

**Stantec**

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Reference: PTTW Discharge Water Quality Analysis

Further to our site meeting of August 31, 2006, I have performed a mass balance to determine the potential water quality that would result from a direct discharge of 1,500 IGM of shallow groundwater to Tributary A of Mountsberg Creek, as well as Mountsberg Creek itself, as a result of the planned pump test for the Mountsberg Quarry. I have compiled shallow groundwater quality data from samples collected on site in the fall of 2004 and spring of 2006 by GLL, as well as surface water quality data collected by Stantec in Tributary A, and at Concession 11 in Mountsberg Creek.

To project potential water quality in Mountsberg Creek downstream of the pump test discharge, and in accordance with MOE guidelines, 75th percentile background water quality concentrations (calculated from data collected by Stantec) were assumed upstream of the discharge. Similarly, 75th percentile groundwater quality concentrations were applied to the quarry discharge.

As a component of this hydrologic assessment for Mountsberg Creek, and in accordance with MOE Green Book (*Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters*) criteria, an estimate of the 7Q20 flow rate for Mountsberg Creek within the immediate vicinity of the subject lands was calculated. The 7Q20 flow rate represents the 7-day average low flow than can be expected to occur once in 20 years and is the statistical flow applied in the evaluation of discharges to surface water.

Daily flow data for Bronte Creek at Water Survey of Canada Station 02HB022 (43° 23' 20" N; 79° 59' 17" W) were analyzed to determine the 7Q20 flow for Bronte Creek at Carlisle (117 km² basin area). This flow was then pro-rated to the watershed area of Mountsberg Creek in the immediate vicinity of the subject lands (39 km²).

The 7Q20 flow rate was calculated using the Log Pearson III Method. Although the period of record is limited to 15 years, the Log Pearson III Method provides for adjustment of any skewness in the data set. A 7Q20 flow rate of 0.182 m³/s was calculated for Bronte Creek at Carlisle, which, when pro-rated to the drainage area of Mountsberg at the subject lands, suggests a 7Q20 of 0.061 m³/s at this location in the November-December period. Projected pump test discharges of 1,500 IGM

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were assumed to occur during the 7Q20 condition in Mountsberg Creek. From the above, as well as our in situ observations, the 7Q20 flow in Tributary A is virtually zero.

Water quality projections in Table 1 were made for selected parameters that were at times observed to be present at greater levels in groundwater than surface water, or demonstrated occasional PWQO exceedence. A mass balance approach was used, and the projected creek concentrations therefore represent water quality under fully mixed conditions. Results suggest that the discharge to Tributary A of Mountsberg Creek under 7Q20 conditions would slightly increase the TDS content in Mountsberg Creek, while concentrations of aluminum, iron, and zinc would be lowered to levels below their respective PWQOs. The projected increases in TDS are not projected to have an impact on the habitat quality of Mountsberg Creek. Due to the very low flows in Tributary A, the water quality of Tributary A downstream of the discharge would essentially reflect the shallow groundwater quality.

Table 1. Predicted Downstream Water Quality (mg/L) in Mountsberg Creek for Parameters of Interest

	PWQO	Background WQ (Mountsberg Creek)			Background WQ (Tributary A)			75 th Percentile GW Concentration	Downstream WQ (Mountsberg C.)	Downstream WQ (Trib. A)
		Max	75th	Mean	Max	75th	Mean			
Aluminum	0.075	0.060	0.030	0.033	0.060	0.033	0.029	0.005	0.014	0.005
TDS		356	352	303	622	410	400	405	386	405
Iron	0.3	0.120	0.120	0.133	0.70	0.36	0.31	0.110	0.113	0.110
Zinc	0.02	0.033	0.020	0.016	0.025	0.020	0.011	0.010	0.013	0.010

Water Quantity

The potential discharge of 1,500 IGD over a period of 6 days implies a potential total volume of flow of approximately 59,000 m³. Topographic mapping of the area in the immediate vicinity of the discharge point in Tributary A suggests that this discharge volume can easily be contained well within the 285-286 m contour interval (which occupies an area of 9.3 ha within the property boundary alone), and should therefore not influence the pump test monitoring equipment, which will be installed at elevations of approximately 288 m or greater. Due to the low gradient within the wetland, some ponding will be created by the discharge. However, the discharge water should readily flow to Mountsberg Creek with minimal backwater effects. Stantec staff will be on-site during the pump test to ensure that the discharge is well-contained within the discharge area and does not interfere with monitoring instrumentation.

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