TECHNICAL MEMORANDUM

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SUPPLEMENTAL ASSESSMENT OF POTENTIAL IMPACTS TO BASEFLOW IN MILL CREEK AND TRIBUTARY 3 – PROPOSED CBM ABERFOYLE SOUTH LAKE PIT

In December 2023, CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada) submitted an Aggregate Resources Act application to licence the proposed Aberfoyle South Lake Pit, located at 6947 Concession Road 2, in the Township of Puslinch, County of Wellington, Ontario. WSP Canada Inc. (WSP) prepared a Level 1/2 Water Report (Water Report) and Natural Environment Report to support this application. Stakeholder comments have been received pertaining to various aspects of the application and reports.

A number of comments from stakeholders expressed concern regarding the potential for impacts to baseflow in Mill Creek and Tributary 3 as a result of the proposed aggregate pit development post-rehabilitation. This technical memorandum provides a supplemental assessment of these potential impacts, in order to provide clarity and context to the predicted changes to baseflow.

BACKGROUND

During hydrological and hydrogeological investigations at the Site, surface water monitoring stations were established along Mill Creek (SW2 and SW3) and Tributary 3 (SW1 and SW4) at the locations shown on Figure 1. The purpose of these stations was to gather baseline data on the site including stream levels, stream flows, shallow groundwater levels, and water temperatures. A groundwater flow model was developed for the site and was calibrated groundwater levels under current conditions. The groundwater flow model was also used to estimate baseflow at these surface water stations under current conditions, and under rehabilitation conditions (i.e. aggregate extraction has been completed).

A key findings of the model simulations presented in the Water Report was that baseflow (i.e. groundwater discharge to surface water features) is redistributed along Tributary 3 and Mill Creek under post-rehabilitation relative to current conditions, but the overall change in baseflow within the system as a whole as a result of the proposed aggregate development was small. Post-rehabilitation baseflow decreases in the reach of Mill Creek between SW2 and SW3 and increases in the reach of Mill Creek downstream of SW3. Similarly, post-rehabilitation baseflow in Tributary 3 decreases in the reach between SW1 and SW4 and increases in the reach between SW4 and Mill Creek.

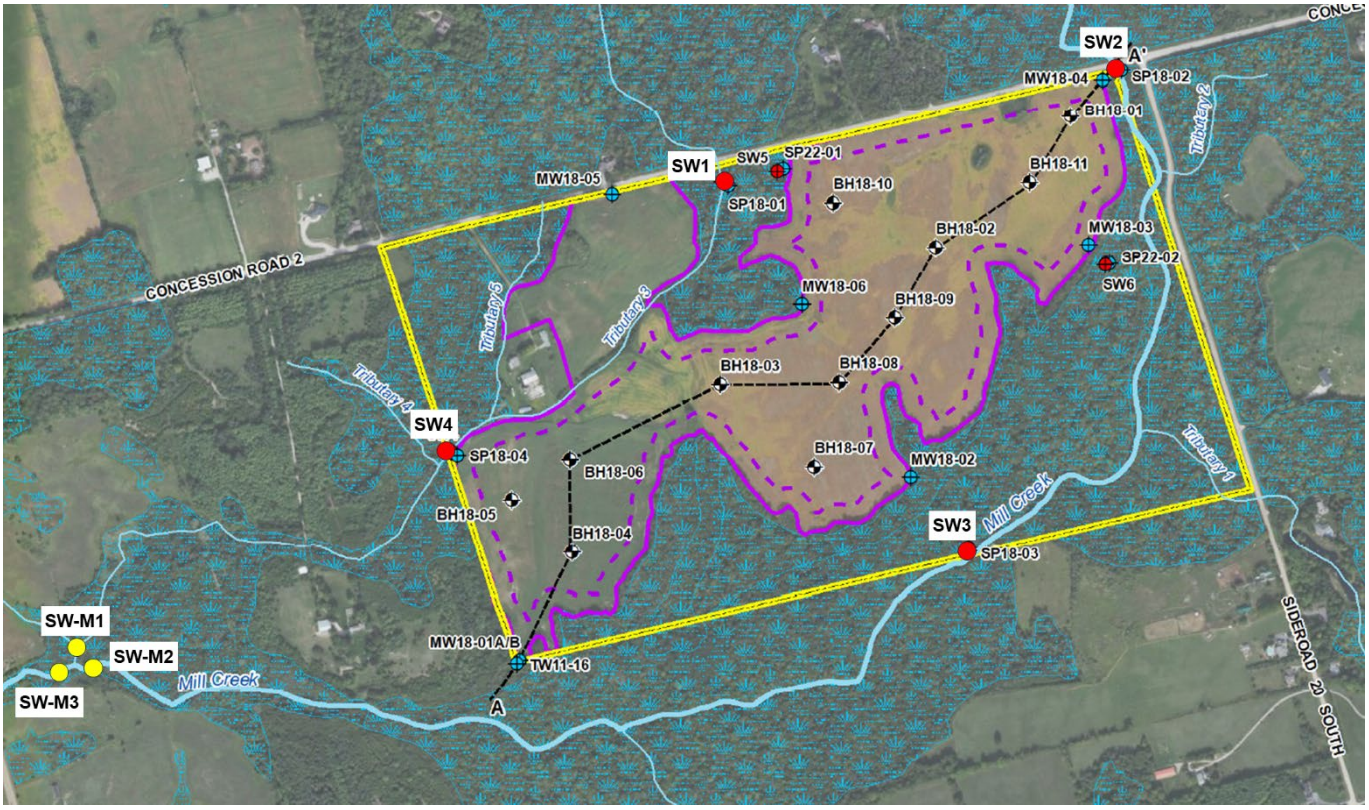

Figure 1: Surface Water Stations on Mill Creek and Tributary 3 (SW1 to SW4), and modelled surface water stations (SW-M1 to SW-M3) at the confluence of Tributary 3 and Mill Creek.

SUPPLEMENTAL ASSESSMENT

To clarify and further illustrate the redistribution of baseflow as originally described in the Water Report, modelled surface water stations (SW-M1, SW-M2, and SW-M3) were introduced at the confluence of Tributary 3 and Mill Creek, downstream of the area of redistributed baseflow, at the locations shown on Figure 1. These simulated stations were added without any alteration or recalibration to the model. The resulting baseflow predictions for the previous and new modelled surface water stations under current conditions and post-rehabilitation are shown in Table 1 and discussed below.

With reference to Table 1, the redistribution of baseflow from upstream portions of Tributary 3 and Mill Creek to downstream portions of Tributary 3 and Mill Creek is again evident, but most importantly, the following is noted:

- At SW-M1, downstream of SW4 on Tributary 3, baseflow increases by 90 m^3/day, an increase of 7% in post-rehabilitated conditions compared to current conditions.
- At SW-M2, downstream of SW3 on Mill Creek, but above the confluence of Tributary 3 and Mill Creek, baseflow decreases by 75 m^3/day, a 1% decrease in post-rehabilitated conditions compared to current conditions.

- At SW-M3, downstream of the confluence of Tributary 3 and Mill Creek, there is essentially no net change in baseflow (0.1% increase between existing and rehabilitated conditions).

Table 1: Simulated Baseflow at Mill Creek and Tributary 3 Surface Water Stations - Current Conditions and Post-Rehabilitation

	Station ID	Description	Pre-Pit Baseflow Contribution (m^3/day)	Rehabilitated		
				Baseflow (m^3/day)	Change in Baseflow (m^3/day)	
Tributary 3	SW1	Upper Tributary 3	611	561	-50	-8%
	SW4	Site Boundary Tributary 3	1,072	1,033	-39	-4%
	SW-M1	Downstream Tributary 3	1,303	1,393	90	7%
Mill Creek	SW2	Upper Mill Creek	9,741	9,686	-55	-1%
	SW3	Site Boundary Mill Creek	9,870	8,725	-1145	-12%
	SW-M2	Mill Creek Downstream of Site Boundary (upstream of Tributary 3)	10,284	10,209	-75	-1%
Mill Creek and Tributary 3	SW-M3	Mill Creek Downstream of Tributary 3 Confluence	13,677	13,689	12	0.1%

SUMMARY

As discussed in the Water Report and further illustrated through the introduction of new modelled surface water stations, there will be a localized redistribution of baseflow along reaches of Tributary 3 and Mill Creek post-rehabilitation relative to current conditions. There will be short reaches that experience a decrease in baseflow and short reaches that experience an increase in baseflow, both on Mill Creek and on Tributary 3.

Overall, the net change in baseflow to the system as a whole in the vicinity of the site as simulated at the confluence of Tributary 3 and Mill Creek is predicted to very small, about 0.1%.

CLOSURE

We trust that this technical memorandum meets your current needs. If you have any questions or require clarification, please contact the undersigned at your earliest convenience.

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