A TETRA TECH COMPANY

March 13, 2012

ISSUED FOR USE
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Government of Yukon
Department of Energy Mines and Resources
P.O. Box 2703
Whitehorse, Yukon Y1A 2C6

Attention: Ms. Josée Perron. P.Eng.
Senior Project Manager, Assessment and Abandoned Mines

Subject: 2011 Geotechnical Inspection of Earth Structures
Mount Nansen Mine, YT.

1.0 INTRODUCTION

As requested, EBA Engineering Consultants Ltd., operating as EBA, A Tetra Tech Company (EBA) has completed a geotechnical inspection of the current condition of the earth structures located at the abandoned Mount Nansen Mine site west of Carmacks, YT. The intent of the inspection was to provide a geotechnical engineering report on the stability of the tailings, water-retaining, and water diversion structures as part of the on-going care and maintenance program. Similar inspections have been completed by EBA in the past, and EBA conducted a Dam Safety Assessment in 2002. The work was also to include a review of recently collected instrumentation (ground temperature and piezometer) data.

2.0 OBSERVATIONS AND RECOMMENDATIONS

Two inspection trips were originally intended – one in the spring of 2011 and one in the fall, for the purposes of examining the site under different water flow conditions.

Mr. Richard Trimble, P.Eng. of EBA's Whitehorse Office completed a one-day inspection on both June 22 and September 28, 2011. The structures examined were:

- Emergency Spillway
- Seepage Collection Dam
- Tailings Dam
- North Diversion Ditch

The June inspection was completed just after the spring freshet and had a higher water level in the tailings pond but low water level in the diversion ditch/spillway. The September inspection was at a time of low water in the tailings pond but higher flows in the ditch/spillway. A new bridge was being constructed downstream of the existing bridge across the diversion ditch at the time of the September inspection. It is understood that this new bridge was required due to excessive abutment settlement and structural failure that occurred earlier in the summer at the current location.

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Specific observations and recommendations are presented in the following sections of this letter, and selected photos are attached. Other photos are also available for review in EBA's files. The observations and recommendations presented relate to both the June and September inspections, unless specifically noted otherwise.

A separate report will be prepared and submitted for the review of recently collected ground temperature and water level (piezometer) data.

2.1 EMERGENCY SPILLWAY

The water level in the tailings pond was very low, and had remained low for a while as there was no evidence of recent flows down the spillway. In general the spillway was well armoured, contained adequate velocity checks (large riprap in channel) and there was no evidence of permafrost thaw issues along the banks. One item noted was the old pipeline and supporting wooden structure across the inlet – if this isn't needed any more, it should be removed to prevent blocking the inlet if it collapses (Photo 1). Photo 2 shows a general view looking down the channel.

Photo 1: Emergency Spillway inlet looking south towards tailings pond – remove pipeline and wooden supports that could potentially collapse and block the channel (June 22/11).

Photo 2: View looking SE down the emergency spillway channel – stable and adequate erosion protection (September 28/11).

2.2 SEEPAGE COLLECTION DAM

The seepage collection dam was reconstructed in 2000 and contains a frozen key trench stabilized by Thermosyphons that were installed parallel to the dam centreline. In general the dam looks good and is considered stable, although some minor seepage on the downslope face was noted in the centre of the dam in June, but not in September (lower pond level). This is not an issue at present, but should continue to be monitored. In addition, there were some erosion gullies noted on the north abutment, caused by surface runoff water, that should also be monitored and repaired with riprap if they continue to enlarge (see Photo 3).

Photo 3: Erosion gullies on north abutment downstream of seepage collection dam (Thermosyphon radiators visible in upper left of photo. (June 22/11).

Some instrumentation installed in boreholes at the centreline of the dam was also observed, and these holes may have affected the Thermosyphon evaporators in the key trench. If this is the case, it may be the reason why some minor seepage was observed in June. It is recommended that the Thermosyphon performance be assessed this winter by using an IR imaging gun to verify that they're still operational[1].

Photo 4 shows the instrumentation location in the dam, with the Thermosyphon radiators in the background.

[1] This work was completed by EBA in a site visit in January 2012, and the Thermosyphons were confirmed to be operational.

Photo 4: View looking from S to N across Seepage Collection Dam -- instrumentation location (red stakes in left center of photo) in Dam that may have affected Thermosyphon evaporators connected to the radiators shown in upper center of photo (Sept 28/11).

2.3 TAILINGS DAM

The water level in the tailings pond was very low, and the dam itself is considered to be in a stable condition (see Photo 5). No evidence of previously noted instabilities or seepage on the north abutment was observed, and there were no signs of significant erosion or permafrost thaw features that could affect stability.

There was one area along the downstream face at the south abutment that contained minor permafrost thaw depressions (see Photo 6) but these have been here for at least ten years and are not considered to affect the slope stability.

Photo 5: General view of crest of tailings dam looking south (June 22/11).

Photo 6: Minor thaw-settlement depressions near survey stakes (see orange flagging in center of photo) on downslope side near south abutment of tailings dam looking NE (June 22/11).

2.4 NORTH DIVERSION DITCH

The north diversion ditch was examined from its source above the southeast corner of the tailings pond, past the intersection with Dome Creek, and down to where it connects with the emergency spillway. The upper portion of the ditch is cut through permafrost, which seems to have reached a new equilibrium.

Immediately above Dome Creek, the diversion cuts through a sand terrace, the erosion of which through several small drainages is depositing fine grained sand into the diversion. To minimize the deposition of sand into the ditch (see Photos 7 and 8), and subsequent suspended solids load during high flow events, it is recommended that these areas be cleaned out as part of the annual maintenance program. In future, should a more permanent solution be required, the ditch could be armoured with geotextile and riprap. A sand sample was taken and tested in the EBA Whitehorse soils laboratory (see attached particle size curve), the results from which could be used to design a suitable geotextile for lining the ditch under a riprap cover.

Photo 7: Flow and sand deposition into the upper diversion ditch above Dome Creek (September 28/11). There are several of these small "fan" deposits south of the Dome Creek inlet, above and west of the tailings pond – this is one of the larger ones.

The lower section of the ditch below Dome Creek is stable; however, the abandoned pipeline and wooden supports (see Photo 9) in the creek just below Dome Creek should be removed. There is the chance that this could collapse into the channel creating disruption to the natural flow, and channel sideslope erosion.

Photo 8: View looking NW showing upper diversion ditch filling with fine grained sand that gets washed downstream during high flow events (September 28/11).

Photo 9: Abandoned pipeline and wooden supports in diversion ditch immediately downstream of Dome Creek inlet– these should be removed to minimize the potential for future collapse and possible effects on future flows (September 28/11).

3.0 SUMMARY OF RECOMMENDATIONS

3.1 Emergency Spillway

- Remove pipeline and wooden supports near spillway inlet.

3.2 Seepage Collection Dam

- Monitor erosion rills on the downstream side of the north abutment and repair by filling with riprap if they continue to enlarge.
- Conduct a winter 2011/2012 thermal evaluation of the Thermosyphon radiators – an IR imaging instrument could be used to confirm that they're still functioning as designed. There is some concern that the instrumentation boreholes in the crest of the dam may have impacted the buried evaporator pipes. Note: This was completed in January 2012 and the Thermosyphons were determined to be functioning.

3.3 Tailings Dam

- Continue to monitor permafrost thaw settlement on the downstream face near the south abutment.
- Consider conducting a review of the status of existing instrumentation in the dam – some of the cables are in "rough" shape and may need to be replaced (if they're still necessary).

3.4 North Diversion Ditch

- Clean out the sand deposits in the the upper and central portion of the ditch on an annual basis. If a permanent solution is required, then armour the sides and base with non-woven geotextile and suitably sized riprap.
- Remove the abandoned pipeline and wooden supports from the diversion ditch just downstream of Dome Creek and also above the bridge to avoid potential future flow disruptions.

3.5 General

- There is a lot of debris around the spillway channel (half shell insulation segments, one abandoned 45 gal drum near discharge); at the top of the tailings dam (sections of sampling tubing); and along the diversion ditch (more sampling tubing) that could easily be picked up and properly disposed of. There are also numerous wooden pallets and random pieces of timber scattered around the tailings pond. If these were cleaned up, it would give a better impression to visitors that the site was being maintained.

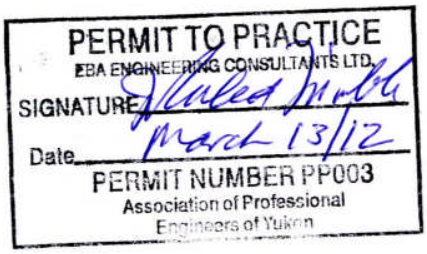
4.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the Government of Yukon, Energy Mines and Resources and their agents. EBA, A Tetra Tech Company, does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Government of Yukon, Energy Mines and Resources or for any Project other than the site described herein. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in the attached General Conditions.

5.0 CLOSURE

We trust this report meets your present requirements. The inspections reported herein are specifically related to geotechnical issues regarding the emergency spillway, tailings pond, seepage collection pond, and diversion ditch at the time of the inspection. Should geotechnical stability issues be noted by site personnel during other routine inspections, EBA should be notified as these observations may affect the conclusions presented in this letter. Should you have any questions or comments, please contact the undersigned.

Sincerely,
EBA, A Tetra Tech Company



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GENERAL CONDITIONS

GEOTECHNICAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA’s Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA’s Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA’s instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

8.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

9.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

10.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

11.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

12.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

13.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

14.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.