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Groundwater Studies

Geochemistry

Phase I / II

Regional Flow Studies

Contaminant Investigations

OMB Hearings

Water Quality Sampling

Monitoring

Groundwater Protection Studies

Groundwater Modelling

Groundwater Mapping

Our File: 9506

June 12, 2015

R.J. Burnside and Associates Limited
292 Speedvale Avenue West, Unit 20
Guelph, Ontario, N1H 1C4

Attention: Mr. David Hopkins, P.Geo.
Senior Hydrogeologist

Dear Mr. Hopkins:

Re: Hidden Quarry
Burnside Letters of April 24, 2015
Burnside Project No.: 300032475.0000

We are pleased to respond to the R.J. Burnside and Associates letters of April 24, 2015 in regards to the Hidden Quarry application. There are only a few comments required. We have retained the same section numbers for cross comparison.

4.1.1 Private Well Sampling

Additional water quality samples will be obtained in advance of any quarry activities. To date it has been found that the average nitrate concentration upgradient of the quarry is 3.89 mg/L vs 1.39 mg/L elsewhere.

4.2 Resent Research and Susceptibility of Local Wells to Contamination

On site monitor M2 is upgradient of the proposed quarry activates and will be used to monitor nitrate impacts from agricultural activities.

4.4 Water Quality and Early Warning and Mitigation

The required testing and completion for M16 through M19 will be done as recommended.

7.0 Brydson Spring and Blue Springs Creek

The measurement of the flow from the Brydson Spring and comparison to flow at SW4, SW5 and SW3 has commenced. The results to date are summarized below;

Monitoring Station	16-Oct-14	28-Apr-15	20-May-15
SW4 (Upstream of Site)	1*	17.10	11.03
SW5	0*	18.94	8.88
SW8	0*	14.27	4.38
SW3 (Downstream of Site)	0	9.37	dry
Brydson Spring	22.4	64.43	43.14

*measurement obtained on October 10 2014

The monitoring plan attached has been modified to include the surface water stations requested by R.J. Burnside and Associates.

8.0 Rock Extraction Water Level Change Monitoring

James Dick Construction Ltd. is in agreement that M3 will be deepened in advance of any quarry activities.

8.1 Historic Low Water Level

JDCL has agreed to conduct additional investigation in upgradient wells post approval. This includes a pumping test to determine available drawdown above current well setting and well bottom. Well specific contingency plans will then be updated.

8.2 Monitoring Plan Revisions

JDCL has agreed to a detailed private well monitoring program.

2.3 Trigger Levels for Sinking Cut

JDCL agrees to providing the Township with data from the automatic water level recording device on a bi-weekly basis until the data indicates that water levels are remaining consistently above the trigger level.

9.0 Additional Work

The required testing and completion for M16 through M19 will be done as recommended.

Response to comments on Hidden Quarry Specific Well Contingency Plans

Our response to Burnside's recommendations on page 2 of 3 of the April 24, 2015 letter are as follows:

1. Status of W7

W7 is a well servicing the former Ball Farm. Mrs. Florida Ball refused us entry on the grounds that the building that houses the well is unsafe. We visited the site in 1998 and Mr. Gordon Ball refused us entry at that time as well. According to Mrs. Ball, she is trying to prepare the property for sale and the well is not in use.

2. Wells W2 and W3 on the Mushroom Farm property

To understand the wells on the mushroom farm a brief description of their use is necessary. W3 is a deep bedrock well that is used to pump large volumes of water (approximately 80 gallons per minute) to the cooling system in the mushroom barn. A series of pipes and heat exchangers raise the temperature of the water and lower the temperature of the air. The warm water is then recharged into W2, a shallow dug well used as an injection well. There is neither a Permit to Take Water nor an Environmental Compliance Approval for a Sewage Works in place for this system even though one would normally be required. W2 was measured to be 3.97 metres deep with a static water level of 2.42 metres below casing top (April 29, 1998). The well had a concrete casing with plywood cover. The well owner said that it dried up in the summer.

W3 is 54.86 metres deep and is open from the top of the dolostone formation to the top of the shale formation (44.8 metres). Graham Well drilling pumped the well at a rate of 80 US gpm and static water level was drawn down to 40.8 m below casing top after 45 minutes. The recommended pump setting is 48.8 m below casing top. Water was 'found at' depths of 36.5 m and 50.3 m, both below the proposed depth of the quarry. The water level during pumping is estimated to be 319 m AMSL which is eight metres below the proposed depth of the quarry and about 28 metres below lowest allowable water level in on-site monitors during extraction phase. The quarry represents a significant potential recharge boundary for Well W3. To our knowledge none of the neighbours have complained about this water use despite the pumping by the Mushroom Farm that has a drawdown more than ten times that of the proposed quarry. On the day of a site visit in 2011, the owner and I could hear the cavitation of the pump, indicating that the water was being lowered to the pump intake level, presumably at the recommended pump depth of 48.8 metres.

Figure 1 shows the on-site response in a shallow (OW13D) and deep well (M2) well to pumping at the Mushroom Farm. The farm well was pumped continuously during a hot

spell between May 23 and May 30, 2015. The maximum response in the shallow bedrock well OW13D at a distance of 150 metres was 0.11 metres and the response in the deep well (M2) at a distance of 215 metres was 0.26 metres. It is our assumption that the pumping well is being operated as observed in 2011 and as recorded on the water well record and has an approximate drawdown of 48 metres. The minimal interference observed on-site verifies that the interference from the proposed 2.54 metre water level change in the quarry will have a negligible impact on private wells north of the quarry along 6th Line Eramosa.

3. Short term tests for W2, W3, W4, W5,W6, W7 and W8

James Dick Construction has agreed to short term tests and additional baseline survey information for wells W3, W4,W5 and W8 to be conducted post approval provided that there is agreement with the homeowner. Short term tests in W2, W6 and W7 cannot be conducted for reasons provided herein. The observed limited interference from pumping at the Mushroom Farm with significantly greater drawdown than the proposed quarry confirms that interference between the quarry and these private wells will be less than originally predicted.

W2 is a shallow dug well presently being used as an injection site for water used in Mushroom Farm cooling system. As stated above there is no Environmental Compliance Approval in place for this works. W2 is thus no longer a viable water well and is not being used as such. The home owner indicated during the well survey that this well went dry during the summer months. No test will be conducted.

W3 is being pumped at a rate (approximately 85 igpm) and requires a Permit to Take Water to be issued for continued use. No Permit to Take Water has been issued. The quarry pond will become a significant reservoir of water and thereby become a potential a long term source of water for the well thereby improving the well performance. A short term test will be conducted on W3.

W4 Mushroom Farm private well is thirty nine metres deep with twenty four metres of available drawdown to recommended pump setting. According to the well drilling record, water was found at 34.8 and 38.1 metres below ground surface. This is below the proposed quarry depth. Also, the well record shows that the well was pumped for 90 minutes with a drawdown of 7.9 metres and a recommended pumping rate of 1.13 L/s (15 igpm). A short term test will be conducted.

W5 test conducted by driller and recorded on well record shows very little drawdown at 15 gpm. There are 14 metres of total available drawdown to bottom of well and 4.5 m available drawdown to recommended pump setting. A short term test will be conducted.

W6 is a dug well that has not been in use for decades. The well was dry in November 2014 and April 2015. No test will be conducted.

W7 Owner refused permission for us to visit well due to safety concerns. No test will be conducted.

W8 – there are twenty nine metres of water in the well with a relatively high static water level (4.18 metres below ground surface). The pump setting not known but there is no need to determine the pump setting pre approval considering limited potential drawdown from the quarry. A short term test will be conducted.

4. Source of Water for W31

Harden Environmental assisted the well owner with adding a concrete casing to the top of the well in May of 2012 and hereby confirm that W31 is a dug well lined with field stone from just below ground surface to a depth of 3.83 metres below ground surface. There is no visual evidence of dolostone bedrock in the well (see attached photo).

Following the upgrading, the well was pumped for thirty minutes at a rate of approximately 0.38 L/s during which a total of 681 litres of water were removed. This resulted in a drawdown of only one centimeter. The diameter of the well is approximately 0.91 metres giving a volume of 6.5 L/cm. The aquifer therefore yielded 675 litres in the thirty minutes. The minimal drawdown proves that the aquifer is both transmissive and has high storativity. The well is not dug into the bedrock, therefore the overburden aquifer yielded the groundwater.

The water quality of the well shows obvious contamination from adjacent farming (barnyard) activities. This proves that the well is not from a confined source and that there is a hydraulic connection between the adjacent barnyard and the well water. There is no indication that this connection is made via surface drainage. The source of water is therefore an unconfined aquifer.

The water level decline in the dug well between upgrading the well on May 22nd and a follow up visit on October 5, 2012 was 0.53 metres. The water level decline in the surface water pond is very similar at 0.52 metres. This similarity in water level change suggests that the well and pond have the same source and/or the pond level influences the water level in the well. That is, the small berm surrounding the pond artificially keeps the water level in the pond elevated and thus influences the nearby well. During a site visit we noted a forty to fifty centimeter difference in elevation between the main pond and the adjacent pond to the south.

As detailed to us by the home owner on our visits, the pond is fed by springs located along the northern shoreline (the upgradient edge of the pond). Originally there was a stone crock at ground surface around the main spring. There is neither bedrock exposure

in the ponds nor along the northern shore, even when water levels in the pond are extremely low as observed in October 2012. As detailed by the home owner, springs occur elsewhere on the property, namely at the base of the rock strewn hill located west of her residence. We estimate the elevation of this spring to be 364 m AMSL compared to the estimated pond elevation at 362.5 m AMSL. Groundwater seepage was also observed along the northern edge of the Allan Wetland (southern edge of the property) within 50 metres of the De Grandis pond. Soil samples taken at that location taken with a soil gouge, found a silt till containing 40 to 60% silt, confirming a relatively impermeable layer beneath the seepage zone.

Streamflow measurements obtained from the channel leading away from the De Grandis ponds confirm a loss of streamflow downstream of the De Grandis ponds. Therefore, downward hydraulic gradients prevail, despite being at a lower topographical elevation than the main pond.

Our conclusion from this physical evidence is that the pond and well are sourced from groundwater moving predominantly laterally in permeable layers within the overburden.

As shown on the quaternary geology map (Figure 3.2 of 2012 Harden Report) Well 31 is located in an area of kame and esker deposits. The kame and esker sands and gravels are the most recent geological materials deposited during the glacial period. Coward and Barouch, 1978 identify the kame deposits and underlying till unit as the sandy till reservoir and state that it forms only ‘minor groundwater aquifers in the Blue Springs Creek basin’. Furthermore, they state that ‘sand and gravel lenses occur in the sandy till unit, but for the most part are not interconnected and have little influence on the hydrogeologic behavior of this unit’. Detailed geological investigations for the Hidden Quarry, in the same geological formation, confirm the existence of permeable deposits underlain by a silty till resulting in preferentially lateral groundwater movement and spring discharge to the ground surface.

Groundwater elevations as determined from local water well records and presented in various reports (Coward and Barouch, 1978, Harden 2012, Matrix Solutions, 2014 and Gartner Lee 2004) decrease through the De Grandis property from north to south and from east to west. Therefore, the source area for Well 31 are the lands north and east of the well.

All observations and physical evidence obtained from the site and immediate surroundings confirm that the well and pond are sourced from an unconfined overburden aquifer with a source area found towards the north or north east.

5. Additional information for wells W20, W35, W38,W42 and W43

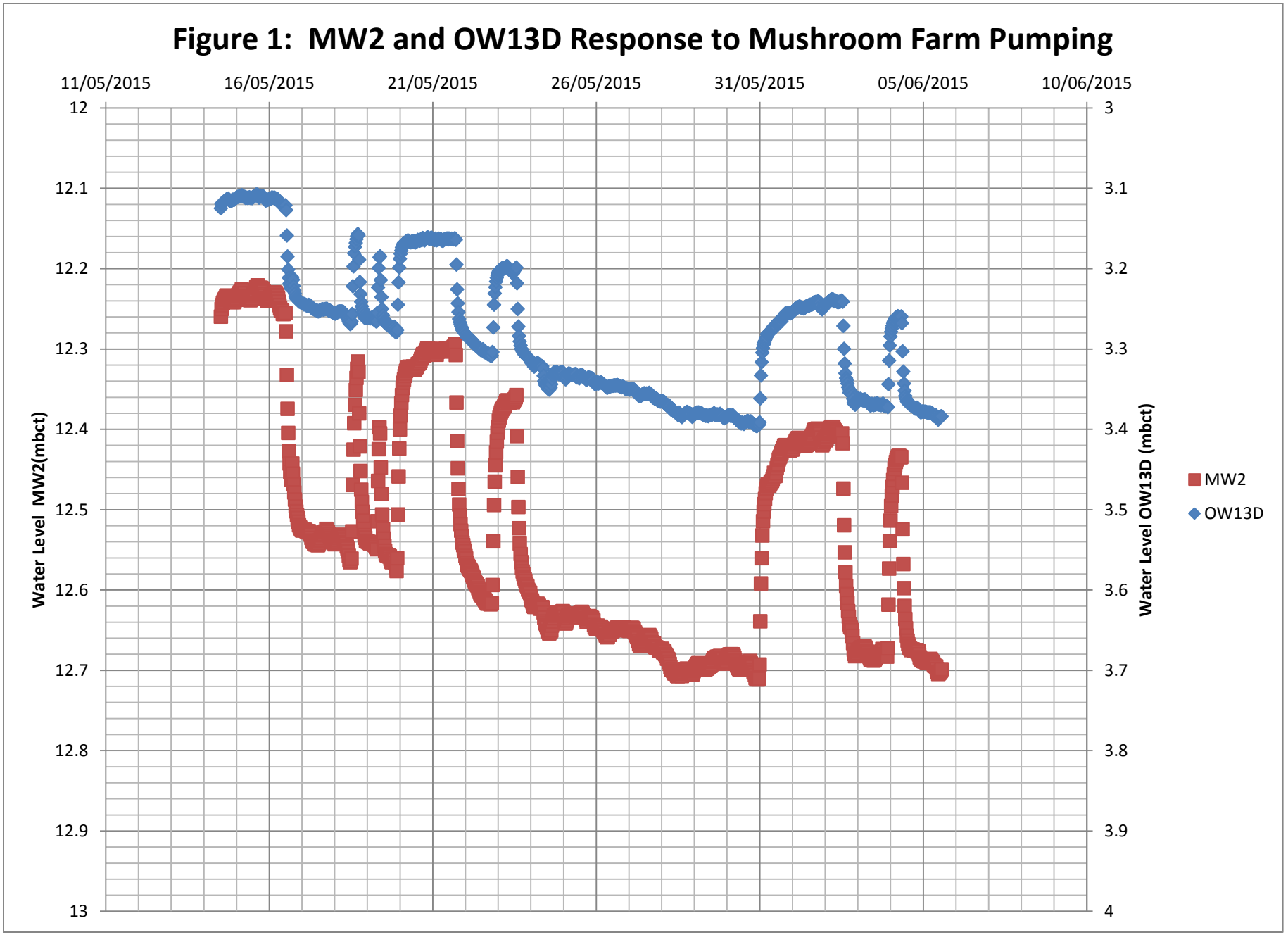
James Dick has agreed to provide this information as a condition of the development.

Respectfully submitted,
Harden Environmental Services Ltd.

Stan Denhoed, M.Sc., P.Eng.
Senior Hydrogeologist

cc: Greg Sweetnam, James Dick Construction Limited

Figure 1: MW2 and OW13D Response to Mushroom Farm Pumping



Well W31