**Ministry of the Environment**
119 King Street West
12th Floor
Hamilton, Ontario L8P 4Y7
Tel.: 905 521-7640
Fax: 905 521-7820

**Ministère de l'Environnement**
119 rue King ouest
12e étage
Hamilton (Ontario) L8P 4Y7
Tél. : 905 521-7640
Téléc. : 905 521-7820

Ontario

April 11, 2007

Mr. Bill Marquardt
St. Marys Cement Inc. (Canada)
55 Industrial Street
TORONTO, Ontario
M4G 3W9

Dear Mr. Marquardt:

Re: **Application for Permit to Take Water for extended Pumping Test**
**Proposed Mountsberg Quarry Location Reference № 4455-6U9MKG**

---

The Technical Support Section of the West Central Region of the Ministry of the Environment has reviewed some 600 individual responses to the posting of your October 4, 2006 application for a permit to Take Water at the proposed Mountsberg Quarry location. As you are aware the application is currently on hold pending the receipt of additional technical information requested from your consultant by this office, including detailed work plans for both surface and groundwater aspects of the proposed pumping test.

Please be advised that the review of the application before us involves technologies which have not previously been applied in such a scenario. Consequently, we are proceeding with caution on this application to ensure that, should we allow it to proceed, the approach used will protect local water resources and have negligible impacts on local water users. We view the test currently under consideration as no more than a preliminary step and well removed from a full scale operation.

At this time your consultant has provided us with a response to comments from the City of Hamilton; however, we have been informed that CART is expecting a Comprehensive Work Plan (still outstanding). Since this document may relate to the application (longer term water management or hydrogeology on-site), the Ministry also requires a copy of this document for our deliberations.

In addition to the Ministry's information requests, the following technical comments and associated questions were submitted to the Ministry through the EBR posting. The Ministry requires St. Marys to provide responses to these questions. The items have been provided verbatim so we do not impart any interpretation to the issue/question.

**Groundwater Issues**

**G1.** To be representative of future Quarry-induced drawdowns and GRS conditions, the drawdowns in the three new pumping wells need to achieve the target drawdowns of about 30m.

a) If the new pumping wells intersect very permeable and transmissive zones, how will these target drawdowns be achieved?

b) If the required pumping rates exceed the PTTW amounts how will the GRS pilot test be undertaken?

**G2.** Additional hydrogeologic investigations to characterize the location and hydraulic properties of the permeable "production zone" within the Amabel Formation dolostone aquifer will be critical to selecting locations for multi-level groundwater monitoring and hence for evaluation of the ability of the GRS to maintain water levels within the deeper bedrock. For reliable evaluation of GRS performance, water levels need to be monitored in those deep permeable horizons that will create and propagate drawdowns away from the Quarry. GLL proposed borehole investigations are intended to identify these horizons. However, as GLL have historically not created monitoring intervals in the most permeable sections of bedrock that are expected to create the greatest drawdowns, there needs to be assurance in the GRS work plan that the most permeable bedrock horizons that correspond to the expected greatest drawdown will be selected for water level monitoring during the GRS pumping tests.

**G3.** In the permeable fractured bedrock setting of the proposed Mounstberg Quarry, there is also the potential for escape of injected water from the GRS that will not be captured by the Quarry. Consider the simple case of an injection well that is open to depth of 35m and intersects the "production zone" and other permeable zones along its length. If the permeability of the production zone is locally reduced and other perhaps shallow bedrock zones have higher permeability, then injected water will preferentially recharge the shallow bedrock over the "production zone". If water levels are maintained in the "production zone" by overall operation of the GRS, then this shallow injected water may escape from the GRS. Given the extremely heterogeneous nature of the bedrock, this escape is a very real possibility.

a) How will the proposed GRS pilot testing identify and quantify this escaping water?

**G4.** Water quality standards for temperature, microbiological, physical and chemical parameters in injected water should be defined for both the GRS pilot test and any future full-scale GRS.

a) Given the potential for escape of injected water, what water quality standards would apply to re-injection water to ensure long-term protection of

groundwater quality in the regional Amabel Formation dolostone aquifer that provides domestic and municipal drinking water?

**G5.** Based on available documentation, there are no identifiable examples of successful application of GRS in deep fractured bedrock settings as exist at the proposed Mounstberg Quarry. Consequently, the GRS is considered unproven and the GRS pilot testing needs to provide a robust and rigorous demonstration and documentation of the potential for successful application of GRS at the proposed Mounstberg Quarry site. This will require, among other things, creation of drawdown conditions representative of actual Quarry conditions, thorough investigation of the bedrock hydrogeologic conditions, comprehensive monitoring of water levels and water quality sampling in an appropriate number of key deep bedrock monitoring intervals and careful monitoring of well pumping rates, flows to the recharge trench/wells and diversion flows to Mountsberg Creek. Careful documentation of the methods and results of the GRS pilot test is essential for demonstrating the potential for successful operation of such a full-scale system at the proposed Quarry site.

**G6.** Since the proposed GRS pilot test is conceptual at this time and will likely be revised following the completion of the hydrogeologic characterization of the Amabel Formation, it would be appropriate for GLL to prepare a more detailed and focused field test plan prior to conducting the GRS pumping tests. This more focused test plan would provide specifics on exact locations for water quality and quantity monitoring which are only generically defined at this time. This field test plan should be prepared following the drilling, dynamic flow logging, geophysical logging, groundwater quality testing and multi-level monitoring completions of the old and new test wells (TW10 and TW14 to TW16) and the new monitoring wells (MW1 to MW-5).

**G7.** Given the unproven application of GRS at this site, the strong potential for unforeseen and unanticipated results and hence the probable necessity for modification of the GRS pilot test as the it evolves, stakeholders other than the proponent should be allowed to monitor field implementation of the proposed GRS pilot test.

**G8.** That monitoring of water quality be completed before, during and following the completion of the pumping test in the pumping wells, recharge wells and representative monitoring wells within the expected zone of influence to assess changes in water quality due to pumping and/or recharge. Parameters monitored should include major ions, trace metals, bacteria and field parameters (temperature, electrical conductivity and pH).

**G9.** That continuous water levels at representative private water wells within Halton Region in the vicinity of the testing site and downgradient be monitored prior to, throughout the testing period and afterwards. A delegate at a public meeting suggested that residents may be more receptive to inclusion of their well in

the monitoring program if a representative of Halton Region accompanied the proponent and/or their consultant.

**G10.** That multi-level piezometers be installed near significant natural features in Halton Region to monitor vertical gradients and any changes that may occur due to pumping and /or recharge.

**Surface Water Issues**

**S1.** The calculation of water quality impacts to Tributary A of Mounstberg Creek and downstream in Mounstberg Creek from PTTW discharges are not realistic and underestimate the impacts that are likely to occur. The Stantec method of predicting surface water quality impacts relies on a simple mixing box model of background stream water quality and quantity and pumped discharge water quality and quantity. Because the volumes of groundwater to be pumped (112L/s) are significantly greater than the estimated low flow in the Creek (virtually zero, according to Stantec), Stantec correctly concludes that the water quality of Tributary A downstream of the discharge would essentially reflect the pumped groundwater quality. The water quality impacts are underestimated because the more dilute shallow groundwater quality at the site is used to represent pumped water quality. The more sensible and realistic estimates of pumped water quality from the 7-day pumping tests of TW12 and TW13 should be used since these data more accurately reflect the deep groundwater quality that will be produced in the GRS pilot test. As GLL note in their Level 2 Hydrogeologic Report (Volume 1, page 27), groundwater from these wells showed exceedences of Provincial Water Quality Objectives (PWQOs) for iron, aluminum and zinc. Consequently, a more realistic prediction of water quality impacts will be that pumped discharge water will most likely exceed PWQOs for selected parameters.

**S2.** There is no assessment of the sensitivity or resilience of natural features located within close proximity of the test site in relation to the magnitude or duration of groundwater and/or surface water level fluctuations or water quality changes that they may be exposed to. This should include an assessment of such factors as seasonal sensitivities of breeding fish and amphibians or times of the year when there is a significant difference in temperature between groundwater and surface water, etc.

a) Will Test 1 run long enough to result the full development of a hydraulic head that may impact wetland water levels located offsite?

**S3.** We are also concerned about the potential risk to the Provincially Significant Wetlands. The test is not supposed to be testing the wetlands' ability to sustain negative impact and the test should be limited and halted if negative impact begins to occur. We note as well that flooding impacts, particularly for residential properties, from the creek overflow are not anticipated and planned for in any material way either.

**S4.** The volume of water to be discharged into Mountsberg Creek and /or one of its tributaries is also significant. We are concerned about the potential environmental impact on the creek because of changes in flow rate, chemical composition, and temperature.

**Generic Issues**

**X1.** Halton Region should be notified of proposed testing at least 2 weeks prior to each test commencement and be provided with a report of findings from the previous testing carried out.

X2 A large number of public submissions have expressed concern over impact of the test on existing water users, including the Carlisle Municipal Wells. We wish to make it clear that the Ministry deems that any impact occurring from the test, were the test to be approved, to be the liability of St. Marys Cement Inc. (Canada).

_____

Paul Odom, Supervisor Water Resources
Technical Support Section, West Central Region
Ministry of the Environment

cc: B. Crosbie, E. Payer, B. Bardswick