

February 18, 2011

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Ms. Julie Belanger  
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**RESPONSE TO REPORT NO. 7 MEADOWBANK MINE DIKE REVIEW BOARD, DATED AUGUST 26, 2010**  
**SUBJECT: REVIEW COMMENTS**

Dear Ms. Belanger

The seventh meeting between the Meadowbank Dike Review Board (MDRB), Agnico-Eagle Mines Limited (AEM), and Golder Associates Ltd. (GAL) was held on July 26 through 29, 2010 at the Meadowbank mine site, Nunavut. The objectives of the meeting were to review the status of the East Dike, and the design and construction of the Bay-Goose and TSF dikes.

On August 26, 2010, the MDRB provided a letter with their comments from this meeting. The following provides Golder's and AEM's response to the MDRB questions and comments raised in their letter.

## **2.0 UPDATE ON MINE STATUS**

*Comment: The staffing for Operations should be beginning at the present time in order that the personnel may gain experience during the construction phase and have the opportunity to profit from the presence of persons who have had involvement from the outset. Consequently, the Board recommends that GAL and Gaston Blanchette advise the project management of what the obligations are going to be in order to permit the Project to evaluate its staffing in this regard.*

**Response:** AEM agrees with the Board's comment. Obligations under Operations have been presented to the Meadowbank General Management Team. AEM has prepared an updated organizational chart for operations and is in the process of staffing this chart.

## **4.0 EAST DIKE**

### **4.1 Field Inspection**

*Comment: AEM advised that two weirs are to be installed to monitor leakage more accurately. These will be located in the North and South Channels and will be of a "V"-notch*



*geometry. The existing rectangular weir in the North Channel may give an indication of major change in flow but lacks the precision for more subtle changes. The flow in the South channel is monitored by visual observation.*

**Response:** A temporary v-notch weir has been installed downstream approximately stations 60+150 to 60+200 to monitor seepage flow in the south channel. The v-notch weir was intended as a temporary structure until a more accurate and permanent facility can be installed. Options relating to the East Dike mitigation are currently under consideration including a permanent system to monitor seepage.

**Comment:** *The Board was advised that the initial survey of settlement monuments has not yet been carried out for reasons related to line of sight obstructions but also because of survey staff limitations. In the view of the Board, this is not diligent practice.*

**Response:** The monuments will require replacement, which is currently planned for completion in second quarter, 2011.

## **4.2 Performance and Design**

### **4.2.1 Instrumentation**

**Comment:** *The Board recommends that detailed evaluation of the three instrumented sections be undertaken to determine by what mechanism these patterns of pressure distribution can be explained. A flow net seepage analysis by finite element modelling may be required.*

**Response:** A detailed evaluation of the three instrumented sections at the East Dike is underway, the results of which will be presented at the next meeting of the Board, scheduled for March 28 and 29, 2011 in Vancouver.

**Comment:** *The Project proposes to measure temperatures with additional thermistor strings adjacent to section 60+490 ±15m to determine the extent of the leakage zone. The Board supports this initiative, especially as the installations will be made by drilling in existing grout casings and thus no extra intrusion is implied. The results should be overlain on the CPT longitudinal section and potential remediation schemes developed including risk analyses for each scheme. The Board wishes to be consulted after this study prior to undertaking any further action.*

**Response:** Temporary thermistor stings were installed during the summer of 2010, and results will be presented at the next meeting of the Board, scheduled for March 28 and 29, 2011 in Vancouver. Options relating to the East Dike mitigation are currently under consideration by AEM. The mitigation strategy will also be presented to the Board during the next MDRB meeting.

#### 4.2.2 Contingency Planning

**Comment:** *The existing EPP (prepared for initial dewatering) needs to be updated for the current status, which is operational and would form part of site wide EPP. The daily inspection needs to be formalized for operational status, as would be expected from the OMS manual. A register of inspections, documentation of observations, an itemized list of leaks, and a photo record, would be expected.*

**Response:** An updated EPP and OMS Manual are in preparation and will be finalized by the end of the first quarter, 2011.

#### 4.2.3 Segregation Potential

**Comment:** *The Project has evaluated the Segregation Potential (SP) using soil index properties following the method developed by J-M Konrad and has shown that observed heave and ground ice accumulation is less than the one dimensional forecast; no additional work is required in this regard other than the ongoing monitoring of overall dike performance.*

**Response:** No response required.

### 5.0 BAY-GOOSE DIKE

#### 5.1 Field Inspection

**Comment:** *The stockpile of fine filter material was examined and the Board remarked on the apparent high fines content (photo # 8). This non-PAG material is produced from relatively friable volcanic rock and the crushing and handling may generate excessive fines. However, the grain size analyses, transmitted subsequent to the Board meeting...indicate the material to be well graded and within the specified envelope except for a small fraction of oversize particles. As the materials were dry when observed it is possible that some segregation on the outer slopes of the piles may have contributed to the perception of a less well graded product. Nevertheless, it is evident that care is required in the exploitation of the stockpiles, particularly when dry, in order to minimize the segregation.*

**Response:** GAL and AEM agree with the Board's comment.

#### 5.2 IFC Drawings & Specifications

**Comment:** *There are no major design aspects pending but field decisions will likely be required with respect to the limits of application of the typical sections and the grouting details. It was noted that additional investigations (percussion holes) are still planned to verify the bedrock profile in more critical areas.*

**Response:** No additional investigations were completed due to logistical constraints.

### 5.3 Grouting

**Comment:** *Drilling operations revealed the presence of accumulated soft sediments at the base of the wall in the North Channel. Despite the fact that preparations had been made to refine the "special washing" technique it was not applied. The Board agrees with the interpretation that the material could not be amended by conventional grouting or even by TAM and that jet grouting is required in the zones as proposed.*

**Response:** No response required.

**Comment:** *Elsewhere, the bedrock contact zone was grouted in a 'live front' grouting strategy, rather than primary and secondary holes, with the rational that travel over thawed SB cut-off material needed to be minimized. The grouting criteria used was aimed to get closure by pressure. The Board is not convinced that this was the correct approach as higher volumes of grout were consumed as compared to the East Dike and suggests that a more traditional approach of limiting volume, allowing set, and achieving incremental closure, be re-evaluated for stages 3 and 4. There may be financial savings and grout may be better confined to the width of the cut-off. It is suspected that some of the grout injected may have ended up in the fine filter zones with consequent increase in heterogeneity and the possibility of creating areas of higher hydraulic gradients.*

**Response:** A "live front" grouting method was not used during the winter grouting program for the South Portion of the Bay Goose Dike. In an effort to reduce quantities of grout injected, particularly for Stages 3 and 4, the thickening sequence was reviewed. From experience gained at the North Portion, it was determined that greater than 90% of the primary and secondary Stages 3 and 4 went to at least Mix B. As such, primary and secondary Stages 3 and 4 in the South Portion were started with Mix B, and if appropriate, thickened to Mixes C, D and thicker. Maximum volumes injected were 600 L/m for Stage 3 and 530 L/m for Stage 4; the former being the same cutoff used during the East Dike grouting program, and 150 L/m less than was used for the North Portion, while Stage 4 volume limit was reduced by a further 70 L/m.

### 5.4 Jet Grouting

**Comment:** *The Board confirms that the [jet grouting] QC program is appropriate but recommends that the verification of drill hole verticality also be included. This is essential to ensure column overlap and cut-off continuity. The Contractor should be required to deliver plots with a commitment for additional holes if overlap is inadequate. The Board wishes to see the jet grouting specifications when these become available.*

**Response:** A document describing the jet grouting program, including planned QA activities, is provided under separate cover with this response.

## 6.0 TAILINGS STORAGE FACILITY

### 6.1 2009 As-Built Reports

**Comment:** *The Board was advised of the planning for the preparation of the 2009 As-Built reports. The Board supports the structure of the report preparation team and urges that this activity be carried out as soon as reasonably possible while the staff members acquainted with the work that was carried out are still on site.*

**Response:** No response required.

### 6.4 2010 Design Update

**Comment:** *... there are plans to enhance the liner tie-in at the Saddle Dam SD-1 with a modification at the till berm. This will require a tailings beach as soon as possible. As far as future tie-ins are concerned, it is anticipated that all overburden will be removed to rock. The adopted configuration will allow remedial grouting if required and, being outside the general embankment profile, work on the cut-off tie-in will be decoupled from embankment construction. The bedrock will be cleaned and mapped, but the Board is not supportive of the concept to place a geotextile cover over 20 mm joint openings with a view to controlling piping. Large joints should be cleaned and plugged with mortar in a more conventional manner. The Board agrees that the option to provide a tie-in by means of a trench excavated in rock is not to be favoured, as blasting will disturb the rock and entail more extensive treatment to preclude piping.*

**Response:** Tailings deposition from Saddle Dam 1 occurred in November 2010 and has covered the upstream tie-in of the structure.

Within the upstream tie-in of the remaining Saddle Dams, all ice-rich and coarse grained materials will be removed such that the geomembrane will tie-in to either native till or bedrock. The exposed bedrock will be mapped. Bentonite-enriched granular material will be placed over bedrock discontinuities having widths greater than 10 mm to reduce the potential for piping.

**Comment:** *Construction management  
With respect to the liner QC/QA:*

- the bedding material is of good quality materials with satisfactory placing and compaction;*
- a comparison should be made with current Diavik practice, with which GAL is familiar, in order to demonstrate the equivalence in scrutiny;*
- as the work may be spread over several months with varying weather conditions there is a need for diligence particularly with respect to winter work and snow incorporation. Several wrinkles were noted during the course of the inspection. There is a need to establish whether these are excessive and to provide the inspection staff with clear criteria for acceptance;*
- protocols should be established to govern equipment working on liners with mandatory use of check lists and reporting of any event that could lead to damage.*

**Response:** AEM has implemented an internal protocol for personnel and equipment working on or near liners.

The Board's comments regarding liner QA inspection and evaluation are appreciated and noted. It is noted that the comments relating to wrinkles are applicable to the bituminous liner placed at the Stormwater Dike during 2009. The practices for bituminous liner placement were reviewed and modified for 2010 based on 2009 experience and practices elsewhere.

**Comment:** *With respect to beach formation:*

- GAL should declare beach requirements in light of current tailings operations; if these are not met they should evaluate alternative ice management for the coming winter season;
- The planning of the tailings deposition is based on a solids content (Cs) of 35% for the remainder year 2010 (50.8% thereafter) and reclaim water maximized to the degree possible. This necessitates a revised filling curve.

**Response:** The beach requirements are such that neither water nor ice is to come in contact with the upstream face of the structures; this requirement is paramount for the Saddle Dams. The development of rockfill berms upstream of the Saddle Dams to develop a cover of tailings over the upstream face (summer activity) and to serve as a deposition structure away from the structures (winter activity) is a planned activity. This scheme was discussed with the Board.

A revised filling scheme is under preparation and will be presented at the next meeting of the Board, scheduled for March 28 and 29, 2011 in Vancouver.

## 7.0 TAILINGS PLANNING

**Comment:** *The base case is for the Center Dyke construction to start in summer 2012, with a commitment for barging in Q1 2012...there is a high priority to assess if the base case is still viable. Apparently a preliminary assessment suggests that it is, given that:*

- the soft silt mantle is not excessive;
- the stiff till below does not need excavation;
- the silt cover will be beneficial on closure and may be strengthened by means of wick drains to accelerate the consolidation;

*However, additional site investigation is required in the middle sector and a feasibility design must be developed soon for project assessment.*

**Response:** GAL and AEM agree with the Board's comment regarding the Central Dike. A geotechnical investigation for the Central Dike is currently underway recognizing the points identified by the Board.

## 8.0 CLOSURE

We hope the above information provides the required clarification. If additional information is required, please do not hesitate to contact us.

Yours very truly,

**GOLDER ASSOCIATES LTD.**

**ORIGINAL SIGNED**

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