

Whitehorse - Tuesday, September 11, 2018

Session #4 - Waste Rock Storage and Covers

Time 410pm-430pm

Topic Evaluating Performance of Cover Design for Remedial Options Analysis of Mine Closure, Cantung Mine, NWT

Abstract The production of acid rock drainage and metal leaching (ARD/ML) from mine tailings is a significant environmental concern at many active and abandoned mine sites. Leachate with low pH and high dissolved metals concentrations derived from mine tailings impoundment areas can negatively impact groundwater and surface water resources if proper controls are not put in place after the cessation of mining operations. The Cantung Mine site is located near the headwaters of the Flat River, approximately 300 km north of Watson Lake, just east of the Yukon border in the Northwest Territories (NWT). Five tailings ponds are present on the mine site. All of the tailings pond containment dams are constructed of local glacial till and alluvial materials consisting of a mixture of silts, sands, and gravels, with occasional cobbles and boulders. Tailings Ponds 1 and 2 (TP1/2) are located immediately east of and below the mill site, and were reclaimed and covered with 1 to 3 m of glacial till cover. Tailings Ponds 3, 4, and 5 (TP3/4/5) are located south of the town site, and currently sit uncovered. Tailings at the Cantung mine site are consistently classified as potentially acid generating (PAG) with elevated metals content and are located in close proximity to the Flat River channel. The cover placed on TP1/2 was established to limit the onset of acidic conditions by preventing oxygen and water ingress into the tailings, though limited engineering was completed to design the cover and ensure it would perform as intended. The presence of both oxygen and water is required for ARD to develop, so the cover was placed to maintain high moisture content in the tailings and thus limit the transport of oxygen. The cover appears to be effectively preventing the onset of acid generation. However, the mechanism by which the cover is working are not well understood. Predictive geochemical modelling, cover design investigation, infiltration and seepage modeling, and oxygen ingress modeling was completed as part of the remedial options analysis to evaluate the effectiveness of the cover at TP1/2. The cover over TP1/2 has been in place for approximately 40 years, providing an analog for use in closing TP-3/4/5, if the mechanisms controlling the development of ARD/ML can be determined. Initial performance assessments of the tailings cover on TP1/2 suggests that the cover functions as a physical barrier limit the infiltration of precipitation and the diffusion of oxygen in to the tailings. Mineralogical data and geochemical observations also suggest that the reactions within the cover are providing neutralization capacity and helping to control the oxygen ingress; additional data analysis indicates that silicate minerals in the cover may be the controlling factor in reactions taking place in the cover.

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Bio(s) Scott Kingston is a Geologist with Tetra Tech Canada Inc, based in the Vancouver, BC office. He obtained his Bachelor of Science degree in Geological Sciences from the University of British Columbia in 2009. In the last 8 years with Tetra Tech Scott has worked extensively on mining and rockwork projects throughout Canada, from mine permitting through closure and reclamation. His primary area of focus is on acid rock drainage and metal leaching (ARD/ML) characterization studies and providing solutions for material management and mitigation of environmental impacts from ARD/ML from mined materials.