TECHNICAL MEMORANDUM

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TO Michel Groleau, Agnico Eagle Mines Ltd.

CC Jennifer Range, David Brown

FROM Kristina Skeries, John Faithful **EMAIL** kskeries@golder.com

APPLICATION OF TSS CONCENTRATIONS AT MELIADINE AND MEADOWBANK MINES AS AN ANALOGUE TO TSS CONCENTRATIONS FROM THE WHALE TAIL WRSF IN POST-CLOSURE

1.0 INTRODUCTION

On June 28, 2019, Agnico Eagle Mines Limited (Agnico Eagle), with the support of Golder Associates Ltd (Golder), participated in a conference call meeting with Environment and Climate Change Canada (ECCC) to address outstanding issues that were presented as technical comments for the Whale Tail Expansion Project FEIS during the Nunavut Impact Review Board Technical Meeting held in Baker Lake June 11-13, 2019. This memo addresses the concern regarding the assumption of 10 mg/L Total Suspended Solids (TSS) used in the Whale Tail Site and Downstream Water Quality model to represent the particulate concentrations originating from the Whale Tail and IVR WRSFs in post-closure. An investigation into comparable site data for concentrations of TSS at the Meadowbank and Meliadine Mines was undertaken to assess the adequacy of this assumption in the model.

2.0 ANALYSIS OF COMPARABLE SITE DATA

To validate the assumption of 10 mg/L TSS entering Mammoth Lake from the Whale Tail WRSF in post-closure, comparable site data from the Meadowbank and Meliadine Mines were assessed. High level statistical analyses were performed on representative data sets from both mines. At the Meadowbank Mine, monitoring data from locations ST-5 (between 2013 – 2019) and ST-6 (between 2012 – 2019) were assessed, and summary statistics are presented in Table 1. These locations are considered to be the closest representation of the runoff from the Whale Tail WRSF at the Meadowbank Mine because they are located in engineered water routing infrastructure that is adjacent to existing waste rock stockpiles.

At the Meliadine Mine, monitoring data from Channel 1, from 2018, was assessed (no data exists prior to 2018; nor are there available data from 2019). Following discussion with site personnel, it was concluded that the monitoring point in Channel 1 would be most comparable to flow originating from the Whale Tail WRSF in post-closure. This monitoring location captures runoff from an adjacent waste rock pile, without the introduction of additional natural runoff. Other locations on the site do not capture sufficient waste rock runoff or have too high a proportion of natural runoff contributing to the drainage. Table 2 presents the summary statistics for monitored TSS concentrations in Channel 1.

Golder Associates Ltd.
1931 Robertson Road, Ottawa, Ontario, K2H 5B7, Canada T: +1 613 592 9600 F: +1 613 592 9601

Table 1: Summary Statistics of TSS Concentrations at Monitoring Stations ST-5 (2013 to 2019) and ST-6 (2012 to 2019), Meadowbank Mine

	n	Minimum	Average	Median	80th Percentile	Maximum
Unit	**-**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
ST-5						
May	1	10	10	10	10	10
June	10	1.0	4.5	5.0	7.0	7.0
July	13	1.0	1.7	1.2	3.0	5.0
August	8	1.0	1.5	1.0	2.2	3.0
September	8	1.0	3.9	4.0	8.0	8.0
October	6	1.0	5.3	4.0	12	14
All months	46	1.0	3.3	1.8	6.6	14
ST-6						
May	4	5.0	11	10	17	17
June	20	1.0	9.9	5.0	20	52
July	20	0.6	6.9	1.2	5.2	51
August	12	0.6	6.0	1.0	1.8	60
September	9	1.0	4.1	5.0	7.0	8.0
October	7	2.0	7.4	7.0	16	16
All months	72	0.6	7.5	3.0	7.4	60

Table 2: Summary Statistics of TSS Concentrations at Monitoring Station Channel 1, Meliadine Mine (2018)

	n	Minimum	Average	Median	80th Percentile	Maximum
Unit	**-**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
June	3	4.0	16	11	24	32
July	2	2.0	5.0	5.0	6.8	8.0
August	3	7.0	7.7	7.0	8.2	9.0
September	1	10	10	10	10	10
All months	9	2.0	10	8.0	11	32

From the datasets presented above, it is shown that the freshet months (May and June) occasionally have TSS concentrations above 10 mg/L. The remaining summer months, however, show TSS concentrations below 10 mg/L.

3.0 CONCLUSIONS

The use of 10 mg/L of TSS as an assumption in the Whale Tail Site and Downstream Water Quality Model is considered to be conservative for the following reasons:

1) The data from Meadowbank and Meliadine Mines presented above are representative of a range of operational site discharges through water routing infrastructure. At Meadowbank Mine, the data represent well established channels comprised of waste rock under higher flow conditions with limited sources of fine material in their watershed or within the channel that could be entrained. At the Meliadine Mine, the data are representative of periods of new waste rock material placement and old waste rock material re-handling, and pads being constructed. In the latter, these activities have greater potential to generate release of TSS material from the waste rock. However, the assumption of 10 mg/L TSS from the Whale Tail and IVR WRSFs applies in post-closure only, when the WRSFs have been stable and untouched for the length of the closure period, and low flow conditions are expected from the Whale Tail WRSF.

2) With few exceptions, monthly median TSS concentrations are below the average concentrations, showing the bias that a few elevated samples in the monitored dataset have on the average calculation. For the Meadowbank Mine monitoring stations, the maximum median concentration from the combined open water months was 3 mg/L (where the maximum average was 7.5 mg/L). For Channel 1 at the Meliadine Mine, the median concentration from the combined open water months was 8 mg/L (where the maximum average was 10 mg/L).

3) At the Whale Tail WRSF, the intention in post-closure is to have a weir structure in place which may allow for a small volume to accumulate before flowing to Mammoth Lake. This would provide some settling potential for TSS in post-closure.

4) As the conceptual hydrological model for the Whale Tail and IVR WRSFs has been refined for the submission of the Water Licence Amendment Application, the flow coming from the WRSFs is minimal compared to the flow that comes from the flooded pit lakes (by nearly two orders of magnitude). In post-closure, it is the flow from the flooded pit lakes that controls the chemistry in Mammoth Lake, and not the Whale Tail WRSF.

GOLDER ASSOCIATES LTD.

Kristina Skeries, MSc
Environmental Specialist

John Faithful, BSc (Hons)
Principal, Senior Water Quality Specialist

KS/JF/jr

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