



Water Resources Division
Resource Management Directorate
Nunavut Regional Office
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Your file - Votre référence
2AM-MEL1631
Our file - Notre référence
GCDOCS#98429487

October 29, 2021

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 (CIRNAC's) Review of Updated Meliadine Gold Mine 2020 Interim Closure and Reclamation Plan (ICRP) for Type "A" Water Licence No. 2AM-MEL1621

Dear Mr. Dwyer,

Thank you for the September 24, 2021 invitation to review the Updated Meliadine Gold Mine 2020 Interim Closure and Reclamation Plan, submitted by Agnico Eagles, for Type "A" Water Licence No. 2AM-MEL1621.

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) reviewed the ICRP pursuant to its mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Crown-Indigenous Relations and Northern Affairs Act*. Please find CIRNAC comments and recommendations in the attached Technical Memorandum.

If there are any questions or concerns, please contact John Onita at (867) 975-3876 or john.onita@canada.ca or Andrew Keim, Manager, at (867) 975-4550 or andrew.keim@canada.ca

Sincerely,

John Onita,
Regional Water Coordinator



Technical Review Memorandum

Date: October 29, 2021

To: Richard Dwyer – Manager of Licensing, Nunavut Water Board

From: John Onita – Regional Water Coordinator, CIRNAC

**Subject: Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC's)
Review of Updated Meliadine Gold Mine 2020 Interim Closure and
Reclamation Plan (ICRP) for Type "A" Water Licence No. 2AM-MEL1621**

Region: ☐ Kitikmeot ☒ Kivalliq ☐ Qikiqtani

A. BACKGROUND

The Meliadine Gold Project is located approximately 25 km north of Rankin Inlet and 80 km southwest of Chesterfield Inlet, in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. This project is a gold mine owned and managed by Agnico Eagle Mines (AEM). The Meliadine gold mine began the operation phase of the project by mining the underground Tiriganiaq deposit in May 2019. AEM has begun ore zone exploitation by extracting the richer ore zones using underground mining techniques (Tiriganiaq Underground), while the open pit ore extraction (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) is scheduled to begin in 2023.

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) has regulatory responsibilities related to resource development and water management in Nunavut. CIRNAC's Mine Site Reclamation Policy for Nunavut (CIRNAC, 2002) requires that financial security be held in the amount equal to total outstanding reclamation liability for land and water.

The updated Meliadine Interim Closure and Reclamation Plan – Update 2020 was submitted to the Nunavut Water Board (NWB) for the Meliadine Gold Project on August 20, 2021, as required per the Amended Water Licence 2AM-MEL1631 and NWB Reasons for Decision document dated May 13, 2021.

The Minister of Northern Affairs is responsible for approving Type "A" water licences issued by the NWB and holding reclamation security required under water licences. CIRNAC reviewed the mine reclamation cost estimation update for the Meliadine Gold Project, provided by AEM as part of the Interim Closure and Reclamation Plan (ICRP) under Type "A" Water Licence 2AM-MEL1631, in its suitability to sufficiently prepare the project for closure. CIRNAC's comments are based on reviewing:



- the Updated 2020 ICRP, Rev. 3, dated 07 April 2021; and
- the Updated supplementary and supporting documents and plans that were submitted by AEM in support of the ICRP 2020 Update.

CIRNAC provides the following comments and recommendations pertaining to the Updated ICRP. Documents reviewed as part of this submission can be found in Table 1 of Section B. Detailed technical review comments can be found in Section C.

B. DOCUMENTS REVIEWED AND REFERENCED

The following table (Table 1) provides a list of the documents reviewed under the submission and reference during the review.

Table 1: Documents Reviewed and Referenced

Document Title	Author, File No., Rev., Date
210922 2AM-MEL1631 674942-4000-4EER-0002_03_ICRP 2020 (Updated report only)	SNC-Lavalin Inc.; Agnico Eagle Mines LTD; April 7, 2021; 674942-4000-4EER-0002_03
Appendix A – Glossary	- Same Reference as above -
Appendix B - List of Abbreviations	- Same Reference as above -
Appendix C - Record of Engagement	- Same Reference as above -
Appendix D - Lessons Learned	- Same Reference as above -
Appendix E - Reclamation Research Plans	- Same Reference as above -
Appendix F - Site Photos	- Same Reference as above -
Appendix G - Monitoring Water Quality Stations	- Same Reference as above -
Appendix H - Regulatory Instruments	- Same Reference as above -
Appendix I - Permafrost Map	- Same Reference as above -
Appendix J - Geology, Seismic, Groundwater, Bathymetry	- Same Reference as above -
Appendix K- Ecological Land	- Same Reference as above -
Appendix L - Post closure General Site Layout	- Same Reference as above -
Appendix M - Integrated Schedule of Activities-2040	- Same Reference as above -
Appendix N - 674942-3000-4EEB-0001-01_Reclaim 7.0	- Same Reference as above -
Appendix O - Design and As-built	- Same Reference as above -
160415 2AM-MEL1631 Water Licence OVCE	Nunavut Water Board; April 1, 2016
Nunavut Waters and Nunavut Surface Rights Tribunal Acts (2016); <i>Nunavut Water Board</i>	NWNSRTA, 2016
Department of Crown-Indigenous Relations and Northern Affairs Act (2000)	CIRNAC Act, 2000



C. CIRNAC REVIEW COMMENTS ON ICRP REV. 3, APRIL 2021

C-1. Review of Rev. 00, 01, 02 ICRP and Reclaim Estimate

In December 2019, AEM provided a quantum of security cost estimate in association with the submission of their first ICRP for the project. The RECLAIM evaluation provided by AEM in their December 2019 submission estimated the quantum of security for the mine to be \$59.5 Million with a \$23.8 Million assigned as land liability and \$35.665 Million assigned as water liability.

As part of the August 2020 Water Licence Amendment Application, AEM amended parts of their ICRP to include for the installation of a saline water pipeline between the mine site and the Itivia facility located on Melvin Bay as well as amended the set-up of the mine facilities to add new structures (see SNC ICRP Financial Security document dated 30 July 2020 – Rev 00 of the ICRP). The Updated ICRP addresses the closure needs for the Meliadine Mine site that include: an underground mine; two open pits; a dry stack tailings storage facility; two (2) waste rock piles (waste rock original schedule for placement in WRSF2 will now go to WRSF, which has been increased in size accordingly); an ore processing facility (mill) and related infrastructure; general support facilities including a camp for people, a power plant, a maintenance shop, a tank farm, ore pads, ponds for management of on-site mine site water (i.e., the water that comes into contact with various parts of the mine), a system to treat water and sewage, haul roads, access roads, and collection ponds, channels, dikes, dams, culverts to manage on-site water and a newly added saline water pipeline between the mine and Itivia facility. In addition, the ICRP also considers the closure requirements associated with offsite related facilities that include: the All-Weather Access Road between Rankin Inlet and the site; the By-Pass road from Itivia Harbour to the All-Weather road, and the Itivia Harbour Facilities at Rankin Inlet.

As a result of the project additions to the ICRP, the amount of security was increased to \$66.88 Million with a \$25.20 Million assigned as land liability and \$41.68 Million assigned as water liability.

In February 2021, CIRNAC in association with the water licence amendment application for the Meliadine Mine, carried out a review of the following two documents to confirm the amount of security currently being proposed by AEM:

- i. Meliadine Interim Closure and Reclamation Plan – Update 2020 as prepared by SNC Lavalin on behalf of AEM and dated 28 January 2021 [also identified as Rev. 02 of the ICRP]; and
- ii. Meliadine – ICRP Update 2020 – Financial Security Cost Estimate Methodology and Assumptions, as prepared by SNC Lavalin on behalf of AEM and dated 28 January 2021 [also identified as Appendix N of the ICRP Rev. 02].



From review of these two documents, and further to discussions in early January 2021 between KIA, AEM and their respective consultants, CIRNAC found that the ICRP Update Documents included revisions that addressed the following:

- a. Unit rates were revised for select reclamation/closure tasks per CIRNAC's recommendations and as discussed in early January at the stakeholders meeting;
- b. Security related to decommissioning and removal of the updated saline waterline design now included; and
- c. The period for the Post-Closure Long Term Monitoring Program was revised from seven to ten years.

As shown in Table 2 below, comparison of the security estimates prepared by AEM and CIRNAC shows that only minor differences remained, which were related to the discount rate used by AEM which was not used by CIRNAC.

**Table 2: Summary Comparison of AEM and CIRNAC Security Estimates (February 2021)**

Reclamation Task	AEM 28 January 2021 Security Estimate	CIRNAC Feb 2021 Security Estimate	Comment
Direct Costs			
Open Pit	\$2,040,399	\$2,040,399	No change
Underground Mine	\$1,096,384	\$1,096,384	No change
Tailings Storage Facility	\$5,081,950	\$5,081,950	No change
Rock Pile	\$307,350	\$307,350	No change
Building and Equipment	\$20,247,209	\$20,247,209	Minor adjustments made by AEM. CIRNAC amended its estimate to match AEM
Chemical and Contaminate Soil Management	\$2,359,406	\$2,359,406	No change
Surface and Groundwater Management	\$4,460,458	\$4,460,458	No change
Interim Care and Maintenance	\$5,294,620	\$5,294,620	No change
Subtotal Direct Total	\$40,887,775	\$40,887,775	\$0
Indirect Costs			
Mobilization/Demobilization	\$6,961,400	\$6,961,400	No change
Active Closure Monitoring	\$3,032,829	\$3,216,591	Difference due to 3% discount rate used by AEM
Post Closure Monitoring	\$5,072,289	\$5,946,970	
Engineering (5%)	\$2,044,389	\$2,044,389	No change
Project Management (5%)	\$2,044,389	\$2,044,389	No change
Health and Safety Plans/Monitoring and QA/QC and Engagement Costs (2%)	\$817,756	\$817,756	No change
Bonding/Insurance (1%)	\$408,878	\$408,878	No change
Contingency (20%)	\$8,177,555	\$8,177,555	No change
Market Price Factor Adjustment (0%)	\$0	\$0	No change
Subtotal Direct Total	\$28,559,484	\$29,617,927	\$1,058,443
Grand Total	\$69,447,259	\$70,505,702	\$1,058,443



Pursuant to discussions between AEM and CIRNAC in January and February 2021, it was agreed the active and post closure monitoring costs would reflect the amount carried in the Arcadis security estimate while the contingency amount could be reduced to 18%, down from 20% as noted above in Table 3. These changes resulted in the security amount going forward of \$69,687,246, where \$40,887,775 is associated with Direct Cost items and \$28,799,471 is associated with Indirect Costs. This is consistent with the details provided in Appendix N of the Updated Rev.03 ICRP.

C-2. Review of the Updated Rev. 03 ICRP April 2021 and Reclaim Estimate

Review of the Updated 2020 ICRP Rev. 03, dated 7 April 2021, confirmed that the Rev. 03 updates (page 16 and page 142) relate solely to the updating of the security amount from the previous estimate provided in January 2021 as part of the Rev. 02 submission which built upon earlier estimates (i.e. July 2020 updates).

CIRNAC Comments:

Section 4.4.1 - the ten post-closure monitoring events were not intended to occur consecutively but rather over a period of 25 years, instead of over a 10-year period as stated by AEM.

Section 8 - the ten post-closure monitoring events were not intended to occur consecutively but rather over a period of 25 years, instead of over a 10-year period as stated by AEM.

Section 5.2.1.4 - does not explicitly reference the decommissioning of the waterline (the two saline water pipelines) between the mine site and Melvin Bay at Itivia.

CIRNAC recommends going forward that a specific bullet stating the need for the waterline decommissioning be added to this part of the ICRP.

C-3. Review of Attachments to Updated Rev 3 ICRP April 2021:

A total of 15 appendix attachments as noted in Section B above were included with the Updated 2020 ICRP Rev. 3, dated 7 April 2021 (Appendix A to O). CIRNAC's summary of the appendix content and review comments are provided in Table 3 below.



Table 3: Review of ICRP Appendices

Appendix	Description / CIRNAC Comment
A – Glossary of Terms and Abbreviations	<p>This appendix provides a glossary of terms and definitions.</p> <p>CIRNAC Comment: No issues or concerns.</p>
B – List of Acronyms, Abbreviations, Units and Symbols	<p>This appendix provides a list of acronyms, abbreviations, units and symbols</p> <p>CIRNAC Comment: No issues or concerns</p>
C – Record of Engagement	<p>This appendix provides a summary note that closure activities occurred in 2018 with closure works carried out at the Itivia quarry site. It notes that on completion, the works were inspected by the GN Regional Lands Inspector and a Rankin Inlet CGS Official, both of whom indicated satisfaction with the state of the quarry site.</p> <p>CIRNAC Comment: This is positive. No issues or concerns</p>
D – Lessons Learned from Other Projects	<p>This appendix provides a summary table presenting lessons from similar projects that would have direct application for the Meliadine closure and reclamation. AEM states that the table will be updated during the next revision of the Interim Closure and Reclamation Plan (ICRP) and for the Final Closure and Reclamation Plan. The lessons learned relate to:</p> <ul style="list-style-type: none"> • revegetation, • open pit mining, • mine site infrastructure, and • landfill location. <p>The list of references is from other AEM projects (Meadowbank, Whale Tail and Meliadine) as part of the ICRP work (dated 2015 to 2018) and a Diavik reference regarding CRP documentation dated 2019.</p> <p>CIRNAC Comment: No issues or concerns with information provided. CIRNAC would suggest AEM ensure that the “lessons learned” were researched or captured to generate the table.</p>
E – Reclamation Research Plans	<p>This appendix provides extracts from the 2018 Annual Report on:</p> <ul style="list-style-type: none"> • Tundra Revegetation / Restoration Study, and • Marine Environmental Reconnaissance Surveys into Melvin Bay <p>It also includes an excerpt from the 2015 Type A Water Licence Application document on Contribution to Regional Monitoring of Caribou and Raptors.</p> <p>CIRNAC Comment: While CIRNAC has no issues or concerns with the information provided, CIRNAC note that the information is quite dated. CIRNAC expects that more recent information could be provided on the research items identified and would like to know if there are any more areas of research that have been undertaken or committed to by AEM.</p>



Appendix	Description / CIRNAC Comment
F – Meliadine Site Photos	<p>This appendix provides four oblique site photographs of the mine complex. One photograph is an aerial taken in 2016, the other three aerial photographs were taken in 2019. Other than the Photo Title, no additional information is provided.</p> <p>CIRNAC Comment: The inclusion of photographs are positive but lack context. AEM should:</p> <ul style="list-style-type: none">• Provide recent 2020 or 2021 photographs.• Label photos to orient reader to the site.• Add photographs of primary features that will be of special interest to closure such as the waste rock storage areas, the mill tailings area, pits and portals, etc.• Include a site plan as a cross reference to illustrate where the photos are being taken from and the field of view of each photo.
G - Monitoring Water Quality Stations	<p>This appendix provides the following figures:</p> <ul style="list-style-type: none">• Tetra Tech mine site plan showing Monitoring Locations During Operations for Water Management. This includes stations MEL-11 to MEL-24 and MEL-27. Note that MEL-27 is a new station that has been added to monitor CP2.• Google Image (Figure 7) on which AEM shows MEL-SR stations at Itivia. This includes MEL-SR1, -SR3, -SR7, -SR8, -SR9, -SR11, -SR13 and -SR14. AEM notes that MEL-12 is not shown due to its distance from Itivia; however, the station not shown is MEL-SR12 and MEL-12 is shown on the Tetra Tech figure. Also, MEL-25 which monitors the secondary containment system at the Itivia Fuel Storage Facility is not shown on the image.• Golder map (Figure 8) showing Meliadine Lake Water Quality Stations Sampled in 2018. This includes Environmental Effects Monitoring stations MEL-01 to MEL-05. <p>The figures do not show the location of MEL-26 which is the Melvin Bay Final Discharge Point.</p> <p>CIRNAC Comment: Monitoring stations do not appear to have changed from the latest water licence locations. A figure should be included to show where station MEL-SR12 is located along the Bypass Road and another figure to show the location of MEL-26 at Melvin Bay. Station MEL-25 should be added to Figure 7.</p>



Appendix	Description / CIRNAC Comment
H – Regulatory Instruments	<p>This appendix provides a list of Regulatory Instruments related to the Meliadine mine development.</p> <p>CIRNAC Comment: No issues or concerns with information provided.</p>
I – Permafrost Map	<p>This appendix provides two permafrost maps, one from Natural Resources Canada (Atlas of Canada 6th Edition, Climate Warming – National Annual Temperature Scenario:2050) and one from Golder (Permafrost Map Figure 6.3-2)</p> <p>CIRNAC Comment: No issues or concerns with information provided.</p>
J – Meliadine Geology, Seismic Zone, Groundwater Flow and Bathymetry	<p>This appendix provides:</p> <ul style="list-style-type: none">• three figures; one is the regional map showing AEM properties, the second is a regional geology map, and the third is a local geology map.• 2015 National Building Code Seismic Hazard Calculation• Five figures (Golder Figures 7.3.1 to 7.3.5) showing the LSA Watersheds and drainage areas• A lake Bathymetry and Thermistor Location figure (6.3-F1)• Figure 8.1.1 illustrating marine local study area around Rankin Inlet <p>CIRNAC Comment: No issues or concerns with information provided.</p>
K – Ecological Land	<p>This appendix provides an Ecological Land Cover Class table that provides regional land cover classes and subclasses along with their total Regional Study area in ha and their % distribution within the study area, as taken from the 2014 FEIS.</p> <p>CIRNAC Comment: No issues or concerns with information provided.</p>
L – Closure and Post Closure General Site Layout	<p>This appendix provides two figures:</p> <ul style="list-style-type: none">• Fig. 7.1 Mine Site Layout for Water Management During Closure• Fig. 7.2 Mine Site Layout After Closure <p>Both of these figures have been updated from the earlier versions to be consistent with the current 2021 Rev. 3 plan.</p> <p>CIRNAC Comment: No issues or concerns with information provided.</p>



Appendix	Description / CIRNAC Comment
M – Closure Integrated Schedule	<p>This appendix provides the preliminary Integrated Closure Schedule. AEM anticipates that the schedule will be refined throughout the Meliadine Mine life as the designs for closure are advanced and the closure methods and strategies are further developed. The schedule is subject to changes following mine plan and development as well as market conditions.</p> <p>CIRNAC Comment: The schedule is consistent with the discussion of Section 8.0 and Table 8.1. No issues or concerns with information as provided other than to note that the schedule does not reflect a 25-year post-closure monitoring period as recommended by CIRNAC</p>
N – Financial Security Cost Estimate Methodology and Assumptions	<p>This appendix provides information on closure measures and considerations, Cost Estimate discussion on Direct and Indirect costs, RECLAIM 7.0 worksheets, and a comparison to the 2019 Estimate. The document was updated on 7 April 2021.</p> <p>CIRNAC Comment: Information is consistent with the assumptions outlined in the earlier version of the ICRP with updates accounting for discussion points between AEM and CIRNAC included therein.</p>
O – Infrastructures As-Built and Design	<p>This appendix provides the design plans for various site infrastructure with:</p> <ul style="list-style-type: none">• As-built plans provided for those structures already built,• Issued for construction design plans for elements remaining to be constructed in the near future, and• concept or design plans for review for other elements yet to be built and requiring more engineering or design evaluation. <p>The plans provided are all consistent with the proposed site infrastructure plans and mine development plans provided in the recent water licence amendment application.</p> <p>CIRNAC Comment: No concerns with the plans provided. Recognising continued evaluation of those work elements remaining to be constructed will be required. For example, the design plans for the water line between the mine and Itivia Bay will need to be reviewed once the issued for construction set is available. Note that for some of the design plans, the implementation phase will be over the life of the mine and as such will be subject to annual or more frequent inspections per the conditions outlined in the existing water licence amendment (for example the construction of the waste rock storage facility).</p>



D. REFERENCES

Department of Crown-Indigenous Relations and Northern Affairs Act (2000)

Nunavut Water Board Type “A” Water Licence 2AM-MEL1631; NWB, April 1, 2016

Nunavut Waters and Nunavut Surface Rights Tribunal Acts (2016); *Nunavut Water Board*

SNC-Lavalin Inc.; Agnico Eagle Mines LTD; *Updated Meliadine Interim Closure and Reclamation Plan (ICRP) – Updated 2020*; April 7, 2021; 674942-4000-4EER-0002_03