Your file - Votre référence
2AM-MEA0815

April 8, 2015

Our file - Notre référence
IQALUIT-#907663

Phyllis Beaulieu
Manager of Licensing
Nunavut Water Board
GJOA HAVEN, NU X0E 1J0

Re: Aboriginal Affairs and Northern Development Canada Final Written Submission on Agnico Eagle Mines Ltd's Application to Renew and Amend Water Licence #2AM-MEA0815

Dear Ms. Beaulieu:

I am responding to the Nunavut Water Board's Pre-Hearing Conference Decision dated February 20, 2015 with Aboriginal Affairs and Northern Development Canada's submission in the Meadowbank Mine water licence amendment process.

In addition to this letter, AANDC's submission also includes the following:

- a technical memorandum prepared by AANDC staff, dated February 24, 2015 (attached); and
- technical review comments prepared by BGC Engineering Inc., dated February 20, 2015 (attached).

AANDC's submission is provided in furtherance of our Department's role under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* ("the Act") and the *Department of Indian Affairs and Northern Development Act*.

This letter sets out AANDC's recommendations to the Nunavut Water Board regarding the fixing of security under section 76(1) of the Act and section 10 of the *Nunavut Waters Regulations.* This letter begins with recommendations specific to this application. We provide some important background explanation on security discounting in the subsequent section.

Site Specific Water Licence Security Recommendations:

1. AANDC recommends that the Board estimate reclamation costs associated with the Meadowbank Mine under this licence at $86,519,614.

2. With assistance from BGC Engineering Inc., AANDC has reviewed AEM's reclamation cost estimate, which was developed for them by Golder Associates Inc (December 2, 2014) on the basis of RECLAIM version 7. AANDC largely accepts the Golder reclamation cost estimate of $84,869,488, with one exception.

The Golder reclamation cost estimate falls slightly short because it does not account for a period of interim care and maintenance in the period between abandonment of a site by the operator and the commencement of site reclamation by other parties (potentially the Crown or another land owner).

In AANDC's experience, there is inevitably a period of interim care and maintenance that is required after an operator abandons a site due to financial difficulty. That time is required for legal processes, non-operator reclamation planning, service procurement, etc. Costs expended on interim care and maintenance in that period reduce the amount of security available for reclamation purposes.

Therefore AANDC recommends that the reclamation cost estimate should include $1,650,126 for a post-abandonment interim care and maintenance phase. Adding this amount to the Golder reclamation cost estimate yields the dollar figure provided by AANDC as our reclamation cost estimate, above.

3. At the time of making this submission, while AANDC has some awareness of negotiations between the Kivalliq Inuit Association and AEM, AANDC does not know what private security might be held by the Kivalliq Inuit Association prior to the Board's licence decision, or what the terms of those security arrangements would be. For that reason, we are unable to provide a site-specific recommendation for any reduction in licence security on the basis of private security.

4. AANDC recognizes that there is a private land owner seeking to ensure that its own interests are also secured. However, in the absence of necessary evidence on private security, AANDC recommends that the entire reclamation cost estimate of $86,519,614 should be secured in the water licence.

5. On the assumption that the Board may receive evidence of private security that furthers the purposes of the Act, it may prove necessary for the Board to consider whether and how much of a discount to apply on the basis of private security. AANDC observes that RECLAIM 7 used by the licensee and accepted by AANDC identifies roughly 68% of the reclamation costs estimates as related to water-based components and the remaining roughly 32% of the reclamation costs estimates are related to land components.

   Ownership of the water is vested with the Crown, while KIA is the fee simple owner of most of the project lands. While AANDC respects previous Board determinations that view land and water holistically, a discounting approach to security requires the drawing of lines. Because most of the project lands are privately owned, the Crown's primary interests are in the small proportion of Crown lands, and in the water in and on all the lands within the project scope.

   On that basis, discounting based on private security must not leave the Crown under-secured either for reclamation costs for Crown land or waters in or on Crown lands, or for water related issues through-out the project scope. Under the current circumstances, AANDC would be concerned if the Board discounted the water licence security by more than approximately 32% of its reclamation cost estimate.

6. If AEM and KIA enter into security arrangements after the Board is able to take them into account in this process, then AEM can apply to the Board at the appropriate time for a reduction in security as part of an amendment process. At that point, AEM would still need to provide the evidence and submissions referred to in this letter and the Board would have to determine

whether that security arrangement is a good substitute for security under the Act, and therefore a reasonable basis to discount the licence security.

The Approach to Discounting

In the last several years, AANDC has supported an approach in which the Nunavut Water Board reduces the amount of security it orders under the water licence on the basis of private security held outside the water licence regime. The purpose of this approach is to reduce 'over bonding', which can occur when an operator must secure the same reclamation activities to two secured parties, in this case the Crown under the Act and the private landowner under their contractual arrangements.

AANDC's support for discounting to avoid over-bonding is conditional. The primary consideration is that in case of operator insolvency, there is adequate security to ensure that environmentally responsible shut-down, interim care and maintenance, and reclamation can be conducted without the Crown or the land-owner incurring costs that should have been borne by the operator.

To achieve this objective, it is crucial that the Board discount only where it is satisfied that the land owner actually holds security, and where the Board has reviewed the terms of that security arrangement, and come to the conclusion that the security stands in good substitute for security that would otherwise have been fixed by the Board as a condition of the licence.

While the Board has decision-making responsibility in fixing the amount of security under the water licence, the operator bears the burden of proving that private security outside the licence is a good substitute for water licence security. That requires the operator to furnish the necessary evidence in a timely way, and provide a satisfactory explanation of why reliance on this private security justifies the Board exercising its jurisdiction to secure less than the full reclamation cost estimate.

Looking at both the security instrument, and any contracts or other limitations governing its access and use, the operator, potentially with the support of the land-owner, would have to establish that:

- The private security available for the same purposes as licence security under section 76(2)(b) of the Act;
- The land owner intends to use the security for the same purposes as licence security under section 76(2)(b) of the Act;
- The land owner is accepting responsibility to ensure that the purposes of the Act are carried out, including responding to an inspector's direction under section 87 of the Act;
- The private security cannot be used for purposes other than those covered in section 76(2)(b) of the Act. Unless that is the case, the private security could be reduced without fulfilling the purposes of the Act. For example, if the security could be drawn as compensation for damages, as opposed to funding physical remediation, the purposes of the Act would not be fulfilled; and
- The private security is no more vulnerable to the operator's or land-owner's creditors than Act-based security would be.

Absent clear Board findings that the land-owner actually holds security, and that the security reasonably approximates Crown-held security, the Board should not discount the water licence security.

It should be clear from the above that the Board does not establish how much security a private land-owner might negotiate with an operator on their land, nor does the Board control the terms of that arrangement. Rather, the Board can consider privately-held security in coming to its conclusion in how to exercise its own jurisdiction in fixing security within the licence. The following sets out what the Department sees as the Board's role in this process:

1. On the basis of evidence, determine what the total cost of abandonment and reclamation of the appurtenant undertaking is likely to be. This is a finding of fact.

2. On the basis of evidence, determine what private security is held by the land-owner outside of the statutory regime, including the terms of its access and use. This is a finding of fact. The evidence in support of this should be provided to the Board well in advance of a hearing on the matter.

3. On the basis of the Board's findings of fact about the private security held outside the statutory regime, determine whether in the Board's view the private security reasonably approximates Crown-held security. This is a decision, not a finding of fact, and requires complex analysis and judgment.

   In AANDC's view, the Board could only be in a good position to conduct this analysis if it is supported by written submissions on that point by the operator, provided well in advance of the hearing. The security arrangement and proponent's submissions, once provided to the Board, would be available for public review so that that AANDC, the landowner, and other interveners would be able to assess and provide comment. Cross-examination on relevant issues may also be helpful to the Board.

4. On the basis of the above, the Board can then determine how much security to fix within the licence for the purposes of 76(1) of the Act and section 10 of the *Nunavut Waters Regulations*, and the security would then be furnished and maintained with the Minister of Aboriginal Affairs and Northern Development.

5. Any Type A licence is of course subject to the approval of the Minister of Aboriginal Affairs in accordance with section 56 of the Act.

<u>Discounting – Procedural Issues for Future Changes</u>

AANDC suggests that the Board should require the licensee to promptly inform the Board of any material change in a private security arrangement that forms the basis for discounting. This is because the amount of private security and the terms of that security are subject to change without notice or approval of the Board. In case of a material change, it would be necessary for the Board to reassess the water licence security and potentially fix a new licence security amount by amendment of the licence.

AANDC recommends that the Board *should not* insert procedural requirements for security re-assessment in the licence itself (either for periodic re-assessment or for re-assessment after a material change). Appropriate processes can be developed at the relevant time based on the Board's own judgment and expertise and the flexibility provided by sections 43(1)(b)(iii), 49 and 52(1)(a) of the Act and section 9 of the *Nunavut Waters Regulations*. In AANDC's experience, the procedural requirements of a given situation are difficult to predict, and therefore should not be fixed in a licence because that makes them unmodifiable without a licence amendment.

It is hoped that the information the department has provided is of assistance to the Board in carrying out its roles and responsibilities in the water licensing process. If you have any questions or need more information, please do not hesitate to contact David Abernthy by email at David. Abernethy@aandc-aadnc.gc.ca or telephone at (867) 975-4555.

Sincerely,

Original signed by

Karen Costello

Director, Resource Management
Nunavut Regional Office
Aboriginal Affairs and Northern Development Canada

Encl.

c.c.: Stephen Traynor, A/Regional Director General, AANDC Nunavut
Erik Allain, Manager of Field Operations, AANDC Nunavut
David Abernethy, Water Resources Regional Coordinator, AANDC Nunavut
Justin Hack, Water Resources Officer, AANDC Nunavut
Stephane Robert, Manager, Regulatory Affairs Nunavut, AEML
Luis Manzo, Director of Lands, KIA

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Aboriginal Affairs and Northern Development Canada

Technical Memorandum dated February 24, 2015

Our file – notre référence
IQALUIT-#893461

Technical Memorandum

Date: February 24, 2015

To: Andrea Morgan, A/Manager Water Resources Division, AANDC

From: David Abernethy, Water Management Coordinator
Amjad Tariq, Regulatory and Science Advisor,

CC: Karen Costello (AANDC), Justin Hack (AANDC), and Erik Allain (AANDC)

Re: Final Written submission - Water Licence Renewal Application, #2AM-MEA0815

Licensee: Agnico Eagle Mines Ltd
Project: Meadowbank Gold Mine
Region: Kivalliq

Comments:

On February 20, 2015, the Nunavut Water Board (NWB) distributed the Pre-Hearing Conference Decision concerning Agnico Eagle Mines Ltd's (Agnico Eagle) application to renew their Meadowbank Gold Mine Type 'A' Water Licence for 10 years. Interested were asked to provide final written submission on or before March 24, 2015.

On January 7, 2015, Agnico Eagle responded to technical review comments provided by intervening parties. Their response adequately addressed the internal Aboriginal Affairs and Northern Development Canada technical review comments that were provided to the NWB on December 24, 2014. Agnico Eagle's responses are provided in Table 1 below. Also, please find attached a memo prepared by BGC Engineering Inc, a consultant retained by Aboriginal Affairs and Northern Development Canada (AANDC), regarding how their technical review comments were addressed by Agnico Eagle during the Technical Meeting.

All of AANDC technical review comments have been adequately addressed by Agnico Eagle.

Table 1

AANDC Reference	Renewal Application Reference	AANDC Commentary from December 24, 201 Letter			AEML Response (January 7, 2015)
		AANDC Observation	AANDC Comment	AANDC Request/Recommendation	
A1	Interim Mine Closure and Reclamation Plan Section 3.3.6.3	Section 3.3.6.3 of the Interim Closure and Reclamation Plan provides the planned reclamation approach and the associated activities. It has been stated that 'The Portage WRSF will be covered by a layer of NPAG rock to ensure geochemical stability by insulating PAG materials and keeping the waste rock frozen'.	AANDC is concerned that how rock cover can 'insulate' PAG with large voids in it. The potential ingress of air (oxygen) coupled with moisture (water) can oxidize sulphide minerals and instigate acid generation process. The freeze control strategy adopted by the proponent is principally dependent on the climate conditions. The potential temperature rise due to climate change and/or global warming may have adverse effects on frozen PAG materials. As a result, acid rock drainage (ARD) can be a source of water pollution issues for surface water bodies and ground water. The proposed approaches to prevent ingress of air (oxygen) and moisture (water) should be documented. The degree of effectiveness of the proposed cover system in terms of ARD control should be determined based on up-to-date scientific knowledge.	Proponent is requested to provide the details of the proposed strategies to prevent water pollution issues. In order to cope with potential water contamination, the degree of effectiveness of the proposed cover system in terms of ARD control should be determined based on up-to-date scientific knowledge. In addition to the thermal monitoring program, an action plan based on scientific analysis should be submitted to NWB.	AEM agrees with AANDC. In 2013, AEM began working with Research Institute in Mines and Environment (RIME - UQAT) and consultants to ensure that the design controls for ARD in the tailings storage facility and waste rock storage facility encapsulation project and freeze control strategies will be effective and use the most up to date scientific knowledge. This, alongside using the most up- to- date climate change models will ensure sources of water pollution are controlled to protect nearby waterbodies and groundwater. This details will be submitted in the final reclamation and closure plan one year prior to closure.
A2	Interim Mine Closure and Reclamation Plan Section 3.3.6.3	Section 3.3.6.3 of the Interim Closure and Reclamation Plan states that 'Investigations and cover trials will be conducted to verify this thickness layer, and adjustments to the closure design will be made as appropriate.'	Proponent has planned to implement rock fill cover at (approximately 4 meter of thickness) the entire site. The rationale behind the 'assumed thicknesses' should be scientifically analyzed.	AANDC requests that the proponent provide a detailed analysis for waste rock layer thickness, since 4 m is an 'assumed thickness'. Additionally, the proponent is requested to document the variables used in 'cover trials' including thickness of layer, size distribution of rock fill material, environmental conditions, etc.	See AEM response to AANDC comment A.1
A3	Interim Mine Closure and Reclamation Plan Section 3.3.6.3	Section 3.3.6.3 of the Interim Closure and Reclamation Plan states that 'Some of the Portage and Goose Pit waste rock will also	AANDC is concerned about the technical feasibility and design of the proposed water cover system. Water cover system design	The proponent should provide a detailed analysis of the water cover system. Such systems also require	See AEM response to AANDC comment A.1

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		be backfilled into a completed portion of the Portage Pit, to be flooded at closure.'	parameters (water depth analysis, wind erosion, particle re-suspension, etc.) and a maintenance plan should be analyzed in detail.	maintaining a specified depth of water all the time over the PAG material. In addition to other technical considerations (e.g., main lake at closure), the proponent will also need some sort of mechanism to compensate the evaporation loss.	
A4	Interim Mine Closure and Reclamation Plan Section 3.3.7.3	Section 3.3.7.3 of the Interim Closure and Reclamation Plan states that 'Tailings management approach for long term stability and control of ARD involves encapsulation of tailings in permafrost. The tailings will be allowed to freeze after deposition and to remain frozen after closure. A closure cover will be placed to insulate the frozen tailings and to protect against erosion.'	In the absence of proponent's technical proposal regarding final cover system for tailings, such speculations are required to be justified. AANDC is concerned the possible temperature rise and/or climate change/global warming. Other tailings management approaches should also be considered for the selection of a technically feasible and environmentally acceptable approach.	AANDC requests that proponent provide a detailed design of the final cover system (s) to deal with potential acid generation processes due to possible temperature rise. Measures to control surface and underground water pollution due to potential precipitation and/or surface runoff should be documented. AANDC also requests that the proponent consider other tailings management approaches in conjunction with the proposed approach. A detailed comparison and analysis of different tailings management techniques is highly recommended.	See AEM response to AANDC comment A.1
A5	Interim Mine Closure and Reclamation Plan Section 3.3.7.3	Section 3.3.7.3 of the Interim Closure and Reclamation Plan states that 'Closure will include the placement of an erosion barrier consisting of a 4 m thick layer of NPAG ultramafic waste rock over the tailings. The surface of the final cover will be graded to blend into the existing topography to allow for surface drainage.'	AANDC is concerned that no rock (being used) is totally NPAG. Surface runoff may dissolve metals and can contaminate underground water and surface water. AANDC is further concerned that how the surface of the final cover will be graded? If soil will be used then it must be tested for its physical properties including hydraulic conductivity in compacted state and load bearing capacity etc.	AANDC requests that the proponent provide details on final cover system design and technical analysis of the surface drainage issues. AANDC request proponent to provide report on physical and chemical interaction of the proposed soil (as cover material) with rock material. Such analysis will dictate the technical feasibility of	See AEM response to AANDC comment A.1. Furthermore, AEM has started progressive closure (including but not limited to the 4m NPAG capping of the portage waste rock storage facility, design of the north cell tailings capping and AEM will begin construction in 2015, and reflooding of Goose Pit will

AANDC Reference	Renewal Application Reference	AANDC Commentary from December 24, 201 Letter			AEML Response (January 7, 2015)
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			Chemical properties of the proposed soil are also required to be documented to ensure compatibility of soil with metals, etc. The chemical interaction of the proposed soil (as cover material) with the rock material (being used) will dictate the technical feasibility of the proposed approach for tailings management.	the proposed methodology for the tailings management. Pursuant to Part J, item 6 of the Licence, The Licensee shall implement progressive reclamation, including progressive covering of the tailings and revegetation (where feasible).	begin in 2015). All progressive closure activities are reported annually in the NWB Meadowbank Annual report.
A6	Interim Mine Closure and Reclamation Plan Section 3.3.7.3	Section 3.3.7.3 of the Interim Closure and Reclamation Plan states that 'If water in the Reclaim Pond is not suitable for release, a water treatment plant may be necessary, this plant would be installed at the mill to treat the water prior to release in the Portage Pit Lake.'	AANDC is concerned about the water treatment technology being adopted at the site. Water treatment technology is required to be analyzed in terms of contaminant removal efficiency.	Pursuant to Part F of the Licence, the Licensee is required to comply with the discharge limits. AANDC request proponent to provide the details on water treatment system being adopted in terms of contaminant removal efficiency vs discharge limits.	AEM agrees with AANDC. AEM will continue to monitor the pit water quality and model on an annual basis to ensure that pit water quality will meet CCME limits and ultimately protect aquatic biota, prior to breaching the dikes. This will inform AEM what water treatment methods may be required prior to or during reflooding. This details will be submitted in the final reclamation and closure plan one year prior to closure.
A7	Interim Mine Closure and Reclamation Plan Section 3.3.7.1	Section 3.3.7.1 of the Interim Closure and Reclamation Plan states that 'closure objectives include minimize wind migration of tailings dust'.	The statement needs explanation that how wind migration will be minimized. What steps will be taken to ensure dust suppression, etc.?	AANDC recommends that proponent provide details on strategies being adopted for dust suppression and control.	AEM is working with consultants to address dust control during closure. As per the Type A water license Part J condition 3 a final reclamation and closure plans will be provided at least 1 year prior to closure and will include steps to ensure dust is controlled.
A8	Interim Mine Closure and Reclamation Plan Section 3.4.1.2	Section 3.4.1.2 of the Interim Closure and Reclamation Plan states that 'Thermistors have been (and more are scheduled to be) installed within the Portage WRSF to monitor the rock cover freezing and performance. The results will be used to evaluate the predicted thermal response of the WRSF with	The Proponent has installed instrumentation for temperature measurement within the Portage WRSF. It has been confirmed that freeze back is occurring in the WRSF structures. The details on the planned control strategies to prevent migration of	The proponent should provide management plans to deal with expected or un-expected temperature rise conditions. The proposed steps to prevent leaching of contaminants from WRSF structures are required to be documented.	See AEM response to AANDC comment A.1.

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		the actual thermal response. Results to date from the thermistors indicate that freeze back is occurring in the WRSF structures'.	leachate from PAG rock storage areas and tailings storage areas in case of temperature rise have not been mentioned.		
B1	Report on Waste Rock Storage Facility (WRSF) Seepage	Golder Associate's report-Construction Summary Report Rock Storage Facility-Interim Till Plug	The report provides details for the construction of the Interim till plug located on the upstream side of the access road to the north cell ditches, between the waste Rock storage facility and the NP-2 lake. The till plug is constructed to block seepage coming from the RSF to go into NP-2 lake.	Pursuant to Part D, item 1, the Licensee is required to provide final design and construction drawings stamped and signed by a Professional Engineer. AANDC request proponent to provide the desired documents stamped by a professional Engineer.	AEM will provide stamped drawings to NWB in its' 2014 annual report submission.
B2	Report on Waste Rock Storage Facility (WRSF) Seepage	The proponent states that 'The till plug is constructed of low permeability till material placed on a granular filter layer against the rockfill road. This structure is considered to be physically stable. In terms of seepage control, the performance of the till plug and the associated pumping keeping a low water level in the sump at the sampling station ST-16 appears to be effective in managing seepage to Lake NP-2.'	Pursuant to Part D, Item 1, the proposed design needs to be stamped by a Professional Engineer.	AANDC request proponent to provide detailed design stamped by a Professional Engineer. The adequacy of implemented approach (till plug) for the long-term is also required to be ascertained to protect water resource.	AEM will provide stamped drawings to NWB in its' 2014 annual report submission.
C1	Mine Waste Rock and Management Plan	The Executive Summary of the Mine Waste Rock and Management Plan states that, 'Tailings are placed sub-aerially as slurry and water from the pond is reclaimed during operation. The tailings deposition strategy is to build beaches against the faces of the perimeter dikes to push the pond away, and ultimately produce a tailings surface that directs drainage towards the western abutment of the storm water dike.'	AANDC is concerned that the tailings surface will have significant potential of oxidation of sulphide minerals under 'no drainage' or 'low drainage' conditions. Low moisture content and oxygen ingress in tailings material can give rise to oxidation of sulphide minerals, resulting in an acid generation process. The potential release of metals and arsenic can impact surface and underground water (flow within active layer).	AANDC request proponent to consider the potential of acid drainage on the surface of sub-aerially as slurry under 'no drainage' or 'low drainage' conditions. Such conditions can jeopardize surface and underground water. The proposed approaches to prevent adverse environmental impacts are also required to be analyzed. These include but are not limited to monitoring of supernatant, ensuring isolation of closure cover, etc.	AEM agrees with AANDC. See AEM response to AANDC comment A.1.
C2	Mine Waste Rock and	The Executive Summary of the	The exact types of NPAG rock fill in	AANDC request proponent	AEM agrees with AANDC.

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	Management Plan	Mine Waste Rock and Management Plan states that 'A minimum 2-m thick cover of NPAG rock fill will be placed over the tailings as an insulating convective layer to confine the active layer within relatively inert materials.'	terms of % of acid generating potential are required to be mentioned and categorized. The cumulative effect of NPAG and ingress of moisture and oxygen through the cover can oxidize underneath PAG tailings. Furthermore, freeze control strategy need to be analyzed in light of thermal monitoring results.	to consider the thawing conditions due to temperature rise. What action plans are in place to deal with such thawing conditions?	See AEM response to AANDC comment A.1.
D1	Water LIcence 2AM-MEA0815 Amendment Submission by Agnico-Eagle (issued on June 9, 2008) Part E, Item 8	Proponent has proposed a change in the Licence. It has been recommended that the following text be deleted. The Licensee shall, on an annual basis during operations, compare the predicted water quantity and quality within the pits, to the measured water quantity and quality. Should the difference between the predicted and measured values be 20% or greater, then the cause(s) of the difference(s) shall be identified and the implications of the difference shall be assessed and reported to the Board.	The proponent has reported that 'These proposed changes were discussed with NWB, KIA, AANDC and EC during a WebEx workshop held on November 28, 2013.	AANDC requests confirmation of the history on this requested change. And, if the variations between predicted and measured water quality and quantity are maintained below 20 percent.	See AEM response to KIA concern for the historical request and refer to the November 28, 2014 meeting minutes and the presentation. AEM refers AANDC to Section 4.4 of the Meadowbank annual report which reports the variation of predicted to measured water quality and quantity within the pits. As is expected, water collected in the pit sumps (measured water quality and quantity) varies year to year. As an example, in 2014, water quantity in Portage Pit was -72% and Bay Goose was -121%, less than 20% predicted. In 2014, four parameters were identified to exceed the 20% relative percent difference of FEIS predicted versus measured water quality value, but the parameters vary by year, which reflects a natural variation. As discussed in the annual report, the water in these sumps is controlled onsite, sent to the reclaim pond and the data is used during the

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					annual review of the water quality predictions to inform pit reflooding. As discussed on November 28th, this will assist AEM in determining water treatment requirements prior to or during reflooding.
D2	Water LIcence 2AM-MEA0815 Amendment Submission by Agnico-Eagle (issued on June 9, 2008) Part F, Item 6 and Part F Item 23	Proponent has proposed a change in the Licence. It has been stated that, 'AEM is proposing to have consistent discharge limits required for discharge from fuel containment facilities to land – see Part F Item 23'	AANDC is concerned that such consistencies may alter the original spirit of the licence. Proponent has proposed to delete all the parameters in the table including Lead (ug/L). The proponent has further recommended change in units for 'Lead' from 1 ug/L to 0.1 mg/L in Part F, Item 23. AANDC has concerns as under, 1. 1ug/L is equal to 0.001 mg/L	AANDC request proponent to keep the original spirit of the licence items and correct the units and concentrations accordingly. If proponent wants consistency regarding units then 1ug/L is equal to 0.001 mg/L for Lead.	AEM refers AANDC to section 7 and 9 in AEM's application supporting document. Furthermore, AEM refers AANDC to Environment Canada technical comment EC-06. AEM proposes to remove Part F Item 6 related to fuel containment discharge to land and proposes to adopt Part F Item 23 for both the Baker Lake and Meadowbank fuel containment areas. AEM also proposes a consistent discharge to land effluent limit for lead (Pb) of 0.1 mg/L as all water from secondary containment areas are discharged to land. During the original license, discharge was planned to be collected and discharged directly into Baker Lake after being collected in a sump. However this design was not needed and therefore this limit is not relevant to the current operations.
D3	Water LIcence 2AM-MEA0815 Amendment Submission by Agnico-Eagle (issued on June 9, 2008) Part H, Item 3	The licence states that, 'The Licensee shall prevent any chemicals, petroleum products or unauthorized wastes associated with the project from entering water.' The proponent has recommended a	AANDC is concerned about the deletion of this item since Part D of the licence is regarding 'conditions applying to new construction' and Part H is about 'conditions applying to Emergency response and contingency planning.	AANDC recommend not deleting the item.	AEM agrees with AANDC.

AANDC Reference	Renewal Application Reference	AANDC Commentary from December 24, 201 Letter			AEML Response (January 7, 2015)
		AANDC Observation	AANDC Comment	AANDC Request/Recommendation	
		change in the licence as under, 'AEM proposes to remove this condition as it is stated in Part D, Item 29'.			
D4	Water LIcence 2AM-MEA0815 Amendment Submission by Agnico-Eagle (issued on June 9, 2008) Schedule I –Conditions Applying to General and Aquatics Effects Monitoring Table 1- Monitoring Group	The proponent states that 'AEM proposes a slightly revised Group 1 list parameters to provide clarity and less redundancy in sampling parameters groups. Group 1 will apply to all mines items related to monitoring and has relevant long term contaminants identified in the original license and those identified in SNC 2014.'	AANDC is concerned since the original grouping was developed by the proponent based on the technical requirements at different zones at mine site. Now proponent has recommended several changes in original grouping. It is not understood that how the grounds are now changed based on which the original grouping was developed.	AANDC request proponent to elucidate the rationale behind the proposed changes in contaminant groups.	As stated in the supporting document Section 9, AEM is presenting monitoring groups that will reduce the numerous redundancies in the parameters list. As an example, in the original license, Group 1 encompasses the list of parameters listed in Group 2 (with the exception of TDS) and most of the parameters in Group 3 (with the exception of dissolved metals). Group 3 includes dissolved metals which are also included in Group 4 which is an even more extensive parameter list and is included in the new group proposed by AEM. AEM has proposed a parameter lists and groups that remains inclusive of all parameters as per the original grouping but reduces confusion and redundancy. AEM agrees the grounds for the original grouping and as a result AEM has not suggested deleting parameters, but rather grouping parameters based on their location to improve clarity and consistency.
E1	Water Management Report and Plan 6. Rock Storage Seepage Water Management	The proponent states that 'AEM plans to develop a comprehensive plan to manage the seepage based on a combination of Golder's recommendations and AEM's internal Freshet Action Plan. Golder recommendations include:	AANDC is concerned that the flow of tailings water through the RSF is complex to track without using an advanced technology. The recently installed thermistors in the RSF will allow monitoring of the ground temperatures only.	AANDC request proponent to develop an action plan to prevent possible water contamination as a result of thawing conditions. This will be in addition to temperature monitoring	See AEM response to AANDC comment A.1.

AANDC Reference	Renewal Application Reference	AANDC Commentary from December 24, 201 Letter			AEML Response (January 7, 2015)
		AANDC Observation	AANDC Comment	AANDC Request/Recommendation	
		1) AEM should continue to develop and maintain tailings beaches adjacent to RF1 and RF2 and to operate the Reclaim Pond towards the centre of the TSF. These are the key recommendations. 2) AEM should consider the installation of additional water management infrastructure which could take the form of a permanent collection and pumping system at the sampling station ST-16 current sump. Also, consideration should be given for contact water ditches and sumps in the surrounding areas of the RSF if additional seepages of contaminated water is observed in the future. 3) The seepage at station ST-16 should continue to be collected and redirected to the TSF and monitored (location, quantity, quality). Continued monitoring is strongly recommended during the winter for seepage water quantity monitoring and possible development of an ice plug in the RSF. The area at ST-16 should be kept clean of snow to allow visual observation and to ensure that water at ST-16 does not overflow over the till plug into Lake NP-2. 4) Regular inspections all around the RSF should be performed, particularly during freshet, to ensure that runoff or any observed seepage is controlled and monitored prior to being released into the environment if the analyses results meet the requirement. 5) AEM should continue to monitor the tailings and waste rock freeze	Contaminant transport modeling can be conducted to determine the pathways of contaminants of concern (COC) or stressors of concern (SOC).	program.	

AANDC Reference	Renewal Application Reference	AANDC Commentary from December 24, 201 Letter			AEML Response (January 7, 2015)
		AANDC Observation	AANDC Comment	AANDC Request/Recommendation	
		back following the Thermistor Monitoring Plan in accordance with Part 1, Item 11 of the Type-A water license. 6) AEM should provide the results of the 2014 monitoring to Golder for review and comment.'			
F1	3.1.1 General Sampling and Analysis Program Table 3-1: Monitoring Program	The program prepared by the proponent indicates that the frequency water testing at ST-16 is 'monthly' during open water	In light of AANDC's inspector's report regarding ST-16, the frequency of testing is required to be increased. General monitoring program is no more valid for ST-16.	AANDC request proponent to revise their monitoring program for ST-16 in light of AANDC's Inspector's direction.	AEM has revised the monitoring plan in response to the ST-16 seepage by designing and implementing a Freshet Action Plan. AEM refers AANDC to the freshet action plan that outlines the revised monitoring program for ST-16.

Prepared by David Abernethy and Amjad Tariq

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BGC Engineering Inc. Technical Review Comments

dated February 20, 2015

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February 20, 2015
Project No.: 0131087

David Abernethy,
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P.O. Box 2200
Iqaluit, NU X0A 0H0
Via email: david.abernethy@aandc-aadnc.gc.ca

Dear David,

Re: Technical Review of Type 'A' Water Licence Renewal Application, Meadowbank Mine, NU – FINAL

1.0 INTRODUCTION

The Meadowbank Gold Mine is situated in Nunavut's Kivalliq Region. Agnico Eagle Mines Ltd. (AEM) is permitted to use water and deposit waste for mining, milling, domestic and other associated activities under its Type 'A' Nunavut Water Board (NWB) Water Licence, # 2AM-MEA0815, that was issued on June 9, 2008 and will expire on May 31, 2015.

AEM is applying to renew its licence for ten years to take the mine through operations and into closure. Aboriginal Affairs and Northern Development Canada (AANDC) is an interested party in the NWB's licencing process because of its mandated responsibilities under the *Nunavut Land Claims Agreement*, the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and *Department of Indian Affairs and Northern Development Act*.

On November 24, 2014, the NWB submitted a Notice of Application for AEM's water licence renewal application.

BGC Engineering Inc. (BGC) was retained by AANDC to conduct a review of technical information contained in the renewal application submitted by the mine owner, AEM and assess any high-level information requests required for the water license process. As requested by AANDC, the scope of the technical review included the following:

- The impacts of re-flooding of the mine pits in closure
- Closure objectives for the tailings storage facility (TSF) and waste rock storage facilities (WRSF)
- Analysis of AEM's updated reclamation cost estimate to determine whether it fully addresses the proposed closure plan, post-closure costs, as described in INAC's 2002 *Mine Site Reclamation Policy for Nunavut* and 2007 *Mine Site Reclamation Guidelines for the Northwest Territories*.

The focus of the review was on geotechnical and water management aspects specific to re-flooding of the mine pits and the closure objectives for the mine waste facilities. As such, not all documents in the water license renewal application were reviewed by BGC.

This work was conducted under the terms of AANDC Standing Offer Agreement No. 01-11-6003/6 Call Up No. 7, dated October 21, 2014.

1.1. Initial Technical Review

On December 18, 2014, BGC submitted a letter to AANDC summarizing the findings of their technical review. On December 24, 2014, AANDC submitted a letter to the Nunavut Water Board, describing the technical review comments and recommendations provided by AANDC personnel, along with BGC's December 18 letter to AANDC included as an attachment.

1.2. January 14 and 15, 2015 Technical Review Meeting and Pre-Hearing Conference

On January 14 and 15, 2015, a technical review meeting and pre-hearing conference for AEM's water license renewal application was held at the Baker Lake Community Hall. AANDC participated via teleconference; Mr. Jack Seto, P.Eng. of BGC also participated via teleconference for the technical review meeting portions of January 14 and the morning of January 15. AEM presented a general description of the mining operations and proposed future plans for mining and for closure and reclamation. AEM also presented summary responses to information requests and comments that were submitted by various interested parties via the NWB by December 24, 2014. BGC did not participate in the Pre-Hearing Conference held the afternoon of January 15.

1.3. Letter Structure

This letter updates BGC's letter to AANDC of December 18, 2014. As with BGC's December 18 letter, it lists the documents reviewed, summarizes BGC's understanding of AEM's mine plan and discusses two geoenvironmental incidents that have occurred at the mine that should be considered in future mine plans. For clarity, the comments and information requests originally provided in BGC's December 18 letter have been tabulated. The table also includes AEM's written response that was shared during the January 14-15, 2015 technical meeting.

2.0 DOCUMENTS REVIEWED

The renewal application consisted of three main documents (BGC did not review all sections of these documents; only those sections highlighted in yellow below were reviewed by BGC):

1. Agnico Eagle Mines Ltd., 2014. Nunavut Water Board (NWB 2AM MEA0815) Type A Water Licence Renewal Application - Main Supporting Document, July 2014
    a. Appendix A - List of Leases, Permits and Authorizations
    b. Appendix B1 - Aquatic Effect Management Plan (AEMP), Version 2, December 2012

c. Appendix B2 - Core Receiving Environment Monitoring Program (CREMP), Design Document, Version 1, December 2012
d. Appendix B3 - Water Quality Monitoring and Management Plan for Dike Construction and Dewatering, Version 4, April 2010
e. Appendix B4 - Groundwater Monitoring Plan, Version 4, January 2014
f. Appendix B5 - Quality Assurance/Quality Control (QA/QC) Plan, Version 2, July 2014
g. Appendix B6 - Water Quality and Flow Monitoring Plan, Version 3, July 2014
h. Appendix B7 - Emergency Response Plan, Version 6, August 2013
i. Appendix B8 - Hazardous Material Management Plan, Version 3, October 2013
j. Appendix B9 - Spill Contingency Plan, Version 4, November 2013
k. Appendix B10 - Operational ARD/ML Testing and Sampling Plan, Version 2, November 2013
l. Appendix B11 - Baker Lake Bulk Fuel Storage Facility Environmental Performance Monitoring Plan, Version 3, June 2014
m. Appendix B12 - Meadowbank Bulk Fuel Storage Facility: Environmental Performance Monitoring Plan, Version 2, June 2014
n. Appendix B13 - Incinerator Waste Management Plan, Version 5, July 2014.
o. Appendix B14 - Interim Closure and Reclamation Plan, Version 2, January 2014
p. Appendix B15 - Landfarm Design and Management Plan, Version 3, February 2013
q. Appendix B16 - Landfill Design and Management Plan, Version 2, March 2013
r. Appendix B17 - 2013 Water Management Report and Plan, Version 1, March 2014
s. Appendix B18 - Ammonia Management Plan, Version 1, February 2013
t. Appendix B19 - Dewatering Dike: Operation, Maintenance and Surveillance Manual, Version 3, September 2013
u. Appendix B20 - Tailings Storage Facility: Operation, Maintenance and Surveillance Manual, Version 3, September 2013
v. Appendix B21 - Mine Waste Rock and Tailings Management Plan, Version 1, March 2014
w. Appendix B22 - Operation and Maintenance Manual: Sewage Treatment Plan, Version 4, April 2013

2. Agnico Eagle Mines Ltd., 2014. NWB 2AM MEA0815: Response to NWB completeness reviews of the Type 'A' water licence renewal application. October 14, 2014

a. Appendix A - AEM Letter Proposed Water Level Trigger for Weekly Monitoring in TPL
b. Appendix B - AEM Freshet Action Plan
c. Appendix C - Meadowbank Mine, Assay Road Seepage Phase 2: Environmental Site Assessment and Engineering QA/QC, Report by Tetra Tech EBA, August 2014
d. Appendix D - November 28, 2013, Meadowbank Annual report workshop minutes
e. Appendix E - Laboratory Detection Limit

3. Golder Associates, 2014. Meadowbank Gold Project - Update to 2014 Interim Closure and Reclamation Plan Cost Estimate Using Reclaim 7.0. Technical Memorandum submitted to AEM, December 2, 2014.

In addition, the following reports, available on the Nunavut Impact Review Board (NIRB) ftp site, were retrieved and reviewed:

I. Agnico Eagle Mines Ltd., 2013. Meadowbank Gold Project 2012 Annual Report
II. Agnico Eagle Mines Ltd., 2014. Meadowbank Gold Project 2013 Annual Report
III. Golder, 2013. Report on 2012 Annual Geotechnical Inspection, Meadowbank Gold Mine, Nunavut. January 15, 2013. (Appendix B of AEM Meadowbank Gold Project 2012 Annual Report)
IV. Golder, 2014. Report on 2013 Annual Geotechnical Inspection, Meadowbank Gold Mine, March 2014. (Appendix B1 of AEM Meadowbank Gold Project 2013 Annual Report).

3.0 MINE DEVELOPMENT AND CLOSURE PLAN SUMMARY (PARAPHRASED FROM AEM)

As described in AEM's renewal application, the Meadowbank Mine is located in an area of continuous permafrost and consists of several gold-bearing deposits that will be mined until 2017. Ore is currently mined in three open pits. Dewatering dikes were constructed to allow for mining of ore beneath shallow lakes. Additional dikes were then constructed to contain and manage tailings within the tailings storage facility (TSF), which includes an attenuation storage pond and a reclaim pond. Tailings are potentially acid-generating (PAG) and are placed sub-aerially as a slurry. Water from the pond is reclaimed during operation. Mining has generated non-potentially-acid-generating (NPAG) and PAG waste rock, which to date have been stored at the Portage Rock Storage Facility (PRSF) and the Vault Rock Storage Facility.

An interim closure and reclamation plan was prepared by Golder Associates in January 2014 (Appendix B14), which updated the original closure and reclamation plan that was prepared by AEM in 2008. The closure objective is guided by the intended end land use of the area, based on stakeholder and local community consultation to date and consists of "*returning the project-affected areas to the 'natural' state"*. This includes re-contouring and re-grading the general mine area to promote proper drainage of surface runoff and to provide a ground profile

consistent with the surroundings. The open pit areas will be flooded to recreate open water areas. Once the re-flooded pits are full and acceptable water quality has been demonstrated, several dikes will be breached. The plan is to cover the waste rock storage facilities (WRSF) with a layer of NPAG rock that is intended to ensure geochemical stability of the PAG materials by insulating them and keeping them frozen. Similarly, the planned tailings management approach for long-term stability and control of acid rock drainage (ARD) is to encapsulate the tailings in permafrost; a closure cover of NPAG is planned to insulate the frozen tailings and to protect against erosion. Temperature measurements from limited thermistor strings installed around the perimeter of the TSF and WRSF indicate that to date, portions of these facilities are frozen. However, because of the active depositional nature of both facilities, no further thermistor strings were installed to date to determine the extent and distribution of frozen mine wastes.

An adaptive management approach has been adopted for completing the detailed engineering designs for closure. Detailed designs for re-flooding of the mine pits and for cover design of the tailings and waste rock storage facilities are ongoing or are planned to be initiated in 2015. AEM has repeatedly stated in their Response to NWB completeness reviews that, "*...AEM will submit the final closure and reclamation plan at least twelve (12) months prior to the expected end of mining (targeted date of Q3 2016)*."

4.0 GEOENVIRONMENTAL INCIDENTS AT MEADOWBANK MINE

Since mining began, there have been two geoenvironmental incidents that resulted in uncontrolled discharge of seepage waters that did not meet water quality criteria:

1. Seepage from the TSF through the PRSF, ultimately winding up in Lake NP-2 and
2. A cyanide leak from the mine mill.

BGC is of the opinion that the short-term measures implemented by AEM to manage these issues (described in Appendix B17 of the renewal application and in Appendix C of the Response to NWB completeness review, respectively) are appropriate.

5.0 TECHNICAL REVIEW AND INFORMATION REQUESTS

Detailed engineering design for re-flooding of the mine pits and cover designs for the TSF and WRSF have not yet been completed and so BGC has not made specific comments relative to these designs. Furthermore, AEM has not submitted its final closure and reclamation plan (expected to be due Q3 2016). Given the lack of specific and detailed engineering at the current stage, it can be expected that a number of specific technical issues may be noted and questioned at later review stages relative to the permitting process for the mine. AANDC should develop appropriate scope and budgets so that these detailed designs can be reviewed in detail when they have been submitted.

Table 5-1 summarizes BGC's initial concerns with the application and includes high-level recommendations and information requests directed to AEM. A total of eleven "items" were identified. AEM's written responses, as shared with participants of the January 14-15, 2015

technical review meeting, are also presented. AEM's responses for points 5.3 and 5.5 refer to development of designs for the final and closure and reclamation plan and have been abridged by BGC in the table. AEM's complete response to points 5.3 and 5.5 are presented as a note at the end of Table 5-1. In general, BGC is satisfied with AEM's response and commitments. Further technical review of AEM's design submissions, monitoring reports and final closure and reclamation plan will be required to confirm that AEM has adequately addressed the information requests or recommendations presented by BGC. Should the requested detail not be provided in their later submissions, additional questions and concerns may be raised. The information requests presented herein do not relieve the Engineer of Record of their responsibilities to provide a considered and complete design assessment.

Table 5-1. BGC Summary

BGC Reference	Renewal Application Reference	BGC Commentary from December 18, 2014 Letter			AEM Response (January 15, 2015)
		BGC Observation	**BGC Comment**	**BGC Request/Recommendation**	
5.1	Annual Monitoring Report Climate	The climate for a given year is not presented within the annual monitoring reports.	Climate data provide important input for interpreting site-specific geothermal aspects, such as the rate of mine waste freezeback and active layer thicknesses, for permafrost encapsulation of the mine wastes. In addition, the previous year's climate is useful for interpreting the hydrology and water balance for the site.	BGC recommends that the annual monitoring report summarize monthly climatic conditions at the Meadowbank site over a 12-month period. Data reported should include minimum/maximum air temperature, air thawing index, snowfall and rainfall, including any intense, short duration rainfall events. The monitoring report should discuss how the climate over the 12-month period compares to historical norms (e.g., relatively warm/average/cold or wet/dry). In the absence of long-term data at the mine site, comparisons can be inferred from nearby meteorological stations with a longer-term record, such as Environment Canada's station at Baker Lake.	*AEM collects climate data since 2008. AEM will summarize monthly climate condition at Meadowbank site and include it in its 2014 annual report.*
5.2	Annual Monitoring Reports; Mine Waste Rock and Tailings Management Plan TSF and RSF Freezeback Monitoring	AEM's annual monitoring reports describe tailings freezing and capping thickness to satisfy the following requirements: • As required by NIRB Project Certificate No. 004, Condition 19… Report to NIRB's Monitoring Officer for the annual reporting of freezeback effectiveness and • As required by Water Licence 2AM-MEA0815 Schedule B, Item 17: *A summary of on-going field trials to determine effective capping thickness for the Tailings Storage Facility and Waste Rock Storage Facilities for the purpose of long-term environmental protection*. In the 2012 and 2013 annual monitoring reports, AEM provided interpretations of ground temperature measurements on Saddle Dam 1 and Saddle Dam 2 (thermistors installed in 2009 and 2010, respectively). The tailings were reported to be frozen and the foundation soils and rock beneath the rockfill dike reportedly remained in a frozen state. Other thermistors have	The concept of permafrost encapsulation of mine wastes (PAG waste rock and tailings), which is being proposed for the Meadowbank Project, is technically feasible as a mitigative measure for managing ARD/ML in arctic mines, as discussed in INAC's 2007 *Mine Site Reclamation Guidelines for the Northwest Territories*. Current site conditions (climate and permafrost temperatures) are favourable for permafrost to aggrade into and persist within, the proposed mine waste deposits. Further monitoring and analyses will be required to relate aspects of acid generation (oxidation potential), evaluate the potential effects of taliks within and below mine waste deposits and assess the potential for cryo-concentration of solutes in tailings, including the collection and possible treatment of such impacted waters. Descriptions of the geothermal regime within the TSF and RSF in the annual monitoring reports and annual geotechnical inspections are merely factual and are not described in the context of whether they met expected performance. BGC acknowledges that the water licence did not specify comparing measured versus predicted performance for the TSF or RSF. However, the Mine Waste Rock and Tailings Management Plan (specifically, Section 8: Thermal Monitoring Plan) describes that the thermal monitoring results in the TSF and RSF "*… are and will continue to be used to evaluate the predicted thermal response of the facilities with the actual thermal response*". As AEM readies to prepare its final closure and reclamation plan, AEM must demonstrate that permafrost encapsulation of the mine wastes is technically feasible, including considerations of future impacts from climate change or from exothermic heat potentially released by oxidation. Closure costs will be significantly influenced by the thickness (quantity) of NPAG cover that will be placed over the tailings and PAG waste dump to promote permafrost encapsulation of these mine wastes. Closure costs will also be impacted by the collection and treatment of tailings pore waters and related monitoring, that may be expelled during tailings freezeback. AEM has collected and reported on over five years of temperature data that could be used to design the tailings and waste rock storage facilities, including cover thicknesses. Specific cover trials have yet to be initiated. To date, AEM has not assessed the available geothermal data, nor	BGC recommends that the annual monitoring reports include the following: 1. A map showing the mean bathymetry of the reclaim pond over the monitoring year and the area(s) of the TSF and RSF in which complete freezeback has been confirmed by thermistor measurements 2. Assessment of potential taliks under current water covers in tailings or thawed areas in waste rock relative to freezeback and cryo-concentration impacts 3. Discussion of measured versus expected thermal performance and active layer thicknesses (related to seasonal ambient air temperatures) 4. Interpretation of permafrost aggradation for all monitored instruments in the TSF and RSF (related to seasonal ambient air temperatures), including pore water pressure measurements within the TSF and RSF.	*Additional instrumentation will be installed during or near the end of operation and during active closure. Pertinent monitoring data and analytical discussions will be included in the Annual Reports which will include a comparison of the actual data versus the predicted results.* *Some of the BGC recommendations will be covered in the TSF NAG cover design work which will be included in the final closure and reclamation plan.*

BGC Reference	Renewal Application Reference	BGC Commentary from December 18, 2014 Letter			AEM Response (January 15, 2015)
		BGC Observation	**BGC Comment**	**BGC Request/Recommendation**	
		been installed more recently (since 2011) through the waste rock and tailings. The thermistor measurements are described in qualitative, factual terms, e.g., they are frozen or unfrozen (with 0˚C as the marker for frozen/unfrozen).	conducted geothermal analyses, to determine whether the measurements met expected performance or what the measurements tell us about the expected future permafrost conditions (i.e., distribution of permafrost temperatures, active layer thicknesses).		
5.3	Mine Waste Rock and Tailings Management Plan (Section 7.3.2, p. 48) Permafrost Encapsulation of TSF and RSF	The management plan states that, "*If, during monitoring, it is found that the freezeback of the dike and tailings deposit are occurring at a rate less than predicted, then enhancement by artificial freezing methods may be considered*."	Neither the rate or extent of permafrost aggradation into the tailings or waste rock storage facilities that is required, or even expected, for design, are explicitly described in the renewal application. Artificial freezing of mine wastes may be a very expensive and even impractical, undertaking, particularly during closure. Such contingency costs were not explicitly included in the 2014 closure and reclamation cost estimate.	BGC recommends that AEM clarify the design intent of permafrost encapsulation as a mine waste management strategy for the TSF and RSF. AEM must also clearly describe the benchmarks (e.g., rate and extent of freezeback, temperature of mine waste) that would trigger AEM to implement artificial freezing methods.	*AEM agrees with AANDC and is currently studying management strategies that will be incorporated in the final closure and reclamation plan. Refer to Note for specific AEM response.*
5.4	2013 Water Management Report and Plan (Appendix C: Rock Storage Facility Seepage) RSF Seepage	The Summer 2013 RSF seepage incident indicated that water from the TSF flowed through the RSF and ultimately, into Lake NP-2.	BGC is of the opinion that the measures implemented by AEM in response to this event were appropriate for the short term. However, the incident showed that there were zones within the RSF that were either unfrozen, or if they were frozen, they were initially porous, with many air-filled voids that did not prevent the flow of tailings seepage waters through the rockfill mass. Thus, it is possible that precipitation waters infiltrating the PAG stockpile may ultimately become released to the environment because the pore spaces are unfrozen and/or not ice-filled.	BGC recommends that AEM carry out the following: 1. Install piezometers within the RSF, including for cover trials, to show the possible presence or levels of liquid water within the RSF. The measurements should be described and assessed in the annual monitoring reports as part of discussions on freezeback effectiveness. 2. For the final closure and reclamation plan, conduct a water balance of the RSF, in terms of closure quantity and water quality, to determine closure water collection and treatment requirements. These items should be accounted for within the water balance and water treatment costs during closure.	*AEM is currently developing an instrumentation and monitoring program for the Portage RSF, in addition to the existing instrumentation already in place within the structure. This program will include additional geotechnical instrumentation and will be developed in collaboration with the RIME and the possibly of other experts. The program will be developed to obtain additional relevant information on RSF thermal behavior and to be complementary to the existing instrumentation already in place. AEM will explore the possibility of installing piezometers in the RSF as part of the instrumentation program; however AEM acknowledges that such a program including instrumentation, must be suitable to the site specific conditions of the Portage RSF. The data from monitoring of the RSF will be used for the completion of the final closure and reclamation plan.*

BGC Reference	Renewal Application Reference	BGC Commentary from December 18, 2014 Letter			AEM Response (January 15, 2015)
		BGC Observation	**BGC Comment**	**BGC Request/Recommendation**	
5.5	Interim Closure and Reclamation Plan, Section 2.3.4.5, p. 24. Geochemistry/ Oxidation	Mine tailings have both high potential for ARD and metals leaching (ML). Some of the pit rock have high potential for ARD, ML, or both.	Oxidation of mine wastes may cause exothermic reactions that could impact the rate of freezeback of the tailings and PAG waste rock or prevent full encapsulation of PAG materials in permafrost.	BGC recommends that studies be conducted and/or thermistors be installed, in the TSF or PAG areas of the RSF to assess if oxidation reactions of PAG waste rock or tailings are impacting the rate of freezeback. Such studies should form part of the cover trials that are being planned.	*AEM agrees with AANDC and is currently studying management strategies that will be incorporated in the final closure and reclamation plan. Refer to Note for specific AEM response.*
5.6	Freshet Action Plan, Section 2.2.1: North Cell Tailings Storage Facility, pp. 11-19. TSF and RSF Diversion Ditches at Closure	A number of diversion ditches have been constructed around the TSF and RSF to "*maintain their integrity and prevent any adverse environmental impacts*".	Currently, portions of the diversion ditches are susceptible to ponding or erosion due to blockages from snow or ice and require manual removal of the snow or ice with an excavator. It is unclear how the diversion ditches were sized and whether they are required during closure.	BGC requests clarification from AEM with respect to the requirement of water management structures around the TSF and RSF for closure. Design details, including hydrologic events for sizing of the channel and erosion protection requirements, should be included in the final closure and reclamation plan. Should snow and ice blockages need to be actively managed during closure, then those costs need to be specifically reflected in the closure cost estimate.	*Design details will be submitted in the final reclamation and closure plan one year prior to closure.*
5.7	Freshet Action Plan, Section 2.4 RSF Seepage, pp. 20-21. ST-16 RSF Seepage Management at Closure	It is understood that a permanent pumping system was installed at sampling location ST-16 to minimize migration of RSF seepage across this area and into Lake NP-2. The till plug, installed against the rockfill road, was only designed and constructed as an interim measure to minimize RSF seepage through the rockfill road.	RSF seepage management measures for this area at closure are unclear.	As part of the final closure and reclamation plan, water management plans for this area should be clarified. If specific measures or monitoring are to be included, then they should be explicitly stated in the closure cost estimate.	*Specific measures and monitoring for RSF seepage will be submitted in the final reclamation and closure plan one year prior to closure.*

BGC Reference	Renewal Application Reference	BGC Commentary from December 18, 2014 Letter			AEM Response (January 15, 2015)
		BGC Observation	**BGC Comment**	**BGC Request/Recommendation**	
5.8	Interim Closure and Reclamation Plan, Section 3.5 Closure Contingency Activities, pp. 80-81; Meadowbank Gold Project - Update to 2014 Interim Closure and Reclamation Plan Cost Estimate Using Reclaim 7.0. Closure Contingencies	The Type-A Water Licence 2AM-MEA0815, Part J - Conditions Applying to Abandonment, Reclamation and Closure, Item 1, requires that the interim closure and reclamation plan include contingency measures for all reclamation components, including action thresholds that are linked to the monitoring programs	The contingency measures described in the interim closure and reclamation plan are general and not detailed, particularly with respect to action thresholds linked to the monitoring programs. Therefore, it is difficult to assess whether the possible contingency measures have been adequately costed or validated against the 15% contingency allowance provided in the reclamation plan cost estimate.	As part of the final closure and reclamation plan, action thresholds and performance measures should be clarified. Scoping-level costs associated with implementing these contingency measures should be worked out to validate that the contingency costs are adequately covered in the reclamation plan cost estimate.	*AEM agrees.*
5.9	Interim Closure and Reclamation Plan Site Specific Closure Criteria	INAC's 2007 *Mine Site Reclamation Guidelines for the Northwest Territories* recommends that the Interim Closure and Reclamation Plan include specific closure criteria regarding reclamation components.	Many aspects of site-specific closure criteria have not been discussed in detail, such as: design hydrologic events for the design of water management structures; how climate change will be incorporated in the closure plan; design maximum credible earthquake for assessing structure stability; etc. Site-specific closure criteria will have a significant impact on engineered structures regarding both construction quantities and related costs. Following from this, it is likely that the costs developed for the final closure and reclamation plan will increase.	BGC recommends that the final closure and reclamation plan explicitly describe the design criteria for which structures are being designed for closure and reclamation.	*AEM agrees.*
5.10	Interim Closure and Reclamation Plan Other Deficiencies	The 2014 Interim Closure and Reclamation Plan was reviewed relative to the content guidelines presented in INAC's 2007 *Mine Site Reclamation Guidelines for the Northwest Territories*.	The 2007 *Mine Site Reclamation Guidelines for the Northwest Territories* suggested that the following elements be included in the Interim Closure and Reclamation Plan: 1. Updated reclamation research plan 2. Renewed or updated descriptions of the likely post-reclamation risks to human and wildlife health and the environment relevant to the information available (Risk Assessments). These two elements were not presented in detail in the interim closure and reclamation plan.	BGC recommends that these elements be included in the final closure and reclamation plan.	*AEM agrees.*

BGC Reference	Renewal Application Reference	BGC Commentary from December 18, 2014 Letter			AEM Response (January 15, 2015)
		BGC Observation	BGC Comment	BGC Request/Recommendation	
5.11	2014 Updated Reclamation Plan Cost Estimate	Indirect costs for engineering and project management were each assumed to be 5% of direct costs. Indirect costs for contingency were assumed to be 15% of direct costs. The mobilization/demobilization (mob/demob) cost line item was estimated to be $4.8M, based on some barge access and camp accommodation costs only.	The basis for developing the indirect costs was not explicitly described and so cannot be audited. As mentioned in Section 5.8, contingency measures were not described in detail in the interim closure and reclamation plan. Mob/demob cost line items typically include many more aspects, such as equipment, staff and materials transport and these costs can be significant for a remote northern mine site. Based on preliminary review, these costs appear low for a remote site such as the Meadowbank Project, where goods, equipment and labour will likely need to be brought in from distant sources.	For the final closure and reclamation plan, all indirect costs need to be detailed relative to a formal construction plan and rational construction schedule. Based on development of this plan and schedule, all indirect costs, including mob/demob, project management, engineering (including construction monitoring and field engineering) and contingency costs should be developed from actual requirements rather than by applying assumed percentages.	*AEM agrees.*

Note: Full AEM response to BGC References 5.3 and 5.5 is as follows:

"AEM agrees with AANDC. In 2013, AEM began working with Research Institute in Mines and Environment (RIME - UQAT) and consultants to ensure that the design controls for ARD in the tailings storage facility and waste rock storage facility encapsulation project and freeze control strategies will be effective and use the most up to date scientific knowledge. This, alongside using the most up-to- date climate change models will ensure sources of water pollution are controlled to protect nearby waterbodies and groundwater. This details will be submitted in the final reclamation and closure plan one year prior to closure."

6.0 LIMITATIONS AND CLOSURE

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We trust the above satisfies your requirements at this time. Should you have any questions or comments, please do not hesitate to contact us.

Yours sincerely,

BGC ENGINEERING INC.
per:

REGISTERED PROFESSIONAL ENGINEER
J.T.C. SETO
LICENSEE
NWT/NU
20 FEBRUARY, 2015

Jack T.C. Seto, M.Sc., P.Eng.
Principal Geotechnical Engineer

PERMIT TO PRACTICE
BGC ENGINEERING INC.
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Date 20 FEBRUARY, 2015
PERMIT NUMBER: P 285
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

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