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NUNAVUT WATER BOARD  
NUNAVUT IMALIRIYIN KATIMAYINGI

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File: NWB1JER0410/D12

February 20<sup>th</sup>, 2007

Greg Missal  
Vice-President Nunavut Affairs  
Tahera Diamond Corporation  
130 Adelaide Street West, Suite 1900  
Toronto, Ontario M5H 3P5

**Subject: NWB review of the submitted Fuel Storage Facilities – Set 3: Desktop Geotechnical Assessment**

Dear Mr. Missal:

The Nunavut Water Board (NWB) requests further clarity on issues related to the Jericho Diamond Mine Final Design Plan –Fuel Farm (**Part D, Item 12**). The following documents were consulted in reviewing the fuel storage facilities:

- i. **Fuel Storage Facilities – Set 3: Desktop Geotechnical Assessment – Tahera Diamond Corporation – Jericho Diamond Project – Fuel Storage Facilities – Set 3: Desktop Geotechnical Assessment** (received: April 18, 2006)

After a review of the above listed correspondence it has been determined that additional information and clarity is needed. The NWB requests additional information regarding the following listed items. Where appropriate, the NWB references **Schedule D, Item 12** of the water licence **2AM-JER0410** (formerly NWB1JER0410).

1. Pursuant to Schedule D.12.c. of the water licence **2AM-JER0410** (formerly NWB1JER0410), the Fuel Storage and Containment Facility shall include “*hydrostatic testing procedures for new tanks (water source and wash water disposal location*”. Additional detail is required to satisfy this licence requirement.
2. Pursuant to Schedule D.12.d. of the water licence **2AM-JER0410** (formerly NWB1JER0410), the Fuel Storage and Containment Facility shall include “*primary and secondary containment measures*”. Additional description is requested on how the design satisfies this licence requirement.
3. **Section 3.0-** Probe holes completed near or on the tank farm location were discussed; labels for probe hole locations were not provided in figures making it impossible to understand exact location. A map outlining location of the probe holes described is requested.
4. **Section 3.0-** The subsurface investigation indicated that the overburden silty sand material is high in ice content. The amount of excess ice content was not provided. The design of the fill pad overlying the overburden material is anticipated to maintain frozen conditions in the overburden and therefore limit thaw settlement. The 2006 Annual

Geotechnical Inspection report noted settlements ranging from 100 to 350 mm for Phase 1 tanks and lower settlement amounts for Phase 2 tanks. Given this monitored performance of the previous tank facility design, how has settlement been accounted for in the current design? What are the details of the settlement analysis and what is the expected amount of settlement? Is creep settlement within overburden material a serviceability issue that is important to this design? If so, how has it been accounted for?

5. **Section 5.2-** Fills will be constructed above ice-rich overburden to preserve native soils in a frozen state so as to minimize potential for thaw settlement. It was stated that fill pad thickness was based on estimated seasonal freeze-thaw depths at the Jericho site. For purposes of the licence record, what are the details of this estimation? How confident is TDC in the selection of this pad thickness for permafrost protection?
6. The design report implies a requirement for material specifications, construction specifications, quality assurance and control, however, there is insufficient detail provided to characterize these requirements. For purposes of the licence written record the NWB requests a construction specification document that includes, but is not limited to, material characteristics, construction methods, placement requirements, monitoring, and QA/QC, that addresses the following:
  - a. **Section 4.0-** It is stated that run of mine (ROM) processing will be necessary to obtain the specified 150 mm and 20 mm materials. What other engineering specifications are required for this material? What is the acceptable gradation? What testing methods will be used to ensure the desired material specification? What is the frequency of the testing?
  - b. **Section 4.0-** Additional detail is requested to outline the specific construction practices for material placement during summer and winter construction.
  - c. **Section 5.2-** Strong recommendations were provided in the design report with respect to site preparation. For example, "*it is strongly recommended that the site preparation commence by benching into the toe of any existing Set 2 tank farm fills so that the new tank farm fill is keyed into the competent existing fills*". Full details of all site and foundation preparation recommendations are requested.
  - d. **Section 5.3-** ROM material was specified for the first 3.0 m of the granular fill pad. "*Best construction practices*" are to be used for placement of this material. A maximum rock size "*ideally about 600 mm diameter*" is stated for use. Confirmation of a maximum allowable rock size of 600 mm diameter as a specification is requested. What are the specifications for maximum ROM material size for the first layer and second layer of the fill pad? What other engineering specifications are there for this material and its placement? What testing and frequency of testing will be completed to ensure this material specification? What lift thickness is required?
  - e. **Section 5.3-** No details of the liner material were provided. What are the engineering and construction specifications for the geomembrane liner?
  - f. **Section 5.3-** It is stated that "*typical*" minimum and maximum material size range of 20 mm and 50 mm, respectively, with select characteristics with regards to angularity, has been suggested for use as bedding material. A commitment is requested if these material characteristics are the specification required for the bedding material. What testing methods and frequency of testing that will be

used to ensure the specified material is used in construction? What lift thickness will be used? Are there any other material or construction specifications required for this material?

- g. **Section 5.3-** A sand or heavy weight geotextile are to be used to protect the liner. What are the engineering specifications for the sand (e.g., size, gradation, thickness, placement density, lift thickness, etc.)? The weight and type of geotextile was provided, what are the engineering specifications for the geotextile strength? How confident is TDC that the sand or geotextile will sufficiently protect the liner from damage? Are these details based on experience from measured performance of liner integrity from other designs or has an analysis been completed? The NWB requests additional detail on the selection of liner protection for both the sand and geotextile options. Have Phase 1 or 2 liner integrity been tested and what are the results?
  - h. **Section 5.3-** Interior and perimeter berms are to be constructed of crushed granular fills with 50 mm maximum size. What are the engineering specifications for the construction of the berms (e.g., density, material gradation, height, slope angle, lift thickness, etc.)?
  - i. **Section 5.3-** It was stated that "*it is imperative that all fill materials be compacted as they are placed*". Specifications on required density to be achieved for each fill material, how density will be tested, and frequency of density testing is requested. The NWB requests detail on how TDC is to achieve the desired compaction if construction was to be completed in freezing versus non-freezing conditions.
  - j. **Section 7.0-** It is stated that "*quality control of the liner materials and installation should be undertaken by liner specialists*". What are the details of the quality assurance/quality control measures for the liner? Confirmation that a liner specialist will complete quality control of the liner is requested.
7. **Section 5.3-** Pursuant to Schedule D.12.e. of the water licence **2AM-JER0410** (formerly NWB1JER0410), the Fuel Storage and Containment Facility shall include "*monitoring to be done during construction*". Additional detail is required to satisfy this licence requirement. It is stated in the design report that "*all aspects of fill placement should be monitored*". This statement is ambiguous. Further information, for purposes of the licence written record, is requested to detail what exactly is to be monitored during construction. Will this information be provided in the construction records and submitted to the board with as-builts? Additionally, further details into how liner integrity will be determined by excavating test pits are requested. How many test pits will be completed?
8. **Section 6.0-** It was recommended that settlement monitoring be completed. How will settlement be monitored and at what frequency? How will this information be provided to the NWB?
9. With the exception of settlement, there were no details provided on long-term monitoring. Additional detail and discussion is requested to address what will be monitored (e.g., water quality, liner performance/integrity, foundation conditions, etc.), methods, and frequency. Will thermistors be installed to assess the integrity overburden material? If so, where will thermistors be installed and how often will monitoring take place? If not, why not?

10. The design of Phase 3 fuel storage facility pad thickness and construction materials are similar to that used for Phase 1 and 2. Are there any measured performance results from Phase 1 or 2 construction of the fuel storage facility to suggest that the proposed design is adequate with satisfactory performance? How has the measured performance of Phase 1 and 2 fuel storage facilities been considered in the proposed Phase 3 design?
11. Additional detail is required on how snow and waters collected within the fuel storage facility will be removed. Additionally, will the base of the facility be graded to a sump? If so what are these design details?
12. No QA/QC program has been provided in the design report. A detailed QA/QC program is requested. TDC is reminded that in the conditional licence for the fuel storage facility (*Approval: Final Design Plan – Fuel Farm, Jericho Mine, date March 30, 2005*), the NWB requested the submission of contractor(s) QA/QC programs for review. TDC responded with a list of items included in the QA/QC program but did not fulfill the conditional licence requirement of submitting the QA/QC program for review.
13. Has the fuel storage facility been designed for secondary containment for all fuel storage that meets at a minimum industry standard (e.g., CCME Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products, published by the National Task Force on Storage Tanks and the National Fire Code) and the regulatory requirements for fuel storage and spill containment in the event of an incident involving one or more of the fuel tanks planned for installation/use on site?
14. Will the construction be supervised by a qualified geotechnical engineer?
15. Pursuant to Part D.12 of the water licence **2AM-JER0410** (formerly NWB1JER0410), sixty days prior to the construction of the Fuel Storage and Containment Facility, final detailed design plan stamped by a qualified Engineer is to be submitted. The engineering drawings within design report have not been signed and stamped by a qualified Engineer. When will signed and stamped engineering drawings be provided to the Board?
16. Does TDC believe that any changes to the design as specified in the design report should be recorded and reflected in the construction records and as-built drawings and submitted to the NWB?

In summary the Board requests a formal response to each of the above stated provisions. Sufficient detail and an avoidance of ambiguity should be followed in submitting response materials to the listed provisions. If you require assistance whatsoever please feel free to contact Dr. Jamie Van Gulck, P.Eng. at (519) 577-4129 or [vangulck@vqqconsulting.com](mailto:vangulck@vqqconsulting.com).

Sincerely,

*Original signed by:*

Joe Murdock  
Director Technical Services