



SteveJan Consultants Inc.
192 Werra Road
Victoria, BC V9B 1N4
CANADA
Mobile: 250-850-9002

TECHNICAL MEMORANDUM

Date: June 23, 2020

Subject: SJCI Comments on Stantec's Technical Memorandum on *Additional Geotechnical Details on TCA Dam K and Dam M Cross Sections* for the Lupin Mine as Requested by Nunavut Water Board in Part E, Item 26 of Lupin Mine Water Licence 2AM-LUP2032

Introduction

SJCI has undertaken a review of the Stantec Technical Memorandum (STM) at the request of the Kitikmeot Inuit Association (KIA), a stakeholder in the current Lupin closure review process. SJCI has been retained by the KIA to assist in the review of several documents recently prepared for Lupin Mines Incorporated (LMI) as had been requested by the Nunavut Water Board (NWB) in a new Water Licence for the Lupin site. Mr. Januszewski, Principal Engineer at SJCI undertook this review. Mr. Januszewski is an Environmental Engineer with a degree in Mineral Processing Engineering and significant experience in mine environmental issues and mine closures. He is not a geo-technical engineer and has had no advanced training in this area and therefore this review is of a more general high-level nature.

Part E, Item 26 of the new NWB Water Licence 2AM-LUP2032 requested:

"...a Technical Memorandum that provides additional geotechnical details on TCA Dam K and Dam M cross sections, including but not limited to the following:

- a. Magnified image that clearly identifies the materials used for the re-sloping, the distance that the re-sloping materials will extend from the crest of these Dams (including a break line with minimums and maximums noted), and the distances to the closure water mark;*
- b. Perpendicular/longitudinal cross section of the outflow structures for Cell 5 and Cell 3, with invert elevations from the cover to the ponds, and a note to clarify the storm return period that will be used for designing the features."*

The Water Licence received ministerial approval on April 9, 2020 and the requirement for the supporting technical memorandum was to be received by the NWB within 60 days. The resultant Stantec Technical Memorandum was dated June 8, 2020.

The NWB issued out an invitation to stakeholders to make comments on the STM by e-mail on June 10, 2020. Comments are to be submitted by June 24, 2020.

Background

The Lupin Tailings Containment Area (TCA) has been undergoing progressive reclamation for a period of time already, notably with placement of cover over a significant portion of the tailings surface. The FCRP (Sec 4.3.2.8) states that to the end of the 2017 construction season 1,311,500m² of exposed tailings have been covered with a 1.0m thick esker material. Approximately 123,500m² of exposed tailings remain to be covered.

The post-closure plan for the facility is to have a number of covered tailings cells and a series of water covered ponds that will have moving water passively across a good portion of its surface and to discharge water to the environment at one location. Two spillways will be constructed to accomplish this, through internal Dam J, and perimeter Dam 1A which will be the final point of discharge from the TCA.

Reference Documents

The following documents were also utilized in the preparation of this Technical Memorandum:

- Lupin Mine Site Final Closure and Reclamation Plan, Golder July 2018; and
- Water Licence 2AM-LUP2032, April 2020

Summary Comments

The Stantec Technical Memorandum (June 8, 2020) addresses the conditions stated in Part E, Item 26 in the new Water Licence.

The items required by the NWB in the Water Licence appear valid and it is interesting these points were not included in the initial submission by LMI.

It is unclear why none of the 15 engineering drawings provided in the Stantec Technical Memorandum are stamped by a Professional Engineer, nor is the Technical Memorandum itself. And the drawings do not have the usual “Not for Construction” stamp on them, possibly suggesting they could be used for construction.

A number of items have been left for resolution by the field engineer at the time the TCA remedial work is being undertaken. This includes identifying the additional areas requiring cover, and with lowering of the water levels in a number of cells and ponds there may be additional areas of tailings requiring removal or covering, surveying to check heights and slopes and re-grading work. Additionally, the field engineer will need to develop a method to be employed to place geo-textile and cover materials over tailings that will remain underwater, as the methodology is not described in the FCRP or in these drawings.

Specific Comments

The FCRP mentions that the total annual water moving across the TCA is expected to be in the order of 250,000 m³, with the majority of flow occurring in June and early July (Sec 3.4.2.13). It does not describe how much the water levels are expected to rise in the various ponds or the two spillways during these

higher flow periods, nor what the elevations and flows will be during design storm events. Table 16 shows the pond levels before and after annual discharges, but it is not understood to the author what that means. The text also doesn't mention how much the water levels will drop (and thus risk exposing additional tailings surfaces) during design dry periods.

The Stantec Technical Memorandum has provided 15 drawings to answer the questions posed in the Water Licence Part E, Items 26a and 26b.

For Condition a) requiring information on the materials being used for dam re-sloping, break lines and several distances with the remedial work undertaken:

Dwg. 1 provides specifications for the various materials, and Dwgs. 14 & 15 address Dam K and Dwgs. 11 & 12 address Dam M for the areas requiring fill placement, slopes, break lines, and horizontal distances to the closure pond water marks. However, there are no detailed specifications for the Compacted Fill, also referred to as Cover Fill, or Esker. This sheet should include items such as a full-size gradation specification, compaction requirements, etc.

The break lines (areas which will require undercutting and removal) are limited to Dam K as shown in Dwg. 14 as there are none shown for Dam M in Dwg. 11.

Regarding Condition b) requiring information on the outflow structures from Cells 5 and Cell 3:

Cross-sections of the outflow structures from both cells are included in Dwg. 5 for Cell 5 and in Dwg. 9 for Cell 3.

The design storm return event water level is shown in Dwgs. 8 & 9 for the drainage channel and outflow structure for Cell 3 but is not included in the comparable drawings for Cell 5. The Stantec Technical Memorandum mentions in its text that the same storm event, a 1-in-100 year, 24-hour storm event applies to both the structures in Cell 5 as in Cell 3. It is unknown why the information was not shown graphically on Dwgs. 4 & 5 for Cell 5.

Additional comments from a review of the drawings:

A number of the drawings would benefit by showing the current Water Levels of the flooded areas when the various ponds are shown in both the Plan and Sectional views.

Dwg.1 Specifications – A number of different Engineers are identified in administering the work in the 2 tables. These include Engineer, Engineer of Record, TCA Engineer of Record, Owners Site Engineer, and Resident Geotechnical Engineer. It is unclear how many engineers this involves as possibly several of these refer to the same person.

The Specifications leave a lot of details to be worked out in the field by the Contractor and or one of the engineers once work is underway. This issue also shows up in the Notes section of several of the other drawings. A number of these items could likely have been detailed in the drawings had more thorough field investigations been undertaken prior to the issuance of the FCRP and more recently with these

drawings. This would have enabled the Contractor's bidding on the civil work program to have a more detailed scope of work to bid on, and thus more accurate (and with smaller contingency?) price quotation would likely result.

Placement of the slope armoring with compacted fill is to involve placement in horizontal lifts, but there is no specification of the height of each lift, nor a compaction specification apart from an over-arching "...slopes shall be track packed to limit surface erosion..." See also Dwgs. 11 & 14 as to how difficult this will be as the additional sloped material to be placed against the dams is not a large area, and thus getting equipment onto these upstream buttresses will be difficult.

The specifications state the Contractor is to remove any impacted water from the tailings cells during cover material placement and it "...must be managed and discharged in such a way that will not impact the water treatment in Pond 1 and Pond 2". However, it doesn't state that the water is not to be discharged to outside of the TCA system without prior Water Quality analyses undertaken and appropriate approvals granted.

Dwg. 5 – Cell 5 Closure-Outflow Channel – The toe of the outlet channel ends in mid-air in Pond 1. A pond floor elevation is required. It could be based on bathymetry of the pond bottom or an estimate. It is understood there are no tailings in Pond 1.

Dwg. 13 – K Dam Repair–Plan View – The Closure Pond edge looks different in this drawing than in FCRP Figure 11 although both show the water level as being at 480.0m. And Figure 11 also doesn't show the ponded water against Dam L as is shown in the bottom right corner of Dwg. 13 of the Technical Memorandum.

Uncertainties

During the writing of this memorandum, the following uncertainties with the proposed closure plan were noted and considered important to mention in this Technical Memorandum:

- The FCRP mentions that 131,500m² remain to be covered and that this work should be completed in 2019. Has this been done? It is unclear how much additional tailings beach area is to be exposed when the water levels are lowered in the ponds as part of implementing the new TCA configuration and remedial work being undertaken to the dams as required from annual geotechnical inspections.
- The FCRP states that the remedial work with implementing the passive water flows across the TCA will be completed once the outflow water (over Dam 1A) meets discharge water quality guidelines. It is uncertain when this may occur (or maybe it already has?). However, any further time until this occurs may provide the opportunity for more detailed studies (engineering design, bathymetry, surveying, depth measurements of existing cover and tailings, etc.) to be undertaken to better understand and nail down more accurately the work required for the Civil Contractor to undertake the works program.

Steve Januszewski, P. Eng. (BC)

Principal Engineer

SteveJan Consultants Inc.

Mobile: 1-250-850-9002