittonny and Bruno Bussière (Université du Québec en Abitibi-Témiscamingue)

1. Plants uptake toxics from mine wastes. Is the vegetation cover suitable for wildlife?

If plant roots do not cross cover systems to reach underlying mine wastes, and if cover materials are clean materials, it should limit plant uptake of toxics from mine wastes. However, depending on the cover system configuration and location of the water table level, some toxics could migrate upward to cover materials with water flow and reach plant roots.

2. It looks the mine waste site is in a low flat area surrounded by adjacent water bodies. what are the dominant water flows? vertical, horizontal or both? How efficient is the intercept drain?

If the question is about the Lorraine mine site, the tailings were deposited in a valley with the lowest elevation at the south. The material below was a low permeability soil. So, water flows vertically close to the surface and then horizontally in the tailings from the north to south, where the drains are located.

3. There was a question about water holding capacity as it relates to vegetation. I didn't understand the response in relation to a cover system needing to manage oxygen is any different than one that's needing to manage net percolation. Don't all cover systems need to have sufficient water holding capacity for the climax vegetation condition, and/or to meet reclamation criteria. The answer the question during the session implied otherwise and that if a cover system was designed to manage oxygen, then one needs to remove species that adversely impact the functionality of underlying cover layers. That's fine, I guess, but does that represent a system that meets a site's closure objectives?

Cover systems designed to act as barriers to oxygen diffusion are used under humid climates, where the water balance is positive, because part of these cover systems need to remain close to water saturation to control oxygen diffusion. In consequence, water is generally not limited for plant uptake in this context.

On all cover systems, it is important to consider possible long-term plant effects on the evolution of material properties and water balance to limit loss of cover performance to act as a barrier. If the cover design appears to be not resistant to these plant effects, there are two options: adjust the design or remove the problematic plants to achieve one of the main technical objectives of reclamation, that is to control acid mine drainage.

11:00-11:30 Challenges with High Carbon, Complex Sulphur Speciation Mine Wastes: Adapting ML/ARD Geochemical Characterization Methods for Canada's Oil Sands. Mackenzie Bromstad and Skya Fawcett (Hydroeq)

1. What is it about the different types of carbon that made some samples turn into a paste rather than a powder?

The texture of different types of organic compounds affects the way that they respond to laboratory pulverization. Materials that remain a bit viscous even after prolonged drying, like bitumen for example, contribute to pasty texture in samples.