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June 24, 2020

Mr. Richard Dwyer, Manager of Licensing
Nunavut Water Board
Gjoa Haven, NU

Via Email: licensing@nwb-oen.ca

Re: 2AM-LUP2032 Lupin Mines Incorporated Water License Commitments dated June 10, 2020

Dear Sir:

This is the submission of the Kitikmeot Inuit Association ("KIA") in response to the Lupin water license commitments for water license 2AM-LUP2032 made by Lupin Mines Inc. (LMI) on June 10, 2020.

I. BACKGROUND:

The KIA is the Regional Inuit Association for the Kitikmeot Region of Nunavut and the Designated Inuit Organization for Article 20 of the Nunavut Agreement for the Kitikmeot Region. The KIA is not a regulating agency with respect to this project, however we are representing Inuit interest due to the historic importance of Tahikyoak (Contwoyto Lake).

KIA has reviewed the materials filed in support of the water license commitments by LMI. We have been assisted in this review by Mr. Steve Januszewski, P.Eng., of SteveJan Consultants Inc. (SJCI).

KIA staff and advisors have reviewed the submitted materials by LMI during the preparation of this submission to the Board.

II. KIA SUBMISSIONS:

KIA's resources are limited and our work reviewing LMI's submitted materials benefitted from retaining SJCI to assist in the review. A summary of comments is provided below. Furthermore, the SJCI technical memorandums in response to LMI's water license commitments are enclosed and form part of this submission and should be referred to for technical detail.

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Part E, Item 25 Design for Waste Rock Dome – Summary of Comments

Use of a 1.0m thick esker material cover over all the waste rock storage facilities (landfill, open crown pillars, shafts, waste rock dome) may be optimistic to ensure ML/ARD does not occur. This is based on the proposed cover not being saturated, without a compaction specification and will likely not remain frozen throughout the year for this facility as it will be impounding waste rock above the surrounding ground level. The best means of avoiding any issues is to bury the highest potential ML/ARD material as deep as possible and have the lowest potential risk material nearest the top (or near the outside perimeter of the stacked facility). This will require a good understanding and inventory of the quality of the waste rock across the site. The alternative of using a more complex cover or a thicker esker material cover would be more difficult.

Part E, Item 26 Technical Memorandum on Additional Geotechnical Details on TCA Dam K and Dam M Cross Sections – Summary of Comments

The items required by the NWB in the Water License 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 of TCA remedial work 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 and 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.

SCJI Technical Memorandum - Part E, Item 27 Technical Memorandum on Exposed Tailings Preliminary Cover Design – Summary of Comments

The Stantec Technical Memorandum (June 8, 2020) addresses the conditions stated in Part E, Item 27 in the new Water License, but focuses on what to do with exposed tailings in one corner of Cell 4. A section towards the end of the STM provides general criteria to be used when covering exposed tailings.

Several areas within the TCA still have exposed tailings and/or will have exposed tailings when the water levels in the ponds or cells are lowered to facilitate passive water flows across

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the TCA as is the goal of the approved TCA closure plan. Cells 3, 4 and 5 (and possibly others) will have additional tailings beaches exposed. Details of proposed excavated channels to drain surface water currently over areas of tailings in Cells 3 and 5 which will then become exposed, are provided in drawings (Nos. 002 -009) provided by Stantec in response to the NWB WL Condition Part E, Item 26.

The Stantec Technical Memorandum was not stamped by the Engineer who prepared it.

The KIA thanks the Board for the opportunity to address our concerns regarding this file. Should you have any questions or would like any clarification, I can be contacted at srlands@kitia.ca or by phone at (867) 982-3310.

ALL OF WHICH IS RESPECTFULLY SUBMITTED:
ON BEHALF OF THE KITIKMEOT INUIT ASSOCIATION

Wynter Kuliktana
Senior Lands Officer
Department of Lands, Environment & Resources
Kitikmeot Inuit Association

Cc: Geoff Clark, Kitikmeot Inuit Association Director of Lands, Environment and Resources

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TECHNICAL MEMORANDUM

Date: June 22, 2020

Subject: SJCI Comments on Golder's Waste Rock "Dome" Design Technical Memorandum for Lupin Mines Inc. as Requested by Nunavut Water Board in Part E, Item 25 of Lupin Mine Water Licence 2AM-LUP2032

Introduction

SJCI has undertaken a review of the Golder Technical Memorandum (GTM) 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, 2AM-LUP 2032. 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 or geo-chemical engineer nor has he had advanced training in these areas and therefore this review is of a more general high-level nature.

Part E, Item 25 of the new Water Licence requested;

"…a Technical Memorandum that provides design details on the Waste Rock Dome, including, but not limited to the following:

a. Cardinal direction cross sections and slopes;
b. Details on drainage systems and conceptual water features; and
c. Erosion control measures and cover stabilization of the dome."

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 Golder Technical Memorandum was dated June 8, 2020.

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

Background

The Lupin minesite has a considerable amount of potentially acid generating and/or metal leaching waste rock distributed throughout the site. The ESA site assessments have estimated the total volume of waste rock on surface at 1,000,000 m3 (Ref: FCRP 2018, URS 2005).

The Final Closure and Reclamation Plan's goal is to dispose of this material in a number of locations including underground, in shafts, open stopes, in the crown pillars, a landfill and in a central waste storage area on surface. There is too much waste rock on surface to dispose of it all deep underground or locations that are just below or at grade where permafrost would be expected to make the masses inert and less likely to absorb any surface water that falls or flows onto them and then potentially generates metal leaching runoff waters to surface. As a result of this overall lack of secure storage capacity, a central waste storage area on surface or a waste rock "dome" as the NWB has called it, is required. The FCRP refers to there being a number of waste storage areas in the central area of the site. All the final repositories of waste rock are to be covered with a 1 m thick esker material layer.

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 Golder Technical Memorandum (June 8, 2020) addresses the conditions stated in Part E, Item 25 in the new Water Licence.

However, use of a 1.0m thick esker material cover over all the waste rock storage facilities (landfill, open crown pillars, shafts, waste rock dome, etc.) may be optimistic to ensure ML/ARD does not occur. This is based on the proposed cover not being saturated, without a compaction specification and that it will likely not remain frozen throughout the year for this facility as it will be impounding waste rock stacked above the surrounding ground level. The best means of avoiding any issues with the currently proposed placement plans is to bury the highest potential ML/ARD material as deep as possible and have the lowest potential risk material nearest the top (i.e., above grade) or near the outside perimeter of the stacked facility. This will require a good understanding and inventory of the quality of the waste rock across the site and their individual ML/ARD potentials. The alternatives of using a more complex cover or a thicker esker material cover would be more difficult.

Specific Comments

The shape and size of the Waste Rock Dome looks significantly different in the drawing provided in the FCRP (Figure 10) versus what is shown in the Golder Technical Memo (Dwg. 1).

The FCRP (Table 17) states there is some 965,000 m3 of waste rock to be disposed on if the central area, whereas the Golder technical memo states on drawing 1, Note 7 that the Waste Rock Dome has a capacity of 290,000 m3. Possibly the difference lies in the material below the new dome being waste rock and amounting to the difference in the 2 volumes above?

As stated in Golder's 2019 HHERA report, relocation of a portion of the waste rock into the central area, grading it to drain freely and covering it with 1.0 m of esker material requires additional measures for potential ARD (SJ insert: or ML) impacted seepage from these areas that may be seen with reductions of pH in the water in Boot Lake and East Lake. Water quality monitoring of these streams was recommended to confirm the conclusion of negligible/low risks to aquatic life from metals.

Boot Lake appears to be the first waterbody north-west and downslope of the main mine mill pad. The author could not find the location of East Lake in the FCRP or Water Licence. Water quality sampling stations (LUP-EL-01 and LUP-BL-01) are listed as being located on the waters of both lakes close to the shorelines near where the potential seepages would input to the lakes.

The Water Licence does not include a map showing all the stipulated water quality monitoring site locations. Fortunately, the FCRP includes 2 figures (Nos. 8 & 12) that show the locations of all the monitoring program stations for the 1) current site and 2) for the new current site and post-closure site, as applicable.

The Water License includes Sample site(s) LUP-SP-01 to SP-XX to be twice yearly samples of seepage from the Waste Rock Dome, and to include all the seepage locations from it. This is supported by monthly sampling sites being added that are nearer the possible new sources of ML/ARD seepage; those being downslope and at the monitoring wells of the landfill and new demolition landfill facilities.

It appears as though the Water Licence has a typo in it, in that it has sampling site LUP-31 and LUP-35 both being "Seepage from the Landfill Facility" and described the same, whereas it is intended that LUP-35 should likelyy be for "Seepage from the Demolition Landfill Facility". FCRP Figure 12 shows the majority of the sample site locations for the Post-Closure site but unfortunately does not include the upper end of the Upper Sewage Lake where the new Demolition Landfill is to be located, and therefore no sampling locations in and around that facility are shown.

It is suggested the annual reporting of the analytical results from these monitoring locations include a professional geochemical interpretation of the data to confirm whether ML/ARD is of concern and how water qualities are trending.

Notes on the 2 drawings provided in the Golder Technical Memorandum include:

Drawing. 1 – Proposed Waste Rock Dome:

It is not apparent how surface water falling on the top of the new facility is to find its way to the perimeter drainage chutes. The top surface doesn't look to be graded towards the 6 perimeter drains shown. It is understood the goal of the cover is to repel water ingress rather than oxygen, and thus

water should be encouraged to not pool on the top but rather to flow reasonably quickly across the surface to the chutes and then down them; and

The proposed locations of the 6 drainage chutes don't all appear to be discharging into natural draws (or low areas) where the water can then easily flow away from the facility.

Drawing 2 – Proposed Waste Rock Dome Sections and Details:

The design basis for the sizing of the Drainage Chutes and Stilling Basins is not provided. What kind of water flows are expected?

Note 3: Is the D50 min. sizing at 190mm and max. sizing of 350mm mean that half the material must have no material smaller than 190mm is size and no more than half the material is to have a maximum size of 350mm? If so, and with the erosion layer on the top of the chutes being 350mm in thickness, will some of the rock within it be bigger than the chute is in thickness; and

The Drainage Chute Typical Profile drawing shows the location of a Stilling Basin, although there is no apparent depression shown for this feature in the drawing. What are its proposed dimensions?

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:

- A better estimate of the total volume of waste rock requiring remediation is required (using 1M m3 without a detailed rationale seems over-simplistic);
- A detailed assessment of the quantities of the various levels of ML/ARD potential (i.e., low, medium, high) of all the waste rock is required; thus enabling a more diligent placement plan for the materials to minimize the risk for future ML/ARD concern;
- LMI should provide an estimate of the total volume of esker material required for the various reclamation tasks that are intended to use this material;
- LMI should confirm the availability of adequate volumes of esker material, and it being available in a timely manner when it is required (i.e., due to its permafrost state it can only be excavated in thin layers. Ref. FRCP Sec 2.3.2);
- Why does the FCRP document, prepared by Golder Associates, not include the name and signatures of the author and its reviewer, as is customary; and
- Why does the RECLAIM costing show all the liabilities as being related to Water and none to the Land (ref: FRCP App. G)?

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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 is 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.

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TECHNICAL MEMORANDUM

Date: June 23, 2020

Subject: SJCI Comments on Stantec's *Technical Memorandum on Exposed Tailings Preliminary Cover Design* for the Lupin Mine as Requested by Nunavut Water Board in Part E, Item 27 of Lupin Mine Water Licence 2AM-LUP2032

Introduction

SteveJan Consultants Inc (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 or geo-chemical engineer and has had no advanced training in these areas and therefore this review is of a more general high-level nature.

Part E, Item 27 of the new NWB Water Licence 2AM-LUP2032 requested:

"…a Technical Memorandum that provides rationale and detailed designs of cover construction for tailings that becomes exposed, including but not limited to the following:

a. *Further rationale supporting in-situ cover as a contingency measure;*
b. *Preliminary detail designs;*
c. *Typical cross sections; and*
d. *Long-term erosion control measures"*

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 covers 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 1,311,500 m2 of exposed tailings have been covered with a 1.0 m thick esker material. Approximately 123,500 m2 of exposed tailings remained to be covered at that time.

Section 2.0 of the 2019 Tailings Area Inspection Report by Stantec Consultants states that:

"…Cells 1 and 2 are completely reclaimed, while Cell 3 is approximately 80% covered and Cell 5 is approximately 70% covered. About 84% of the entire tailings area is reclaimed with at least 1m of sand/gravel cover…"

Thus the area of previously identified exposed tailings that requires covering remains at 123,500 m2.

The post-closure plan for the facility is to have a number of esker covered tailings cells and a series of water covered ponds that will move water passively from pond to pond across a good portion of the TCA and 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, by Golder Associates, July 2018;
- Water Licence 2AM-LUP2032, April 2020; and
- 2019 Lupin Mine tailings Area Inspection Report, by Stantec Consultants, October 24, 2019

Summary Comments

The Stantec Technical Memorandum (June 8, 2020) addresses the conditions stated in Part E, Item 27 in the new Water Licence, but focuses on what to do with exposed tailings in one corner of Cell 4. A section towards the end of the STM provides general criteria to be used when covering exposed tailings.

Several areas within the TCA still have exposed tailings and/or will have exposed tailings when the water levels in the ponds or cells are lowered to facilitate passive water flows across the TCA as is the goal of the approved TCA closure plan. Cells 3, 4 and 5 (and possibly others) will have additional tailings beaches exposed. Details of proposed excavated channels to drain surface water currently over areas of tailings in Cells 3 and 5 which will then become exposed, are provided in drawings (Nos. 002 - 009) provided by Stantec in response to the NWB WL Condition Part E, Item 26.

The Stantec Technical Memorandum was not stamped by the Engineer who prepared it.

Specific Comments

1. **Comments on the rationale provided in the STM (to answer NWB request 27a.) include;**

Bullets 1 & 2 – The text suggests the window for oxidation of the tailings is quite short due to the significant period over which the esker cover will be partially frozen. However, there is no information provided in the STM describing the range of weather scenarios (wet year, dry year, etc.) that are possible and their impacts on water levels in the TCA cells and ponds and resultant effects on state of permafrost and % saturation of the esker covers.

Bullet 3 – The text suggests that leaving material up against the dam toes makes them more secure. This is correct; however, the alternative to leaving the tailings in place, and covering them in-situ is only one possible solution. The tailings could be excavated and relocated elsewhere (using conventional excavation, dredging or hydraulic monitoring and relocation to deeper pond areas) and then the dams could be lowered. This would make for lower dams to monitor in the long term and it also has the benefit of providing immediately nearby cover material.

Bullet 4 – The text suggests small pockets of tailings cannot be practically removed from bedrock outcrops. An alternative to covering perched tailings sitting on bedrock is to excavate or hydraulically monitor them and relocate them to deeper areas of the cells or ponds.

Bullet 5 – The author agrees with the STM text that it is better to leave thick tailings in place; unless a more aggressive removal program has been selected.

Bullet 6 – Dealing with sludge like consistency tailings, possibly mixed with lime treatment sludges and/or lakebed sediments is a problem. An alternative to trying to get access onto these areas to place a cover (which maybe very difficult if not impossible if the area is not frozen) is to remove the tailings entirely (by conventional excavation, by dredging or hydraulic monitoring) and relocating them to a better location, possibly to below grade where they will freeze or will be below a water cover.

Bullet 7 – The text suggests the plan is already in place, and a contract has been let to have the TCA remediation work done. This is not considered to be a valid rationale when another better plan may be available. A contract can be broken. The best long-term solution should be the goal.

2. **Comments on STM response to item 27b), request for "Preliminary detail designs" include;**

The STM contains several photographs of the exposed tailings and a number of drawings describing the "Preliminary Design" it has for cover placement over the small area of exposed tailings in the north-west corner of Cell 4. The information provided is adequate to deal with what is to be done in that location. Interestingly, neither the volume nor surface area of that tailings beach is mentioned in the text. However, the NWB request was likely asking about various areas where tailings will become exposed when water levels are dropped (i.e., "…cover construction for tailings that becomes exposed…").

The last text paragraph in the Preliminary Design section provides "…general criteria to be used to cover encountered exposed tailings…" No criteria have been provided for the minimum (i.e., surface area or volume) of tailings that are to have a cover placed over them. Further work on determining location-specific plans appears to be left to the field engineer once the TCA remediation work is underway.

3. **Comments on STM response Item 27c) "Typical cross sections" include;**

The STM provides the necessary sections for the proposed cover over the exposed tailings in Cell 4.

However, it is unclear how the cover and erosion protection materials are to be placed on the exposed tailings where the toe extends out and under a water cover. And the drawings show the water level as being at 485m., whereas the water level will likely be closer to the current (i.e., deeper) level of 488.0m +/-.

4. **Comments on STM response to Item 27d. "Long-term erosion control measures" include:**

The text in the section on the Preliminary Design states the "…the cover shoreline will be armored with boulders to prevent wave erosion…". There is no specification provided on the boulder/rip rap armoring (possibly it will be as per the Spec provided in Dwg. 001 in the Stantec Technical Memorandum responding to Condition 26., but it should be so stated).

Is there a requirement to have bedding material placed on either side of the geotextile to limit it being torn by the coarse rip rap or the esker material placed and compacted up against it? And would a filter material layer outside of the geotextile assist in limiting erosive forces wearing away the protection materials (i.e., the riprap, geotextile, and esker) and eventually expose the tailings to erosion?

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