



Acres International Limited  
500 Portage Avenue, 6th Floor  
Winnipeg, Manitoba, Canada • R3C 3Y8  
Tel: 204-786-8751 • Fax: 204-786-2242  
www.acres.com

October 20, 2005  
P13808.04

Nunavut Water Board  
P.O. Box 119  
Gjoa Haven, NU  
X0E 1J0

**Attention:** Ms. Dionne Filiatrault, P.Eng.,  
Manager of Technical Services

Dear Dionne:

**Jericho Diamond Mine  
Review of Long Lake Divider Dyke Design Report  
NWB Water Licence NWB1JER0410**

At the request of Nunavut Water Board (NWB), Acres International Limited (Acres) has conducted an independent review on the design report of the Long Lake Divider Dyke that was submitted by Tahera Diamond Corporation (Tahera), on behalf of Benachee Resources Inc. (BRI). BRI is a wholly-owned subsidiary of Tahera and is the registered holder of the Nunavut Water Board Water Licence No. NWB1JER0410 (Water Licence). The design report was prepared by EBA Engineering Consultants Ltd., dated June 2005.

**Background**

Part D of the Water Licence describes the Conditions Applying to Construction. Item 2 of Part D specifically indicated that BRI shall submit to the NWB a detailed design plan and drawings, which outlines the construction of any dams, dykes or structures intended to contain, withhold, divert or retain water or waste materials.

The divider dyke which is referred to in the design report is Divider Dyke A. This dyke is one of the two dykes proposed to contain the fine processed kimberlite solids (fine PK) in the eastern portion of the Long Lake. Long Lake will be utilized as the Processed Kimberlite Containment Area (PKCA). If required, a second dyke (Divider Dyke B) will be constructed during future mine operations on the eastern portion of Long Lake to satisfy water quality requirements. Divider Dyke A will be constructed in stages, with the first stage to be constructed to el 521 m, in anticipation of water level reaching el 520 m in the spring of 2006. The crest of the dyke will subsequently be increased in stages to its final crest elevation of el 524 m. The Divider Dyke A is intended to retain the fine PK solids, but would allow water movement through the dyke. The dyke will also be used as a haul road for the construction of the West Dam.

**Acres Review and Comments**

Based on the review of the design report for the Long Lake Divider Dyke document, Acres has the following comments:

**1. General**

The design report provided the requirements for the construction of the Divider Dyke A, as stipulated in Part D Item 2 of the water license. The report included the detail design, construction drawings, as well as technical construction specifications. Design information related to the construction materials, foundation, slopes of the dykes, etc. are included in the design report.

**2. Design Intent**

Second bullet of the design intent needs to clearly indicate that the divider dyke was not intended to be an impervious structure, i.e. to retain water. This is to separate the dyke concept and the major difference between the Divider Dykes A and B, with the West, East and Southeast Dams. See comment No. 4 in the following.

**3. Dyke's Foundation**

It should be noted that the foundation conditions of the Divider Dyke A were derived from borehole information which are not exactly located under the dyke's alignment, but at the Divider Dyke B alignment. However, the general site topography appears to support similar site conditions at Divider Dyke A location. In addition, foundation preparation, geotechnical inspection requirements and the approval process that is in place under the technical specifications (Sections 2, 3 and 4 of the Specs) will ensure that Divider Dyke A will be built as per design requirements presented in the design report.

**4. Riprap Materials**

Section 6.2 of the report provided some information on the slope protection requirements, as a result of potential waves which may erode the dyke.

It was indicated that the maximum wave height was estimated at 0.36 m. Applying the Hudson formula to determine the size of the riprap materials, the  $d_{50}$  of the riprap material was verified with a particle size as shown in the report ( $d_{50}=155$  mm).

However, the report recommended that the riprap gradation will contain smaller particle size materials with  $d_{50}$  ranges between 40 and 130 mm (Figure 1, or Technical Specs, Section 3.4, Table 3.3). Why does the riprap's specifications differ from the design requirements? Would it be more difficult to produce the riprap size with  $d_{50}=155$  mm? It is assumed from the mine run rockfill's specifications that the riprap can be produced using selective processing. If the riprap can be produced to obtain  $d_{50}=155$  mm, the riprap layer may not need to be as thick (3 m horizontal thickness) as specified in the drawing.

**5. Stability Analysis – Phreatic Water Line**

Results of stability analysis were presented graphically in Appendix A. Figures A4, A5 and A6 showed stability analysis for the downstream slopes. The phreatic water surfaces generated in these figures do not appear to be representative for long term or static conditions. The figures appear to show that a head difference (up to 6 m) between the upstream and downstream conditions will be achieved using a rockfill dyke with filter sand and transition

materials on its upstream slope. It is understood that the dyke will not be impervious, and therefore such a head difference may only occur during freezing conditions (as indicated on Page 4 of the report), or if the filter layer becomes impervious. Therefore, the water levels on both sides of the dyke should be relatively equal. Nevertheless, it is anticipated that the proposed slopes of the dykes should be able to meet the factor safety requirements as per Canadian Dam Association (CDA) guidelines.

**6. Emergency Spillway (Surface Overflow)**

Section 2.0 (Page 2) and 2.3 of the report (Page 4) refer to the construction of a low sill or overflow channel with crest at el 520 m to pass potential overflow of water in the case that the dyke's filter layer become frozen and restricts the flow through the dyke during the winter period. However, no drawing details were provided.

The report needs to provide typical design for this structure, information on how it will be constructed (location, type of materials, size, etc.), and under what criteria or conditions are required for construction.

In summary, the Design report for the Divider Dyke A contains all of the necessary design requirements prior to the dyke construction. It is understood that the divider dyke is not an impervious dyke, and it can be classified as a very low consequence category structure. Any minor instabilities (sloughing, settlements, etc.), should they develop, can be handled as part of the routine maintenance and regular inspection/monitoring process. Should you have any further questions or concerns regarding the above, please do not hesitate to contact me.

Yours very truly,

A handwritten signature in black ink, appearing to read 'R. A. Halim', followed by a long horizontal arrow pointing to the right.

R. A. Halim, P.Eng.  
Senior Geotechnical Engineer

RAH:sep

cc Mr. J. Murdock, NWB