



MEADOWBANK DIVISION

## **Monitoring Program Summary Report**

**August 2012**

Type A Water License 2AM-MEA0815

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## **SECTION 1 • BACKGROUND**

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As required under Part I, Item 25 of Type A Water License 2AM-MEA0815, this report documents the water management and monitoring activity at the mine site for the month. This includes water usage, Portage Attenuation Pond discharge water quality and sewage treatment plant discharge water quality (to onsite storm water management pond).

In addition, a summary of spills/actions for the month is included.

## **SECTION 2 • WATER MANAGEMENT**

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### **2.1 WATER USAGE**

Freshwater usage for August 2012 is summarized in Table 2.1 below. Total freshwater used for the month was 97,575 m<sup>3</sup>. The total amount of reclaim water used in the mill for August was 248,596 m<sup>3</sup>. The yearly freshwater used is actually over the quantity prescribe of 700,000 m3 by our licence. The total freshwater used to date is 740,086.

During 2011 and up to mid-2012, AEM actively investigated methods to reduce fresh water consumption. This involved an extensive analysis, including pilot test procedures and process flow measurement within our mill which uses 90% of the freshwater at the site. Cooling water, flocculent mix water, gland water were all considered to be replaced by reclaim water. An Action Plan was put in place and several projects were approved for funding. As a result engineering has been completed for our action plan and by the end of 2012 we anticipate that our freshwater usage will be reduced to below our current water use limit (see Appendix 1 Letter to NWB, Sept 21, 2012).

**Table2-1: Freshwater Usage (m3)**

	<b>February</b>
Freshwater Storage Tank	97,437
Emulsion Plant	138
Water Truck	0
<b>Total</b>	<b>97,575</b>
<b>Year to date total</b>	<b>740,086</b>

### **2.2 SEWAGE TREATMENT PLANTS**

Four effluent wastewater samples were taken from the onsite sewage treatment plants (STP's) in August.

The Seprotech STP results are shown in Table 2.2.1 below; the LJ-Mix STP results are shown in Table 2.2.2. The results of the discharge show the system was working well. The effluent is discharged to the onsite stormwater pond and is not discharged to the natural environment.

**Table 2.2.1: Seprotech Effluent Results**

Date	Units	6-Aug-12	15-Aug-12	20-Aug-12	27-Aug-12
Ammonia	mg N/L	<0.05	<0.05	<0.05	<0.05
Ammonia-Ammonium	mg N/L	11.5	13.6	11.3	8.0
Total Kjeldahl Nitrogen	mg N/L	18	18	15	13
BOD-5	mg/L	8	11	9	22
COD	mg/L	61	84	74	76
Total Suspended Solids	mg/L	25	29	12	27
Nitrate	mg N/L	21.1	22.3	24.4	20.9
Nitrite	mg N/L	0.06	0.24	0.19	0.1
Total Phosphorus	mg/L	11.3	15.7	9.3	11.4
pH *	units	5.20	6.10	5.60	5.60
Fecal Coliform	UFC/100 mL	40	80	170	200
Total Coliform	UFC/100 mL	1,000	1,600	1,700	<10,000

**Table 2.2.2: LJ-Mix Effluent Results**

Date	Units	6-Aug-12	15-Aug-12	20-Aug-12	27-Aug-12
Ammonia	mg N/L	<0.05	<0.05	<0.05	<0.05
Ammonia-Ammonium	mg N/L	17.3	9.8	14.7	10.6
Total Kjeldahl Nitrogen	mg N/L	26	16	21	18
BOD-5	mg/L	19	12	25	42
COD	mg/L	86	92	85	130
Total Suspended Solids	mg/L	50	34	31	63
Nitrate	mg N/L	24.3	23.5	22.3	23.2
Nitrite	mg N/L	0.13	0.14	0.99	0.04
Total Phosphorus	mg/L	11.1	17.0	0.43	12.4
pH *	units	5.90	6.10	6.00	5.80
Fecal Coliform	UFC/100 mL	250	80	<100	100
Total Coliform	UFC/100 mL	3,000	2,400	2,000	3,000

## 2.3 ATTENUATION POND EFFLUENT

In August, we discharged effluent to the environment from the Portage Attenuation Pond in Third Portage Lake.

Five weekly effluent samples were taken from the Actiflo Water Treatment Plant (ST-9). All the results respected the effluent quality limits the License A (Part F, item 2).

The sample results are shown in Table 2.3.1 next page.

**Table 2.3.1: ST-9 - Effluent Monitoring**

Date Hour	Max grab conc.	Units	August 1 <sup>st</sup> 2012 9:15	August 7 <sup>th</sup> 2012 9:15	August 13 <sup>th</sup> 2012 9:15	August 21 <sup>st</sup> 2012 9:15	August 28 <sup>th</sup> 2012 9:00	Monthly average	Max avg. conc.
Ammonia	32	mg N/L	0.64	0.12	0.08	0.06	1	0.38	16
Chloride	2000	mg/L	32.2	48.5	28.9	9.7	16.9	27.2	1000
Cyanide Total	1.0	mg/L	0.386	0.106	0.154	0.463	0.143	0.250	0.5
Nitrate	40	mg N/L	27.1	3.8	2.3	9.1	34.5	15.4	20
pH**	6-9.0		7.63	7.61	6.96	6.94	7.53	7.33	6-9.0
C10-C50	6	mg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1	3
TSS	30	mg/L	1	3	11	6	1	4	15
Turbidity**	15	NTU	2.05	0.80	1.26	0.89	0.1	1.02	15
aluminum	1.5	mg/L	0.429	0.893	0.691	0.766	0.579	0.67	1.5
arsenic	0.60	mg/L	0.0204	0.018	0.0062	< 0.0005	0.0026	0.0095	0.30
cadmium	0.004	mg/L	0.00012	< 0.00002	< 0.00002	< 0.00002	0.00014	0.00006	0.002
copper	0.2	mg/L	0.0013	0.0007	0.0703	0.00009	0.0100	0.0165	0.1
mercury	0.0008	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	0.0004
nickel	0.4	mg/L	0.0271	0.014	0.0309	< 0.0005	0.0122	0.0169	0.2
lead	0.20	mg/L	0.0032	0.086	< 0.0003	< 0.0003	< 0.0003	0.0180	0.10
zinc	0.8	mg/L	0.027	0.005	0.002	< 0.001	0.007	0.008	0.4
Dissolved aluminum	1.0	mg/L	0.05	0.09	0.04	0.01	0.08	0.054	1.0

\*\* indicate the analysis was performed by the environmental department

## 2.4 NON CONTACT WATER

A TSS exceedance, on August 7<sup>th</sup>, 2012, from North Cell Diversion Water Ditch (Non-contact water) as occurred. The value of 60 mg/L was caused by a pumping level too low in the ditch. The situation has been corrected and another sample was taken to confirm compliance. The sampling result revealed a value of 1 mg/L.

### SECTION 3 • SPILL MANAGEMENT

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AEM has developed a system of tracking spills on-site. Table 3.1 summarizes the AEM spill reports for the month. One (1) spill occurred on site and was reported to the GN spill hotline. This spill was the responsibility of the Woodward Group Shipping Co. AEM assisted with the containment and clean-up.

**Table 3-1: Summary of AEM Internal Spill Reports**

Date of Spill	Hazardous Material	Quantity	Location	Cause of spill	Clean-up action taken	Reported to Spill Hot Line
9-Aug-12	Diesel	200L	Baker Lake Marshaling area	Failed component	Contain with Maritime barriers and used absorbent sheets. Contaminated material sent to Hazmat Storage	Yes

## **APPENDIX A**

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### **Mill fresh water reduction- Project review**

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September 21, 2012

*Via Email*

David Hohnstein  
Director Technical Services  
Nunavut Water Board  
P.O. Box 119  
Gjoa Haven, NU  
X0B 1J0

Dear Mr. Hohnstein,

**Re: Meadowbank Gold Project - 2AM-MEA0815 – Amendment to Fresh Water Consumption**

At this time I feel it is necessary to provide the Board with an update and current status of our freshwater usage situation. The Meadowbank mill commissioning was started in January 2010, with the first gold being produced end of February. We have achieved “commercial production” in March 2010.

Currently, Part E, item 3, of our Type A Water License – 2AM-MEA0815 allows for an annual freshwater water consumption of 700,000 cubic meters. The water consumption in the license is based on a theoretical water balance estimated by Hatch and Associates during the detailed engineering of the project.

After the commercial production, Agnico-Eagle, Meadowbank Division (AEM) realized that freshwater consumption would (and did) exceed the usage limits (700,000 m<sup>3</sup> /year) as stated in the license (see Table 1). As a result, we developed an action plan that was immediately put in place to minimize the use of fresh water at the mill.

The first order of business was to determine if the increase was impacting water levels in Third Portage Lake. Records indicate that the water level was not impacted the water level at our intake barge is the same as preproduction levels (See Table 2).

We then considered options in accordance with Part E, Item 4 of the water license which states,

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**Regional Office:**  
20, Route 395  
Cadillac, Quebec  
J0Y 1C0  
Tel: 819-759-3700 Fax: 819-759-3663

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**Baker Lake Office:**  
P.O. Box 540  
Baker Lake, Nunavut  
X0C 0A0  
Tel: 867-793-4610 Fax: 867-793-4611

*4. The Licensee shall to the greatest practical extent recycle water and the use of reclaim water from the Tailings Storage Facility.*

**Table 1: Fresh Water usage m3**

	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
<b>January</b>	1725	4039	71524	99644
<b>February</b>	1933	92262	73387	84720
<b>March</b>	4744	2560	87800	89271
<b>April</b>	2738	97788	86454	86271
<b>May</b>	20547	85288	99742	93567
<b>June</b>	4600	102032	90666	92576
<b>July</b>	4978	96683	94595	95820
<b>August</b>	4612	99162	101137	97575
<b>September</b>	3686	95229	140858	
<b>October</b>	2544	88410	85124	
<b>November</b>	2420	74627	68636	
<b>December</b>	2477	81645	88328	
<b>Total</b>	<b>57004</b>	<b>919724</b>	<b>1088253</b>	<b>739444</b>

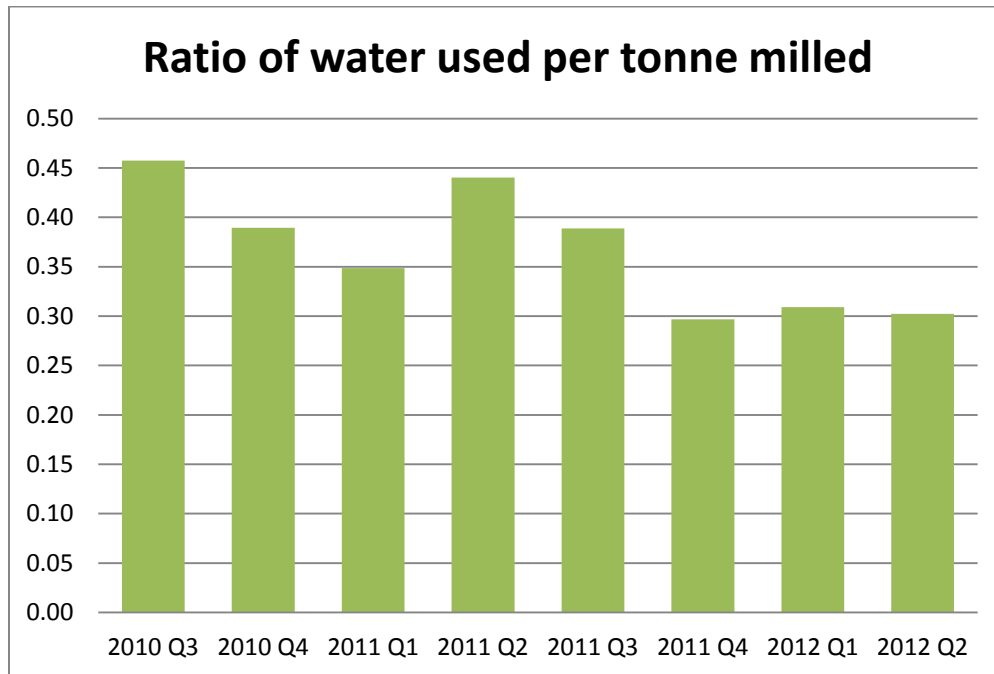
**Table 2: Third Portage Lake - Water level msl**

<b>December</b>	133.63	133.65	133.65	133.67
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The mill is the main contributor of the fresh water consumption (90% of the freshwater at the site) and the quantity of water is related to the quantity of tonnes passing in the mill. Actually, we recirculate 72 % of our total water consumption at site. During 2011 and up to mid-2012, AEM actively investigated methods to reduce fresh water consumption at the mill. This involved an extensive analysis, including pilot test procedures and process flow measurement within our mill. Cooling water, flocculent mix water, gland water were all considered to be replaced by reclaim water. An Action Plan was put in place and several projects were completed (see Appendix 1 Mill Freshwater Review).

To date we have already reduced fresh water consumption by 18 m3/hr (which represent a reduction of 157,680 m3 per year while increasing mill throughput by 1000 – 1500 tonnes per day). Figure 1 indicates that the ratio of water used per tonne milled decreased significantly 0.46 (Q3 2010) to 0.30 (Q2 2012).

**Figure 1: Ratio of water used per tonne milled**



In summer 2012, engineering has been completed for our action plan to decrease fresh water consumption by the end of 2012. We anticipate that our freshwater usage will be reduced to below our current freshwater use limit.

Also, as a bit of background, we needed to update our Water Management Plan (and water balance) before we can apply for an amendment. The 2011 Water Management Plan was not finalized due to the mine plans undergoing a significant change (Life of Mine decreased from 2020 to 2017). We therefore commissioned for a subsequent Water Management Plan in 2012 which is expected to be finalized by November, 2012 (the earliest date we could apply for an amendment as this document is key information for any such application).

AEM is of the opinion that reducing our water use to within our current limit through this project is a much better environmental solution than increasing our overall footprint by applying for an increase. We are seeking concurrence from the Board that this is an acceptable path forward in the short term. It would seem pointless to submit an amendment application (the earliest we could do this is November when the new Water



Management Plan is scheduled for finalization) and then withdraw it in December when our reclaim/recycle project is completed. Of course AEM will apply for the amendment if the reclaim project is not as successful as we anticipate but, as stated, we are committed to meet our current License for the end of the year.

I would very much appreciate your assistance in defining the next steps that we should follow to process this amendment to the License A.

Should you have any questions, please contact me via email at [stephane.robert@agnico-eagle.com](mailto:stephane.robert@agnico-eagle.com)

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

Stéphane Robert  
Manager Regulatory Affairs Nunavut



## Appendix A

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### Mill fresh water reduction- Project review

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**Regional Office:**  
20, Route 395  
Cadillac, Quebec  
J0Y 1C0  
Tel: 819-759-3700 Fax: 819-759-3663

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**Baker Lake Office:**  
P.O. Box 540  
Baker Lake, Nunavut  
X0C 0A0  
Tel: 867-793-4610 Fax: 867-793-4611



## Mill Project Summary

<b>Document number</b>	6165 Fresh water reduction		
<b>Department</b>	Mill–Process plant	<b>Project start date</b>	June 1 <sup>st</sup> , 2012
<b>Area description</b>	650	<b>Project end date</b>	December 31 <sup>st</sup> , 2012
<b>Issued by</b>	Normand Ménard, eng.	<b>Issued date</b>	September 7, 2012
<b>Short description</b>	Look at converting all fresh water user to reclaim water		

### 1. Project background

Meadowbank mill was first design to operate while using two different sources of water, fresh water from Third Portage Lake and reclaim water from our tailing pond. Fresh water consumption was anticipated to be in the neighborhood of 60 m<sup>3</sup>/hr and permit was obtained for 80 m<sup>3</sup>/hr. Unfortunately, not long after the beginning of our operation, some crucial systems which were designed to operate on reclaim water had to be temporarily operated on fresh water because of bad reclaim water quality. Overall, these systems increase our fresh water usage by another 60 m<sup>3</sup>/hr.

The main problem was calcium carbonate deposition throughout our reclaim water piping network. Some of our system like the SAG and Ball mill gearbox heat exchanger system was plugging up on a regular basis putting the life of major process equipment at risk. Other system as slurry pump gland water seal which was designed to operate on reclaim water has to be kept on fresh water until a solution could be implemented to eliminate the scaling problem. We also had problem with the material selection of some equipment's which could be attacked by some of the chemical contain in our reclaim water.

### 2. Project Mandate

The scope of the project is to review all fresh water users and look at converting them to reclaim water. The scope extends beyond only those users planned to be running on reclaim water during the design phase of the site. We will review all actual user of fresh water and look at option to convert all of them. The goal is to reduce to a minimum our fresh water consumption by the end of 2012.

### 3. Actual water consumption assessment

The following table summarizes all our fresh water users, their actual estimated consumption and an evaluation of their potential to be converted to reclaim water.

<i>Users</i>	<i>Consumption (m<sup>3</sup>/hr)</i>	<i>Could be switched to reclaim</i>
<u>Water used for reagent preparation</u> <ul style="list-style-type: none"><li>• Metabisulphite</li><li>• Cyanide</li><li>• Caustic</li></ul>	19.0 (all together)	YES

## Mill Project Summary

<ul style="list-style-type: none"> <li>Copper sulphate</li> <li>Lime</li> </ul>		
Water used for : <ul style="list-style-type: none"> <li>Floculant preparation</li> <li>Floculant dilution and dilution</li> </ul>	18.0 (all together)	Yes Yes
Water used for : <ul style="list-style-type: none"> <li>Stripping circuit</li> <li>SAG gear box and lube unit oil cooling</li> <li>Ball mill gearbox and lube unit oil cooling</li> </ul>	4.0 18.0 18.0	Yes Yes
Water used for: <ul style="list-style-type: none"> <li>Slurry pump gland water seal</li> </ul>	42.0	Yes
<b>Total:</b>	<b>119</b>	

### 4. Action plan

The first and most important thing to allow the use of reclaim water in our processes is to gain control over the scaling problem. Therefore, we need to determine the extent of the problem and define what was needed to be done. In order to do so, water sample will be taken and analyzed by an exterior laboratory. Based on their recommendation, we will proceed with the appropriate treatment of our water system.

Once this is completed, we could start looking at every individual fresh water user and develop a particular plan for each of them:

- 4.1. Reagent preparation:** We need to confirm that no chemical interaction between reclaim water and the prepared chemical will either cause a safety concern or a degradation of the final product. Once that is confirmed, we will have to change the actual piping network to allow mixing with reclaim water.
- 4.2. Flocculent preparation and dilution:** We need to confirm that no chemical interaction between reclaim water and flocculants will either cause a safety concern or a degradation of the final product. Once that is confirmed, we could switch to reclaim. Piping to do so is already in place.
- 4.3. SAG and Ball mill gearbox and lube unit cooling:** We need to check that the reclaim water quality meets the equipment requirement. Proceed with any required change and re-route reclaim water piping to feed the system.
- 4.4. Slurry pump gland water seal:** We need to check that the reclaim water quality meets the equipment requirement. Proceed with any required change. Reclaim water piping the feed gland seal system is already in place.

## Mill Project Summary

### 5. Project status

The following table explains where we stand with this project and what will be the next step.

Objective	Status	Completion date
Eliminate scaling problem in reclaim water network	Reclaim water was analyzed in 2011. A chemical treatment approach was developed and installed earlier in 2012. Last water analysis campaign is showing major improvement in reduction of scale formation. <b><u>We could proceed with the fresh to reclaim water conversion for all the identify users.</u></b>	Completed in May 2012
Use of reclaim water for reagent preparation	Some chemical interactions are foreseen with some of the reagent. However, we will go ahead with the conversion of the lime water addition. Piping work has been evaluated and work will proceed shortly.	Mid October 2012
Use of reclaim water for flocculent preparation and dilution	Floculant dilution water was already switch to reclaim which represent a reduction of 18 m <sup>3</sup> /hr. Water use for flocculent preparation will not be switched to reclaim.	Completed in August 2012
SAG and Ball mill gear box and lube unit cooling	Based on water analysis, we need to replace our brass heat exchanger to a 316SS heat exchanger. 6 heat exchanger in total. All 6 are in order and should arrive on site by the end of September. The heat exchanger installation and the required piping modification will take place in October.	End of October 2012
Slurry pump gland water seal	We are still looking at option to treat the reclaim water to satisfy this application. Could not confirm yet if this will be viable. We should know if we could go ahead by the end of September.	End of 2012



## ***Mill Project Summary***

### **6. Expected results timetable**

The following table is showing our total water consumption reduction target month by month until the end of 2012.

<b>2012</b>	<b>Total fresh water consumption reduction (m<sup>3</sup>/hr)</b>
August	18
September	18
October	58
November	58
December	119 (if gland seal could be switch)

### **7. Conclusion**

Based on the available information, we expect to convert quite a few systems from fresh water to reclaim water by the end of 2012. The worst case project results will be reduction of 58 m<sup>3</sup>/hr of our fresh water consumption which will bring our total consumption down to 60 m<sup>3</sup>/hr. However, if all fresh water reduction initiative could be implemented, the total mill consumption will be reduced as low as 5 m<sup>3</sup>/hr by year end.