Appendix B

Kensington Project Tailings Storage Facility Consolidation Testing & Modeling



Memorandum

Date:	February 21, 2005	Our Ref:	101-20/6-A.01
To:	Rick Richins	Cont.#:	V5-0188
From:	Jaime Cathcart/Graham Greenaway		
Re:	Consolidation Testing and Modeling		

This memorandum briefly describes the consolidation characteristics of the Kensington tailings, as determined by recent laboratory testing, and presents the results of consolidation modeling to provide an estimate of post-closure seepage rates in the Kensington Slate Creek Lake Tailings Treatment Facility (TTF). The proposed mine operating plan provided by Couer Alaska (Coeur) was used to define the quantity of tailings reporting to the TTF during operations. The majority of the tailings reporting to the TTF will be Total Tailings. However, during periods when the coarser tailings fraction is used to provide underground backfill, only Fine Fraction tailings will report to the TTF. Both Total Tailings and Fine Fraction tailings samples were tested to determine their consolidation characteristics.

Previous consolidation analyses conducted in 2004 used assumed tailings consolidation characteristics, based on available information on the Kensington tailings and conservative consolidation parameters for similar tailings materials. These analyses did not incorporate the mine operating plan and assumed that all tailings would report to the TTF.

The laboratory testing indicates that the tailings will achieve much higher densities (lower void ratios) than originally anticipated during initial particle settling after slurry discharge. Consequently, there is significantly less pore water remaining to contribute to ongoing consolidation seepage. The current consolidation analysis indicates that seepage rates from the tailings deposit will be negligible shortly after the end of operations, particularly around the periphery of the facility where tailings are shallower. Although it may take several more years for the deeper tailings in the center of the TTF to fully consolidate, the seepage rate from these tailings is predicted to be minor (3 gpm or less).

Laboratory Testing

A slurry consolidometer device was used to develop consolidation and compressibility parameters for the tailings over a range of effective stresses. The apparatus is designed to evaluate the consolidation characteristics of slurries that initially have high void ratios and high moisture contents at low effective stresses. The testing was carried out at the Golder Associates geotechnical laboratory in Calgary, Alberta, under the direction of Knight Piésold Ltd. (KP).

Two tailings samples were tested. As only a Total Tailings sample was available for testing, a portion of the Total Tailings sample was used to create a Fine Fraction sample. This was prepared by allowing the Total Tailings sample to settle and segregate, followed by removal of the top layer of finer tailings to represent Fine Fraction Tailings. This was carried out in an attempt to generate a tailings sample representative of the tailings that will be placed in the facility during periods of underground backfilling operations.

For both the Total Tailings and Fine Fraction tailings tests, the samples were placed into the consolidometer at an initial solids content of approximatley 45%. Routine measurements of settlement

with time were recorded during each loading stage. Once settlement ceased or became negligible during loading, the confining pressure was increased to the next loading stage. Confining pressures ranging from approximately 1 kPa to 400 kPa were applied in both tests.

The coefficient of consolidation and void ratio was determined for each stress level. Calculated coefficients of consolidation (cv) and void ratios determined for the Total Tailings and Fine Fraction Tailings were very similar. The relationships between void ratio and effective confining stress for the Total Tailings and Fine Fraction Tailings are shown on Figure 1. It is evident that there is little difference between these two tailings materials. Calculated coefficients of consolidation range from 0.5 to 1.0 m²/year at low stresses to approximately 40 m²/year at high stresses. The low coefficients of consolidation at low stresses indicate that the tailings will initially consolidate slowly until higher effective stress conditions are achieved by ongoing dissipation of excess pore water pressures.

Consolidation and Seepage Modeling

The consolidation model was run for the expected 10-year life of the mine using a finite difference consolidation model developed by KP. The model incorporates the consolidation characteristics of the tailings, large strain consolidation theory and the tailings rate of rise during operations (based on tailings production from the mine operating plan).

The attached figures present the results of the consolidation modeling for the Slate Creek Lake TTF.

Figure 2 shows the predicted average dry density of the tailings deposit during operations and after closure. The dry densities are higher than predicted by the previous analysis in 2004 due to the higher initial settled density (lower initial void ratio) determined from the laboratory testing.

Consolidation modelling was carried out for varying final depths of tailings to examine the influence of tailings depth on the rate of consolidation and seepage after closure. The tailings deposit at closure is generally shallowest around the periphery of the TTF and deepest toward the centre in the area currently occupied by Slate Creek Lake, as shown by Figure 3.

The shallow depth tailings (less than 30 feet) around the periphery of the facility are predicted to be over 90% consolidated in less than 2 years after the end of operations. The intermediate depth tailings are predicted to be 90% consolidated within 10 years, while the deepest tailings in the center of the facility (approximately 75-100 feet thick) are predicted to take much longer to reach this level of consolidation, likely several decades. However, predicted seepage rates from even the deepest tailings are very low.

Consolidation seepage flows to the tailings surface are predicted to be minimal over much of the facility within 2 years after the end of operations. Figure 4 shows the estimated seepage flux (US gpm/ft²) to surface from the consolidating tailings for the shallow, intermediate and deep tailings areas. The corresponding predicted seepage rates with time after the end of operations for each of these areas are shown on Figure 5. The total predicted seepage to the tailings surface after closure is approximately 6 gpm after 2 years and about 4 gpm after 5 years. Almost all on-going consolidation seepage to surface after this time is from the deepest tailings in the center of the facility (approximately 3 gpm). These seepage rates are much lower than previously estimated by the 2004 study.

The consolidation analysis indicates that seepage rates from the tailings deposit will be negligible shortly after the end of operations, particularly around the periphery of the facility where tailings are shallower. Although it may take several more years for the deeper tailings in the center of the TTF to fully consolidate, the seepage rate from these tailings is predicted to be minor (3 gpm or less).









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