



August 15<sup>th</sup>, 2017

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**Re: Agnico Eagle's response to Meadowbank Gold Project 2016 Annual Report and Recommendations**

Dear Ms. Granchinho,

As requested, the following information and comments are intended to address the recommendations outlined in response to the NIRB recommendations and comments in the letter dated July 6, 2017, Opportunity to Address Comments Received Regarding Agnico Eagle Mine Ltd.'s "Meadowbank Gold Project" 2016 Annual Report.

Should you have any questions or require further information, please do not hesitate to contact us at the below.

Regards,  
**Agnico Eagle Mines Limited – Meadowbank Division**

Regards,

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## **1 Environment and Climate Change Canada (ECCC)**

### **1.1 Dikes and Dams**

**Concern:** Section 3.1 Dikes and Dams indicates that there is currently no downstream seepage monitoring at the Bay Goose dike since the amount of seepage was determined not to be significant. Agnico Eagle Mines Ltd. (the Proponent) goes on to state that monitoring will continue to determine increases/decreases in seepage in this area.

**Recommendation 1:** ECCC recommends that the Proponent clarify whether or not monitoring is occurring at the Bay Goose Dike and at what intervals, as these statements are conflicting.

**Agnico Eagle's Response:**

*Seepage channels and water pond accumulation have historically been observed at the toe of Bay-Goose Dike in some areas (North Channel, Central Channel, Central Shallows, and Channel 3). There is currently no downstream seepage collection system at the downstream toe of the dike as the amount of seepage reporting downstream is currently too small to require such a system. Those small seepages do not have any contact with the surrounding lakes and are all located on the dry side of the dikes and dams. Part of the seepage is reported to the pits, including Goose pit where mining activity have ceased and where natural reflooding is occurring.*

*Flow from these channels has historically been monitored by various monitoring stations when flow of water is present. These stations consist of a plastic pipe installed in the various channels. The flow rate through the plastic pipe is manually calculated by measuring the amount of time required to fill a graduated bucket. As the flow in these channels is low or intermittent, these readings are taken once a week when the channels start flowing. In 2016, seepage rate was monitored once per week at station 6 (31+750), station 7 (30+640), station 8 (30+420) and station 9 (30+380) from the 5th of July to the 29th of September.*

*Agnico will continue to perform the inspection of the dike according to the description above and any increase of seepage observed during these inspections will be monitored.*

### **1.2 Predicted vs Measured Water Quality**

**Concern:** In comparing measured water quality values to predicted values in Section 4.6 Predicted vs Measured Water Quality, the Proponent suggests differences greater than +/- 20% potentially being attributed to laboratories having detection limits higher than the predicted values.

**Recommendation 2:** ECCC recommends that the Proponent seek out laboratories that have low enough detection limits to be able to properly assess samples.



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### **Agnico Eagle's Response:**

*Agnico Eagle will continue to update its water quality model using the best information available. The information contained in section 4.6 of the 2016 Annual Report is based on the comparison of actual water quality obtained from samples taken on site, with prediction provided in the FEIS water quality model. Agnico intends to continue the comparison as required by the Water License. Additionally Agnico complete yearly an updated water quality forecast for the Meadowbank site, as required by the Water License. Updated annually, this model is developed to predict water quality at closure. The model uses the most recent data from on-site sampling to update the forecast model. Sample results used for modelling are from analysis conducted by an accredited laboratory.*

*The laboratory services selected by Agnico are conducted by accredited facilities and reach the analysis lower detection limits (LDL) where the results can be compared to the CCME guidelines. Agnico Eagle will continue to ensure that the accredited laboratory can reach the required detection limits.*

**Concern:** Section 4.6 also shows additional parameters that exceed Canadian Council of Ministers of the Environment (CCME) guidelines in the measured pit water quality between 2015 and 2016, however these parameters are not discussed.

**Recommendation 3:** ECCC recommends that the Proponent provide a discussion on any new exceedances of guidelines (i.e. reason for exceedance and any planned mitigation to address it). The Proponent should also provide a discussion on any parameters that no longer exceed guidelines (i.e. measures used to address exceedance, what worked and what did not).

### **Agnico Eagle's Response:**

*Agnico acknowledges the comment from ECCC, and will provide in the next water quality forecast a discussion on any new exceedances of guidelines and on any parameters that no longer exceed guidelines.*

*In next year's report, a comparison table will be added to summarize which parameters are higher and lower than the CCME guidelines in each pit for the current and previous year (i.e. 2017 and 2016).*

*It should also be noted that a yearly updated water quality forecast is available in the 2016 Water Management Plan and Report, developed to predict water quality at closure within the pit areas. The model uses the most recent data from on-site sampling to update yearly the forecast model. Details for different parameter trends are also included in the forecast model.*



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## 1.3 Recommendations for Additional Mitigation or Adaptive Management

**Concern:** Section 12.2.4 Recommendations for Additional Mitigation or Adaptive Management states that "Additional mitigation to reduce waterfowl mortalities was implemented in 2016, including increased monitoring of the tailings storage facility (daily) during the waterfowl migratory period, and increased frequency of deterrent use if required. These management actions successfully reduced mortalities related to the TSF."

**Recommendation 4:** ECCC recommends that the headings listed in Table 12.5, "Proposed Monitoring Methods" and "Monitoring Conducted (2016)", be updated to include daily monitoring of waterbirds at the tailings storage facility (TSF). The table/information in the 2017 report should also be updated.

**Agnico Eagle's Response:**

*Proposed mitigation measures have been included in Table 12.5. and will be part of 2017 annual report. We have highlighted the excerpt from Table 12.5.*

**Table 12.5. Terrestrial impacts and associated effects predicted in the FEIS, proposed monitoring, actual monitoring (2016) and any observed impacts (2016). Adapted from Table 10.1 in the 2015 Wildlife Monitoring Summary Report (Appendix G13 of the 2016 Annual Report). Measured impacts exceeding or potentially exceeding impact predictions/thresholds are indicated in grey.**

Potential Impact	Potential Cause(s)	Proposed Monitoring Methods	Monitoring Conducted (2016)	Threshold/ Prediction	Measured Impact (2016)
<b>Waterbirds</b>					
Disturbance of Nesting Waterfowl	Noise and Activity; dewatering	Waterfowl Nest Surveys; <b>Monitoring of the TSF during migratory period; Deterrent use if required</b>	Waterfowl Nest Surveys; Ground Surveys; <b>Monitoring of the TSF during migratory period; Deterrent use when required</b>	One nest failure per year	No waterfowl nesting onsite identified
Exposure to Contaminated	Mine site dust; Secondary	Vegetation and Soil	Not scheduled in	No excess mine-related	N/A





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Potential Impact	Potential Cause(s)	Proposed Monitoring Methods	Monitoring Conducted (2016)	Threshold/ Prediction	Measured Impact (2016)
Water or Vegetation	containment structures and tailings storage facilities	Samples	2016	risk	
Project-related Mortality	Vehicle/ bird collisions	Ground Surveys, Collision Reporting System	Ground Surveys, AWAR Road Surveys	One mortality per year	One duck entrapped in gill nets and killed during Phaser Lake fishout

### 1.4 Water Management Plan (Appendix C - 2016 Meadowbank Water Quality Forecasting Update)

**Concern:** For the metal parameters in Figure 2-1, only dissolved values are shown. ECCC acknowledges that in this annual report the Proponent completed analysis on both total and dissolved values, however, this was not included for the water quality forecasting figures.

**Recommendation 5:** ECCC recommends that the Proponent also provide the total form data and include it in the water quality forecasting figures.

**Agnico Eagle's Response:**

*For 2016, Agnico compared previous year forecast with current measured value. The previous year's forecast was based on dissolve values only. In the 2017 report, the forecasted and measured total and dissolved concentrations in the North and South Cell TSF Reclaim Ponds for specific parameters of concern will be compared.*

**Concern:** ECCC notes that the legend for dissolved copper concentration in Figure 2-1 is not complete as it does not include all categories from the figure.

**Recommendation 6:** ECCC recommends that the legend be updated to include all categories.

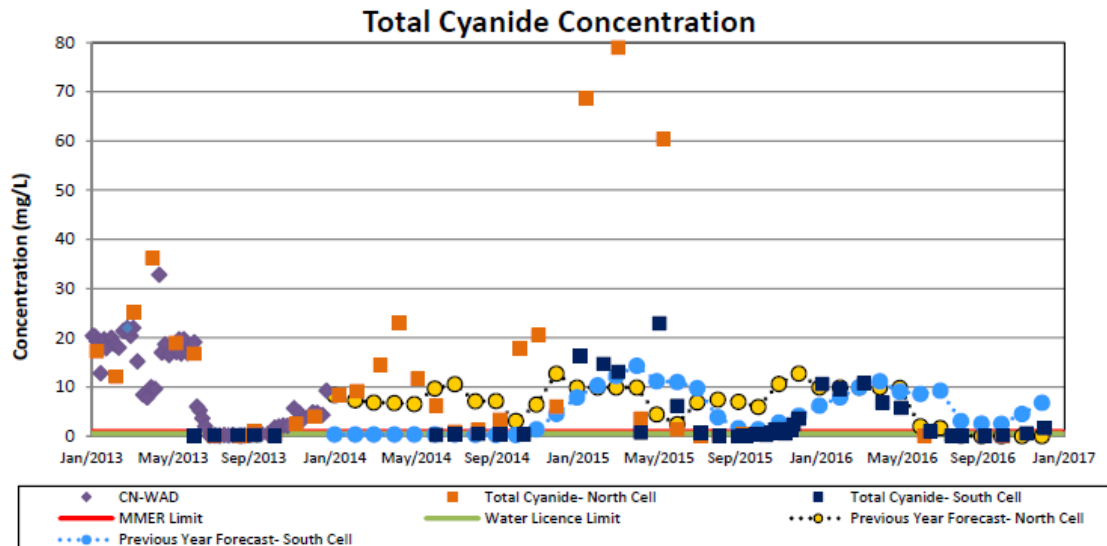
**Agnico Eagle's Response:**

*There has been an error in the formatting of the legend for the dissolved copper concentration in Figure 2-1. The legend box was not extended enough and thus, does not show legend item "Previous Year Forecast – South Cell". You'll find the figure with the updated legend below.*



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Figure 2-1: Concentration in the North and South Cell TSF Reclaim Ponds



**Concern:** ECCC acknowledges the new analysis based on total concentrations rather than only using dissolved concentrations as presented in Section 4.2.4 Forecasted Concentration in Portage and Goose Pits.

**Recommendation 7:** However, the rationale that although total concentrations are above Canadian Council of Ministers of the Environment (CCME) guidelines, there is no concern if the dissolved concentrations are below the guidelines should not be used. CCME guidelines are based on total concentration and therefore dissolved concentrations cannot be compared to CCME guidelines.

## **Agnico Eagle's Response:**

*Agnico acknowledges that the CCME guidelines should be compared to only the total forecasted concentrations. The reason for comparing the forecasted dissolved concentrations to the CCME guidelines was to highlight any parameters that will remain a parameter of concern even when efforts were brought forth to limit the suspended solids fraction in the pit water column. These dissolved parameters would require further treatment to precipitate them out of the pit water column.*

*For 2017 report, only total forecasted concentrations will be compared to the CCME guidelines. However, the water quality forecast model will still consider the dissolved concentration. The results from the total and dissolved concentration forecasting will be*



*used to adjust the model against the measured concentrations in the North and South Cell Reclaim Pond and in the Portage and Goose Pits.*

**Concern:** Section 4.2.4 also states that forecasted concentrations of silver are lower than CCME guidelines compared to the 2015 forecast when silver was a contaminant of concern. This is due to the 2016 model considering a lower silver loading from the mill effluent based on measurements taken.

**Recommendation 8:** ECCC recommends that the Proponent provide a description of the changes in mill/mine process that resulted in these lower silver concentrations.

**Agnico Eagle's Response:**

*Agnico considered that the variation of silver is due to difference in the geological lithology of zones mined.*

## **1.5 Air Quality and Dustfall Monitoring Report**

**Concern:** Incineration loads are not clearly defined in the log books, reports, or stack testing results. The load (volume) treated, relative to the capacity of the incinerator, has an impact on the efficiency of the treatment and the effective reduction of dioxins and furans released during incineration activities.

**Recommendation 9:** ECCC requests that the Proponent clearly indicate the capacity of the incinerator and indicate in log books the volume of waste treated in the incinerator relative to the capacity of the incinerator (e.g. percentage of max load). ECCC also recommends that the Proponent provide information on whether the stack tests were conducted under load conditions typical of burns conducted throughout the year.

**Agnico Eagle's Response:**

*The quantity of waste being incinerated is averaging 1,750 kg per day during operations with a camp size of approximately 520 persons during operations. The incinerator has an approximate incineration capacity of 175 kg/h based on a 10 hours burn cycle. If this cannot be achieved, the primary chamber can be used as storage. According to the Eco Waste Solution, the type of waste that is used never exceeds the weight limit. To ensure maximum efficiency, 3 quarters of the chamber has to be filled to ensure that the gas outlet of the primary chamber is never blocked. The system has a sizable front door for easy access to manually load feed waste into the unit with a front end loader. Dry waste (paper, cardboard) and wet waste (organic matter including food) are layered to ensure proper combustion and maximum efficiency according to the incinerator operational instructions. The batch cycle for the Primary Chamber typically lasts approximately 10 hours for the burn cycle and is followed by a cool down of approximately 6 hours. The Secondary Chamber operates with a retention time of approximately 2 seconds. As this procedure is followed by all trained incinerator operators, it is considered that the stack tests were conducted under load conditions typical of burns conducted throughout the*



*year. In 2016, stack testing was done from June 30<sup>th</sup> to July 3<sup>rd</sup> and conducted under load conditions typical of burns conducted throughout the year.*

*Agnico will modify the logbook to indicate more clearly the total estimated volume used of the operational capacity of the primary chamber.*

## **1.6 Wildlife Monitoring Summary Report**

**Recommendation 10:** Consistent with ECCC's concerns presented during the Whale Tail Pit Project review, ECCC recommends the following changes to the Terrestrial Ecosystem Management Plan (TEMP):

- a. Tailings storage facility monitoring should include shorebirds
- b. Semipalmated Sandpiper be added as a wildlife receptor of concern to the Wildlife Screening Level Risk Assessment Plan
- c. Ingestion of water and sediment at the TSF as potential pathways of exposure to contaminants should be added to the Wildlife Screening Level Risk Assessment Plan
- d. Develop a waterbird mitigation plan related to fish-outs

The Proponent committed to incorporating these changes through the Whale Tail Pit Project review (i.e. Information Request Responses and Technical Meeting commitment list). In addition to the above, ECCC should be included in all mine site incident reports involving migratory birds as a standard procedure.

**Agnico Eagle's Response:**

*Agnico Eagle agrees with ECCC and has incorporated these recommendations into the TEMP and associated monitoring plans.*

**Concern:** Following an incident in 2016, the Proponent conducted an assessment of trends in waterfowl mortalities at the Meadowbank site. Issues identified in the assessment include the use of the TSF and waterbird by-catch during fish-outs.

**Recommendation 11:** Recommendation's to address these specific issues are made in Section 6.7 Management recommendations.

These issues are similar to concerns identified by ECCC during the Whale Tail Pit Project review. Although the Whale Tail Pit Project is still under review, through the environmental assessment process, the Proponent has, as indicated above, committed to the development of a fish-out plan and improvements to Meadowbank TSF monitoring and wildlife health risk assessment. The Proponent has consulted ECCC in the plan development and the structure can be adjusted to future fish-outs. These additional measures will help to lessen site-specific issues related to migratory birds by refining mitigation and improving adaptive management.



**Agnico Eagle's Response:**

*Agnico Eagle acknowledges ECCC comment and will make sure to continue monitoring the TSF and to follow the plan for future fish-outs.*

**Concern:** A merganser was incidentally caught in gill nets during the Phaser Lake fish-out. The local Conservation Office was notified but ECCC was not (Appendix C - Wildlife Mortality Reports).

As a reminder, ECCC has management responsibilities for all migratory birds pursuant to the Migratory Birds Convention Act and should be notified when interactions and mortality incidents involving migratory birds occur. The Waterbird Mitigation Plan proposed for the Whale Tail Pit Project fish-out should prevent this reporting oversight from occurring in future fish-outs. However, it is important that the Proponent expand reporting to ECCC for migratory bird incidents during all site activities. Engaging ECCC early will allow assessment of further risks to migratory birds and possible adaptive management recommendations.

**Recommendation 12:** ECCC recommends that the Proponent revise site-specific wildlife reporting protocols to include ECCC when migratory birds are involved.

**Agnico Eagle's Response:**

*Agnico Eagle acknowledges ECCC comment and will make sure to include ECCC in communication when incidents concerning migratory birds are reported.*

## **2 Government of Nunavut (GN)**

### **2.1 Appendix J6, Socio-economic Monitoring report. Summary of findings table, 9.2 Use of GN Health Services**

**Concern:** "Overall, per capita health centre visits in communities with the most Meadowbank employees (Baker Lake, Rankin Inlet, and Arviat) have not increased significantly since Meadowbank began operating (i.e. consistent or lower than 2006/2007 levels). The number of employees referred to their community health care centres for personal or work-related reasons ranges (from 14 to 58 people per year), though it is difficult to draw a relationship between movement of this indicator and use of GN Health Services.

Pg 65 Since the mine began production, between 14 and 58 employees are referred to community health care centres per year. The number of referrals have been highest in recent years (2013-2015). Referrals for work-related reasons may represent increased demand on GN health services. However, this data alone does not indicate:

- Whether a Meadowbank worker, on average, is a higher user of health care services than other workers or unemployed people
- To what extent these referrals are for work related reasons
- To what extent referrals are reflected as visits to GN versus provincial health centres



Furthermore, there is a possible counter effect where employees use on-site medical services in lieu of GN health services while on rotation. Therefore it is difficult to draw a relationship between movement of this metric and use of GN Health Services."

Population data and health center visits have been reviewed for Baker Lake. Data shows that the general population has increased from 1935 people in 2012 to 1996 people in 2015 (Nunavut Bureau of Statistics). In the same time period health center visits by beneficiaries has increased from 10,618 to 14,926. This would indicate that a counter effect of the on-site medical services is not occurring in Baker lake. For the same time period other communities across Nunavut have seen rates remain relatively the same.

Specific statistics are not available to distinguish mine workers or visits due to mine related activities. Consultation with Baker Lake Health Center staff have noted visits related to injury associated with binge drinking; Family violence from spousal disputes when individual returns home after accusation of extramarital affair; children being parented by others while parent(s) work at the mine resulting in missed school, poor diet causing obesity; Increase in STI rates; Mental Health consultations due to stress of being away from spouse or family.

In addition to an increase in visits from the above list, additional referrals (3 – 4/week) are being taken by the health center dealing directly with 'Fit to Work' forms required by the mine and health insurance provider.

**Recommendation 1:** The GN recommends that the proponent and other appropriate stakeholders discuss the above issues at the next Kivalliq Socio-Economic Monitoring Committee meeting.

**Agnico Eagle's Response:**

*Agnico welcomes discussion of the above issues at the next Kivalliq Socio-Economic Monitoring Committee meeting. Considering many of the issues brought forth are from consultation with Baker Lake Health Center staff, Agnico would further welcome the participation of the appropriate representative of the Center at any future Committee meetings.*

**2.2 Appendix J6, Socio-economic Monitoring report. Pg 52, Table 11 and Table 12**

**Concern:** "Agnico Eagle is a partner and investor in the Kivalliq Mine Training Society (KMTS). In 2014, the KMTS established a community based Family Network program. This program was cancelled in 2015 and replaced with a "work ready" program. The work readiness program is a one week program that is delivered at the community level. The program is intended to prepare potential employees with the information and tools to cope with working in an industrial camp setting away from home for 2 week work rotations.

In 2015, the fly-in fly-out (FIFO) program was reviewed and amended and is now called the "Making It Work Program". Spouses of employees come to Meadowbank to experience what mining life is like at Meadowbank. The program includes spousal counselling sessions on



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effective communications, financial management, conflict resolutions and healthy living. The work readiness program was taken by 155 people, Making it work taken by 64 people."

The program delivery is a benefit to the community as a whole. The report does not include effectiveness of the course or evaluation of the course by those that have taken it.

**Recommendation 2:** The GN recommends that the proponent consider surveying the participants of the Work Readiness Program and the Making It Work program or perform a satisfaction survey to evaluate the delivery of the programs and consider this feedback in future program delivery.

**Agnico Eagle's Response:**

*In regards to the Work Readiness program, there is a survey component which is completed by participants at the end of the program. This survey asks questions and opinions of the participants in regards to the overall training session, the training material, the trainer, the facility, and whether or not they feel the training will be beneficial to them. They are also encouraged to share any other thoughts they may have about what they would change about the course as well as their most important take away from it.*

### 2.3 Appendix J6, Socio-economic Monitoring report.

**Concern:** "• Housing - Rent increase is also listed as common reason for employees leaving mine site jobs.(Pg 20)

- Housing - While Baker Lake had one of the highest percentages of people on the waiting list in 2010, other communities with fewer Meadowbank employees, including Naujaat and Whale Cove, had similar rates. Additional data on changes over time will be required to assess the potential impact that Meadowbank may have had on demand for and availability of public housing. (pg 56)

- Infrastructure - Housing is not listed in any of the material supplied in the infrastructure section. (pg 62)

- Social Assistance -The number of social assistance caseloads, as a fraction of the population, declined by more than 50% from 2006 to 2011 in Baker Lake, coinciding with construction at Meadowbank and the opening of the mine. The number of caseloads increased again between 2011 and 2015, but has remained below 2007 levels. (pg. 66)"

- NHC has made changes to the Public Housing Rent Scale system. Effective February 1st, 2014, NHC enacted changes which affect how the rental subsidy is calculated. Rents will now be calculated from the primary tenants' income only. The income of other working tenants in the household will not affect the rent.

- NHC recommends that housing be measured as part of VSEC 9: Community Infrastructure and Services. While it is important that Housing is listed as an Indicator is included in VSEC 7: Individual and Community Wellness, it is important for housing





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demand/availability, to be considered as a determinate of economic wellbeing (social assistance) of the community.

- The proponent continues to use the 2010 wait lists. The NHC has developed improved methods of measuring housing needs. The proponent would benefit from including the Data from this enhanced collection methodology.

- As noted in Northern Health's Guidebook for Community Leaders – Health Happens in Communities,

(<https://www.northernhealth.ca/Portals/0/About/PositionPapers/documents/HHCGuidebookV35May2015.pdf>) determining how risk factors impact health conditions is complex. It is noted that focusing upstream on social determinants of health can help in creating a supportive upstream environment. Creating a supportive environment is one of the 5 strategies listed in the World Health Organization international resolution The Ottawa Charter for Health Promotion. Housing is one of the main social determinants of health.

- Housing is often linked to many other health indicators such as disease transmission and mental health related issues. As noted in the Meadowbank 2016 Annual Report, overcrowding occurs across the territory. Although the report notes the existing state regarding community wellness, the report does not note programs by the proponent to improve community wellness. The current community we plan in Baker Lake is attempting a number of strategies including healthy eating, literacy, suicide prevention, reduction in problematic substance use and safe sex.

- Given the high mine employment rate from the community of Baker Lake, home ownership at only 22%, Overcrowding at 41% and major repairs at 43% a housing initiative would address a number of community wellness areas.

**Recommendation 3:** • The NHC requests that the proponent disseminate the Rent Scale changes to all employees to ensure they have a thorough understanding of the new system. We recommend that this information be included in their "Community Wellness Program" so that the most accurate information is distributed to employees

- We recommend that housing be included in the VSEC 9: Community Infrastructure and Services

- We suggest the proponent work with NHC to incorporate the updated Needs Lists (wait list) into their SEMP.

- It would benefit the community for the proponent and other stakeholders to form a working group on addressing sustainable housing initiatives to reduce the above related conditions. A pilot program could be initiated in Baker Lake to determine the feasibility of initiative(s) of the working group.

### **Agnico Eagle's Response:**

*In regards to the "Making it Work" program, there is currently no formal survey component which is used at the end of the program. However, once the course has concluded, the on-site HR Inuit Agent will speak with the supervisor(s) of the Inuit employee(s) who took part in the program in order to see if there has been a change in their behavior since completing it. Moving forward, the recommendation of the GN to*





*include a survey component will be analyzed and considered in order to further evaluate this program's efficiency.*

**2.4 Meadowbank Gold Project – 2016 Annual Report, Pg 170 and Meadowbank Gold Project – 2016 Annual Report, Appendix 1, Management Plans Part 2, Landfill Design and Management Plan. Pg 15**

**Concern:** "Thermal modelling indicates that the tailings will freeze in the long term, and that the talik that currently exists below 2PL Arm will freeze before seepage from the TSF will reach the groundwater below the permafrost. The tailings are potentially acid generating (PAG) therefore a cover of NPAG material will be placed over the tailings to physically isolate the tailings and to confine the active layer within relatively inert materials."

The information provided notes that leachate is weak and further that it will become part of the permafrost layer. The reports do not provide any predictions on timeframes or outcomes should the permafrost layer containing the leachate melt.

**Recommendation 4:** The proponent should include leachate characterization and outcomes of the leachate on the water system should it not be incorporated into the permafrost or thaw due to climate change, in their next annual report.

**Agnico Eagle's Response:**

*Agnico does not solely rely on the thermal properties of the TSF cover but also on the tailings being saturated which reduce oxidation and acid rock drainage potential. The objective of the cover system of the TSF is to maintain the tailings material below 0°C under most conditions and to maintain saturation above 85%. The saturation of the tailings will reduce the tailings reactivity should part of the upper region of the tailings mass thaw during a warm year event.*

*To achieve the goals and criteria for the reclaimed TSF, the final design will consist of an engineered cover system including landform that promotes water shedding from all surfaces of the TSF. The design for the engineered cover system will consist in a layer of compacted NPAG waste rock (soapstone) of a minimal thickness of 2.0 m. The design basis will promote chemical stability of the tailings in the event that the maximum air average temperature increases over the forecasted temperature.*

*The 2.0 m thick cover will be the minimal cover thickness required by the design for the landform. Agnico is planning to grade this cover in order to divert water out of the TSF and to optimize freezeback; thus the cover is expected to be much thicker than 2.0 m in most areas of the TSF. The TSF Landform final design will be included in the Final Closure and Reclamation Plan.*



### 3 Indigenous and Northern Affairs Canada (INAC)

#### 3.1 General Monitoring

**Recommendation 1:** As INAC recommended in its review of Agnico Eagle Mines Ltd.'s (AEM) Meadowbank Gold Project 2015 Annual Report, it would be constructive if AEM were to develop and include a table to track the recommendations presented in the supplementary documentation provided as part of the Annual Report, such as the annual geotechnical inspection report (produced by Golder Associés Ltée or Golder) and reports produced from meetings held by the Meadowbank Dike Review Board (MDRB). This table would help to ensure the follow up of potential issues, such as information regarding whether a recommendation was adopted, how it was implemented and/or the rationale as to why a recommendation was not considered. In INAC's review of the materials for the 2016 Annual Report, it was difficult to determine if the recommendations from the previous year were implemented and if the recommendations from this year were incorporated in the upcoming activities. Examples of recommendations that could not be tracked include the following:

From 2015 Annual Report

- Recommendation to monitor the water quality of the ponding occurring at Stormwater Dike to determine whether or not the water is seepage from the North Cell.
- Recommendation to flag the piezometers that recorded data below 0°C in the past and to account for that in interpretation of the data as they might be broken.

From 2016 supplementary documentation

- Recommendations from the MDRB relating to verification of causes of shear movements within Stormwater dike and establishing supportive evidence for mitigation measures to reduce potential creep displacement.
- Recommendations from 2016 Annual Geotechnical Inspection by Golder related to Geotechnical Instrumentation.

The above list is not inclusive of all recommendations that could not be tracked. As highlighted by the difficulty to track recommendations from 2015 reports, INAC also recommends that this tracking be carried over from year-to-year, so that any recommendations deferred to be completed in subsequent years, will be addressed in the following year's Annual Report.

**Agnico Eagle's Response:**

*In the 2016 Annual Report, Agnico included the responses and action plan related to the MDRB recommendations, along with the MDRB report in Appendix B2. Agnico also included the responses and action plan regarding the recommendations of the 2016 Annual Geotechnical Inspection, along with the inspection report in Appendix B1. The responses and action plan were also provided in the same format for the Annual Report 2015. The Agnico responses provided in the 2016 Annual Report are attached in Appendices 1 and 2 of the present document for your review.*



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*Agnico believes that providing responses to the MDRB report and Annual Geotechnical Inspection in the actual format used for the 2015 and 2016 Annual Report is adequate and answers to the conditions 11 and 12, Part I of the Water Licence 2AM-MEA1525. The Annual Report 2017 will also include the responses to the MDRB report and 2017 Annual Geotechnical Inspection.*

### 3.2 Central Dike Seepage

**Recommendation 2:** Seepage at the downstream toe of the Central Dike identified in 2014 was still observed in 2016, for which AEM has implemented several mitigations. Both Golder and the Meadowbank Dike Review Board who are monitoring the issue presented recommendations to AEM in their respective reports: “Report: 2016 Annual Geotechnical Inspection” (Appendix B1) and “Meadowbank Dike Review Board Reports” (Appendix B2). INAC found AEM’s responses to the recommendations made in these two reports at the end of Appendix B1 and Appendix B2. INAC advises that these recommendations and the accompanying responses be included directly in the relevant sections of annual report and not in appendices. Furthermore, INAC would like to see AEM implementing this practice for all subsequent years would additional significant issues be identified.

**Agnico Eagle’s Response:**

*Agnico Eagle acknowledges INAC comment and will include the recommendations and the accompanying responses directly in the relevant sections of the forthcoming annual reports for the Central Dike seepage.*

### 3.3 Water Quantity and Quality Predictions

**Concern:** Section 4.6 “Predicted VS Measured Water Quality” presents the methodology to compare between the predicted and measured values for water quantity and water quality. Two different methods are used for each category, but no rationale is presented to support the difference in calculations. The two methods yield two different results which affect the determination of what constitute a difference greater than 20% and ultimately affects reporting requirements.

**Recommendation 3:** INAC recommends that AEM justifies the choice of methodology.

**Agnico Eagle’s Response:**

*The percent difference formulas used to assess the difference between the water quantity and water quality used for the 2016 Annual Report were the same formulas used in the comparison of the 2015 Annual Report.*

*For the 2017 Annual Report, it is recommended that the predicted and measured values for water quality and quantity be compared using the “% Difference” formula.*



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The following tables present the % Difference for 2013 to 2016 and compare the results to the Relative % Difference. Though the values are different, they provide similar conclusions.

**Water Quantity Year 3^ (2012)**

<i>Pits</i>	<i>Predicted (m<sup>3</sup>)</i>	<i>Measured (m<sup>3</sup>)</i>	<i>Relative % difference between predicted vs measured</i>	<i>% Difference between predicted vs measured</i>
<i>Portage</i>	<i>931,800</i>	<i>1,026,000</i>	<i>10</i>	<i>10</i>
<i>Bay Goose</i>	<i>1,235,100</i>	<i>499,000</i>	<i>-85</i>	<i>-60</i>

**Water Quantity Year 4^ (2013)**

<i>Pits**</i>	<i>Predicted (m<sup>3</sup>)</i>	<i>Measured (m<sup>3</sup>)</i>	<i>Relative % difference between predicted vs measured</i>	<i>% Difference between predicted vs measured</i>
<i>Portage</i>	<i>931,800</i>	<i>676,706</i>	<i>-32</i>	<i>-27</i>
<i>Bay Goose</i>	<i>1,235,100</i>	<i>344,994</i>	<i>-113</i>	<i>-72</i>

**Water Quantity Year 5^ (2014)**

<i>Pits**</i>	<i>Predicted (m<sup>3</sup>)</i>	<i>Measured (m<sup>3</sup>)</i>	<i>Relative % difference between predicted vs measured</i>	<i>% Difference between predicted vs measured</i>
<i>Portage</i>	<i>715,200</i>	<i>165,877</i>	<i>-125</i>	<i>-77</i>
<i>Bay Goose</i>	<i>1,235,100</i>	<i>307,769</i>	<i>-120</i>	<i>-75</i>
<i>Vault Pit</i>	<i>46,100</i>	<i>101,617</i>	<i>75</i>	<i>120</i>

**Water Quantity Year 6^ (2015)**

<i>Pits**</i>	<i>Predicted (m<sup>3</sup>)</i>	<i>Measured (m<sup>3</sup>)</i>	<i>Relative % difference between predicted vs measured</i>	<i>% Difference between predicted vs measured</i>
<i>Portage</i>	<i>715,200</i>	<i>136,627</i>	<i>-136</i>	<i>-81</i>
<i>Bay Goose</i>	<i>1,235,100</i>	<i>383,800</i>	<i>-105</i>	<i>-69</i>
<i>Vault Pit</i>	<i>46,100</i>	<i>111,336</i>	<i>83</i>	<i>142</i>

**Water Quantity - Year 7^ (2016)**

<i>Pits**</i>	<i>Predicted (m<sup>3</sup>)</i>	<i>Measured (m<sup>3</sup>)</i>	<i>Relative % difference between predicted vs measured</i>	<i>% Difference between predicted vs measured</i>
<i>Portage</i>	<i>715,200</i>	<i>132,359</i>	<i>-138</i>	<i>-81</i>
<i>Bay Goose</i>	<i>1,235,100</i>	<i>352,431</i>	<i>-111</i>	<i>-71</i>
<i>Vault Pit</i>	<i>55,600</i>	<i>54,964</i>	<i>-1</i>	<i>-1</i>

**Concern:** Page 28 of the 2016 Annual Report details results of the comparison between predicted seepage and groundwater sources and volumes and the measured volumes from Portage, Goose and Vault Pits. Results from Portage and Goose indicate that significantly less



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water was actually flooding the pits than predicted. Although it is mentioned that flooding sequence and volumes are updated to account for the measured inflows.

**Recommendation 4:** INAC recommends that AEM discusses the probable causes of the discrepancies and how these results could affect the re-flooding plans.

**Agnico Eagle's Response:**

*The reduced volumes observed in Portage and Goose Pits are attributed to the lower volume of seepage flow rate entering the pit.*

*With regard to Vault Pit, the higher volume observed in 2014 could also be attributed to higher freshet volumes, similarly observed in 2015. In 2014 and 2015, Agnico pumped out from the pit 101,617 m<sup>3</sup> and 111,336 m<sup>3</sup> respectively. In 2016, only 54,964m<sup>3</sup> was pumped out.*

*The water balance which includes the volumes required for pits reflooding takes into considerations the updated inflows values. The pits reflooding sequence and schedules is taken into consideration the end of mining activities in the pits, the amount of natural inflows and precipitation, as well as the limits of freshwater use for reflooding from the lakes prescribed in the Water License. No major changes to the reflooding volumes and schedules are occurring due to the smaller volumes of natural inflows.*

**Concern:** Pages 28-33 of the 2016 Annual Report detail comparison between predicted and measured water quality values. In 2016, almost all the parameters of concern show significant divergence from predicted values. The results also highlight an increase in the number of parameters that are exceeding predictions from year to year since 2012.

**Recommendation 5:** INAC recommends that AEM includes a discussion of the probable causes of these discrepancies, the mitigation measures that could address those causes and the potential long term effects on water quality in the flooded pits. Furthermore, AEM should comment on the increasing trend in number of parameters exceeding the predicted values, the probability of this trend to continue until closure and the specific changes to water management required to address the increasing trend.

**Agnico Eagle's Response:**

*As presented at page 33 of the 2016 annual report, Agnico Eagle suggests several possible reasons for differences greater than +/- 20% between predicted and measured values:*

- Management of seepage, groundwater and local runoff results in reduced volume of water available to attenuate loads reaching pits;*
- Higher contaminant loads in pit water could be related to higher observed loads in seepages flowing into pits;*
- Some parameter detection limits are higher than predicted values (e.g., for dissolved metal analysis);*



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- *Un-ionized ammonia concentration in water is highly influenced by pH (higher pH = higher fraction of un-ionized ammonia);*
- *Pit water has higher background values of many parameters (e.g., ammonia, nitrate due to explosive activity during pit activity; runoff and seepage in contact with potentially acid generating [PAG] rock).*

*A yearly updated water quality forecast is available in the 2016 Water Management Plan and Report (appendix C2 of the 2016 Annual Report), developed to predict water quality at closure within the pit areas. The model uses the most recent data from on-site sampling to update yearly the forecast model. Details for different parameter trends and comparison to regulatory limits and guidelines are included in the forecast model report. Parameters that may require treatment at closure are presented in the report. Treatments options are also presented, as well as recommendations in order to improve the quality of the model.*

### 3.4 Waste Rock Seepage

**Concern:** Section 5.1 describes the geochemical monitoring of the waste rock. Based on a request from the NIRB, AEM explained how measured values compared with Final Environmental Impact Statement (FEIS) predictions, and how rock disposal practices were incorporating preventative and control measures to avoid Acid Rock Drainage (ARD). AEM states “To date water monitoring analysis from run off indicates no concerns related to ARD” but no results are provided to support the determination. It is unclear if the seepage results presented in Section 8.3.3.11 to 8.3.3.13 were used to determine that there is no concern with regards to ARD and what methodology was used for the monitoring.

**Recommendation 6:** INAC recommends AEM reports clearly on the results that supported the determination that the rock disposal practices are effectively preventing and controlling acidic seepage.

#### **Agnico Eagle’s Response:**

*Segregation of ore, waste rock as potentially acid generating (PAG) or non-potentially acid generating (NPAG) material based on operational testing during mining activity to differentiate waste rock type is part of the Meadowbank Waste Rock Management Plan. Sampling and testing of waste materials for acid rock drainage (ARD) is conducted during mine operation in order to segregate PAG waste from NPAG waste rock material, so that waste material can be assigned to specific locations or use. This practice has been ongoing since the beginning of the mining operations at Meadowbank, and will continue during the remaining operation period.*

*Operational sampling and analysis is completed on site during mining activities in order to identify and delineate the material type in the pits during mining. Agnico Eagle*



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*sampled approximately 25% of all blast holes and analyzed the percentages of sulphur and carbon. The results from these analyses are used to differentiate the PAG and NPAG materials. Once characterized, the waste rock material is segregated and placed in appropriate location.*

*The geochemical properties of all Meadowbank mining wastes have been confirmed with duplicates samples sent to certified laboratory, through both static and kinetic testing on numerous representative samples, by various test methods and through multiple project development stages.*

*In 2013 there was seepage observed at the Portage RSF that had the potential to lead to environmental impacts, as described in section 8.3.3.11 of the 2016 Annual Report. This was first reported in the 2013 Annual Report (as well as to regulators in July 2013) as a small volume of the seepage, with elevated levels of Cyanide, Nickel and Copper (among other constituents) had migrated, through a rockfill perimeter road, to the near shore area of NP-2 Lake. Agnico determined, in 2013, that the seepage contained reclaim water from the North Cell TSF that had flowed under the Portage RSF to a sump area designated as sampling station ST-16, located on the north side of the RSF. Following effective mitigative and management actions in 2013 and 2014, seepage was contained and has continued to be monitored throughout 2016. It is important to be noted that the seepage reported at ST-16 is not related with acid rock drainage from the waste rock contained in the RSF, but rather from infiltration of reclaim water from the TSF through the RSF. As mentioned above, several mitigation measures were implemented in since 2013 to control effectively this seepage.*

*Inspection and monitoring around the Portage waste rock storage facility report very minimal water accumulation around the facility, mostly related to melt and runoff water in the spring. Thermistors installed in the Portage RSF also indicate that freeze back is occurring within the rock pile; freeze back of the pile and the 4.0 m layer of NPAG rock will provide geochemical stability and to act as a thermal barrier to control acid rock drainage potential.*

*The waste rock mined at Vault is largely NPAG; starting at the end of 2014, Agnico sent quarterly samples to an accredited laboratory to validate Agnico internal determination. The Vault FEIS prediction said that the ARD from Vault rock will be low which was consistent with Agnico findings. In the FEIS, it was determined that 14% of the rock will be PAG, 11% uncertain and 75% NPAG. Analysis from Agnico's internal determination shows that in 2016, as previously said, for Vault material, 8.7% is PAG, 10.7% uncertain*





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*and 80.6% is NPAG. Ultimately, there is a higher ratio of NPAG versus what was initially predicted. Similar results were obtained in 2014 and 2015. As a mitigative measure any PAG or uncertain waste rock material is placed in the middle of the Vault Waste Rock Storage Facility while NPAG material is placed on the perimeter to encapsulate the PAG material. Runoff or seepage water monitoring analysis confirms to date the effectiveness of this abatement measure. To date water monitoring analysis from run off indicates no concerns related to ARD. The water seepage from the Vault RSF area is expected to be of suitable quality to allow discharge to the environment without treatment and capping of this facility is therefore not proposed. AEM initiated water quality monitoring at Vault in 2014 and results to date confirm the prediction. An adaptive management plan will include continued monitoring of water quality during operations to confirm modelling predictions, and to allow adjustments to the closure plan as required.*

*As discussed in section 8.3.3.13 of the 2016 Annual Report, in 2016, ponded water was observed at the base of the VRSF (sampling station ST-24) in June, July and September. As per NWB Water License, samples were collected to assess water quality and the results are presented in Table 8.29. No water was pumped from this location as it is mainly a ponding area without flow, and the water is evaporating. From the analysis results for ST-24, available in Table 8.29 of the 2016 Annual Report, there is no indication of acid rock drainage from the Vault RSF.*

### 3.5 Waste Rock Quantity

**Concern:** Section 5.2 Waste Rock Volume lists the total volume of waste rock generated in 2016. To facilitate review and understanding of the progression of the work.

**Recommendation 7:** INAC recommends AEM provides a comparison of the volume generated annually with the FEIS predictions and discusses how the results might warrant re-evaluation of the Waste Management Plan with regards to the design of the Waste Rock Storage Areas and the capping requirements for closure.

**Agnico Eagle's Response:**

*The current RSF design volume is similar to the original 2009 design; the deposition pattern has changed to allow for the separate, temporary NAG material storage area. The expansion is still within the original mine footprint and all runoff is directed to the TSF or the South Cell. The Portage RSF design change was considered a minor revision and the 2012 Waste Rock Management Plan references this change. The material contained in the RSF NAG area is planned to be reclaimed for closure purposed.*

*As presented in the Waste Rock and Tailings Management Plan (available in Appendix D1) and in the Annual Report, the cover of NAG material over the Portage RSF PAG*





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*sector has been completed during operation as progressive closure. As of January 2016, 80% of the area of the Portage PRSF had been covered with NPAG rock. At the end of production in closure, the only remaining part of the RSF not covered with NAG material will be the last bench of the facility, as this area will be used for landfilling in closure, as presented in the Interim Closure and Reclamation Plan. The landfill area on top of the RSF will be covered during closure with NAG material. As per the current waste rock material balance, sufficient NAG material will be available to cover the landfill area.*

*It is important to note that the Waste Rock and Tailing Management Plan is updated yearly with the current production quantities and the actual Life of Mine, dictating the production and mining schedule. The planning of the placement of the waste rock material is reviewed for each Life of Mine designed, considering the different waste rock facility locations (Portage RSF, but also Portage pit backfilling) and capacity, as well as the closure cover requirement for the Portage RSF.*

*The Waste Rock and Tailing Management Plan will continue to be updated yearly and will be presented in the 2017 Annual Report, including a discussion on material balance and material quantity required for closure NAG cover, and a comparison of the volume generated annually with the FEIS predictions.*

### 3.6 Tailing Storage Facility Capacity

**Concern:** Section 5.3.1 reports on the Tailing Storage Facility Capacity. The remaining capacity presented is outdated (December 2015) and does not address the capacity remaining at the end of 2016.

**Recommendation 8:** INAC recommends AEM presents the remaining capacity as of December 2016, compares the results with FEIS predictions and discusses how the remaining capacity will be adequate for the revised deposition plan.

#### **Agnico Eagle's Response:**

*Agnico agrees with the comment from INAC and noted the mistake in section 5.3.1. It should be written: "The estimated remaining capacity in the TSF (in the South Cell only) as of end of December 2016 is 5.4 Mm<sup>3</sup> (6.9 Mt)", with the elevation of the South Cell structures at El.143m. It is important to note that the South Cell structures, as per existing approvals, could be raised to an elevation of 150m as per their original design. A comparison with the FEIS predictions will be provided in the next Annual Report.*

### 3.7 Thermal Modeling

**Concern:** Section 5.3.2 reports on the monitoring of the freezeback efficiency and the permafrost monitoring program. The results from thermistors readings are presented, but AEM does not present a discussion of these results and how they are integrated in the update of the Waste Rock and Tailings Management Plan. Section 2.1.4.3 of the "Waste Rock and Tailings



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Management Plan” (Appendix D), which discusses climate change and permafrost contains several error messages and repeated information that appears to be formatting issues. There is no further discussion on the results of the current monitoring and how they compare with the thermal modeling used for conceptual freezeback and capping plans presented in the FEIS. Under section 7.3 of Appendix D (Tailings Reclamation), a short discussion is presented on the design of the Tailing Storage Facility at closure. AEM states “Tailings material, beneath the minimum 2.0 m thick cover, appears to remain frozen for all years (excluding the warmest years) from the 100-year database, accounting for climate change”. However, no results are presented and no details are given on the type of climate change scenario utilized, the data considered, and the model methodology. It is unclear if this conclusion is based on monitoring results from the thermistors, and how this compares with values predicted in the FEIS.

**Recommendation 9:** INAC recommends AEM includes a meaningful discussion of the results from the permafrost monitoring in the Annual Report. FEIS predictions should be compared with monitoring results and be clearly presented. AEM should present the updated modeling supporting their conclusions that the conceptual plans for thermal encapsulation of the Tailing Storage Facility and the Waste Rock Storage Facility remain effective to prevent and control deleterious seepage over long term. Finally, if results show discrepancies from the predicted values, AEM should discuss the management actions that should be implemented to address the risk.

### **Agnico Eagle’s Response:**

*Agnico reviewed the Waste Rock and Tailings Management Plan and noticed also the formatting issues in certain sections of the report. Please find attached the corrected Waste Rock and Tailings Management Plan in Appendix 3 of this document.*

*The discussion on the monitoring data of the various thermistors on site in the TSF and RSF will be still included in the 2017 Annual Report. A discussion will be included to compare the actual data with the predicted data from the FEIS. It should also be noted that the section 12.5 of the 2016 Annual Report summarizes the measured impacts on permafrost due to specific mine activities in 2016 as compared to FEIS predictions, as part of the Post-Environmental Assessment Monitoring Program (PEAMP).*

*Agnico is currently working on the design of the cover for the tailings facility. Modelling is being performed, as well as instrumentation and test pads have been installed in the TSF to support the design work on the cover. The final design of the TSF cover will be presented in the Final Closure and Reclamation Plan, including mitigation plan with regards to the cover performance.*

*Instrumentation has been installed in the Portage RSF to monitor the freeze back in the waste rock. Results to date from the thermistors indicate that freeze back is occurring in the PRSF structures, as described in Section 5.3.2 of the 2016 Annual Report. Modelling is also performed to confirm the performance of the RSF cover.*



### 3.8 Water Chemistry

**Concern:** Section 8.1 presents results from the Core Receiving Monitoring Program. AEM discuss their key findings for 2016 and the assessment of the result to determine the appropriate management actions. With respect to water chemistry, AEM lists several parameters that are considered as significant mine-related changes relative to baseline conditions and mentions that this situation has been reported in the past. Although results show exceedance of several triggers, AEM determines that the likelihood of adverse effects on aquatic life remains low and no further discussion is provided.

**Recommendation 10:** INAC recommends AEM provides a rationale for their determination and discuss the management actions that should be implemented when the triggers are exceeded. Furthermore, AEM should report on their plans to implement these management actions and how their effectiveness would be monitored.

**Agnico Eagle's Response:**

*Historical trend assessment results related to each of the mining activities are discussed at length in the 2012 CREMP report (Azimuth, 2013). The 2016 water chemistry parameters (mean values) for Meadowbank study lakes exceeded their respective trigger values are presented in Table 3.2–3. For each parameter/area that exceeded the trigger, formal statistical testing of the observed result was conducted using the BACI statistical model (one-tailed; looking for uni-directional changes only). In this analysis, the model interaction term (or BACI effect term) represents the change at the test area relative to baseline after accounting for natural temporal changes (i.e., temporal changes at the reference area); for simplicity, changes are noted “relative to baseline/reference” conditions. Results are provided in Table 3.2–4 of the 2016 report.*

*Agnico Eagle will provide additional detail on the action plans, if the water quality is triggered, and associated monitoring in the 2017 Annual Report and associated management plans.*

*The CREMP continues to detect changes in some general water quality parameters that appear to be related to mining activity. These changes are also reflected in higher concentrations of some parameters when compared to the model predictions in FEIS. The FEIS water quality predictions are estimates of change water quality in Third Portage Lake, Second Portage Lake, and Wally Lake assuming different mixing scenarios and loading estimates from water releases and dike leaching. The model for Third Portage Lake includes treated water release from the project in year's 1 to 4 and long-term loading of metals from the Bay-Goose dike material. The Second Portage Lake water quality model includes loading of parameters from the Third Portage and East dikes and inflow from Third Portage and Wally lakes. The water quality model for Wally incorporates long-term loadings from the Vault dike and effluent releases from the Vault*



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*Attenuation pond. At the time the FEIS was issued, the CWQG for cadmium was lower than the MDL for the baseline data. A thorough review of the ecological significance of the predicted cadmium concentrations was presented in the FEIS, and the probability of cadmium causing toxicity was considered “extremely low” (Cumberland, 2005). Arsenic was also predicted to exceed the CWQGs in Wally Lake. Similar to cadmium, the MDL was equal to the guideline (i.e., 0.005 mg/L). The models were considered conservative because the MDLs were used as the baseline concentrations. The current MDLs for arsenic and cadmium are 0.0001 mg/L and 0.000005 mg/L, respectively. All of the samples collected in 2016 from Third Portage, Second Portage, and Wally Lakes were below the MDL for cadmium. In the case of arsenic at Wally, the concentrations are below the trigger value, and well below the CCME water quality guideline of 0.005 mg/L. Overall, the FEIS predicted the magnitude of potential effect on water quality in each of the lakes as “low” (see Section 2.4.1 for more details on the decision criteria for effect magnitude).*

*The same list of parameters that exceed the Meadowbank trigger values typically exceed the concentrations predicted in the FEIS, namely ionic compounds (calcium and magnesium), hardness, and total alkalinity. Chloride, fluoride, nitrate (as N), and sulphate also exceed the FEIS predictions for Third Portage Lake, Second Portage Lake, and Wally Lake in some samples. Most metals are below the predicted concentrations for Third Portage Lake (Table 3.2–5), Second Portage Lake (Table 3.2–6), and Wally Lake (Table 3.2–7) with the exception of isolated instances of aluminum, iron, and manganese. Strontium consistently exceeded the model predictions in all three lakes, but importantly did not exceed the trigger (95th percentile of baseline) indicating current strontium concentrations are representative of pre-development conditions. It is important to point out that none of the above parameters that exceed the trigger values or FEIS model predictions have trigger values that were set in the context of effects-based threshold values (e.g., CCME water quality guidelines). Thus, CREMP water quality results are consistent with the “low” significance (i.e., <1x CCME WQG) rating applied to model predictions in the FEIS (Cumberland, 2005).*

*In the absence of available thresholds, trigger values for these substances were set at the 95th percentile of baseline data (i.e., in the absence of any mine-related inputs, 5% of the samples would be expected to exceed the trigger). Consequently, the BACI model results reported above only indicate that statistically significant changes have been detected relative to baseline/reference conditions. Available information suggests that the observed concentrations of these parameters are well below levels of concern. As in the past, it is recommended that these trends continue to be monitored in 2017.*



## 4 Kivalliq Inuit Association

### 4.1 General

**Concern:** The list of abbreviations at the beginning of the report is a great improvement (following our recommendation in the HESL review of the 2015 Annual Report). Some abbreviations, however, are not included in this list, and are not explained in the text (i.e., spelled out in full the first time they appear in the text). For example, 'D/S', 'TPS', 'TSM'.

**Recommendation 1:** Please include all abbreviations in the list at the beginning of the report, and spell out their meaning when first introduced in the text. Please ensure that the abbreviation list is in alphabetical order to make it easy to reference.

**Agnico Eagle's Response:**

*Agnico Eagle acknowledges KIA comments and will make sure to spell out the abbreviation meaning when first introduces in the text. The abbreviation list at the beginning of the report will also be reviewed to make sure they include all abbreviations in alphabetical order.*

### 4.2 Introduction

**Concern:** The 2016 Annual Report addresses reporting requirements under the following authorizations:

- NWB Type A Water License 2AM-MEA 1525;
- NIRB Project Certificate No. 4;
- DFO HADD Authorization NU-03-190 AWAR;
- DFO HADD Authorization NU-03-191 MinSite;
- DFO Authorization NU-14-1046 Phaser Lake;
- INAC Land Leases 66A/8-71-2 (AWAR) and 66A/8-72-2 (AWAR Quarries);
- KIA Right of Way KVRW06F04

AEM notes that reporting requirements for the Metal Mining Effluent Regulations (MMER) were submitted directly to Environment and Climate Change Canada (ECCC). We request that copies of these reports also be provided directly to the KIA.

**Recommendation 2:** AEM should provide copies to the KIA of all MMER reports submitted to ECCC.

**Agnico Eagle's Response:**

*As stated in response to KIA comments regarding the 2015 Annual report, Agnico Eagle reported data to Environment and Climate Change Canada (ECCC) via the RISS electronic database reporting system. All of these reported data were part of the annual report (2016 Annual Report Section 8.2 and Table 8.2 to 8.7) and will continue to be included. Agnico received the EEM Cycle 2 Interpretative report's comments from ECCC on January*



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20, 2016. On February 21, 2017, Agnico sent his response to ECCC's comments. This can be found in Appendix G3 on the 2016 Annual Report. Agnico also provided to ECCC on February 17, 2017 the EEM Cycle 3 Study Design. This report was not provided via the 2016 Annual Report as it was not yet approved by ECCC when the 2016 Annual report was submitted. As of now, this Study Design has been approved and can be found in Appendix 4 of this document. You will also found in Appendix 5, ECCC comments and Agnico responses to this Cycle 3 Study design, along with the ECCC approval letter. Agnico Eagle will continue to provide to KIA and other regulators copies of reports and data submitted to ECCC via the Annual Report. Copy of report provides to ECCC will also be put in appendix of the quarterly report to KIA required under Condition 5.1 of the Production Lease KVPL08D280. KIA will be added to the distribution list of the following reports.

### 4.3 Construction/Earthworks: Dikes and Dams

**Concern:** AEM outlines its surveillance program to monitor deformations, seepage and geothermal responses, as required by the water license:

- Daily inspection – carried out daily by a designated qualified engineer or technician;
- Thermistor and piezometer monitoring – carried out generally weekly or bi-weekly by a designated qualified engineer or technician;
- Detailed inspection - carried out generally monthly or bi-monthly by a designated qualified engineer or technician; and
- Engineering annual inspection – carried out annually by qualified engineer (consultant), during open water, if possible, to verify that the facilities are functioning as intended.

No major concerns were raised for most of the monitored structures based on available geotechnical instrumentation data and visual inspection in 2016 (i.e., at dewatering dikes, and at Tailing Storage Facilities). The Central Dike showed no unexpected settlement, erosion, bulging or sloughing. Seepage first reported in 2014 at the downstream toe of the dike, however, continued in 2016. Mitigation measures were implemented in 2015 to control the seepage.

#### East Dike

AEM has been discharging seepage water from the East Dike collection system back to Second Portage Lake since January 2014. The discharge is monitored subject to MMER requirements and to date, AEM reports that parameters are within acceptable levels.

#### Bay Goose Dike

Mining activity ceased in the Goose Pit in 2015. There has been some seepage (~26 m<sup>3</sup>/day in the summer) in four areas along the dike but it is not considered a risk. AEM reports that “there is currently no downstream seepage collection and monitoring system as the amount of seepage through the dike is not significant” but that “the area will continue to be monitored to determine increases/decreases of the seepage in these areas” , and “the condition of the dike will continually be monitored” p.12.



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The first statement indicates that there is no monitoring of the seepage, which contradicts the second and third statements suggesting that monitoring is ongoing.

**Recommendation 3:** Please clarify whether monitoring of the seepage along the dike is occurring, and if so, with what frequency.

**Agnico Eagle's Response:**

*Seepage channels and water pond accumulation have historically been observed at the toe of Bay-Goose Dike in some areas (North Channel, Central Channel, Central Shallows , and Channel 3). There is currently no downstream seepage collection system at the downstream toe of the dike as the amount of seepage reporting downstream is currently too small to require such a system. Those small seepages do not have any contact with the surrounding lakes and are all located on the dry side of the dikes and dams. Part of the seepage is reported to the pits, including Goose pit where mining activity have ceased and where natural reflooding is occurring.*

*Flow from these channels has historically been monitored by various monitoring stations when flow of water is present. These stations consist of a plastic pipe installed in the various channels. The flow rate through the plastic pipe is manually calculated by measuring the amount of time required to fill a graduated bucket. As the flow in these channels is low or intermittent, these reading are taken once a week when the channels start flowing. In 2016, seepage rate was monitored once per week at station 6 (31+750), station 7 (30+640), station 8 (30+420) and station 9 (30+380) from the 5th of July to the 29th of September.*

*Agnico will continue to perform the inspection of the dike according to the description above and any increase of seepage observed during these inspections will be monitored.*

**Concern:**

**Central Dike**

Seepage at the downstream toe of the Central Dike, which was first reported in the fall of 2014, continued in 2016. AEM began pumping the seepage back into the South Cell Rock Storage Facility (RSF) in April 2015. In 2016, the diesel pump was replaced with a permanent electrical pump. Golder is currently updating the seepage model, which will be completed in 2017.

**Stormwater Dike**

Cracks were observed in the foundation of the dike in the summer of 2016. Monitoring of the dike's movement has been implemented, and a buttress type structure was constructed at the downstream toe of the dike (following recommendations by Golder, the designer of the dike). The Meadowbank Dike Review Board (MDRB) inspected the structure in September 2016 and made recommendations which are presented in Appendix B2.





**Recommendation 4:** Please also list the MDRB's recommendations in the Annual Report and indicate how they will be addressed.

**Agnico Eagle's Response:**

*Agnico Eagle provided the MDRB report as well as Agnico responses to MDRB recommendations directly in the Appendix B2. Please find attached the responses from Agnico to the MDRB recommendation in Appendix 1 of this document.*

*Agnico believes that providing responses to the MDRB report in the actual format used for the 2015 and 2016 Annual Report is adequate and answers to the conditions 11 and 12, Part I of the Water Licence 2AM-MEA1525. The Annual Report 2017 will also include the responses to the MDRB report and 2017 Annual Geotechnical Inspection.*

#### **4.4 Water Management Activities: Lake Level Monitoring**

**Concern:** AEM reports that the water levels of Third Portage Lake, Second Portage Lake and Wally Lake have "remained within the range of naturally occurring levels" (p. 21) in 2016, yet no comparison with levels in the open water season of previous years is made. As we stated in our review of the 2015 Annual Report it would be helpful to present the range of naturally occurring water levels from each year of monitoring for these lakes, to validate the claim that variations in water levels have not been impacted by discharge volume.

**Recommendation 5:** Please provide data on variation in water levels for Third Portage Lake, Second Portage Lake and Wally Lake for each year monitoring of lake levels has been conducted.

**Agnico Eagle's Response:**

*In the next Annual Report for 2017, Agnico Eagle will continue to include the lake water level monitoring data recorded during the year for Third Portage Lake, Second Portage Lake and Wally Lake, and will include the maximum and minimum water levels recorded. The maximum and minimum water levels recorded for the previous years will also be presented.*

#### **4.5 Water Management Activities: Water Balance Water Quality Model Reporting Summary**

**Concern:** AEM reports that the water management plan has been updated to reflect:

- Phaser and Vault Pit modifications;
- Updated truck mining fleet; Updated stockpile status;
- Modification to the Central Portage Pit Waste Rock Storage design and overall volume; and
- South Cell and North Cell Tailings Storage Facilities net acid generating (NAG) capping volumes and timeframe.

The water balance was also updated in 2016 to reflect the above modifications and changes to the life of mine (LOM) associated with prolonged mining activities. These include:





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- Fresh water consumption revision; Total daily mill water requirement;
- Updated tailings deposition plan affecting the North Cell and South Cell deposition calendar;
- Pit water inflow revision based on observed flowmeter data as well as a revision of the pits and Tailings Storage Facility (TSF) run off inflows related to their underlying watersheds;
- Flooding sequence and volumes update to take into account the updated run off inflows, as well as to optimize flooding activities to reduce the impact on wall stability;
- Report on the dewatering of Phaser Lake in 2016; Updating the seepage section; and
- Changes in tailings dry density as observed through bathymetric analysis.

The updated water quality model indicates that treatment may be required for aluminum, arsenic, chromium, copper, iron, silver, selenium and fluoride so that the pit water quality meets CCME criteria at mine closure. This represents a change from the statements made in the 2014 Annual Report (which predicted that only copper and selenium might require treatment) and the 2015 Annual Report (which predicted that copper, silver, selenium and total nitrogen might require treatment) yet no explanations are presented. Furthermore, the parameters of concern that are identified in the Annual Report as potentially requiring treatment do not align with those identified in Appendix C2 – 2016 Water Management Report and Plan. In particular, silver is not included as a parameter of concern requiring treatment at pit closure in Appendix C2 because “silver is no longer problematic...due to a lower silver loading” (Appendix C2 p.45), but total nitrogen equivalent is included as a parameter requiring treatment (although it is not listed as one in the Annual Report) (Appendix C2, Appendix C – 2016 Meadowbank Water Quality Forecasting Update, Section 6.2)."

**Recommendation 6:** Please explain why there has been an increasing trend in the number of parameters predicted to exceed CCME guidelines for protection of aquatic life in pits at mine closure. Why are aluminum, arsenic, chromium, iron and fluoride now a concern in 2016 and is there any concern that the number of parameters will continue increase?

**Agnico Eagle's Response:**

*Please note that the list of parameters that may require treatment presented in section 4.4 of the 2016 Annual Report is inconsistent with the Water Quality Forecasting Update for the 2016 Water Management Plan, presented in Appendix C2 of the Annual Report. Agnico will ensure consistency of this information throughout the different documents for the next Annual Report.*

*In the 2014 and 2015 Annual Reports, the forecasting of the metal concentrations were based on the dissolved fraction since it was assumed that the suspended particles should settle out in the pit and not be re-mobilized in the water column once the dike is breached.*



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*In the 2016 Annual Report, total concentrations of the metals were considered in order to assess its impact if the suspended particles did not settle out in the pit. If we look at the forecasted dissolved concentrations in the 2016 model, only copper is higher than the CCME guidelines, and chromium and selenium are slightly higher than the CCME guidelines. The dissolved fraction for aluminium, arsenic and iron are lower than the CCME guidelines.*

*The 2016 model also considers the loads from pit seepages, which increases the loads of certain parameters into the pit water. For total aluminium, total arsenic, total and dissolved chromium, total iron and fluoride, the higher forecasted concentrations can be attributed to these additional seepage loads to Portage Pit and Goose Pit. The analytical results from the groundwater sampled around the Portage and Goose Pits also confirm this observation. Parameters such as aluminum, arsenic and chromium are measured in very low but detectable concentrations in the groundwater. Fluoride is also present in the groundwater sampled around the Portage and Goose Pit.*

*Silver was identified as a parameter of concern in the 2015 model since its forecasted concentration was slightly higher than the CCME guidelines. In 2016, the silver concentration measured in the mill effluent was lower than the values measured in 2015. Consequently, a lower value was considered in the 2016 model. In the 2015, an average concentration of 0.028 mg/L of Ag was measured in the mill effluent versus 0.005 mg/L of Ag in 2016.*

*The Total Nitrogen equivalent parameter was introduced in the 2015 Annual Report to compare the Total Nitrogen forecasted in the pit water against a threshold value for classification of an oligotrophic lake in terms of nutrient concentrations. Total Nitrogen equivalent parameter is the sum of total ammonia and nitrate concentrations. In the 2015 and 2016 model, the Total Nitrogen equivalent parameter was forecasted to be higher than this threshold, assuming no natural degradation that is occurring in the pit water. Note that the CCME has a guideline for each parameter individually, and for 2016, the forecasted values for ammonia and nitrate were lower than these guidelines.*

*Based on the Life of Mine presented in the 2016 Annual Report, it is not anticipated that there will be additional parameters of concern. The 2016 model is conservative, especially with regard to the pit seepage loadings that were assumed to be constant throughout the years until the pits are completely flooded. This is a conservative assumption. There should be a decrease in seepage flow since the hydraulic gradient between the pit water and groundwater level will decrease over time during reflooding. The model will be adjusted in 2017 based on new pit water quality data collected and results from on-going studies on the hydrogeology of the pit.*



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**Recommendation 7:** We note that this change in water quality predictions was not presented or evaluated in Section 12.1.1.2 of the 2016 Annual Report, which discusses the accuracy of predicted impacts to water quality. AEM should include a discussion of why there is an increasing trend from year to year (since 2014) in the number of parameters predicted to exceed CCME guidelines in pits at mine closure.

**Agnico Eagle's Response:**

*The increasing trend from year to year in the number of parameters forecasted to exceed the CCME guidelines in the pits a mine closure can be attributed to the following:*

- 1. Every year, the water quality forecast model is adjusted based on the mill effluent sampled during that year. In 2015, higher concentrations of dissolved copper, dissolved silver and dissolved selenium in the mill effluent were measured in the mill effluent and used in the model when compared to the 2014 model, resulting in the identification of silver and selenium as additional parameters of concern. Silver was not identified as a parameter of concern in the 2016 model based on the mill effluent sampled that year.*
- 2. As noted in Recommendation 6 above, the forecast of total metal concentrations and additional loading from pit seepages were considered in the 2016 model. This resulted in the identification of additional parameters of concerns related to the suspended fraction of the metals in the pit water as well as new parameters such as fluoride.*

*As described in Recommendation 6, Total Nitrogen equivalent was introduced in 2015 to compare this value to a threshold value associated with oligotrophic lakes. This value, along with ammonia and nitrate, will continue to be evaluated each year to assess the forecasted concentration of nitrogen species in the pit water at closure.*

*Section 12 – Post-Environmental Assessment Monitoring Program (PEAMP) – Evaluation of Impact Predictions, includes a review of monitoring conducted in 2016 in relation to impacts described in the Final Environmental Impact Statement (FEIS; Cumberland, 2005). As outlined in the FEIS, the Core Receiving Environment Monitoring Program (CREMP) is intended to monitor large-scale (e.g. basin-wide) changes in physical and biological variables to evaluate potential impacts from all mine related sources in the receiving environment. It therefore serves as the most important monitoring program for evaluating short term and long term potential impacts to populations. According to the NWB water license (2AM-MEA1525), the dikes will only be breached once the water quality in the pits meets CCME guidelines, baseline concentrations or site specific criteria developed during the closure plan approval process. This applies also for the Vault area. Therefore, Agnico does not believe that the water quality forecast results should be included in Section 12. Agnico will continue to present the water quality forecast including the treatment option as part of the Water Management Plan and will be discussed in Section 4 – Water Management Activities of the Annual Report.*



**Recommendation 8:** Please address the discrepancy re: silver as a predicted parameter requiring treatment at closure in the 2016 Annual Report vs. Appendix C2.

**Agnico Eagle's Response:**

*Silver was identified as a parameter of concern in the 2015 model since its forecasted concentration was slightly higher than the CCME guidelines. In 2016, the silver concentration measured in the mill effluent was lower than the values measured in 2015. Consequently, a lower value was considered in the 2016 model. In 2015, an average concentration of 0.028 mg/L of Ag was measured in the mill effluent versus 0.005 mg/L of Ag in 2016.*

*Please note that the list of parameters that may require treatment presented in section 4.4 of the 2016 Annual Report is inconsistent with the Water Quality Forecasting Update for the 2016 Water Management Plan, presented in Appendix C2 of the Annual Report. Agnico will ensure consistency of this information throughout the different documents for the next Annual Report.*

**Recommendation 9:** Please address the discrepancy re: total nitrogen equivalent as a predicted parameter requiring treatment at closure in the 2016 Annual Report vs. Appendix C2.

**Agnico Eagle's Response:**

*The Total Nitrogen equivalent parameter was introduced in the 2015 Annual Report to compare the Total Nitrogen forecasted in the pit water against a threshold value for classification of an oligotrophic lake in terms of nutrient concentrations. Total Nitrogen equivalent parameter is the sum of total ammonia and nitrate concentrations. In the 2015 and 2016 model, the Total Nitrogen equivalent parameter was forecasted to be higher than this threshold, assuming no natural degradation that is occurring in the pit water. Note that the CCME has a guideline for each parameter individually, and for 2016, the forecasted values for ammonia and nitrate were lower than these guidelines.*

*Please note that the list of parameters that may require treatment presented in section 4.4 of the 2016 Annual Report is inconsistent with the Water Quality Forecasting Update for the 2016 Water Management Plan, presented in Appendix C2 of the Annual Report. Agnico will ensure consistency of this information throughout the different documents for the next Annual Report.*

#### **4.6 Water Management Activities: Predicted vs Measured Water Quality [and Quantity]**

**Concern:** An annual comparison between predicted water quality and quantity and measured water quality and quantity within Portage, Goose and Vault Pits is required under the water



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license. Percent differences of 20% or greater must be explained and their implications discussed.

A comparison of predicted and measured water quality and quantity within the pits was conducted for 2016, by comparing the measured water quality and quantity for that year with the predicted values for 2012- 2016. Under the water license, AEM is required to explain percent differences of >20% between predicted and measured values.

AEM uses different formulas to calculate percent difference for water quality vs. water quantity (percent error for the former and percent change for the latter). No explanation is given for why the two parameters are measured differently. The formula provided for water quality is:

$$\% \text{ difference} = ((A-B)/B)*100$$

and the formula provided for water quantity is:

$$\text{Relative \% difference} = (A-B)/((A+B)/2) * 100$$

where A = measured value and B = predicted value.

These formulas yield different results, which affect the determination of what measured and predicted values are >20% different from each other.

**Recommendation 10:** Please explain why percent difference is measured differently for water quality vs. water quantity predicted and measured values. Is the formula used for water quality different than the formula used in previous years? If so, this will confound inter-annual comparisons.

**Agnico Eagle's Response:**

*The percent difference formulas used to assess the difference between the water quantity and water quality used for the 2016 Annual Report were the same formulas used in the 2015 Annual Report.*

*For the 2017 Annual Report, it is recommended that the predicted and measured values for water quality and quantity be compared using the “% Difference” formula.*

*The following tables present the % Difference for 2013 to 2016 and compare the results to the Relative % Difference. Though the values are different, they provide similar conclusions.*



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## Water Quantity Year 3^ (2012)

<i>Pits</i>	<i>Predicted (m<sup>3</sup>)</i>	<i>Measured (m<sup>3</sup>)</i>	<i>Relative % difference between predicted vs measured</i>	<i>% Difference between predicted vs measured</i>
<i>Portage</i>	931,800	1,026,000	10	10
<i>Bay Goose</i>	1,235,100	499,000	-85	-60

## Water Quantity Year 4^ (2013)

<i>Pits**</i>	<i>Predicted (m<sup>3</sup>)</i>	<i>Measured (m<sup>3</sup>)</i>	<i>Relative % difference between predicted vs measured</i>	<i>% Difference between predicted vs measured</i>
<i>Portage</i>	931,800	676,706	-32	-27
<i>Bay Goose</i>	1,235,100	344,994	-113	-72

## Water Quantity Year 5^ (2014)

<i>Pits**</i>	<i>Predicted (m<sup>3</sup>)</i>	<i>Measured (m<sup>3</sup>)</i>	<i>Relative % difference between predicted vs measured</i>	<i>% Difference between predicted vs measured</i>
<i>Portage</i>	715,200	165,877	-125	-77
<i>Bay Goose</i>	1,235,100	307,769	-120	-75
<i>Vault Pit</i>	46,100	101,617	75	120

## Water Quantity Year 6^ (2015)

<i>Pits**</i>	<i>Predicted (m<sup>3</sup>)</i>	<i>Measured (m<sup>3</sup>)</i>	<i>Relative % difference between predicted vs measured</i>	<i>% Difference between predicted vs measured</i>
<i>Portage</i>	715,200	136,627	-136	-81
<i>Bay Goose</i>	1,235,100	383,800	-105	-69
<i>Vault Pit</i>	46,100	111,336	83	142

## Water Quantity - Year 7^ (2016)

<i>Pits**</i>	<i>Predicted (m<sup>3</sup>)</i>	<i>Measured (m<sup>3</sup>)</i>	<i>Relative % difference between predicted vs measured</i>	<i>% Difference between predicted vs measured</i>
<i>Portage</i>	715,200	132,359	-138	-81
<i>Bay Goose</i>	1,235,100	352,431	-111	-71
<i>Vault Pit</i>	55,600	54,964	-1	-1

**Concern:** The volume of water measured in the Portage Pit in 2016 was more than 20% below the volume predicted for 2013 to 2016. AEM explains that this is partly because seepage water from East Dike was pumped to the Portage Pit sump prior to 2014, but that since 2014 this seepage water has been pumped into Second Portage Lake, leading to a significant decrease in water quantity in Portage Pit between 2012 and 2015.



The volume of water measured in Goose Pit was more than 20% below the volume predicted for 2012 to 2016, indicating that the contribution of seepage and groundwater sources to the pit is less than originally predicted.

The volume of water measured in Vault Pit was more than 20% greater than the volume predicted in 2014 and 2015 (by 75% and 83% respectively). AEM suggests this is due to “more precipitation including larger freshet and rainfalls in 2015”. While this may be the case for 2015, it does not explain the 75% higher than expected volume measured in 2014 and would appear to contradict the lower volumes observed in Portage and Goose Pits in 2015. In 2016 there was no significant difference between predicted and measured volume.

**Recommendation 11:** Please explain possible reasons for the greater than expected water volumes measured in Vault Pit in 2014 and consider these against the reasons for reduced volumes in Portage and Goose Pits.

**Agnico Eagle’s Response:**

*The reduced volumes observed in Portage and Goose Pits are attributed to the lower volume of seepage flow rate entering the pit.*

*With regard to Vault Pit, the higher volume observed in 2014 could also be attributed to higher freshet volumes, similarly observed in 2015. In 2014 and 2015, Agnico pumped out from the pit 101,617 m<sup>3</sup> and 111,336 m<sup>3</sup> respectively. In 2016, only 54,964m<sup>3</sup> was pumped out.*

*The water balance which includes the volumes required for pits reflooding takes into considerations the updated inflows values. The pits reflooding sequence and schedules is taken into consideration the end of mining activities in the pits, the amount of natural inflows and precipitation, as well as the limits of freshwater use for reflooding from the lakes prescribed in the Water License. No major changes to the reflooding volumes and schedules are occurring due to the smaller volumes of natural inflows.*

**Concern:** Water quality in the three pit sumps (Portage, Goose and Vault) showed similar patterns in 2016 to those in previous years (2012-2016). Most parameters of concern had greater than 20% differences between their measured and predicted concentrations (i.e., in both positive and negative directions) in all pit sumps. AEM suggests several possible reasons for differences greater than +/- 20% between predicted and measured values:

- Management of seepage, groundwater and local runoff results in reduced volume of water available to attenuate loads reaching pits;
- Higher contaminant loads in pit water could be related to higher observed loads in seepages flowing into pits;
- Some parameter detection limits are higher than predicted values (e.g., for dissolved metal analysis);
- Un-ionized ammonia concentration in water is highly influenced by pH (higher pH = higher fraction of un-ionized ammonia);





- Pit water has higher background values of many parameters (e.g., ammonia, nitrate due to explosive activity during pit activity; runoff and seepage in contact with potentially acid generating [PAG] rock).

None of the pits are discharged directly to the environment.

**Recommendation 12:** AEM should ensure that the accredited laboratory used to analyze pit water quality can reach the required detection limits for pertinent comparisons for all future monitoring.

**Agnico Eagle's Response:**

*Agnico Eagle will continue to update its water quality model using the best information available. The information contained in section 4.6 of the 2016 Annual Report is based on the comparison of actual water quality obtained from samples taken on site, with prediction provided in the FEIS water quality model. Agnico intends to continue the comparison as required by the Water License. Additionally Agnico complete yearly an updated water quality forecast for the Meadowbank site, as required by the Water License. Updated annually, this model is developed to predict water quality at closure. The model uses the most recent data from on-site sampling to update the forecast model. Sample results used for modelling are from analysis conducted by an accredited laboratory.*

*The laboratory services selected by Agnico are conducted by accredited facilities and reach the analysis lower detection limits (LDL) where the results can be compared to the CCME guidelines. Agnico Eagle will continue to ensure that the accredited laboratory can reach the required detection limits.*

#### **4.7 Waste Rock Management Activities: Geochemical Monitoring**

**Concern:** Within two years of the start of operations, AEM is required to re-evaluate the characterization of mine waste materials for acid generating potential, metal leaching and non-metal constituents to confirm predictions presented in the environmental impact statement, and to re-evaluate rock disposal practices (via sampling) to ensure preventive and control measures are incorporated into the Waste Management Plan. Results of the re-evaluations are to be provided to the NWB and NIRB's Monitoring Officer.

AEM indicates that it characterized PAG and NPAG materials of waste rock by analysing 25% of blast holes for percentages of sulphur and carbon in 2016. As we recommended in our review of the 2015 Annual Report, a summary of the proportion of each type of waste rock (i.e., PAG, uncertain, and NPAG) found in this analysis is now provided in the 2016 Annual Report.

AEM states that any PAG or uncertain waste rock material is placed in the middle of the facility and is surrounded by NPAG material to encapsulate the PAG material. The effectiveness of this abatement measure is then evaluated by monitoring runoff or seepage water. AEM reports that





no indication of PAG leaching has been observed from runoff water to date, but seepage results are not reported. No description of the monitoring method is given (e.g., how many samples collected, where, and how often).

**Recommendation 13:** Please report results of the seepage monitoring to confirm no PAG leaching has occurred at the waste rock storage facility.

**Agnico Eagle's Response:**

*As detailed in the 2016 Annual report, Agnico Eagle conduct inspection around both RSF to determine if there is seepage at the base of the RSF. In 2016, as in previous year, seepage has been observed at both RSF. Sample are taken in accordance with the NWB Water License 2AM-MEA1525 and reported in the annual report – ST-16 for the ponding water at the base of Portage RSF and ST-24 Vault RSF. Results are present in the 2016 Annual Report under Section 8.3.3.11 and 8.3.3.13 respectively.*

*The waste rock storage facility at Portage includes a sector including only NPAG material, and a sector for PAG material, capped with NPAG material during operations. Inspection and monitoring around the Portage waste rock storage facility report very minimal water accumulation around the facility, mostly related to melt and runoff water in the spring. Thermistors installed in the Portage RSF also indicate that freeze back is occurring within the rock pile; freeze back of the pile and the 4.0 m layer of NPAG rock will provide geochemical stability and to act as a thermal barrier to control acid rock drainage potential. The station ST-16 collects some water accumulating along the Portage RSF. It is important to be noted that the seepage reported at ST-16 in 2013 is not related with acid rock drainage from the waste rock contained in the Portage RSF, but rather from infiltration of reclaim water from the TSF through the RSF. Several mitigation measures were implemented in since 2013 to control effectively this seepage.*

*In 2014, as per inspections conducted within the framework of the Freshet Action Plan, run off was noted at the northeast side of the Portage NPAG waste rock extension pile in a natural depression (WEP). Agnico contained this run off and pumped it back to the North Cell TSF as a precaution and to prevent egress to the East Diversion non-contact water ditch. Sampling have commence in 2016 at sumps WEP1 and WEP2 as per NWB Water License 2AM-MEA1525. There are no applicable license limits. Results are presented in Table 8.26 for WEP1 and Table 8.27 for WEP 2, and discussed in section 8.3.3.12 of the 2016 Annual Report.*

*The waste rock mined at Vault is largely NPAG, and as discussed in the Annual Report, there is a higher ratio of NPAG versus what was initially predicted. As a mitigative measure any PAG or uncertain waste rock material is placed in the middle of the Vault*



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*Waste Rock Storage Facility while NPAG material is placed on the perimeter to encapsulate the PAG material. Runoff or seepage water monitoring analysis confirms to date the effectiveness of this abatement measure. To date water monitoring analysis from run off indicates no concerns related to ARD. The water seepage from the Vault RSF area is expected to be of suitable quality to allow discharge to the environment without treatment and capping of this facility is therefore not proposed. AEM initiated water quality monitoring at Vault in 2014 and results to date confirm the prediction. An adaptive management plan will include continued monitoring of water quality during operations to confirm modelling predictions, and to allow adjustments to the closure plan as required.*

*As discussed in section 8.3.3.13 of the 2016 Annual Report, in 2016, ponded water was observed at the base of the VRSF (sampling station ST-24) in June, July and September. As per NWB Water License, samples were collected to assess water quality and the results are presented in Table 8.29. No water was pumped from this location as it is mainly a ponding area without flow, and the water is evaporating. From the analysis results for ST-24, available in Table 8.29 of the 2016 Annual Report, there is no indication of acid rock drainage from the Vault RSF.*

**Recommendation 14:** AEM should provide details on the approach that is used to monitor the waste rock disposal method. In addition, AEM should indicate what the threshold level of acceptable PAG runoff or seepage will be, and describe available mitigation measures which can be applied if this level is surpassed.

**Agnico Eagle's Response:**

*Segregation of ore, waste rock as potentially acid generating (PAG) or non-potentially acid generating (NPAG) material based on operational testing during mining activity to differentiate waste rock type is part of the Meadowbank Waste Rock Management Plan. Sampling and testing of waste materials for acid rock drainage (ARD) is conducted during mine operation in order to segregate PAG waste from NPAG waste rock material, so that waste material can be assigned to specific locations or use. This practice has been ongoing since the beginning of the mining operations at Meadowbank, and will continue during the remaining operation period.*

*Operational sampling and analysis is completed on site during mining activities in order to identify and delineate the material type in the pits during mining. Agnico Eagle sampled approximately 25% of all blast holes and analyzed the percentages of sulphur and carbon. The results from these analyses are used to differentiate the PAG and NPAG*



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*materials. Once characterized, the waste rock material is segregated and placed in appropriate location.*

*The geochemical properties of all Meadowbank mining wastes have been confirmed with duplicates samples sent to certified laboratory, through both static and kinetic testing on numerous representative samples, by various test methods and through multiple project development stages.*

*Information regarding the waste rock characterization is also managed and recorded by the mine dispatch Wenco system, tracking in real time load of material, including waste rock, and their respective destination. The system and the dispatcher in charge, guides the operators and ensures the ore and waste rock material is transported to the appropriate destination. The system displays in real time information about equipment location and destination, as well as pit development information. All production data, including all waste rock haulage to the PAG and NPAG waste rock storage facilities (RSF), as well as construction use are recorded into a database.*

*Sampling of waste rocks facility seepages will continue to be monitored as per NWB Water License 2AM-MEA1525, and reported in the Annual Report. There are no applicable license limits. Contact water will be managed and pumped to appropriate area and will not be in contact with the receiving environment.*

**Concern:** AEM has recommended in previous annual reports that surface water chemistry sampling at fish-bearing watercourses be discontinued, unless turbidity issues were visually observed. AEM indicates that detailed monitoring will be implemented if an erosional issue arises, with, at a minimum, a single water chemistry sample being collected upstream and downstream of the source. In 2016, nine formal erosion inspections were completed by qualified environment technicians in May through September, and weekly visual inspections were conducted during AWAR inspections. Daily inspections were also made in collaboration with the Meadowbank Energy and Infrastructures Department. As no erosional issues were observed, surface water quality sampling was not carried out at non-HADD (harmful alteration, disruption or destruction of fish habitat) crossings or quarry contact water pools.

We are concerned that water quality issues unrelated to turbidity (e.g., PAG leaching) may be missed if regular surface water chemistry sampling does not occur at fish-bearing watercourses.

**Recommendation 15:** AEM describes a schedule for monitoring for turbidity issues in 2016 which combines formal and informal inspections. Will this approach be continued in future years? We recommend that, in addition to monitoring for turbidity yearly, detailed surface water chemistry sampling be conducted every three to five years at fish-bearing watercourses.



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### **Agnico Eagle's Response:**

*The monitoring approach described in the 2016 Annual Report for the monitoring of the water quality along the AWAR at the non-HADD will continue in 2017 and following years, unless turbidity issues were visually observed. As the road is made of NPAG material, and as no sign of erosion or turbidity, Agnico considers the planned monitoring approach sufficient.*

### **4.8 Waste Rock Management Activities: Tailings Storage Facility Capacity**

**Concern:** The deposition plan model concludes that the total estimated capacity of the TSF North Cell and South Cell is 32.0 Mt. The total capacity of the North cell is estimated at 18.2 Mt and the total capacity of the South Cell is estimated at 15.0 Mt. The sum of these totals (33.2 Mt) exceeds the combined estimated capacity (32.0 Mt). The estimated remaining capacity in the South Cell, as of the end of December 2015, is reported as 6.9 Mm<sup>3</sup>. No updated estimate is given for the South Cell remaining capacity (i.e., as of December 2016), nor any estimate for the North Cell remaining capacity.

**Recommendation 16:** Please clarify the discrepancy between the total estimated capacity and the sum of the individual capacities for the North and South Cells.

### **Agnico Eagle's Response:**

*According to the Table 7.1 of the Mine Waste Rock and Tailings Management Plan found in Appendix D1 of the 2016 Annual Report, 29.9Mt of ore will be processed from the beginning of Meadowbank mine operation until the end of the current LOM. This tonnage is fitting inside the 32.0Mt highlighted above.*

*Agnico agrees with the comment from KIA and noted the mistake in section 5.3.1. It should be written: "The estimated remaining capacity in the TSF (in the South Cell only) as of end of December 2016 is 5.4 Mm<sup>3</sup> (6.9 Mt)", with the elevation of the South Cell structures at El.143m. It is important to note that the South Cell structures could be raised to an elevation of 150m as per their original design.*

**Recommendation 17:** Please explain why a 2016 estimate of remaining capacity is not reported for the South and North Cells.

### **Agnico Eagle's Response:**

*Agnico agrees with the comment from INAC and noted the mistake in section 5.3.1. It should be written: "The estimated remaining capacity in the TSF (in the South Cell only) as of end of December 2016 is 5.4 Mm<sup>3</sup> (6.9 Mt)", with the elevation of the South Cell structures at El.143m. It is important to note that the South Cell structures, as per existing approvals, could be raised to an elevation of 150m as per their original design.*



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*No remaining capacity is reported for the North Cell TSF as this cell as reached its maximal capacity in 2015 and no deposition occurred in the North Cell in 2016.*

### 4.9 Waste Rock Management Activities: Tailings Freezeback and Capping Thickness

**Concern:** AEM reports that a laboratory testing program was developed in 2016 (in collaboration with the Research Institute of Mines and Environment) to test the effects of freeze/thaw and wet/dry cycles on soapstone, which is to be used as cover material for the TSF and RSF. AEM states that testing was completed and that the results indicate that “it seems that Meadowbank’s soapstone has a good resistance to F/T and W/D cycles” (p. 75). No data are presented to support this statement.

**Recommendation 18:** Please provide the results of the laboratory testing program on soapstone resistance to freeze/thaw and wet/dry cycles.

**Agnico Eagle’s Response:** *The experimental program focuses on evaluating the resistance to weathering cycles by the soapstone which will be used as cover materials. Based on the results and weathering criteria available in the literature, it seems that Meadowbank’s soapstone have a good resistance to F/T and W/D cycles. However, the laboratory program was still under way in 2016 and additional data are required to fully understand the resistance of Meadowbank’s soapstone to F/T and W/D cycles. Additional discussion of the program will be included in the 2017 Annual Report.*

### 4.10 Spill Management

**Concern:** More spills were reported in 2016 than in any previous year from 2011-2015: 34 to the Government of Nunavut Spill hotline and 374 non-reportable spills were reported internally. AEM acknowledges there is a significant increase in reported spills, and in 2016 it began a Spill Reduction Action Plan to address the problem. AEM indicates that “a KPI was developed to monitor and follow the situation” (p. 86). It is not clear what a KPI is.

**Recommendation 19:** Please define KPI and add to acronym list at beginning of the Annual Report. Assuming KPI stands for “Key Performance Indicators”, AEM should indicate what KPI(s) they have selected and how it/they will help address the increased frequency of spills in 2016.

**Agnico Eagle’s Response:**

*KPI stands for “Key Performance Indicators”. On a daily basis, the KPI “Spill Frequency” is calculated and reported to the daily management meeting. The Spill Frequency is the ratio of the total number of spill to date in the year over the number of days in the current year. The total number of spill to date includes the spills internally reported as well as the spills reported to the regulators. This KPI is used to follow trends related to spill increase or reduction, and to guide corrective actions if needed. For 2017, the target of the Spill Frequency is 1.05 spill/day.*



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*All spills reported internally and to regulators are managed appropriately on site according to our spill contingency plan. Spills are contained and cleaned, contaminated material is disposed to the appropriate area (landfarm, TSF if required) and the clean-up actions are monitored closely by the Environment team.*

**Concern:** There appears to be a mistake in the number of spills reported to the hotline for the 2011-2015 period. The 2016 Annual Report indicates that 18, 12, 16, 7, and 9 spills were reported in 2011, 2012, 2013, 2014, and 2015 respectively. The 2015 Annual Report, however, indicates that 18 spills were reported in 2015, and 12, 16, 7 and 9 were reported in 2011, 2012, 2013 and 2014 respectively.

**Recommendation 20:** Please clarify the number of reported spills for the 2011-2015 period.

**Agnico Eagle's Response:**

*Thanks for bringing this to our attention. Agnico Eagle report to the hotline 12, 16, 7, 9, 18 and 34 spills from 2011, 2012, 2013, 2014, 2015 and 2016 respectively. This error will be corrected in the 2017 Annual Report.*

**Concern:** AEM reports that spill prevention training was provided to employees in 2016. While training includes "induction training" for new employees, visitors and contractors, it is not clear how frequently refresher training is provided to long-term staff.

**Recommendation 21:** Please indicate whether refresher training is part of spill prevention initiatives, and if so, how frequently it is provided to staff.

**Agnico Eagle's Response:**

*All employees and contractors must participate in an induction session online prior to the arrival at the mine site, which includes a training section on spill management (prevention, reporting and cleaning). In 2016, 803 induction training were given to new employees, visitor and contractors. The induction training needs to be redone every 3 years for existing employees and contractors on site. Every employee and contractor who operates a vehicle on site must participate in training on vehicle operation. Spill management is a component of this training session.*

### 4.11 Spill Management: Landfarm

**Concern:** AEM decided to find a new location for the landfarm (Landfarm 2) to continue treatment of contaminated soil, since the existing landfarm (Landfarm 1) is located on the northwest side of the South Tailings Cell, which is predicted to be flooded with reclaim water in the summer of 2017. Landfarm 2 was constructed in 2016. An extension of Landfarm 1 was also built at a higher elevation in 2016 to continue treatment of soil at this location. AEM does not indicate where Landfarm 2 is located, nor when it will begin operation. Similarly, it is not clear when Landfarm 1 will cease operation, and how the remaining soil there will be managed to





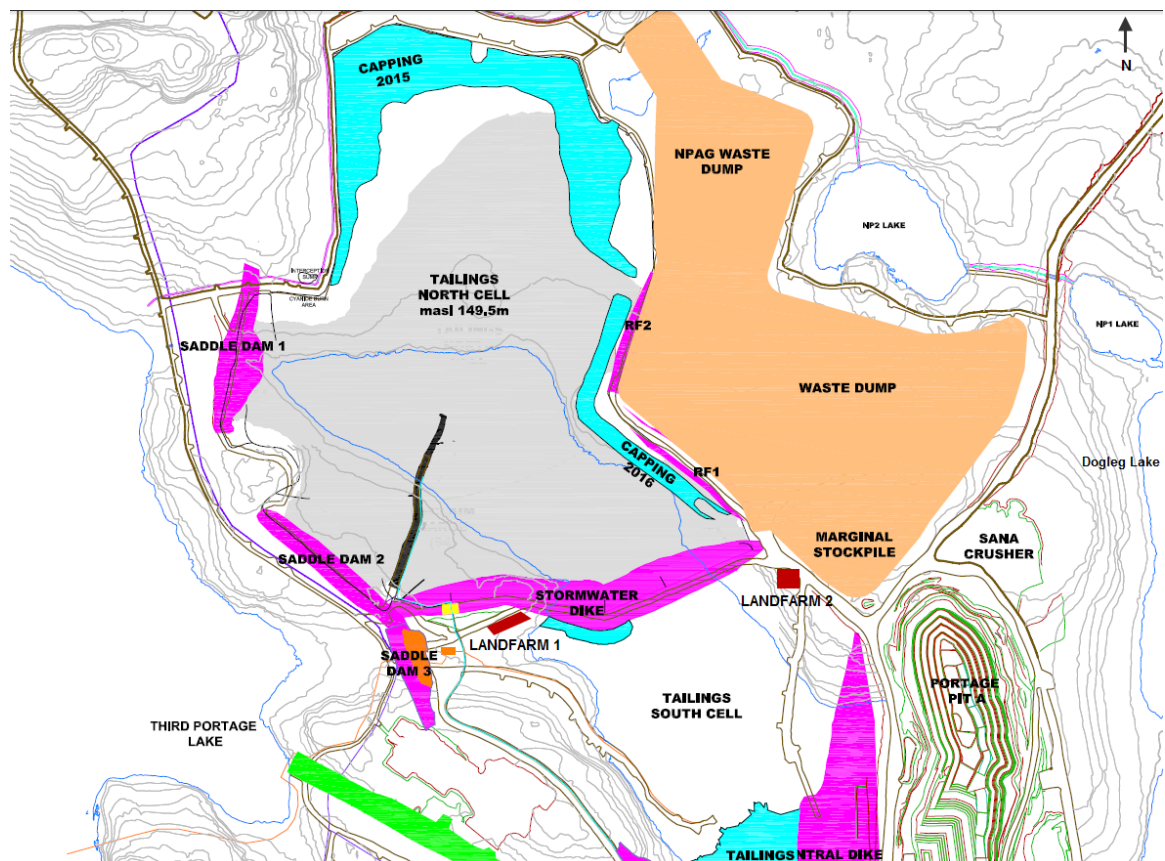
avoid exposure to flooding and the generation of unnecessary contact water in the summer of 2017. AEM states that more information on landfarm activities is presented in Appendix F3 “2016 Landfarm Report”, however, basic information on operations, location, and mitigation of flooding should also be summarized in the Annual Report.

**Recommendation 22:** Please indicate the location of Landfarm 2 and explain when it will begin operation in the Annual Report.

**Agnico Eagle’s Response:**

*All the requested details can be found in the Landfarm Design and Management Plan Version provide in Appendix I1 and in the Landfarm As-Built available in Appendix J1 of the 2016 Annual Report.*

*Landfarm 2 is located on the north east side of the South Tailing Cell, north of the Central Dike. Please find on figure below the location of the Landfarm 1 and Landfarm 2. The as-built report has been sent to NWB on November 18, 2016 (Appendix J1 2016 Annual Report). Disposal of contaminated soil in Landfarm 2 have started in January 2017. The completion of the Landfarm 1 and the details of the first year of operation of the Landfarm 2 will be discussed in the Annual Report 2017.*





**Recommendation 23:** Please explain when Landfarm 1 will cease operation, and how the remaining soil at the landfarm will be managed to avoid exposure to flooding anticipated in the summer of 2017.

**Agnico Eagle's Response:**

*All the requested details can be found in the Landfarm Design and Management Plan Version 4 provide in Appendix I1 and J1 of the 2016 Annual Report.*

*Landfarm 1 facility is planned to be flooded by reclaim water in mid-2017 so the operation may continue until mid-2017. Agnico may have to move some soil still in remediation from Landfarm 1 to Landfarm 2 if required. Ultimately the Landfarm 1 pad will be flooded with reclaim water. Un-remediated soil will be moved by truck to Landfarm 2 as necessary. Another option for management of contaminated soil can be direct placement of this material in the Tailings Storage Facility, if bioremediation is not effective or for operational reasons, as stated in the Landfarm Design and Management Plan 2017, in Appendix I1 of the 2016 Annual Report. Some soil contained in the Landfarm 1 may remain in the TSF South Cell.*

#### **4.12 Monitoring: Core Receiving Monitoring Program (CREMP)**

**Concern:** AEM reports that “as in the past, there were some statistically significant mine-related changes relative to baseline/reference conditions identified in 2016” (p. 115) in water chemistry of Meadowbank Study Lakes, relating to alkalinity, conductivity, hardness, major cations (calcium, potassium, magnesium and sodium) and total dissolved solids. Despite exceedances of early warning triggers for several water quality parameters, AEM concludes that “observed changes are still relatively low and unlikely to adversely affect aquatic life” (p. 115). No evidence is provided to support the argument that these exceedances are not harmful to aquatic organisms.

**Recommendation 24:** Please provide support for the statement that water chemistry exceedances “are...unlikely to adversely affect aquatic life” and a discussion of actions that have been taken in response to these early warning trigger exceedances.

**Agnico Eagle's Response:**

*Agnico Eagle will refer to Section 3.2.2 of 2016 CREMP report found in Appendix G1 of the 2016 Annual Report for an exhaustive description. The 2016 Annual Report main document, Section 8.1, is only a summary of the key points found in the 2016 CREMP Report (Appendix G1). There was the same question in regards to the 2015 Annual Report. If the response below is not satisfying, please provide to Agnico some clarification on the details you want to have.*

*Historical trend assessment results related to each of the mining activities are discussed at length in the 2012 CREMP report (Azimuth, 2013). Water chemistry parameters for*





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which the 2016 means for Meadowbank study lakes exceeded their respective trigger values are presented in (CREMP 2016 report). For each parameter/area that exceeded the trigger, formal statistical testing of the observed result was conducted using the BACI statistical model (one-tailed; looking for uni-directional changes only). In this analysis, the model interaction term (or BACI effect term) represents the change at the test area relative to baseline after accounting for natural temporal changes (i.e., temporal changes at the reference area); for simplicity, changes are noted “relative to baseline/reference” conditions. Results are provided in **Error! Reference source not found.** of 2016 CREMP Report; key results (i.e., those parameter/area combinations where the 2016 results were statistically different [ $p < 0.05$ ]) were as follows:

- *Laboratory Conductivity/Hardness – TPN, TPE, SP, and WAL showed an increase relative to baseline/reference conditions. Conductivity is a composite variable that responds positively to increasing concentrations of ionic compounds (e.g., chlorides, sulphates, carbonates, sodium, magnesium, calcium, potassium and metallic ions). The observed change, therefore, is indicative of changes in its underlying compounds (e.g., see ionic compounds below for additional context).*
- *Ionic Compounds (Calcium, Magnesium, Potassium, Sodium) – TPN, TPE, and SP showed an increase (relative to baseline/reference) in all of these major ions; WAL showed increases in calcium and magnesium. Concentrations at these NF areas have typically been <6 mg/L (calcium), <2 mg/L (magnesium), < 1.5 mg/L (sodium), and <1 mg/L (potassium). Slight increases of these ionic compounds in the Meadowbank study lakes are unlikely to adversely affect biota. In fact, there is a considerable amount of literature demonstrating that the presence of these ions lowers the bioavailability of many dissolved metals.*
- *TDS – TPN, TPE, and SP showed an increase relative to baseline/reference conditions. Similar to conductivity, TDS is a composite variable based on the combined amount of all inorganic and organic substances contained in a sample. The current TDS discharge limit in the water use license (2AM-MEA1525) is 1,400 mg/L for both the maximum average concentration and maximum allowable grab sample concentration. Weber-Scannell and Duffy (2007) reviewed TDS toxicity to aquatic life. While they recommend deriving ion-specific limits for aquatic life (i.e., rather than for TDS), none of the literature studies they compiled showed effects at TDS concentrations less than 250 mg/L and they report mean TDS in the world’s rivers of approximately 120 mg/L. There are no federal water quality guidelines for TDS in Canada or the US. In Alaska, TDS may not exceed 500 mg/L without a special permit and 1000 mg/L at any time (ADEC, 2012). A TDS receiving environment benchmark 500 mg/L was adopted at Diavik (WLWB, 2013). Thus, these changes leading to TDS concentrations on the order of 15 to 45 mg/L are very low and not of concern.*



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- Alkalinity – SP showed an increase in bicarbonate and total alkalinity in 2016 relative to baseline/reference conditions. Bicarbonate ( $\text{HCO}_3^-$ ) comprised 100% of the total alkalinity fraction, typical of surface water with pH in the range of 6.5 to 9. Bicarbonate alkalinity at SP has consistently exceeded the trigger dating back to 2011, and in 2016 was 11.1 mg/L, similar to the concentration reported in 2015 of 11.5 mg/L. The temporal trend of slightly increasing alkalinity relative to baseline/reference conditions is unlikely to adversely affect biota at SP.

It is important to note that total and dissolved metals concentrations were consistently low or below their respective MDLs at the NF, MF, and FF locations (**Error! Reference source not found.** 2016 CREMP Report) and that none of these parameters have ever exceeded trigger or threshold values. In 2016, the same metals were measured above laboratory detection limits (MDLs) as in 2015. This is important to note in relation to ongoing discharges to the receiving environment (e.g., discharge from Vault attenuation pond to Wally Lake [June – September] and discharge of East Dike seepage to Second Portage Lake [during all of 2016]). Refer to Section **Error! Reference source not found.** and **Error! Reference source not found.** of the 2016 CREMP Report for more details on major mine-related activities in 2016.

The CREMP continues to detect changes in some general water quality parameters that appear to be related to mining activity. These changes are also reflected in higher concentrations of some parameters when compared to the model predictions in FEIS. The FEIS water quality predictions are estimates of change water quality in Third Portage Lake, Second Portage Lake, and Wally Lake assuming different mixing scenarios and loading estimates from water releases and dike leaching. The model for Third Portage Lake includes treated water release from the project in year's 1 to 4 and long-term loading of metals from the Bay-Goose dike material. The Second Portage Lake water quality model includes loading of parameters from the Third Portage and East dikes and inflow from Third Portage and Wally lakes. The water quality model for Wally incorporates long-term loadings from the Vault dike and effluent releases from the Vault Attenuation pond. At the time the FEIS was issued, the CWQG for cadmium was lower than the MDL for the baseline data. A thorough review of the ecological significance of the predicted cadmium concentrations was presented in the FEIS, and the probability of cadmium causing toxicity was considered "extremely low" (Cumberland, 2005). Arsenic was also predicted to exceed the CWQGs in Wally Lake. Similar to cadmium, the MDL was equal to the guideline (i.e., 0.005 mg/L). The models were considered conservative because the MDLs were used as the baseline concentrations. The current MDLs for arsenic and cadmium are 0.0001 mg/L and 0.000005 mg/L, respectively. All of the samples collected in 2016 from Third Portage, Second Portage, and Wally Lakes were below the MDL for cadmium. In the case of arsenic at Wally, the concentrations are below the trigger value, and well below the CCME water quality guideline of 0.005 mg/L. Overall, the FEIS predicted the magnitude of potential effect on water quality in each of the lakes as "low" (see Section **Error! Reference source not found.** of the 2016 CREMP Report for more details on the decision criteria for effect magnitude).



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*The same list of parameters that exceed the Meadowbank trigger values typically exceed the concentrations predicted in the FEIS, namely ionic compounds (calcium and magnesium), hardness, and total alkalinity. Chloride, fluoride, nitrate (as N), and sulphate also exceed the FEIS predictions for Third Portage Lake, Second Portage Lake, and Wally Lake in some samples. Most metals are below the predicted concentrations for Third Portage Lake (**Error! Reference source not found.** 2016 CREMP Report), Second Portage Lake (**Error! Reference source not found.** 2016 CREMP Report), and Wally Lake (**Error! Reference source not found.** 2016 CREMP Report) with the exception of isolated instances of aluminum, iron, and manganese. Strontium consistently exceeded the model predictions in all three lakes, but importantly did not exceed the trigger (95th percentile of baseline) indicating current strontium concentrations are representative of pre-development conditions. It is important to point out that none of the above parameters that exceed the trigger values or FEIS model predictions have trigger values that were set in the context of effects-based threshold values (e.g., CCME water quality guidelines). Thus, CREMP water quality results are consistent with the “low” significance (i.e., <1x CCME WQG) rating applied to model predictions in the FEIS (Cumberland, 2005).*

*In the absence of available thresholds, trigger values for these substances were set at the 95th percentile of baseline data (i.e., in the absence of any mine-related inputs, 5% of the samples would be expected to exceed the trigger). Consequently, the BACI model results reported above only indicate that statistically significant changes have been detected relative to baseline/reference conditions. Available information suggests that the observed concentrations of these parameters are well below levels of concern. As in the past, it is recommended that these trends continue to be monitored in 2017.*

**Concern:** Some polycyclic aromatic hydrocarbons (PAHs) were measured in composite sediment samples collected at Second Portage, Third Portage, Wally and Innuguguayalik Lakes. AEM states, however that “the absolute concentrations are unlikely to pose risk to benthic invertebrates at the NF [near field] locations” (p. 116). AEM does not explain the reasoning behind this statement.

**Recommendation 25:** Please provide support for the statement that PAHs measured in Meadowbank lakes are not expected to adversely affect benthic invertebrates.

**Agnico Eagle’s Response:**

*As discussed in the 2016 CREMP report, the measured PAHs in 2016 are thought to likely be false positives and unrelated to mining activities. However, in the event that they are “real”, they were considered not to pose unacceptable risks to benthic invertebrates for the following reasons: (1) concentrations were either below CCME Interim Sediment Quality Guidelines (ISQGs) or marginally above (see acenaphthylene discussion below) and (2) no effects were seen in the benthic community monitoring.*



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*Acenaphthylene at TPE measured 0.0063 mg/kg (dw) slightly above the CCME Interim Sediment Quality Guideline (ISQG) of 0.0053 mg/kg. None of the other detected PAHs exceeded the ISQGs in 2016. There is no ISQG for acenaphthylene specifically for freshwater sediments; rather, the marine ISQG was adopted for freshwater environments. The ISQG (or threshold effect level [TEL]) is defined as the lowest concentration range where adverse effects rarely occur (i.e., fewer than 25%). Concentrations between the ISQG (0.0053 mg/kg) and the probable effect level (PEL; 0.128 mg/kg) is defined as the range in concentrations where adverse effects occasionally occur (CCME 2001). In the case of acenaphthylene, concentrations in marine sediments below the ISQG are associated with adverse effects in 7% of the studies used to derive the guidelines. At concentrations between the ISQG and PEL, adverse effects occurred in 14% of the marine (and estuarine) studies used to derive the guidelines (CCME 1999). Notwithstanding the potential for laboratory variability in the acenaphthylene concentration at TPE (only slightly above the detection limit), the ISQG was only marginally exceeded in sediment collected from TPE in 2016. Acenaphthylene was below detection in all other sediment samples from the near-field stations in 2016. Importantly, exceedance of the ISQG is not evidence of adverse effects to the benthic invertebrate community. They are intended to be used with other supporting information, such as biological assessments, when determining whether the measured concentrations are posing risks to aquatic receptors. In the case of the CREMP, robust statistical analyses (before-after-control-impact) of the benthic invertebrate community is done on an annual basis to determine whether potential changes in parameters, such as metals or PAHs, is adversely affecting the benthic invertebrate community. As noted in the 2016 CREMP report, there was no evidence of statistically significant adverse effects to the benthic invertebrate community at TPE in 2016. Furthermore, absolute abundance at TPE has been consistent over the past 4 years. The absence of adverse effects to the benthic invertebrate community at TPE provides strong evidence that detected acenaphthylene at TPE in 2016 is unlikely to pose risks to the benthic invertebrate community.*

### 4.13 Monitoring: Vault Attenuation Pond Discharge

**Concern:** AEM states that the results of the 2016 Environmental Effects Monitoring (EEM) effluent characterization monitoring were previously reported to ECCC. It is not clear why this information is not also presented in the Annual Report. AEM plans to submit the EEM Cycle 3 Interpretive Report (evaluating Wally Lake- Vault Discharge) to ECCC in July 2018.

**Recommendation 26:** Please provide the results of the 2016 EEM effluent characterization monitoring of the Vault Attenuation Pond Discharge in the Annual Report.

#### **Agnico Eagle's Response:**

*Agnico Eagle has provided the 2016 EEM effluent characterization of the Vault Attenuation Pond Discharge. The results can be found on Table 8.4 and discussion on Section 8.2.2 of the 2016 Annual Report. Agnico wants to recall that all data related to the MMER and EEM Monitoring is provided in the 2016 Annual Report in Section*



*8.2. Refer to the response to Recommendation 2 for additional details on EEM Cycle 2 Interpretative report and on the EEM Cycle 3 Study Design.*

**Recommendation 27:** Please provide the KIA with a copy of the EEM Cycle 3 Interpretive Report in 2018.

**Agnico Eagle's Response:**

*Agnico Eagle takes notes of KIA's request and will provide a copy to KIA of the EEM Cycle 3 Interpretative Report to be submitted to ECCC in 2018. A copy will also be included with the Annual Report that will be prepared following the EEM Cycle 3 Interpretative Report submission.*

#### **4.14 Monitoring: East Dike Discharge**

**Concern:** AEM states that the results of the 2016 EEM effluent characterization monitoring for the East Dike Discharge were previously reported to ECCC. It is not clear why this information is not also presented in the Annual Report

**Recommendation 28:** Please provide the results the 2016 EEM effluent characterization monitoring for the East Dike Discharge in the Annual Report.

**Agnico Eagle's Response:**

*Agnico Eagle has provided the 2016 EEM effluent characterization of the East Dike Discharge. The results can be found on Table 8.7 and discussion on Section 8.2.3 of the 2016 Annual Report. Agnico wants to recall that all data related to the MMER and EEM Monitoring is provided in the 2016 Annual Report in Section 8.2.*

#### **4.15 Monitoring: Mine Site Water Collection System**

**Concern:** AEM reports that "copper is slightly elevated above CCME at NP-2 South, East, West, and NP1-West " (p. 127). The CCME guideline for protection of aquatic life for copper is 0.002 mg/L. Average levels in 2016 at NP-2 South and NP-2 Winter were 2-3 times above the CCME limit (0.005 and 0.0062 mg/L respectively). AEM does not provide any criteria by which to assess whether these levels are slightly or significantly elevated above CCME guidelines from a biological perspective. No discussion of potential impacts on aquatic organisms is provided.

**Recommendation 29:** Please qualify the statement that 2016 average copper levels at NP-2 South and NP-2 Winter are "slightly elevated" by providing evidence that such levels are not a serious concern for aquatic life. Please report comparisons of current water quality with those present prior to development in addition to "average" levels during operation of the mine.

**Agnico Eagle's Response:**



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*Maximum average values of total copper at NP-2 in 2015 were 0.006 mg/L, which is higher than the CCME guideline of 0.002 mg/L, but substantially lower than both Water License criteria (0.2 mg/L) and MMER criteria (0.6 mg/L). CCME guidelines are generally considered to be conservative targets for long-term water quality - "Guideline values are meant to protect all forms of aquatic life and all aspects of the aquatic life cycles, including the most sensitive life stage of the most sensitive species over the long term (CCME, 1999 - <http://ceqg-rcqe.ccme.ca/download/en/312>)". Water quality was not monitored at NP-2 prior to 2014. However, data from reference lakes in the Meadowbank area indicates typical background concentrations of total copper are <0.001 mg/L, although concentrations in receiving lakes have occasionally exceeded CCME guidelines as well. Since monitoring of NP-2 will be ongoing through 2018, longer-term trends in copper concentrations will be assessed in relation to CCME guidelines, as appropriate.*

### 4.16 Monitoring: QAQC Sampling

**Concern:** AEM is required to hire an independent contractor to conduct water quality monitoring under the NIRB Project Certificate. AEM refers to “qualified technicians” and “Agnico technicians” conducting water quality field sampling, but the name of the independent contractor is not listed.

**Recommendation 30:** Please provide the name of the company hired to provide the field technicians for water quality monitoring. If AEM’s own staff participated in a portion of the field sampling, please indicate which field events were conducted by the third party’s field technicians, and which were conducted by AEM’s staff.

#### **Agnico Eagle’s Response:**

*As a clarification and as stated in NIRB Condition 23: “[...] Cumberland shall ensure that water quality monitoring performed at locations within receiving waters that allow for an assimilative capacity assessment of concern to regulators, be carried out by an independent contractor [...]” also “NIRB’s preference is for independent, third party sampling. However in the case where MMC collects its own samples, the sampling shall be conducted in accordance with a methodology approved by NWB through a Quality Assurance /Quality Control (“QA/QC”) plan and must be submitted to an independent third party laboratory for analysis.”*

*Agnico Eagle does not hire an independent contractor to conduct water quality sampling on site and operates as per the approved Quality Assurance / Quality Control (QA/QC) Plan (Version 2, 2014) approved by the NWB. Data quality was assured throughout the collection and analysis of samples using specified standardized procedures, by the employment of accredited laboratories, and by staffing the program with experienced technicians, as discussed in section 8.3.6 of the Annual Report.*





*QA/QC methods and results for specific field programs are discussed separately in their respective reports; these field programs are presented in the appendices of the 2016 Annual Report. The CREMP program, as well as the EEM program both conducted in receiving waters, involve the participation of qualified contractors for some sampling and data interpretation.*

#### **4.17 Monitoring: Mill Seepage**

**Concern:** AEM implemented a monitoring program for mill seepage in 2014, as part of the Freshet Action Plan. The 2016 Annual Report indicates that concentrations of CN free, CN total and copper were below regulatory guidelines, while iron concentrations were higher at monitoring wells, while all parameters were below CCME guidelines for the Protection of Aquatic Life at Third Portage Lake. No data are presented to support these statements in the Annual Report, nor in Appendix C2, Appendix D- 2017 Freshet Action Plan.

**Recommendation 31:** Please provide a table summarizing monitoring results, with comparisons to regulatory guidelines/thresholds for the mill seepage monitoring program.

**Agnico Eagle's Response:**

*In the Annual Report 2016, Table 8.67, 8.68 and 8.69 contain regulatory guidelines, monitoring results from the seepage and Third Portage Lake (TPL-Assay), respectively.*

#### **4.18 Monitoring: Summary of Results of AEMP – Related Monitoring Programs**

**Concern:** Table 8.73 (Summary of 2016 CREMP Results) indicates that acenaphthylene, a polycyclic aromatic hydrocarbon, exceeded the threshold at Third Portage Lake, but that the concentration was less than 5 times the method detection limit. AEM concludes that “acenaphthylene is not considered a risk to benthic invertebrate community at TPE [Third Portage Lake]” (p. 151). No magnitude, spatial scale, causation or permanence are assigned to the chemical's occurrence at Third Portage Lake. It is not clear why this information is missing, since the CCME guidelines indicate that acenaphthylene is a persistent substance, with a half-life of between 12 days and 14 weeks in water. Given this, it is unclear why that chemical was deemed as posing no risk to benthic invertebrates.

The occurrence of acenaphthylene at Third Portage Lake is not discussed in the text of the Annual Report. Similarly, the PAHs measured in sediment of Second Portage, Wally and Innuguguayalik Lakes, which are discussed in Section 2.8.1 (CREMP; see Recommendation #24), are not summarized in Table 8.73.

**Recommendation 32:** Given the fact that acenaphthylene is a persistent substance, please explain why it is not considered a risk to benthic invertebrates in Third Portage Lake, and fill in the information in Table 8.73 regarding the chemical's magnitude, spatial scale, causation, permanence, and management action for its occurrence in the lake.

**Agnico Eagle's Response:**



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*See the response to Recommendation 25 for a full discussion on acenaphthylene, the CCME sediment quality guidelines, and the potential for adverse effects to benthic invertebrates. Please find below the updated Table 8.73.*





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Variable Type & Variable	Magnitude <sup>1</sup>	Spatial Scale <sup>2</sup>	Causation <sup>3</sup>	Permanence <sup>4</sup>	Uncertainty <sup>5</sup>	Comments	Management Action <sup>6</sup>
Exposure - Limnology							
Oxygen	0	n/a	n/a	n/a	?	All stations - consistent with previous years	0
Temperature	0	n/a	n/a	n/a	?	All stations - consistent with previous years	0
Conductivity	0	Small	Low	n/a	???	Sp. conductivity readings at SP (January) and WAL (March) were elevated relative to historical conductivity readings in each lake. The results are highly uncertain because of possible issues with the probe. Conductivity readings for the rest of the year were within the normal historical range for each lake. No action required.	0
Exposure - Water Chemistry							
Conventionals	1	Large	High	Low	?	The following parameters (conventionals and nutrients) were elevated relative to reference/baseline conditions. However, concentrations suggest <u>low</u> potential for adverse effects: <b>Alkalinity</b> (SP); <b>Conductivity</b> (TPN, TPE, SP, WAL); <b>Hardness</b> (TPN, TPE, SP, WAL); <b>Ca/K/Mg/Na</b> (TPN, TPE, SP [not Na], WAL [not Na or K]); <b>TDS</b> (TPN, TPE, SP, WAL)	1
Nutrients	0	n/a	n/a	n/a	?	No trigger exceedances.	0
Total Metals	0	n/a	n/a	n/a	?	No trigger exceedances.	0
Dissolved Metals	0	n/a	n/a	n/a	?	No trigger exceedances.	0
Total Suspended Solids	0	n/a	n/a	n/a	?	No trigger exceedances.	0
Exposure - Sediment Chemistry							
Physical	0	n/a	n/a	n/a	?		0
Total Metals	1	Moderate	High	Moderate	??	Sediment chromium concentrations continue to exceed the trigger at TPE. Concentrations appear to be stabilizing based on the results from 2015 and 2016.	1
Organics	0	n/a	n/a	n/a	?	Minor PAHs (e.g., acenaphthylene at TPE) thought to be false positives and unrelated to mining (e.g., hits at INUG too). Will be watched in 2017.	1
Effects - Phytoplankton							
Chlorophyll-a*	0	n/a	n/a	n/a	?	Continued data quality issue for chlorophyll-a (temperature control in transit).	0
Total Biomass	0	n/a	n/a	n/a	?	No statistically significant adverse effects were detected in 2016.	0
Taxa Richness	0	n/a	n/a	n/a	?	16% lower richness was reported at TPE in 2016 relative to baseline/reference. The trigger for adverse effects to phytoplankton richness is a reduction of 20% or more.	0
Effects - Benthic Invertebrates							
Total Abundance	0	n/a	n/a	n/a	?	Decreased abundance at TPE relative to INUG in the past four years, but the differences are primarily driven by increased abundance at INUG while abundance at TPE has been relatively stable. None of the results are statistically significant.	0
Total Richness	0	n/a	n/a	n/a	?	Richness continues to track higher for most stations. The benthic communities are dominated by chironomids, and the relative proportion of major taxa remains stable at all stations.	0
Notes:							
<sup>1</sup> Magnitude Ratings (narrative in brackets used in the absence of specific triggers/thresholds):							
0 – no exceedances of triggers or thresholds (or no apparent changes from baseline of concern)							
1 – early warning trigger exceeded (or change from baseline warranting concern)							
2 – threshold exceeded (or change from baseline exceeding magnitude of concern)							
<sup>2</sup> Spatial Scale Ratings:				<sup>3</sup> Causation Ratings:			
n/a – no magnitude of effect, therefore not evaluated				n/a – no magnitude of effect, therefore not evaluated			
Small – localized scale				Low – no evidence for a mine-related source			
Moderate – sub-basin to basin scale				Moderate – some likelihood of a mine-related source			
Large – basin to whole lake scale				High – the source of the problem is very likely to be mine-related			
<sup>4</sup> Permanence Ratings:				<sup>5</sup> Uncertainty Ratings:			
n/a – no magnitude of effect, therefore not evaluated				? – low uncertainty			
Low – rapidly reversible (e.g., months to years)				?? – moderate uncertainty			
Moderate – slowly reversible (e.g., years to decades)				??? – high uncertainty			
High – largely irreversible (e.g., decades +)							
<sup>6</sup> Management Actions:							
0 – no action beyond routine CREMP monitoring							
1 – continued trend monitoring in 2017							
2 – active follow-up with more detailed quantitative assessment in 2017							



**Recommendation 33:** Please discuss the occurrence of acenaphthylene in Section 2.8.1 of the report.

**Agnico Eagle's Response:**

*The 2016 Annual Report main document, Section 8.1, is only a summary of the key points found in the 2016 CREMP Report (Appendix G1) and PAH issue were briefly described. Agnico Eagle will continue to refer the reader to the 2016 CREMP report found in Appendix G1 of the 2016 Annual Report for a complete review of the results, action plan and results interpretation.*

*See the response to Recommendation 25 for a full discussion on acenaphthylene, the CCME sediment quality guidelines, and the potential for adverse effects to benthic invertebrates.*

**Recommendation 34:** Please include information on the PAHs measured in the sediment of Second Portage, Wally and Innuguguayalik Lakes in Table 8.73.

**Agnico Eagle's Response:**

*PAHs have periodically been detected in the sediments collected from both exposure and reference areas as part of the Meadowbank CREMP. In all instances, the concentrations have been less than 5 times the detection limit reported by the laboratory. We believe that the detected concentrations of acenaphthylene, naphthalene, 2-methylnaphthalene, and phenanthrene in 2016 are false-positives due to variability in the analytical method rather than "actual" concentrations in the sediments. Unfortunately the sediments were discarded before the results could be verified by reanalysis. For 2017, all sediment samples will be screened upon receiving the analytical results to identify potential instances of false-positives. If questionable results are observed for any of the samples, the laboratory will be instructed to re-run the analyses to confirm the results.*

*This hypothesis is supported by the lack of a spatial pattern consistent with mining activities (e.g., some PAHs were detected at the reference area INUG). Table 8.73 (see Recommendation 32 above) has been updated to reflect that (1) detected PAHs are thought to be false-positives and (2) notwithstanding, the situation will be watched closely in 2017 to verify whether the detected PAHs were a one-off laboratory issue or the start of a mine-related trend. As discussed above, no further action is deemed warranted at this time as the detected PAH concentrations generally meet sediment quality guidelines (acenaphthylene is the exception and is discussed above) and no adverse effects were identified in benthic invertebrate community monitoring (i.e., even if they are "real" and mining related, they do not currently pose unacceptable risks to benthic invertebrates).*



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### 4.19 Monitoring: Identification of Potential Risks and Discussion

**Concern:** The difference in Lake Trout size and weight observed between Third Portage Lake populations and reference lake populations is explained as possibly being due to “an inherent difference” between the receiving lake and reference lakes and “an artifact of using lake trout as a sentinel species” (p. 155). No further explanation is given. As we stated in our review of the 2015 Annual Report, this lack of discussion is problematic, because it suggests that a foundation of the CREMP is fundamentally flawed (i.e., using the two reference lakes chosen for fish comparisons and using Lake Trout as a sentinel species), yet no solution to the potential problem is identified. It is not clear why AEM believes that the observed differences are due to artifacts of study design and not mine-related impacts. Furthermore, if there are inherent differences between Third Portage Lake and the two reference lakes, and if Lake Trout is not a suitable sentinel species, then there is little confidence in the data and an alternative approach to monitoring fish needs to be established.

**Recommendation 35:** Please explain why the observed differences in the Lake Trout populations is considered due to factors related to study design and not mine-related impacts. Discuss if this difference was present at the start of the project when the reference lakes were first chosen. Given this conclusion, please indicate how the study design will be changed to overcome these problems, allowing for more robust monitoring of potential mine-related impacts on fish populations.

**Agnico Eagle’s Response:**

*The adult fish surveys are not part of the CREMP. They are a component of the Environmental Effects Monitoring (EEM) program which is a requirement of the Metal Mining Effluent Regulations of the Fisheries Act and is conducted on a three year cycle. Guidance with respect to study design and data interpretation is provided by Environment Canada (Environment Canada. 2012. Metal mining technical guidance for environmental effects monitoring) and the study design for each cycle must be submitted to and approved by Environment Canada prior to the study being conducted. The results of previous studies are taken into consideration when a study design is prepared.*

*The baseline fish studies undertaken in advance of mine development focused on characterizing the fish communities (i.e., species composition) and population structures of the project lakes and candidate reference lakes and did not examine the EEM endpoints.*

*There is natural variability among fish populations and this natural variability can result in statistically significant differences. The EEM approach recognizes this fact through the use of critical effect sizes. Differences that are less than the critical effect size are generally considered to be within the range of natural variability. As there is only one parameter that differs significantly between Third Portage Lake and Pipe Dream Lake, and this difference is less than half of the critical effect size, the population parameters*



*in Third Portage Lake are considered to be within the range of natural variability and not to indicate that there is any cause for concern with respect to the lake trout population in Third Portage Lake.*

#### **4.20 Monitoring: Air Quality Monitoring**

**Concern:** AEM reports that the measured concentrations of dioxins and furans for the incinerator stack testing exceeded the Government of Nunavut standard in one out of three tests in 2016, by 12.5%. No explanation is given for the exceedance or its magnitude.

**Recommendation 36:** Please explain why there was an exceedance of 12.5% above the Government of Nunavut standard for dioxins and furans in one of the incinerator stack tests and what management actions were taken to prevent future occurrences.

**Agnico Eagle's Response:**

*To ensure proper operation of the incinerator, operator training was initially provided by an experienced technician from the incinerator supplier/manufacturer (Eco Waste Solutions). Training for operation of the incinerator is now given by the supervisor in charge of the incinerator. Only solid waste from the accommodation camp, kitchen, shops, and offices that cannot be landfilled are burned in the incinerator. The materials to be incinerated are limited to putrescible waste such organic matter including food containers, wrappings including plastics that are contaminated by food, paper and cardboard; and animals carcasses (small size only). Waste is segregated before disposal in incinerator, as per the waste management procedure on site.*

*Critical process parameters and process control data as per the incinerator operation specifications such as temperature, combustion air flow and burner output are computer controlled to maintain optimal combustion conditions. These parameters are recorded daily and the records are kept for at least 2 years. Those records are regularly verified to assure that the burns are done at a temperature higher than 1000oC and a holding time of at least one second to ensure complete combustion and minimize dioxin and furan emissions.*

*Considering all the measures taken to avoid any exceedance, it is difficult to explain why an exceedance was detected. Agnico will provide in the next Annual Report a summary of all exceedances to date, along with explanations for these exceedances. To prevent other exceedance, Agnico will revise the incinerator management plan with the operators and continue to sensitize the employees to the importance of good waste segregation.*



#### 4.21 Closure: Mine Site

**Concern:** The Portage Rock Storage Facility is designed for storage of PAG waste rock in a manner that will prevent acid rock drainage generation over the long-term. The strategy focuses on freeze control of the PAG waste rock, with a 4 m layer of NPAG rock capping the PAG rock that is encapsulated in permafrost. AEM states that “the waste rock below the capping layer is expected to freeze, resulting in low rates of acid rock drainage (ARD) generation in the long term” (p. 170). A similar approach is used in the Tailings Storage Facility so that “the tailings will freeze in the long term, and ...the talik that currently exists below 2PL Arm will freeze before seepage from the TSF will reach the groundwater below the permafrost” (p. 170).

As we stated in our review of the 2015 Annual Report, the strategy for long-term storage of PAG waste rock is contingent on there being permafrost over the long-term. How has climate change been incorporated into the design and modelling of the storage strategy? If permafrost is disappearing because of higher temperatures, the likelihood that acid rock drainage generation will occur increases.

**Recommendation 37:** Please indicate how climate change effects on permafrost are taken into account in the design and modelling of success of the freeze control strategy for PAG waste rock and confirm if a 4m cap is sufficient to ensure long-term freezing of the waste rock. Please ensure this information is incorporated into the updated Closure and Reclamation Plan.

**Agnico Eagle’s Response:**

*Climate change effects on permafrost are taken into account in the design and modelling of the freeze control strategy for PAG waste rock, as described in the 2014 Interim Closure and Reclamation Report (provided in the 2014 Annual Report) prepared by Golder and Associates, and more specifically section 2.4.1.1.*

*Instrumentation has been installed in the Portage RSF to monitor the freeze back in the waste rock. Results to date from the thermistors indicate that freeze back is occurring in the PRSF structures, as described in Section 5.3.2 of the 2016 Annual Report. Modelling is also performed to confirm the performance of the RSF cover.*

*Currently, the Portage RSF has a 4 m non-potentially acid generating (NPAG) cover system encapsulating the potentially acid generating (PAG) waste rock over 80% of the surface (as of December 2016). The purpose of the cover system is to ensure geochemical stability of the Portage RSF by insulating the PAG waste rock from direct interaction with atmospheric forces by keeping the waste rock frozen.*

*In 2016, Agnico initiated a review of the thermal the modelling of the Portage PAG waste rock, including the impact of the climate change. Additional information will be provided in the 2017 Annual Report, as well as in the Final Reclamation and Closure Plan.*



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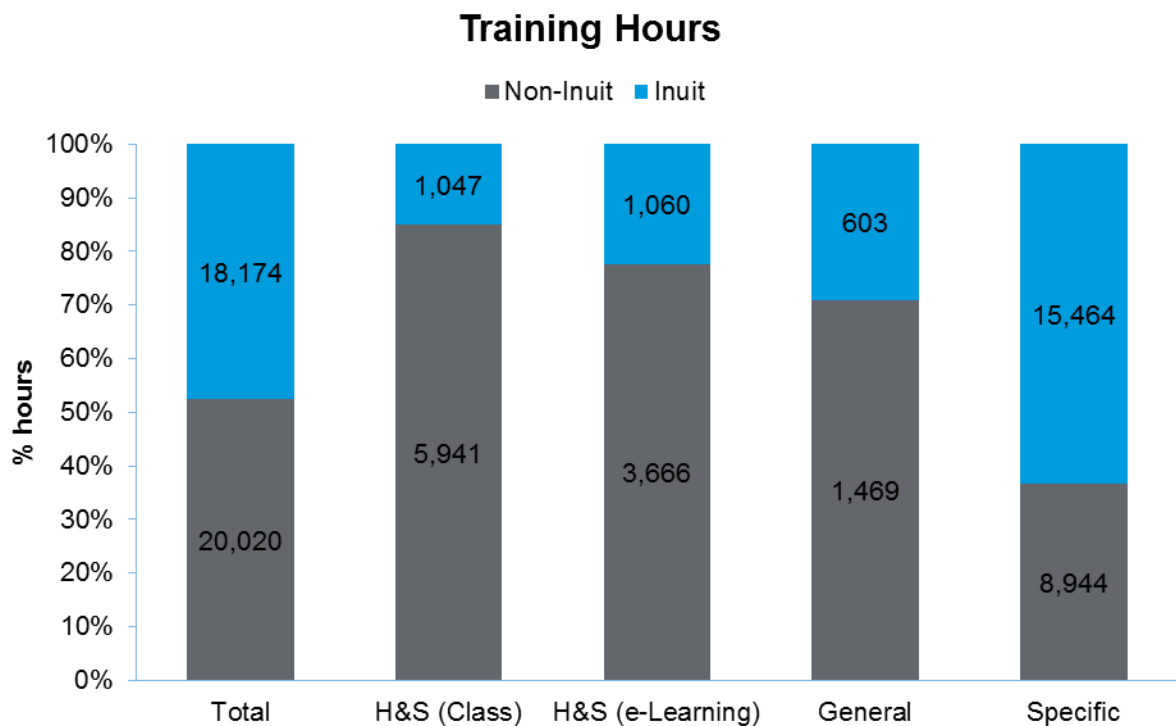
## 4.22 Modifications/General/Other: Education & Training

**Concern:** It is very difficult to read Figure 41 because the white portion of the bar graphs blends in with the white background.

**Recommendation 38:** Please change the colour scheme in Figure 41 to provide more contrast between the bar graphs and background.

**Agnico Eagle's Response:**

*Please find below Figure 41 corrected to facilitate the reading. Agnico acknowledge KIA comments and will make sure for the following Annual Report to use colour that will contrast.*



**Concern:** AEM states that “the majority of mandatory training sessions are offered via e-learning priori to an employee’s arrival on site” (p. 200). While training prior to commencing employment is clearly important, frequent refresher courses on health and safety would be beneficial for all staff. It is not clear whether refresher courses on health and safety issues are offered to Meadowbank staff on a regular basis.

**Recommendation 39:** Please indicate whether refresher courses in health and safety are provided to Meadowbank staff on a regular basis.



**Agnico Eagle's Response:**

*Refresher courses are offered as per predetermined schedule. Each training has a "valid duration" (or has an expiration date). The expiration date of training is set as per various criteria's and/or external regulations, for example Mine Act.*

*Agnico has a tool called the Training Chart that allows supervisors to know, at all time, which trainings are about to expire (within 90 days) or which trainings are expired for all of their employees. This tool allows scheduling the refresher course on a timely manner.*

**Concern:** AEM reports that 59 employees successfully completed cross cultural training in 2016. How is it determined who participates in the program? Is it voluntary or mandatory for certain people?

**Recommendation 40:** Please clarify the selection process for participation in the Cross Cultural Training Program. If voluntary, what steps has AEM taken to improve participation rates?

**Agnico Eagle's Response:**

*The cross-cultural training program is mandatory for all Agnico employees working at our mine site. Since everyone has to follow the course, there is no specific selection process.*

#### **4.23 PEAMP – Evaluation of Impact Predictions: Accuracy of Predictions**

**Concern:** The results of the 2016 monitoring of surface water quality and surface water quantity were compared with predicted values in Tables 12.2 and 12.3. It is not clear why the results discussed earlier in the Annual Report's Section 4.6 (Predicted vs Measured Water Quality [and Quantity]; Section 2.4.6 of this Review) are not presented here as well. In particular, no mention is made of the lake volumes that exceeded the >20% percent difference threshold between predicted and measured values, nor the parameter of concern concentrations that exceeded the >20% percent difference threshold between predicted and measured values.

**Recommendation 41:** Please include a discussion in Section 12.1.1 (and in the Tables 12.2 and 12.3) of the exceedances of >20% percent difference for water quality and water quantity which are presented earlier in Section 4.6 of the Annual Report.

**Agnico Eagle's Response:**

*As per Meadowbank's NIRB Project Certificate, Appendix D (Post-Environmental Assessment Monitoring Program (PEAMP)), the section 12 provides a review of monitoring conducted in 2016 in relation to impacts described in the Final Environmental Impact Statement (FEIS; Cumberland, 2005). The VEC identified in the FEIS related to Aquatic Environment, includes surface water quantity and quality for the receiving lakes.*



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*The section 4.6 Predicted vs Measured Water Quality and Quantity is required by the Water License 2AM-MEA1525 Part E, Item 9, and compare the predicted water quantity and quality within the pits, not within the receiving lakes. Therefore, the discussion on exceedances of >20% percent difference for water quality and water quantity will remain in section 4 and will not be included in the PEAMP section of the Annual Report.*

**Concern:** AEM reports that two Terrestrial Ecosystem Monitoring Program thresholds were exceeded or potentially exceeded in 2016: waterfowl mortalities, and potentially, sensory disturbance of caribou related to the AWAR.

In Table 12.5, however, under Predatory Mammals, AEM reports that “one fox [was] euthanized after not responding to deterrents [and] one killed on mine road [and] one killed on AWAR” (p. 224). These three mortalities exceed the stated threshold of one mortality per year for predatory mammals. It is not clear why these mortalities are not considered exceedances of the predicted impacts for terrestrial wildlife.

**Recommendation 42:** Please clarify why the deaths of the three Arctic foxes are not considered exceedances of predicted impacts for terrestrial wildlife.

**Agnico Eagle’s Response:**

*The ‘one individual’ threshold for predatory mammals applies only to the less common (and listed) Wolverine and Grizzly Bear, as per section 3.5 of the 2006 Terrestrial Management Plan (TEMP). Common species such as Wolf, Arctic Fox, Ermine, etc. are not subject to this threshold. That is why three Arctic Fox deaths in 2016 did not trigger the threshold.*

**Concern:** An assessment of historical trends for mortality of predatory mammals should be conducted since the threshold of one mortality per year was exceeded in 2016 (see Recommendation #40).

**Recommendation 43:** Please assess the historical trends for mortality of predatory mammals for the Meadowbank project.

**Agnico Eagle’s Response:**

One wolverine and three wolves have been killed along the Meadowbank AWAR between 2007 and 2016.

#### **4.24 PEAMP – Evaluation of Impact Predictions: Recommendations for Additional Mitigation or Adaptive Management**

**Concern:** AEM discusses mitigation measures to reduce waterfowl mortalities, but not mortality of predatory mammals (e.g., Arctic foxes). Discussion of additional mitigation measures to prevent or reduce mortality of predatory mammals should be included.





**Recommendation 44:** Please include a discussion of mitigation measures that will be implemented to prevent or reduce further mortality of predatory mammals on site and along the mine road and AWAR.

**Agnico Eagle's Response:**

*Agnico Eagle will include a discussion in the 2017 Annual Report following meetings and discussions of mitigation measures with the terrestrial advisory group (TAG).*

**4.25 PEAMP – Evaluation of Impact Predictions: Contributions to Regional Monitoring**

**Concern:** There are two headings with the same title, but different information.

**Recommendation 45:** Please clarify the headings referring to Contributions to Regional Monitoring.

**Agnico Eagle's Response:**

*Section 12.5.5 of the 2016 Annual Report should be deleted as this is an error. Section 12.5.4 is the only section detailing the Agnico Eagle 2016 Contributions to Regional Monitoring on permafrost.*

**4.26 Appendix D1: Waste Rock and Tailings Management Plan**

**Concern:** AEM discusses the impact of climate change on site conditions in Section 2.1.4.3. This section appears incomplete, as it contains several paragraphs that are repeated, and error messages. In addition, the conclusions drawn on climate change effects are not well supported. According to the text, a 6.4°C increase in maximum average air temperature is predicted for the region by 2100 (i.e., for sites located at 65°N latitude), with accompanying reductions in near-surface permafrost of 12-15%, and increases in active layer thickness of 15-30%. Yet, the text then says that: “predictions based on a warming of 4°C to 5°C over the next 50 years (NRC, 2004) (approximately double the rate predicted above) suggests [sic] that the Meadowbank site would remain within the zone of continuous permafrost, but the active layer thickness would be expected to increase, and the total thickness of permafrost may slowly reduce in time” (p. 10).

The rate of warming stated (4 to 5°C over the next 50 years) is not double the 6.4°C increase stated by 2100. The implications of either rate on permafrost and waste rock/tailings management at Meadowbank are significant, and merit an in-depth analysis and discussion. Yet, no further details are presented either in this Appendix or in the Annual Report.

**Recommendation 46:** Please address the discrepancy in predicted temperature increases presented in the text.

**Agnico Eagle's Response:**

*The information presented in the section 2.1.4.3 is a summary of the several reports and studies that Agnico based its modeling to obtain the Meadowbank mining licence.*



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*Modelling results and findings was removed from the text to focus on the management plan itself. Agnico understands the comment from the KIA and will review this section in the next management plan for the 2017 Annual Report.*

**Recommendation 47:** Please present an in-depth discussion of the implications of a 4 to 6.4°C maximum average air temperature increase for the permafrost at Meadowbank, and subsequently, waste rock and tailings management over the long-term (i.e., >100 years), particularly management of PAG waste rock.

**Agnico Eagle's Response:**

*Climate change effects on permafrost are taken into account in the design and modelling of the freeze control strategy for PAG waste rock, as described in the 2014 Interim Closure and Reclamation Report (provided in the 2014 Annual Report) prepared by Golder and Associates, and more specifically section 2.4.1.1. A summary is presented below.*

*Predictions based on a warming of 4°C to 5°C over the next 50 years (NRC 2004), which approximately double the rate described above from BGC (2003) and IPCC (2007), suggest that the Project areas would remain within the zone of continuous permafrost under this scenario. The active layer thickness would be expected to increase, while the total thickness of permafrost may slowly reduce in time. However, these changes are not anticipated to compromise the planned permafrost encapsulation strategies for the rock storage and tailings facilities.*

*Instrumentation has been installed in the Portage RSF to monitor the freeze back in the waste rock. Instruments are also installed in the TSF North Cell to monitor the freezing of the tailings. Results to date from the thermistors indicate that freeze back is occurring in the PRSF structures, as described in Section 5.3.2 of the 2016 Annual Report. Modelling is also performed to assess the performance of the RSF cover.*

*Currently, the Portage RSF has a 4 m non-potentially acid generating (NPAG) cover system encapsulating the potentially acid generating (PAG) waste rock over 80% of the surface (as of December 2016). The purpose of the cover system is to ensure geochemical stability of the Portage RSF by insulating the PAG waste rock from direct interaction with atmospheric forces by keeping the waste rock frozen.*

*In 2016, Agnico initiated a review of the thermal the modelling of the Portage PAG waste rock, including the impact of the climate change. Two representative concentration pathway scenarios (RCP) were used to evaluate the impact of climate change at 4m depth over 150 years. Additional information will be provided in the 2017 Annual Report, as well as in the next Interim Reclamation and Closure Plan.*



**Concern:** AEM outlines its control strategies for acid rock drainage in Section 4. The strategies employed by AEM (freeze controlled and climate controlled) rely on continuous permafrost and low net precipitation, two conditions that are threatened by climate change in the Meadowbank region. For example, the Nunavut Climate Change Centre (see <http://www.climatechangenunavut.ca/en/understanding-climate-change/climate-change-nunavut>) indicates that permafrost depth and coverage are predicted to decrease in the future, while precipitation is expected to increase across the territory (and has already increased by 8% in Nunavut over the last century).

Given the significant reliance on a stable cold and relatively dry climate at Meadowbank for control of acid mine drainage, we believe the potential threats of climate change on AEM's control strategies over the short- and long-term merit an in-depth assessment and discussion in the Annual Report.

**Recommendation 48:** AEM should discuss ongoing mitigation and adaptive management strategies to reduce the impact of climate change on project activities, project infrastructure and the long-term stability of the site post-closure. In particular, AEM should consider new Intergovernmental Panel on Climate Change (IPCC) models for climate change in the region that have emerged since the Meadowbank Environmental Assessment and how they affect original plans for control of acid mine drainage over the short- and long-term at the mine.

**Agnico Eagle's Response:**

*Agnico agrees with the KIA comments and will continue to integrate IPCC model for climate change in the design of the future infrastructure and closure design at the Meadowbank site.*

**Concern:** AEM outlines tailings management strategies in Section 7.2. As with acid rock drainage, tailings disposal depends on the "arid climate and permafrost environment" (p. 58) currently present at Meadowbank. AEM states that "it is anticipated that the tailings will eventually become encapsulated by permafrost" (p. 58), but no assessment or discussion of the short- and long-term efficacy of this strategy under climate change is provided.

**Recommendation 49:** AEM should discuss ongoing mitigation and adaptive management strategies to reduce the impact of climate change on project activities, project infrastructure and the long-term stability of the site post-closure. In particular, AEM should consider new IPCC models for climate change in the region that have emerged since the Meadowbank Environmental Assessment and how they affect original plans for tailings disposal over the short- and long-term at the mine.

**Agnico Eagle's Response:**

*Agnico agree to use the IPCC models for climate change to evaluate the long-term stability of the tailings storage facility. Agnico is currently proceeding to progressive reclamation work over the North Cell TSF by placing NPAG material layers over the*



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*tailings. Agnico is monitoring settlement of the capping and freeze back of the tailings on a larger scale than the test pad installed with the support of the RIME since 2014. The objective is to evaluate the constructability and the thermal effectiveness of the cover.*

**Concern:** AEM's plans for tailings reclamation (Section 7.3) consist of aggradation into surrounding permafrost to limit the movement of contaminants through surface and groundwater, with the tailings material capped with NAG material to keep them frozen as much as possible. AEM states that: "Tailings material, beneath the minimum 2.0 m thick cover, appears to remain frozen for all years (excluding the warmest years) from the 100-year database, accounting for climate change" (p. 60). Temperatures in the region are expected to rise in the future under climate change, potentially beyond what has been recorded over the past 100 years. It is thus questionable whether conclusions on the efficacy of tailings reclamation strategies based on previous climate trends are reliable under a changing climate. The Sabina Gold & Silver Corporation is using a 5 m cap in response to climate change uncertainty at its Back River Gold Project.

**Recommendation 50:** AEM should discuss ongoing mitigation and adaptive management strategies to reduce the impact of climate change on project activities, project infrastructure and the long-term stability of the site post-closure. In particular, AEM should consider new IPCC models for climate change in the region that have emerged since the Meadowbank Environmental Assessment and how they affect original plans for tailings reclamation over the short- and long- term at the mine.

**Agnico Eagle's Response:**

*Agnico agrees to use the IPCC models for climate change to evaluate the long-term stability of the tailings storage facility. As mentioned in response to recommendation 49, Agnico is currently proceeding to progressive reclamation work over the North Cell TSF and is monitoring settlement of the capping and freeze back of the tailings to evaluate the constructability and the thermal effectiveness of the cover.*

*Agnico does not only rely on the thermal properties of the cover but also the capacity to keep the tailings saturated in order to reduce oxidation and acid rock drainage. The 2.0m thick cover is the minimal cover thickness for the design for the landform of the cover over the North TSF. The NPAG cover will be constructed in order to divert water out of the TSF and to optimize freezeback; thus the cover will be much thicker than 2.0m in most areas of the TSF. Details on the TSF Landform design will be included in the next Interim Closure and Reclamation plan.*

**Recommendation 51:** Please evaluate whether a 2 m cap is sufficient for keeping tailings frozen, given climate change projections for the region and why a 2m cap is considered sufficient for tailings encapsulation, but 4m is proposed for waste rock (See 2.9.1.1).



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**Agnico Eagle's Response:**

*Agnico is evaluating the effectiveness of the 2m cap by monitoring freeze back of the tailings in the North Cell TSF and results are confirming to date the efficiency of the cover.*

*The difference between the cover thickness of the RSF and the TSF is related to the configuration of the both facilities. The RSF is much higher and more exposed to the wind. The RSF includes also voids due to the porosity of the waste rock, and is not a dense saturated material like tailings. The RSF presents a different thermal behavior than the TSF.*

**Concern:** In section 7.4, AEM states that “tailings are to remain frozen for a period of over 150 years following closure, taking into account the agreed-upon climate change scenario” (p. 61). It is not clear what scenario is being used for modelling.

**Recommendation 52:** Please indicate what climate change scenario is being used to predict the duration of tailings freezeback and whether the prediction needs to be updated in response to newer IPCC climate change models.

**Agnico Eagle's Response:**

*Agnico used IPCC climate change models for the prediction of tailings freezeback; for now, the RCP 4.5 and RCP 6 scenario were selected. Details on the TSF cover design and closure concepts will be included in the next Interim Closure and Reclamation plan.*

**Recommendation 53:** Please discuss mitigation plans if post-closure monitoring reveals that freezeback will not last for over 150 years.

**Agnico Eagle's Response:**

*Different technology could be used to improve effectiveness of a thermal cap such as increasing cap thickness or adding a layer of finer material. Mitigation plans will be developed and discussed in the next Interim Closure and Reclamation plan.*



## **APPENDIX 1**

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MDRB report – AEM responses



## **APPENDIX 2**

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### 2016 Annual Geotechnical Inspection - AEM responses



## **APPENDIX 3**

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### Waste Rock and Tailings Management Plan





## **APPENDIX 4**

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EEM Cycle 3 Study Design ECCC



## **APPENDIX 5**

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Agnico responses to Cycle 3 Study design, along with the ECCC approval letter