Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

Water Resources Division
Resource Management Directorate
Nunavut Regional Office
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Your file - Votre référence
2AM-LUP2032
Our file - Notre référence
CIDM#1292732

February 16, 2021

Mr. Richard Dwyer
Manager of Licensing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0
sent via e-mail: licensing@nwb-oen.ca

Re: Crown-Indigenous Relations and Northern Affairs Canada's reply to Lupin Mines Incorporated's response to our comments on the Final Closure and Reclamation Plan for water licence #2AM-LUP2032 – Lupin Mine Project

Dear Mr. Dwyer,

Thank you for your February 2, 2021 invitation for reply to Lupin Mines Incorporated's (LMI) February 1, 2021 response to Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC) November 17, 2020 comments on the Final Closure and Reclamation Plan (FCRP) (version 1, August 2020).

In general, LMI's responses do not address CIRNAC's comments and many defer integrating information until version 2 of the FCRP. Therefore, CIRNAC's general recommendation is for the Nunavut Water Board to defer approval of the plan until interveners have been able to review version 2 of the FCRP. Version 2 of the FCRP is expected to be submitted at the end of March 2021, with the 2020 Annual Report for water licence 2AM-LUP2032.

CIRNAC is concerned with LMI's repeated deferral of our requests for information which would allow for the evaluation of the potential effectiveness of their proposed reclamation strategies. The remainder of this letter is separated into two sections, the first regarding information which CIRNAC has been requesting since the water licence renewal process and the second section contains specific replies to each of LMI's responses. Both sections have been developed with the support of Arcadis Canada Inc.

Missing information on reclamation methodologies

Specifics on reclamation methods and designs are necessary to evaluate if they will be adequate for long term physical and chemical stability of the site. CIRNAC has been

requesting further details since the water licence renewal process initiated in 2019. As LMI did not provide the information during the renewal process, the renewed licence included three conditions to provide some of the missing information within 60 days of licence issuance. These are Part E, Item 25 for design details of the waste rock dome design, Part E, Item 26 for geotechnical details on TCA Dams K & M, and Part E, Item 27 for preliminary design cover for newly exposed tailings.

The Board provided CIRNAC with the opportunity to review three technical memos submitted by LMI covering these three topics. LMI's response to our comments was that the information requested would be integrated into the FCRP revision. The revision number was not specified, which has led to confusion. Our October 30, 2020 reply to the Board's question on whether these responses satisfactory was that we would review the FCRP, as at the time we believed it integrated the missing information. On November 2, 2020, the Board distributed a letter stating it had reviewed the memos and found: "*the information functional and generally satisfying Part E, Items 25, 26, and 27 of Water Licence 2AM-LUP2032.*"

Though the Board is generally satisfied, CIRNAC is seeking details on how the site will be reclaimed. Below is a summary on the information CIRNAC considers to be missing from what was to be provided under Part E Items 25, 26 and 27 of the water licence. The lists for Items 25 and 27 are a re-iteration of comments submitted on August 25, 2020, as well as comments regarding Item 26.

I. Information provided for Item 25 "dome design" is insufficient to provide confidence in long term erosion protection and cover stability. Concerns include:
    a. lack of detailed grading information for top of "dome";
    b. lack of design information on storm / freshet flows;
    c. no protection against rill erosion on long 10% slope surfaces;
    d. lack of runoff channels from discharge chutes;
    e. potential for toe erosion from discharge chute runoff flows;
    f. lack of specific notes to address construction constraints that need to be addressed before cover can be placed;
    g. failure to show where materials to be removed prior to cover placement are located; and
    h. failure to show locations of shaft, crown pillar area, that will be buried under the dome.

II. Information provided for Item 26 "additional geotechnical details" includes a series of 15 drawings and our concerns are summarized as:
    a. no detailed information or specifications are provided with respect to the work to be performed on the embankment slopes;
    b. no information is provided with respect to the "compacted fill" to be placed on the dams as shown on dam section drawings;
    c. section drawings show no erosion control measures related for the dam slopes and no armouring or rip rap for any dam work;
    d. it is unclear how the embankment fill will be placed in horizontal layers and adequately compacted to ensure long term stability;

e. there is no information on the closure works on the west end of the M dam as extends beyond the N dam M dam intersection;
f. the is no information on how any potential closure works on the N dam will be carried out if needed or how they will confirm that works are not needed; and
g. there is no discussion of logistics of dewatering Pond 2 and impacts on schedule and work if water level is not lowered before work on the dams is scheduled.

III. Information provided for Item 27 “cover design for potential exposed tailings” is still insufficient to allow for general approval of approach. Based on information provided, LMI should be required to submit details on any new exposed tailings encountered (e.g. potential exposed tailings as may be encountered in Pond 2 between the 480 m contour and the toe of the M&N dams) and provide specific information on proposed approach prior to carrying out any work on the tailings. (Note that there is a potential logistical / timing issue with respect to covering future exposed tails after dewatering if dewatering is the last step of the reclamation of the reclamation.)

Further details on these concerns are presented in Annex A. CIRNAC’s general recommendation is for LMI to provide sufficient information to answer these questions in revision 2 of the FCRP.

Reply to LMI responses to CIRNAC comments on FCRP

Below are further comments on each of the comments CIRNAC initially provided on November 17, 2020, to which LMI responded on February 1, 2021.

1. **Integration of comment responses to the FCRP** – CIRNAC recommended the licensee incorporate to the FCRP I) a disposition table listing issues, commitments, and responses, II) information provided for Part E, Items 25, 26 & 27 of the water licence. LMI commits to the second request for revision 2 of the FCRP. CIRNAC recommends that both a disposition table and information pertaining to licence conditions Part E, Items 25, 26 & 27 be included in revision 2, and that interveners be an opportunity to review revision 2 when it is provided.

2. **Schedule updates** – CIRNAC recommended the FCRP include a detailed and updated work schedule. LMI is committing to provide this information with the Annual Report. This does not address our concern, as the work schedule included in the current version of the FCRP is inaccurate and out of date. CIRNAC recommends version 2 of the FCRP include an updated and accurate work schedule.

3. **Removal of contaminated materials from mill site area prior to consolidating waste rock and construction dome cover** – CIRNAC requested a detailed site plan with location and estimated extent of arsenic and petroleum hydrocarbon (PHC) impacted soils, as well as information on the method for confirming contaminated

materials removal prior to further work. The licensee has provided a figure with test pit locations, indicating which ones have exceedances. This map does not estimate potential extents, does not indicate which exceedances are for arsenic or PHC, and has no indication of potential depth of contamination. Furthermore LMI deferred answering how they will confirm removal of contaminated materials until April 9, 2021, when the Quality Assurance/Quality Control (QA/QC) Plan of the Post Closure Monitoring Plan is to be submitted. To address CIRNAC's concerns, the location and extents of arsenic and PHC impacted soils need to be integrated in the closure plan as they will have to be remediated. We recommend this information be added to version 2 of the FCRP, as well as a method for confirming removal of contaminated materials, since it forms part of the reclamation work and needs to be completed prior to post closure monitoring.

4. **Crown pillar stabilization and disposal of materials underground** – CIRNAC recommended the licensee include a more detailed discussion on how the surface openings and the open stope would be filled, and how long term subsidence of fill material would be avoided. The licensee has responded "*the surface openings and the open stope will be completely filled. Waste materials will be dumped beside the openings and then progressively dozed into the openings.*" As well, they state they expect subsidence to occur during construction, so that it could be accommodated during final grading. This information is not sufficiently detailed to evaluate the likelihood of its effectiveness. For example, does the "progressive dozing into the openings" involve pushing end-dumped material over the opening edge with the bulldozer, or will the fill be placed in lifts, allowing the bulldozer to track over and compact the material? The method used will have an incidence on the likelihood of subsidence. CIRNAC recommends LMI include the information requested in version 2 of the FCRP.

   CIRNAC also recommended the documents provided to the Mines Inspector with respect to final closure of the surface openings be shared, as presently we only have a copy of the authorization letter. Documents referred to in the authorization letter which we would like to see are:
   - 2020-06-25 Drilling and Blasting Plan Approval;
   - West Zone Crown Pillar Blast Locations – Plan view; and
   - M8277 Break-Away Drill and Blast – Lupin Mine Closure – West Zone Pilla…[*sic*].

5. **Long term stability of dome cover and erosion stopes** – CIRNAC recommended information LMI submitted in a technical memo on June 8, 2020 regarding conceptual design for the waste rock "dome" be integrated into the FCRP. Furthermore CIRNAC requested that our concerns raised on August 25, 2020 be addressed and any further details or modifications for these reclamation works developed since June 2020 be provided. LMI has committed to doing so in revision 2 of the FCRP, which CIRNAC will review once received.

6. **Tailings containment area - embankment stabilization and erosion** – CIRNAC recommended the design notes, specifications and drawings for long term stabilization and closure work at the tailings containment area including Dams K & M provided in a June 8, 2020 technical memo for Part E, Item 26 of the licence, be incorporated into the FCRP. Additionally CIRNAC requested any further details or modifications for these reclamation works developed since June 2020. LMI has committed to doing so in revision 2 of the FCRP, which CIRNAC will review once received.

7. **Tailings containment area - N Dam and potentially exposed tailings** – CIRNAC requested the contour information used in the N Dam Safety analysis and the final contour elevations and associated water management for the N Dam containment area be shared. The licensee indicated which contour information they used to generate N Dam profiles, and indicated "*Cell N cover will be shaped to shed water and does not require an outlet*." Plans for the shape of the Cell N cover are not in the FCRP, and CIRNAC recommends they be included for future review.

8. **Financial security** – CIRNAC requested the licensee provide a discussion on the security estimate values. LMI has provided the requested information in their reply and CIRNAC recommends they incorporate these up to date figures in their FCRP.

CIRNAC appreciates the opportunity to participate in this review. If there are any questions, please contact me at (867) 975-3876 or sarah.forte@canada.ca, or Bridget Campbell at (867) 975-4282 or bridget.campbell@canada.ca.

Sincerely,

Sarah Forté

Sarah Forté
Water management specialist

ANNEX A
Unresolved comments regarding technical memos for
Part E, Items 25, 26 & 27 of water licence 2AM-LUP2032

CIRNAC's concerns are raised as questions in the discussions below. The information for Items 25 and 27 is a re-iteration of comments submitted on August 25, 2020. Comments regarding Item 26 have not been shared previously. They have been bolded in the text to emphasize where we still consider information to be lacking. CIRNAC recommends this information be integrated into revision 2 of the Final Closure and Reclamation Plan.

Comments on Item 25 – Waste rock dome design

Our review of the plans and sections observed that the 10% slopes, about 300m of top edge in the north portion of the "dome" is as much as 10m high and this extends out about 100m to the toe. The west and southwest side of the dome has a height of between 5m and 6m and thus extends out some 50+/- meters in these areas. Other than indicating that a berm will be constructed on the top edge of the dome to direct "dome surface" runoff to drainage chutes, no erosion control measures are included for ensure erosion protection and stability of these long 10% esker slopes.
The plans and sections indicate that surface water runoff from the 1.6% surface slope, is expected to be drained off the dome, down the 10% slopes, via 6 runoff "drainage chutes". Surface runoff is to be directed to these "chutes" by a small perimeter berm along the edge of the dome surface (0.5m high, 0.5m crest width, 2:1 slopes) constructed with the same esker material as the 1m dome cover surface. Given the importance of this berm in preventing overland sheet flow to the 10% slopes, we question the long term stability of the berm design as presented.

No information is provided to support the designs of the top perimeter berm, the chutes, or the stilling basins. No drainage elevations are provided with respect to surface grading on the top of the dome edges, and no information is provided with respect to the drainage runoff flows leaving the "stilling basins" at the toe of the dome. No details are provided for the toe of the 10% slopes, nor for runoff from "stilling basins", which in some locations could undercut the toe of the cover (see north central discharge). In the absence of this information we do not have confidence that the design as shown will be stable in the long term. The proposed designs as shown reinforce our concerns that the 10% slopes will at a minimum be subject to long term rill erosion even if the upper berm controls runoff to the discharge chutes. We are concerned about the long term performance integrity of the up diversion berm if constructed as shown with esker material. We note that any failure along of the top berm would result in additional erosive forces on the 10% slopes. We are concerned that no toe stabilization / armouring measures are included to protect the toe of the 10% slope. **Provide information listed in this paragraph to demonstrate how the long-term erosion stability of the designs is being ensured.**

In reviewing the typical drainage chute details, it appears to us that they are inconsistent as the 0.5 m depth of the drainage chute as shown in cross section is shown as 0.5 m berm on the top of the chute drainage profile detail and the perimeter berm is not shown on this detail. **A plan view detail of the top and bottom of the drainage chutes should be provided.**

The notes on the site plan included:

- Note 1 which states that *"subgrade under the dome area is to be prepared in accordance with the Water Licence and FCRP before waste rock or cover materials are placed".*

The intent of this statement is correct, but it is not clear to us how LMI will ensure compliance with this note is achieved if it these requirements are not specifically stated on the drawings. **Ensure all relevant requirements are specifically referenced.**

- Drawing Note 2 provides a list of materials that are to be removed before waste rock is placed, but the drawing does not identify the locations of these materials.

It is unclear how this will be achieved in the absence of specific references to the dome plan. **Include location of materials to be removed before waste rock placement.**

- Drawing Note 4 states that crown pillar and openings and mine shafts are to be filled before waste rock is placed on top.

Provide plans shared with Inspector of Mines to obtain approvals.

Moreover, in addition to our specific concerns with the "dome" design concepts, we are also generally concerned that the remedial requirements that need to be undertaken are not specifically identified or referenced on the plan provided. We are concerned for example that in the absence of specific information on where contaminated soils to be removed are located, that confirmation that these soils have been remove may be not be considered prior to reworking of the waste rock and placement of the esker cover. **Provide specific cross reference to these works to ensure that they are identified in the FCRP and noted as appropriate.**

Comments on Item 26 – Geotechnical details on TCA Dams M & K

CIRNAC's comments are arranged by drawing.

Specifications

Drawing 001 – Information is missing with respect to embankment stabilization as follows:

- *Table 1* is labelled "Foundation Preparation Specification"; *Table 2* is labelled "Fill Placement Specifications" - **Provide a table with specifications for "Tailings Dam Embankment Repair/Stabilization"**
- *Table 1* has specifications under the headings of "General, Cover Foundation Preparation, and Dam Outfall Channel Area Foundation" - **Include a section dealing with embankment placement and stabilization**.

- *Table 2* has “fill specifications” for “cover” - **Include specification for embankment placement and stabilization**
- *Table 2* lists “fill types” as “cover fill, riprap, and geotextile filter fabric” - **Include reference to “compacted fill” type material as shown in sections for M and K dams (drawings 11,12,14, and 15)**

Cell 5

Dwg 002 –Plan View

Plan does not indicate any flows from area between N & M dams. It is also unclear how surface water in the area between N &M dams will flow into the drainage channel. **How will flows from area between N & M dams be treated, how will they flow into the drainage channel?** In addition, the current design of the downstream side of the N Dam does not appear consistent with industry practice for long-term structures, **how will long-term stability of this structure be ensured?**

Dwg 003 –Profile

Stations 510 to 880 shows 30m base width drainage channel flowing to east at 0% slope. Stations 120 to 400 are also shown as sloping at 0% to the outlet at J dam. **How will flows be ensured at these locations?**

What is the material above the Tailings Upper Limit comprised? If it is tailings it will need to be regraded such that the 1m profile is maintained above tailings or the cover needs to be raised and drainage paths modified accordingly.

Given the length of the profile it may be appropriate to have a series of check dams along the profile to slow water down during significant rain fall events. **What is being done to ensure integrity during higher flow periods?**

Dwg 004 - Cell 5 Cross Section

We have difficulty in understanding these sections (i.e. the difference between the assumed tailings upper limit and the bottom of the esker fill cover.) **Provide a discussion on how the slopes on the tailings cover will be adjusted once the elevation of the tailings is confirmed.**

Also from the results of recent investigation work by LMI’s consultant they have confirmed that the 1 m minimum cover has not been maintained in numerous locations across both Cell 5 and 3. **How will the stability of the cover be maintained if wind erosion is the primary cause of the material losses assuming the original placement was at least 1m thick?** Even with the relatively flat side slopes the nature of the esker material on side will likely experience erosion which would subsequently impact the performance of the channel. Vegetation would normally be used to stabilize the side slope but as we know this approach will not work at Lupin given the lack of vegetation observed to date on the TCA sections capped decades ago.

Dwg 005 - Outflow Channel
The detail should show where the spillway ends in relation to final post water elevation. The spillway should be terminated before the elevation of the final post water elevation and it should be confirmed that there are no obstructions at the end of the spillway as a result of the ground elevations at that location (ie the ponding of water at the outflow of the channel should be avoided). **Include information on final post water elevation.**

How was the Freshet runoff dealt with in the calculation of the 100 year storm event? If the two happen concurrently, there is the potential the existing design will not accommodate the increased flow.

Cell 3
Dwg 006 –Plan View
Detail the entire drainage channel (existing and new) to illustrate the watershed that could be reporting to the drainage channel. **Provide design information as to how the size of the channel was derived, to help determine if the channel is appropriately sized**.

How was the Freshet runoff dealt with in the calculation of the 100 year storm event? If the two happen concurrently, there is the potential the existing design will not accommodate the increased flow.

Dwg 007 –Profile
Slope identifiers are missing from the profiles. **Provide information to allow us to identify whether or not dead zones would exist along the profile.**

Given the length of the profile it may be appropriate to have a series of check dams along the profile to slow water down during significant rain fall events. **What is being done to ensure integrity during higher flow periods?**

Dwg 008 - Cell 3 Cross Section
Esker material on the side slopes of the drainage ditch will experience erosion if placed at a 40% slope which would subsequently impact the performance of the drainage channel. Vegetation would normally be used to stabilize the side slope but as we know this approach will not work at Lupin given the lack of vegetation observed to date on the TCA sections capped decades ago. **How will erosion of the esker material be prevented?**

The drawing notes specify that 1m minimum cover will maintained over the tailings, but it is not clearly shown that the 1m cover will be maintained over the invert of the drainage ditch. **What is the depth of cover over the invert of the drainage ditch?**

Dwg 009 - Outflow Channel
We have no concerns with design provided the design event used to complete the design is reasonable and accounts for the Freshet. **Has the 100 year event been added to the typical freshet run off?**

M Dam

Dwg 010 –Plan View

We have several concerns related to this drawing:

1) Given the sequencing of the reclamation works as currently understood, it is unclear if the water level in Pond 2 will be lowered to below the toe of the M Dam prior to the initiation of the M Dam rehabilitation works. **Clarify when Pond 2 water level will be lowered in relation to M Dam rehabilitation.**
2) No specific notes have been added to the drawing explicitly instructing the contractor to remove unstable soil from within the rehabilitation work area after the water level has been lowered. **To avoid confusion or misinterpretation of the engineer's design intent, add explicit notes on this drawing confirming how the dam rehabilitation work is to proceed to ensure soft and/or saturated soils/tailings are removed from the work area.**

If the rehabilitation work is to be completed prior to the breach of the outfall dam to Pond 2, then there is the potential for water levels to be as high as they were observed in 2019 or at a level coincident with the elevation of the dam toe. As such there is the potential for wave action to undermine the toe of the M Dam, similar to what was observed at the K Dam. In order to mitigate this potential issue, consideration should be given to the placement of riprap armouring along the toe of the dam within the wave action zone thereby ensuring the long-term stability of the dam toe. **How will the toe of M Dam be protected from potential wave action?**

Furthermore, if esker material is to be used to rehabilitate the dam slopes instead of the rip rap as originally stated in the ICRP and as per the Kinross documents supporting the 2005 approval of TCA closure, then the final long-term slope for the downstream side of the M Dam should be designed in a manner consistent with industry practice for earth structures. Any surface water flow down the face of the slope would be retarded by the installation of a transect drainage swale or channel so as to minimize the potential for surface erosion. Again, in the absence of potential vegetation cover, other erosion control measures are required to ensure the long term stability of the dam structure particularly with the steepness of the downstream slope proposed in the current design. **How will dam slopes be protected from erosion given that industry practise is not being followed?**

Dwg 011 – Sections 1

Same comment as for Dwg 010 regarding protection of downstream slope from erosion.

Dwg 012 – Sections 2

Same comment as for Dwg 010 regarding protection of downstream slope from erosion.

K Dam
Dwg 013 –Plan View
Same comment as discussed for the M Dam apply to the rehabilitation of the K Dam where there is current evidence of material erosion along the dam.

Dwg 014 – Sections 1
Same comment as for M Dam Dwg 010 regarding protection of downstream slope from erosion.

Furthermore, consideration should be given to stepping out or buttressing the downstream slope when the height of the rehabilitation work exceeds 5 m in the vertical dimension. This additional structure should be contoured so as to provide transect drainage across the face of the rehabilitated area thereby minimizing the potential for esker material erosion. In the absence of any potential to vegetate the downstream slope other erosion control measures are necessary to ensure the long-term stability of the slope.

Dwg 015 – Sections 2
Same comment as for M Dam Dwg 010 regarding protection of downstream slope from erosion.

Comments on Item 27 - Preliminary cover design for newly exposed tailings
In general, we have no issues with the rational and design approach for the Cell 4 exposed tailings or the plans sections and details provided. However, it is noted that Cell 4 exposed tailings are known exposed tailings. The Nunavut Water Board request was to provide details on how LMI would handle tailings that could potentially become exposed when drawing down the water levels in the ponds.

While it can be inferred that the approach to covering any newly exposed tailings that might result from drawing down Ponds 1 and 2 would be the same as that used for covering the Cell 4 tailings, no details or discussions have been presented on how such tailings covers would be placed and secured. For example,

- **Would esker materials be placed directly over the tailings or would a geotextile filter clothe be placed prior to placing esker materials over the tailings?**
- **Would the perimeters of the cover material be stabilized with geotextile fabric and boulder materials?**

At this point in time, the Stantec's comment on how any potentially exposed tailings materials would be handled is that "*If other exposed tailings are found, outside of the identified Cell 4 area, specific design will be done according to specific site conditions. The general criteria above will apply, along with specific design feature(s) as needed once site condition and specifics are identified."* **How will necessary site specific design(s) for any such tailings area cover(s) be provided for review before any exposed tailings are covered?**

In Stantec's Closure section, they state that "*… cover on any potentially exposed tailings within the dewatered former pond areas will be the most prudent measure to mitigate ARD risks"*. CIRNAC, as stated in the past, disagrees with the above statement. We note that the FCRP stated that any exposed tailings would either be covered in place or removed to the containment cells and covered. In our opinion, relocation and consolidation of any exposed tailings outside of the existing tailings cells into the existing cells is the most appropriate action which would also provide the most robust long term stability of the site and tailings areas. Our comment in this regard is also applicable to the existing Cell 4 exposed tailings, which we would have preferred that LMI relocate to Cell 5. **How does LMI reconcile the FCRP and the closure section of the submitted document?**