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**9545-1-1-JER-R**





May 12, 2005

Ms. Phyllis Beaulieu
Manager of Licensing
Nunavut Water Board
Box 119,
Gjoa Haven, NU. X0B 1J0

Dear Ms. Beaulieu,

**Re: Jericho Diamond Project Borrow Management Plan**

Thank you for providing INAC with an opportunity to review the above-mentioned plan.

Under Part D, Conditions Applying to Construction, Item 15, Benachee is required to:

*"...at least sixty (60) days prior to the construction of the Causeway, submit to the board for approval the final detailed Causeway design plan stamped by a Geotechnical Engineer and/or Engineering Geologist. The report shall be developed in accordance with Schedule D, Item 15.*

Schedule D - Conditions Applying to Construction, Item 15 states: .

*The detailed design report for the construction of the Causeway referred to in, shall include but not necessarily be limited to the following:*

a. *Detailed implementation schedule for construction;*
b. *Detailed criteria and parameters;*
c. *Mitigation measures to reduce TSS and control sedimentation;*
d. *Construction sampling of waste rock used for causeway construction;*
e. *The Licensee should ensure the Causeway is constructed to minimize disturbance and maximize development of fish habitat including benthic substrate;*
f. *Monitoring to be done during construction.*

This letter summarizes the comments provided by members of INAC's technical and scientific review team for the construction of a combined water intake/causeway system. Comments are provided with respect to the above license conditions.

a. Detailed Implementation Schedule for construction

The proposed schedule is provided in Section 1.3 "Description of Work", and Table 1, whereby Phase I would involve installation of the intake wet well, piping and fish screen, together with the outer edge of the causeway footprint, during May 2005, at a time when the ice cover can be used for equipment access. Phase II would involve completion of the causeway structure sometime after the lake ice has melted - during the summer 2005 period. INAC accepts the schedule as proposed.



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b. Design Criteria and Parameters

Drawing No. 316996-SK-P-1000, Rev. P1 plus comments in Section 1.4, 1.5, 1.6, 2.1 and 2.2 provide details for the proposed design and construction of the water intake/causeway system.

1. The proposed length of the causeway is 90 metres, but it is indicated that the structure might have to be extended until a minimum water depth of 4 metres is achieved. New lake-bottom surveys have recently been completed and this information will be used to help establish the final length. Based on this new information, what is now the expected causeway length?

2. Will the minimum 4 metres water depth be established on the basis of the current lake level? This depth is to accommodate an ice thickness of 2 metres plus 2 metres to incorporate the intake pipe, low lake levels, and separation above the lake bed. There has been no technical definition of what a "typical" lake level is, nor has an adequate technical argument been provided to establish what the design "low" lake level should be. If the 4 metres depth is measured from the current lake level, then it is important that it be established whether it is average, or otherwise. Assuming that the invert of the intake pipe is 0.5 metres above the bed, combined with a 0.9 metres pipe diameter, leaves only about 0.6 metres to accommodate a lower lake level and an assurance that the pipe would not be impacted by an ice cover. There has to be better technical back-up to support the proposed intake pipe levels.

3. For a maximum diversion rate of 100 m3/s, the average flow velocity within the 0.9 metre diameter pipe would only be 0.04 m/s. Some ingestion and accumulation of sediments will occur within the pipe during periods when severe wave action is occurring on the lake and sediment is suspended.

   - Has any consideration been made as to whether this might be the case, and what might be the rate of deposition?
   - Will it be possible to back-flush the intake pipe if it becomes necessary to remove deposited sediment?

4. Since the Alternative 2 design is the Department of Fisheries and Oceans (DFO) - approved arrangement, why is it necessary for Alternative 1 design to also be shown on the drawing?

5. In Section 1.4.2, Tahera should confirm that the freeboard of the causeway (crest elevation at Elev. 469.0 metres) is sufficient to prevent ice damage and scour due to wind-driven rafts of ice from the lake, especially during breakup. This was a problem at Polaris, where a similar intake concept was used, and ice rafts damaged the pump house building. The perimeter of the causeway should have a minimum 1 metre high protective berm to stop vehicles from skidding off. This may affect the design crest width of the causeway (shown as 7 metres) in order to accommodate a standard driving lane and the base width of the berms.

6. The angle of the embankment sideslope of 1.3(H):1(V) equates to 37-38 degrees, which is not unreasonable. The angle is not a concern for the general embankment construction, except at the end where the intake pipe is to protrude from the rockfill. If the angle is less than about 32 degrees and assuming that the crest location is fixed, then the rock fill will extend over the intake pipe and screen. Should the lake depth be greater than expected and the pipe correspondingly lower, then the rockfill might also extend over the intake pipe screen, even with the slope at the angle of repose. Since the specifications call for use of "appropriately sized" fill in this area, it is worth ensuring that the finer material can maintain the required slope angles to stay clear of the end of pipe. Note that these issues would not be a concern if Alternative 1 design was adopted.

7. Has the size of embankment material at the surface been based on some potential wave height?

c. Mitigation Measures to Reduce TSS and Control Sedimentation

Section 2.3 states that a silt curtain will be used during Phase II to control TSS, if it become obvious during Phase I that this would be a good idea. Specifying the use "clean" rock will help mitigate the amount of sediment suspension and re-suspension. The proposed plan is acceptable.

d. Construction Sampling Monitoring of Waste Rock

This issue is addressed in Section 2.3. It is proposed to "... *visually inspect on a periodic basis to establish that it is free of till and overburden materials. Unclean rock will be rejected for use in the construction of the causeway.*" A second stage of dealing with potential TSS issues would be the use of silt curtains, but this would only be possible during Stage II work. It seems that a TSS issue could not be mitigated with complete certainty during Stage I. Can Benachee expand on this?

e. Minimize Disturbance and Maximize Development of Fish Habitat ..."

This issue is not addressed in the report. INAC defers to DFO for matters pertaining to fish habitat.

f. Monitoring During Construction

This has been addressed in INAC's comments for "d" and "e".

This concludes INAC's comments. Should the NWB or Benachee Resources Inc. have any questions or require clarification on any of the comments in this review, do not hesitate to contact the undersigned.

Robert Eno
Water Resources Coordinator

c. Greg Missal - Tahera Diamond Corporation