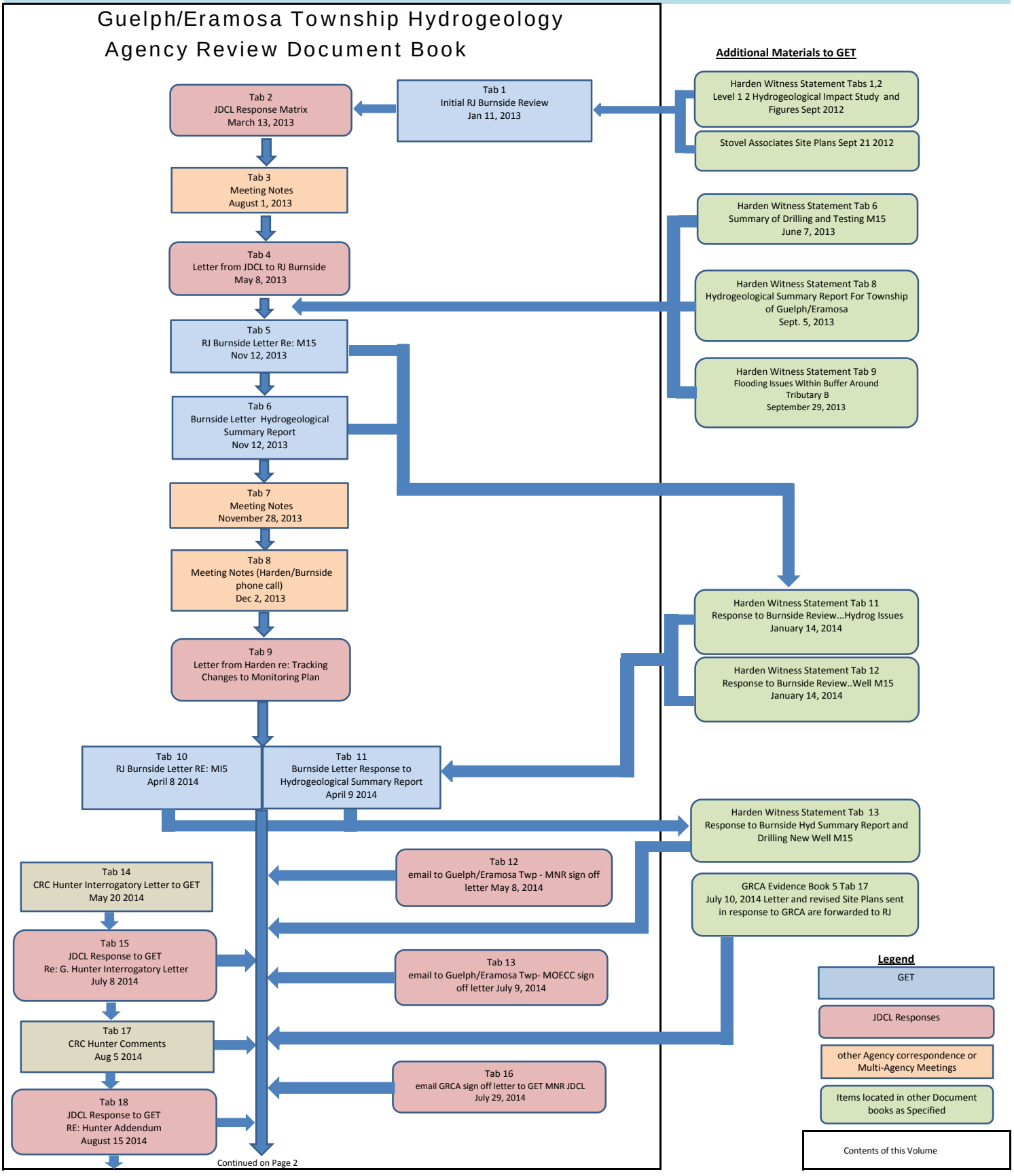
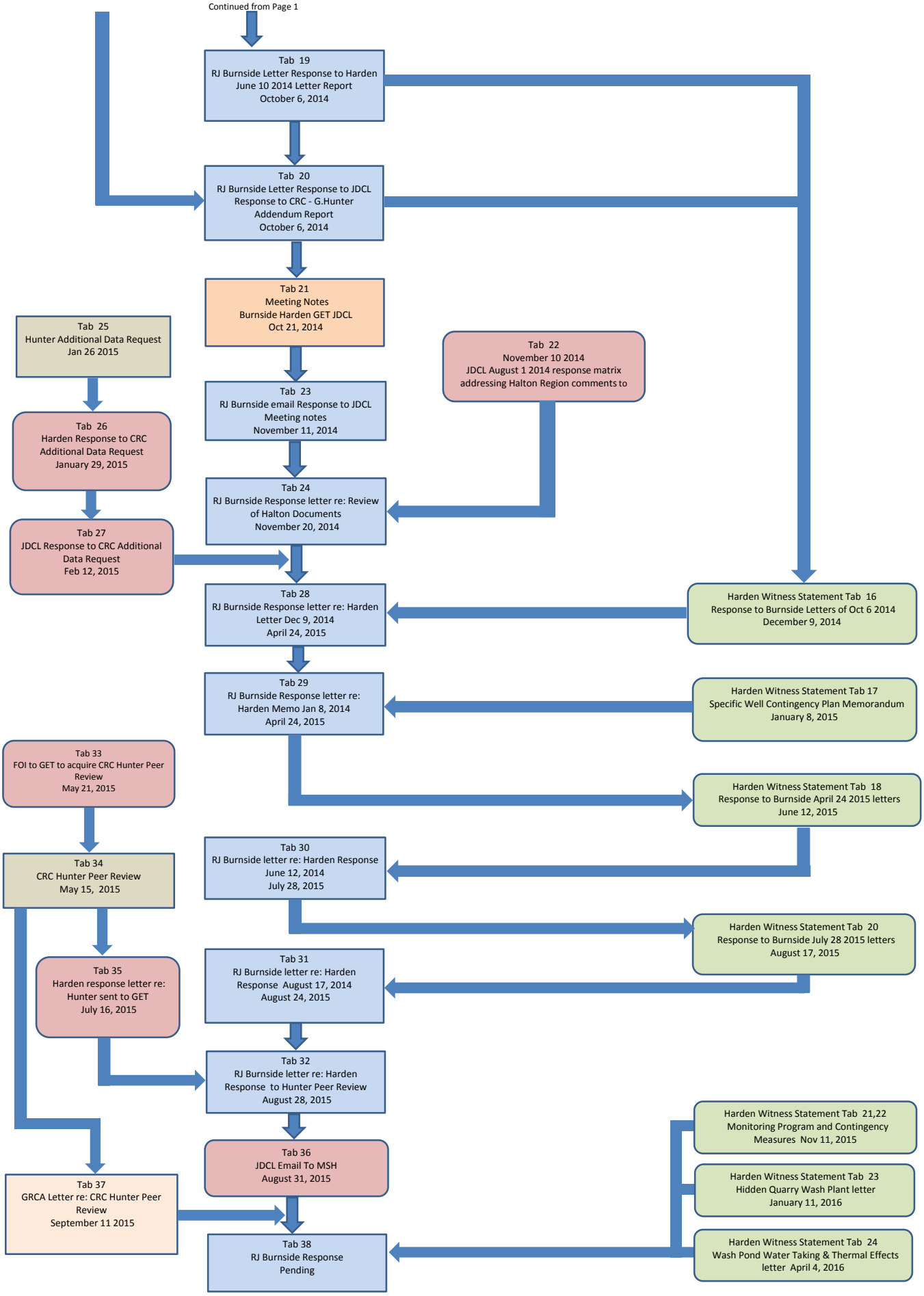
Evidence Book 8 Volume 1



Volume 1 Tab 1-18 Volume 2 Tab 19-29 Volume 3 Tab 30-38

Continued from Page 1



Township of Guelph/Eramosa

Hydrogeology Review Document Book Index

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 Canada
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

January 11, 2013

Via: Email

Mrs. Janice Sheppard, AMCT
CAO
Township of Guelph/Eramosa
P.O. Box 700
Guelph ON N1G 5B4

Dear Janice:

Re: ZBA Hidden Quarry – Township of Guelph/Eramosa
James Dick Construction
File No.: 300032475.0000

We have reviewed the above noted ZBA along with the following documentation:

- Site Plan Drawings, prepared by Stovel and Associates, plotted September 21, 2012:
  - Page 1 of 5, Existing Features
  - Page 2 of 5, Operations Plan
  - Page 3 of 5, Quarry Phasing
  - Page 4 of 5, Cross Sections
  - Page 5 of 5, Cross Sections
- Planning Report, prepared by Stovel and Associates Inc., dated September 2012;
- Stage I – II Archaeological Assessment, prepared by York North Archaeological Services Inc., dated August 31, 2012;
- Air Quality Assessment, prepared by RWDI, dated September 6, 2012;
- Traffic Impact Study, prepared by Cole Engineering, dated April 2012;
- Level II Natural Environment Technical Report, prepared by GWS Ecological & Forestry Services Inc., dated August 2012; and,
- Level I and II Hydrogeological Investigation, prepared by Harden Environmental Services Ltd., dated September 2012.

We offer the following comments.

Background
The subject site (Part of Lot 6, Concession 1 in the Township of Guelph/Eramosa) is currently zoned Agricultural and Hazard. The applicant is proposing to amend the existing Agricultural and Hazard zoning to Extractive Industrial with a special provision to provide relief from required surface water excavation setbacks. Since 1999, the Official

Plan has identified this area as an Aggregate Resource area; only a portion of the property will be used for extraction purposes. Extraction is being proposed both above (80%) and below (20%) the water table. The site will be accessed off of 6th Line. The proposed annual tonnage limit for the site is 700,000 tonnes.

General

- Details of private water and wastewater services required to service the scale house or Shop/Office/Lab building should be provide on the drawing showing location and size/footprint. CBO to confirm adequacy of services.
- A residential unit exists within the proposed site. Details regarding the intended use or removal of this residence and the associated services and entrance should be provided.
- Details should be provided for the driveway apron and should adhere to Township Design Standards within the ROW.
- A high point at the property limit of the right of way should be provided in the New Entrance/Exit to the site to ensure additional surface runoff is not being directed towards 6th Line.
- The proposed entrance to be paved from the scale house to the public road.
- Will the existing service entrance shown on the Operations Plan remain or be removed?
- Fence/Gate geometry to be such that one full truck length can be off the travelled portion of the public road with the gate closed.
- Note 5 on the Operations Plan indicates that the existing property limits are fences although also indicates that fencing and repairs will be undertaken once extraction is initiated. An inspection of the existing fence condition is recommended to confirm the condition of existing fence and to establish the municipality's requirements in this regard.
- Top of rock elevation should be added to the Operations Plan.
- The Township's By-law Enforcement Officer should confirm the activities noted below conform to the Township's Noise Control by-law:
  - extraction operations may occur between the hours of 7 a.m. and 7 p.m., Monday to Friday and 7 a.m. until 1 p.m. on Saturday;
  - hauling operations may occur between 6 a.m. and 6 p.m. Monday to Friday and 6 a,m, to 1 p.m. on Saturday; and,
  - drilling and blasting will occur between 8 a.m. and 5 p.m. Monday to Friday.
- It is understood that a small pond will be constructed for wash water. Additional details should be provided on washing operations.
- Additional details should be provided outlining how the stripped overburden will be dealt with.

Archaeological Assessment

- It is noted that a significant cultural heritage feature has been identified in the northwest portion of the site. The technical recommendations of the archaeologist (York North Archaeological Services) have been included on the site operation plan.
- It is understood that a Stage III assessment will be undertaken prior to any works being completed on site. This assessment should be completed to the satisfaction of the Ministry of Tourism, Culture and Sport.

Air Quality

- The Emissions Summary and Dispersion Modelling (ESDM) as prepared by RWDI was reviewed. Although the documentation took some time to interpret, there was nothing in the ESDM to indicate that the site could not request and receive an Environmental Compliance Approval ("ECA").

Traffic Impact Study

The Traffic Impact Study (TIS) for the proposed quarry was prepared by Cole Engineering Limited (2012) and generally considers traffic operations at the access onto the 6th Line as well as the intersection of Highway 7/6th Line and Highway 7/5th Line. Our comments in this regard are as follows:

- The TIS notes that 5th Line is under the jurisdiction of the Township of Guelph/Eramosa, however it is actually under the jurisdiction of the Town of Milton.
- Comments should be obtained from the Ministry of Transportation (MTO), for operations affecting Highway 7, and from the Town of Milton, for operations affecting 5th Line.
- No information is provided on the anticipated lifespan of the quarry, which would provide context into the potential for longer term impacts.
- The forecast of background traffic is based on traffic counts taken in February 2012. The MTO classifies Highway 7 as a commuter road, which is also confirmed by the strong directional distribution of traffic on a daily basis (i.e., high eastbound traffic in a.m. peak period and high westbound traffic in p.m. peak period). On a seasonal basis, MTO's commuter roads typically have 20 to 25% higher traffic volumes in the summer months, when compared to winter traffic (i.e., February counts). Traffic volumes should be increased to account for these seasonal variations.
- The forecast of trip generation from the proposed quarry is based on data from a proxy site (i.e., Erin Pit). On a weekly basis, the calculation assumes consistent traffic over a Monday to Saturday period, inclusive. Information should be provided to confirm this assumption. The number of working days assumed for the critical month (i.e., August) also does not appear to take into account holiday period, or any reduced operations due to weather, over the monthly period. Also the trip generation is based on average loads which are typical of tractor trailers, whereas actual trip volumes may be higher if the fleet is comprised of higher numbers of tandem or triaxle trucks. Based on the above factors, the estimates for peak period traffic may be low.
- No analysis was provided on the requirements for turning lanes at the intersection of Highway 7/6th Line and at the intersection of Highway 7/5th Line. It is recommended that turning lane warrants and requirements be reviewed for these intersections.
- The TIS does not provide any review of the need to upgrade 6th Line to accommodate the increased truck traffic. It is recommended that a geotechnical study be provided to confirm the road base and road surface requirements. Road widths should also be reviewed, to confirm sufficiency to allow two lanes.
- Analysis of stopping sight distances have been provided for the proposed access onto 6th Line, based on an assumed 50 km/h operating speed. However, since speeds are not posted, the legal speeds on this rural road should be assumed to be 80 km/h, in accordance with the Highway Traffic Act. The required stopping sight distance should be revised accordingly.

- The TIS does not analyze the available sight distances at the intersection of Highway 7/6th Line. It should be confirmed that sufficient stopping sight distances and turning sight distances are available to accommodate the significant increase in truck turning movements at this location.
- The visibility triangles (daylighting) are limited at the intersection of Highway 7/6th Line, by encroachment of existing trees. Considering the down gradient on the 6th Line approach and the type of traffic (i.e., large trucks), visibility triangles should be provided for the approaches, in accordance with the requirements of the Geometric Design Manual for Ontario Highways.
- The design and placement of truck entrance warning signs should meet the requirements of the Ontario Traffic Manual, based on a design speed of 100 km/h on Highway 7 and 80 km/h on 6th Line.

Natural Environmental Technical Report
Burnside has reviewed the report titled "Proposed Hidden Quarry Level II Natural Environment Technical Report" as prepared by GWS Ecological &Forestry Services Inc. Our comments are as follows:

- Development and site alteration are not permitted within a Provincially Significant Wetland ("PSW"). The boundary of the Eramosa River-Blue Springs Creek PSW should be staked in the field with the Ministry of Natural Resources ("MNR") or the Grand River Conservation Authority ("GRCA") with MNR's approval. The report notes that the boundary will be staked at a later date but we strongly suggest that this exercise should occur prior to acceptance of the Level II report as it could have significant implications on the limit of extraction.
- Development and site alteration are not permitted adjacent to a PSW unless it can be demonstrated that no negative effects will result. As such, additional information is required to confirm that the proposed quarry will not affect the hydrology of the wetland. Specifically, the Level II report notes that a hydraulic barrier will be required to prevent the loss of water from the wetland into the quarry bottom. However, there is no discussion of potential effects based on changes to the amount of water entering the wetland. Will the drainage area to the wetland be reduced as a result of the quarry?
- Development and site alteration are also not permitted within or adjacent to Significant Wildlife Habitat unless it can be demonstrated that no negative effects will result. It is not clear that all Significant Wildlife Habitats have been identified and, as such, it is not clear that adequate protection will be provided. We specifically note that the following types of habitats have not been discussed or addressed:
  - According to Section 4.5.5 of the report, Little Brown Bat was recorded on the property. This species is listed as Endangered federally but not provincially. As a result, its habitat would qualify as a type of Habitat for Species of Conservation Concern, in accordance with the Under the Natural Heritage Reference Manual (MNR, 2005) and the Significant Wildlife Habitat Technical Guide (MNR, 2000). The latest guidance for the MNR is that habitat may exist in naturally occurring forest stands (FOD communities) but not in plantations (CUP). It is suggested that the MNR be contacted for further guidance on identifying the significant habitat of this species and the type of protection required.

Hydrogeological Investigation
Burnside has reviewed the report prepared by Harden Environmental Services Ltd entitled "Level 1 and 11 Hydrogeological Investigation Hidden Quarry, Rockwood, Ontario as dated September 2012 and have the following comments:

- We raise some caution with respect to the water level information provided from standpipes installed in open pit excavations.
- TP9 has no description of the dolostone rock. Since the basal till layer has been removed, it is possible that the rock could be acting as an underdrain. Many intervals in the test pit logs do not include descriptions of soil colour and, as a result, it is not clear whether there was any evidence of colour changes associated with saturated conditions.
- Borehole logs for M5 to M10 were missing from the report.
- It is noted that wells M1D to M4 do not include a surface seal and, as a result, the water levels reported may not be accurate.
- Multi-level wells are located only on the west side of the site. The overburden geology changes from primarily sand at M3 to primarily silty sand till at M11. An understanding of the change in geology and variations in water levels between M3/M9 and M11 is needed so that the impacts of extraction on Tributary B can be fully understood.
- Table C1 provides flow data. It is not clear from the table whether data with no values are due to no measurement being taken or whether flows were below the sensitivity of the flow meter. The data should be compared with precipitation data. This should be clarified. Continuous flow measurements would provide an additional level of understanding since spit flows are highly variable.
- An in-situ hydraulic assessment was completed using falling head testing and using a pump to remove water at constant rate (M2, M4). Table D1 indicates that a falling head test was completed at M2 and a short term pumping test was completed in both M2 and M4. A comparison of hydraulic conductivity values obtained with the two methods at M2 should be provided.
- Both MW1D, M2 and M4 have a silica sand pack above the lower bentonite seal whereas the other two bedrock wells (M13-D, M14-D) have a bentonite seal above the sand pack to surface. Wells M1D and M13D have lower hydraulic conductivity values. Is it possible that the minimal annular seal and substantial sand pack in M2 and M4 is impacting the results of hydraulic conductivity testing?
- A good job was done in documenting wells near the site. The two nearby overburden wells are either no longer used (No. 6) or are used occasionally for cleaning purposes (No. 2). Well No. 2 is shallow (3.97 mbtoc) and should be monitored.
- Viewlog™ and Modflow™ were used to create a model of groundwater potentials for the bedrock aquifer.
  - The model uses three layers to represent the bedrock aquifer. How does the model consider the overburden at the site?
  - Hydraulic conductivity values of 5.8 $v10^{-7}$ m/sec (M1D) and 4.0 x 10^{-7} m/sec (M13D). How were these lower k values utilized in the model?
  - Appendix D does not contain any hydraulic conductivity data for M3 and the highest k value is 2.0 x 10^{-4} m/sec at MpN-1. What is the rationale for assigning a value of 1.8 x 10^{-4} m/sec to the bedrock and what is the thickness of this layer?

  - Is the recharge value of 150 mm realistic given the hummocky nature of the site, the relatively coarse deposits that overlie the bedrock in some areas and the closed drainage areas (D5, D6 and D7)?
  - How does the recharge used in the model created for the site compare to values used in the Source Water Protection work completed for the area by Golder and Aqua Resource?
  - Figure H10 provides the predicted groundwater flow in the bedrock. How does this compare to the current flow direction (there is no north arrow on the map)?
  - The model is used to predict changes in bedrock water levels as a result of extraction in two areas of the site (east pond and west pond). What will the impacts be in the overburden?
  - Many of the figures (H4, H5, H6 and H7) do not have legends and, as a result, the significance of the colours used is not always apparent.
  - Tributary B is an ephemeral stream which was assigned a recharge value of 0.154 m/day. How was this value calculated? How was limited flow data for SW5/SW7 considered in the calculation?
  - Burnside recommends that a thorough review of the model be completed by a groundwater modeller with experience in fractured rock geology.
- The infiltration rates used in the groundwater model are less than the rates in the Gartner Lee model (2004) which seems reasonable given the till layer overlying the bedrock. However, it is not clear if higher recharge rates in micro drainage area D7 would affect the interpretation of future impacts. Based on the 1 m contours in Figure 3.4 it is also not clear why D5 and D6 are not considered as one micro-drainage area.
- The bedrock surface is shown in Figure 3.5. The proposed extraction area should be added to this map. It appears that there are few (if any) bedrock monitoring wells within the two extraction areas. Given the heterogeneity of the bedrock, it is recommended that monitoring wells be installed within the extraction areas.
- The report indicates that in general the basal silt till is thin or absent above the bedrock near Tributary B. It is our opinion that there is insufficient information to conclude that the basal till is thin or absent near Tributary B. TP3, TP5 and TP11 did not encounter bedrock but did have finer grained materials. There is no discussion about the difference in effective "k" values between the till and the finer grained materials. This suggests that the water "lost" by Tributary B is may be remaining in the overburden and may not reach the bedrock.
- It is noted in the report that the Brydon Spring likely represents discharge directly from the bedrock and can be considered to be the re-emergence of Tributaries B and C. There are limited bedrock wells on the proposed quarry site and there is no data that confirms that the tributary loses water to the bedrock. Tracer testing should be considered to confirm this statement.
- It is indicated that some monitors have up to 17 years of records and provides groundwater potentials for overburden and bedrock in Figures 3.16 and 3.17. Although there are numerous monitors on site, few (if any) are actually within the extraction area. Only one bedrock well (M2) extends to the bottom of the proposed extraction depth. This well is screened near the top of the bedrock and, as a result, only provide information for a small portion of the bedrock. Water level data from TP8 and TP9 is from a different date than the remainder of the data that was used to prepare Figure 3.16. There also appears to be limited data to support the contours between MW1 and M7. Similarly, there does not appear to be sufficient data

presented in the report to support the assertion that "groundwater occurring within the overburden does so above the silt till as a silt layer generally in the northern portion of the site and percolates into the bedrock within the southern portion of the site. An isopach map of silt thickness would assist in demonstrating the limit of the till unit.

- An estimate of hydraulic conductivity and transmissivity based on data collected during short term pumping tests and falling head tests is provided. Based on the mapping provided, it appears that none of the bedrock wells tested are within the two proposed extraction areas. Onsite in-situ testing was completed in wells with limited screened intervals. The lack of data within the extraction areas results in several concerns:
  - Given the heterogeneity of the bedrock, is there the potential for zones of higher or lower hydraulic conductivity to be present. There are significant variations in flow (400 L/min at mushroom farm vs. 82 L/m in TW2).
  - The excavation will behave as a large diameter well open through the bedrock sequence. The onsite wells are screened over discrete intervals and hydraulic testing will not be representative of the entire bedrock sequence.
  - The Guelph/Eramosa Study used significantly higher hydraulic conductivity values. Since the bedrock is heterogeneous significant variations in hydraulic conductivity can be expected. Additional data from within the extraction areas is needed to confirm on-site conditions.
- Figure 3.18 shows the relationship between water levels in the tributary and MP2, M9 and MP1. The water levels in the tributary are consistently higher than levels in the monitors, however, this may simply demonstrate a lack of connection between the base of the tributary and the fine grained till. Adding stratigraphy to Figure 3.18 would assist in the interpretation of water levels.
- It is agreed that there does not appear to be any groundwater contribution to the Northwest wetland from the bedrock. The water level data in Figure 3.19 and information in cross section B-B' suggests that upward gradients in the overburden west of the wetland may provide discharge to the wetland in the spring when water levels are highest. Please comment.
- It is indicated that Allen wetland is supported by direct precipitation runoff and interflow from the north. Streamflow enters the wetland from the De Grandis Pond. There does not appear to be any relationship between water levels in the Allen wetland and the bedrock wells on the Hidden Quarry Site with diffuse groundwater seepage into the pond interpreted as interflow along the contact between the relatively permeable surficial till found on the De Grandis property and there silt till identified beneath the wetland. The water level in bedrock well 6707545 on cross section A to A' are is the overburden. This well appears to be unconfined. There do not appear to be any bedrock wells in the vicinity of the De Grandis Property. If similar conditions exist on the De Grandis property, is there the potential that the maximum predicted drawdown of 0.6 m shown in Figure 4.3 could impact the Pond?
- Elevated nitrate concentrations (>5 mg/L) were present in samples from bedrock wells M2 and M3. Both M2 and M3 are bedrock wells located at the north end of the Hidden Quarry site. The top of screen at M3 is near the bedrock/till contact and the top of screen at M2 is about 7 m below the bedrock/till contact. Neither well has a surface seal. As a result, it is not certain if there was a conduit created through the till when the wells were constructed. The current level of information does not allow the following concerns to be addressed:

  - What is the source of the nitrate?
  - If the elevated nitrate is currently present in only the shallow bedrock, excavation of the bedrock will create a vertical connection between the shallow and deep fracture systems. What will be the impact to nearby domestic well quality?
  - The final depth of extraction is not indicated. What are the impacts of mixing water from the underlying shale with the water from the dolostone?
- The bedrock below the water table will be blasted and the broken rock will be removed with excavators or draglines stationed above the water table without dewatering (Note: should dewatering be required additional review of the detailed operations will be required). The proposed mining area is shown in Figure 4.1. The proposed depth of extraction should be shown on all the cross sections with an additional cross section created to show the extraction area east of Tributary 5.
- The construction of a hydraulic barrier along the downgradient side of the onsite wetland is proposed. The proposed barrier is to be 2.5 m wide and keyed into the silt/silt till layer.
  - It is not clear from Figure 4.2 how the location of the proposed barrier corresponds to the limits of micro drainage areas on Figure 3.4. The scale of the contours on Figure 3.4 suggests that D5 and D6 are connected. The addition of the limits of extraction and the location of the proposed barrier to this Figure would assist in confirming that runoff to the wetland will not change.
  - The addition of wells and water level data to Figure 5.1 along with observed lithology is needed to ensure that the barrier is placed at the optional location.
  - Additional detail on how the width of the barrier was calculated should be provided.
- There does not appear to be any wells which are located in the two extraction areas that penetrate the entire bedrock sequence. As a result, the bulk hydraulic conductivity and the depths of fracture are not reliably known. The extraction of the bedrock may result in the connection of horizontal fractures that are currently separated by zones of relatively impermeable bedrock. This could result in the alteration of current groundwater flow in the bedrock. The statement that the creation of a waterbody will result in increased storage and will benefit downstream wells, springs, ponds or streams during drier conditions suggests that there is a connection between the bedrock beneath the site and downstream resources. As a result, any decrease in available water onsite or changes in water quality will potentially impact downgradient features.
- There is not sufficient information on the bedrock in the extraction areas to allow for a reliable prediction of drawdown to be made. The vertical spacing and contribution of the water bearing fractures is not known and as a result, inflow into the pit may result in temporary dewatering of shallow fractures. The length of time for water levels to stabilize is not estimated. There is also a potential that bedrock water quality will be affected if cascading occurs within the extraction area.
- The report indicates that there is downgradient of the Northwest Wetland (southeast of M1), groundwater flow in the silty sand layer and sand and gravel layer ceases and there is only groundwater found in the bedrock. There are no overburden monitoring wells downgradient of M1S/D and as a result, there is no evidence to confirm that there is no water in the overburden.
- Northwest Wetland water balance should address the following:
  - There is a difference between the flux of groundwater upgradient and downgradient of the wetland. Is the increase unsaturated thickness due to

variations in the elevations of the top of the till or is it a result of contribution by the wetland?
  - The design hydraulic conductivity of the barrier 1 x 10^{-7} m/s in Section 5.1.1.2 which is different than the value of 5 x 10^{-8} m/s in Section 4.2.1.
- The predicted water level change in the aquifer for the nearest well will be 1.6 m. However, there are no wells within the proposed extraction areas that penetrate to the proposed depth of the quarry. As a result, the potential for a connection with nearby domestic wells is not known.
- The extraction of the bedrock has the potential to connect shallow fractures with deeper fractures and as a result, there is the potential to cause changes in water quality in nearby domestic wells. Please comment.
- There are no wells that provide an indication of water levels in the bedrock within the extraction areas. Wells in test pits are not considered to provide reliable water levels. The monitoring network needs to be modified to provide additional information on water levels in the overburden south of the wetland and to provide a better understanding of where the significant water bearing fractures occur in the bedrock. We concur with the need to compete a well survey. Contingency measures should be tied into trigger levels for both water levels and water quality.

Summary
It is recommended that the above noted technical issues be addressed prior to approving the zone change application.

Please feel free to contact me or Don McNalty if you have any questions regarding the above noted comments. This review has been carried out by staff with specific areas of expertise. Consequently questions or comments may be passed on to the appropriate individuals who have carried out the initial reviews

Yours truly,

R.J. Burnside & Associates Limited

Jackie Kay

Jackie Kay, P.Eng. MBA
JK/jw

Cc: Gae Kruse, Township of Guelph/Eramosa (Email)
Mike Davies, Cuesta Planning Consultants (Email)
Heather Ireland, GRCA (Email)

130102 Sheppard.docx
11/01/2013 2:17 PM

Burnside Hydrogeological Comments	34	"We raise some caution with respect to the water level information provided from standpipes installed in open pit excavations"	Agree. We concur that water levels obtained from test pit monitors are not ideal, however, where water levels are obtained, the pattern of seasonal variation appears to be reasonable in comparison to nearby monitoring wells installed with hydraulic seals. The test pit monitors without hydraulic seals include TP1, TP2, TP5 (removed), TP8 and TP9. Please find included a graph (Figure R1) of recent water levels obtained from TP1 and TP2 compared to nearby overburden drilled wells. The pattern and magnitude of change match very well suggesting that despite not having a seal, the standpipes provide a good representation of the water table.	No Action Required		No Action Required
Burnside Hydrogeological Comments	35	"TP9 has no description of the dolostone rock. Since the basal till layer has been removed, it is possible that the rock could be acting as an underdrain. Many intervals in the test pit logs do not include descriptions of soil colour and, as a result, it is not clear whether there was any evidence of colour changes associated with saturated conditions."	Agree. Please find below the requested detail. TP8 Depth- 3.8m Colour- 2.5Y5/4 Light olive brown TP8 Depth- 4.5m Colour 10YR6/2 light brownish grey TP8 Depth- 5.8m Colour 3.5 5/3 Light Olive Brown TP9 Depth-1m Colour 10YR6/3 Light olive brown TP9 Depth 4m Colour- 2.5 6/3 Light yellowish Brown TP9 Depth 4.6m Colour-2.5Y7/1 Light Grey (Rock) The basal till thickness was very thin at TP9, less than the length of the drive point (0.30 m). The excavation was made in February 2012, a time when infiltration should have been observed to perch on top of the till layer. I supervised the excavation and observed that there was no saturated soil above the till layer. The bedrock beneath the test pit was competent and did not break up as the teeth of the back hoe scraped along It is my opinion that if saturated conditions occur above the till in this area it is for a short duration.	No Action Required		No Action Required
Burnside Hydrogeological Comments	36	"Borehole logs for M5 to M10 were missing from the report."	Agree. There are no borehole records for these monitors. They are drive points installed from the ground surface.	No Action Required		No Action Required
Burnside Hydrogeological Comments	37	"It is noted that wells M1D to M4 do not include a surface seal and, as a result, the water levels reported may not be accurate."	Seals were installed above the screen in each of the monitors and although water may penetrate along the outside of the casing from the ground surface, the bentonite seals prevent movement to the screened portion of the well. At M1D, there is a consistent difference in hydraulic potential of approximately 1.5 metres between M1D and M1S. This suggests the hydraulic seal is working. AT M2, there is no saturated soil above the bedrock as confirmed at MW12. This monitor accurately reflects bedrock levels. At M3 there is a bentonite seal at the bedrock/overburden interface. Water levels verify that there is an unsaturated thickness of rock below the till. There is no indication from seasonal data that the absence of a full hydraulic seal is affecting static water levels. M4 has a seal to prevent water moving along the borehole annulus into the screened portion. There is no indication that seasonal infiltration events are affecting the water level in any of the bedrock wells.	No Action Required		No Action Required
Burnside Hydrogeological Comments	38	"Multi-level wells are located only on the west side of the site. The overburden geology changes from primarily sand at M3 to primarily silty sand till at M11. An understanding of the change in geology and variations in water levels between M3/M9 and M11 is needed so that the impacts of extraction on Tributary B can be fully understood."	No extraction will be occurring in the vicinity of M9, but at both M3 and M11 located at the edge of the proposed extraction, the entire thickness of overburden is unsaturated. Mini piezometers were installed beside Tributary B to determine whether or not there was any contribution of groundwater to Tributary B. As seen from MP3 and MP4, there is none along the northern property boundary. As seen from MP1 and 2, there is no groundwater contribution mid way through the site. Thus the proposed extraction cannot reduce water input to Tributary B. Every year Tributary B ceases to flow from the site in late spring or early summer and thus every year when flow commences in early spring the hydraulic gradient between the dry bottom of Tributary B and the water table is at a maximum. As water exfiltrates from Tributary B, flow will take the path of least resistance and in the northern portion of the site, as evidenced at MP3 and MP4, the infiltration occurs nearly vertically. At MP1 and MP2 located midway through the site, there is evidence of lateral movement governed by sediments immediately below the streambed. As well, TP5 excavated within the water course has fine-grained material at the surface. However, at MW11 and M3 the overburden is unsaturated, indicating that this low permeability condition does not persist laterally from the stream. Not only will extraction remain a minimum of 20-30 metres away from Tributary B, there will be a 2:1 slope in the overburden thus it is unlikely that water exfiltrating from Tributary B will be encountered. Other points for your consideration are; - The hydraulic potential in the bedrock aquifer will rise in the southern halves of both the East and West Pond as a result of the hydraulic potential levelling effect of the open body of water. Therefore, there will be no greater hydraulic gradient between Tributary B and the potentiometric surface, post extraction. - The Tributary has been altered significantly prior to JDCL ownership. Much of the Tributary is channelized to promote drainage. - The flow in Tributary B is governed largely by the state of the berms at the edge of the De Grandis ponds. We have observed two breaches in the berms resulting in two separate streams exiting the De Grandis pond. The state of repair of this berm affects water flow in Tributary B, the Allen Wetland and the De Grandis Ponds. Ms. Degrandis has approached the GRCA to deepen her ponds, thus changing the flow conditions into Tributary B. - In the unlikely event that significant seasonal seepage occurs into the excavation, silty material can be used to prevent an increase in the rate of loss of water from Tributary B.	No Action Required		No Action Required
Burnside Hydrogeological Comments	39	"Table C1 provides flow data. It is not clear from the table whether data with no values are due to no measurement being taken or whether flows were below the sensitivity of the flow meter. The data should be compared with precipitation data. This should be clarified. Continuous flow measurements would provide an additional level of understanding since spit flows are highly variable."	Blank cells indicate that no data was obtained. The intention of the streamflow data is to confirm the role that the site plays in terms of stream hydrology. It is clear Tributary B is a losing stream and that at no time does the streamflow at SW3 exceed that of SW4 indicating that even during spring freshet there is not a significant component of runoff from this site. A comparison of streamflow measured at SW4 to rainfall is provided in Figures R2 and R3. There is no recognizable correlation between monthly precipitation and the spot stream flow measurements. . Although highly variable in magnitude, the relationship between streamflow upstream and downstream is consistently showing a loss of water through the site.	No Action Required		No Action Required
Burnside Hydrogeological Comments	40	"An in-situ hydraulic assessment was completed using falling head testing and using a pump to remove water at constant rate (M2, M4). Table D1 indicates that a falling head test was completed at M2 and a short term pumping test was completed in both M2 and M4. A comparison of hydraulic conductivity values obtained with the two methods at M2 should be provided."	Agreed. A copy of the t/t' data obtained for the pumping test at M2 is attached as Figure R4. The estimated transmissivity of the aquifer is 2.7 m2/day. M2 is essentially an open hole (filled with coarse sand) through the complete thickness of the dolostone aquifer approximately 42 metres. Using k = T/b relationship, the estimated hydraulic conductivity is 7 x 10-7 m/s. This is not dissimilar to the slug test value of 1.8 x 10-6 m/s.	No Action Required		No Action Required
Burnside Hydrogeological Comments	41	"Both MW 1D, M2 and M4 have a silica sand pack above the lower bentonite seal whereas the other two bedrock wells (M13-D, M14-D) have a bentonite seal above the sand pack to surface. Wells M1D and M13D have lower hydraulic conductivity values. Is it possible that the minimal annular seal and substantial sand pack in M2 and M4 is impacting the results of hydraulic conductivity testing?"	Ageed. It is my opinion that the bentonite seal is preventing direct leakage through the borehole annulus into the screened portion of the well. It is possible in the fractured rock environment for vertical fractures to exist and thus allow for a connection to the borehole annulus above the seal through the aquifer around the hydraulic seal. This would provide a pathway from the test section to aquifer above the seal. If the borehole was the only vertical connection above the hydraulic seal, then the hydraulic conductivity measured in the test will be falsely higher than otherwise would occur. However, vertical fractures necessary to circumvent the hydraulic seal, if present, also have the potential to connect the test section to the aquifer above the seal and thus have the same effect as the unsealed borehole annulus.	No Action Required		No Action Required
Burnside Hydrogeological Comments	42	A good job was done in documenting wells near the site. The two nearby overburden wells are either no longer used (No. 6) or are used occasionally for cleaning purposes (No. 2). Well No. 2 is shallow (3.97 mbtoc) and should be monitored.	The adjacent land owner discharges water from his cooling system at the location of W2, thus monitoring this location will not provide useful information.	No Action Required		No Action Required
Burnside Hydrogeological Comments	43	Viewlog and Modflow were used to create a model of groundwater potentials for the bedrock aquifer - How does the model consider overburden at the site?	The model does not consider overburden at the site. Much of the site overburden is dry and where it is saturated, it is so because of relatively thin layers of lower permeable material. The overburden geology within the moraine is highly variable from layered silt, unweathered till, sand and gravel etc.. making accurate simulation of actual conditions very difficult. The model concentrates on more predictable geological conditions in the rock to address the potential impact on private wells which rely upon bedrock aquifer water and to estimate the area of influence of the quarry. The model is also used to estimate the potential gradients beneath the northwest wetland and this outcome is used in the water balance of the northwest wetland.	No Action Required		No Action Required
Burnside Hydrogeological Comments	44	- Hydraulic conductivity values of 5.8 x 10-7 m/sec (M1D) and 4.0 x 10-7 m/sec (M13D). How were these lower k values utilized in the model?	The final hydraulic conductivities used in the model were based on comparing model results with regional data . This included the pattern of northwest to southwest groundwater flow across the site. Ultimately, a hydraulic conductivity more than an order of magnitude greater than estimated at M1D and M13D was used. Lower hydraulic conductivity values in the bedrock also could simulate the heads, however, an unrealistically low recharge value would then be needed to mimic actual observed conditions. Thus, through the model calibration process, a value of hydraulic conductivity of greater value than observed at M1D and M13D was arrived at.	No Action Required		No Action Required

Burnside Hydrogeological Comments	45	- Appendix D does not contain any hydraulic conductivity data for M3 and the highest k value is 2.0 x 10-4 m/sec at MpN-1. What is the rationale for assigning a value of 1.8x10-4 m/sec to the bedrock and what is the thickness of this layer?	The rationale for this was that there is a bend in the regional groundwater flow pattern based on measured hydraulic heads from on-site wells and private wells (Figure R5). The only way to simulate this bending is to include a zone of higher hydraulic conductivity as shown. Brydson Spring occurs at the southern end of this zone and is a significant point discharge, confirming that enhanced permeability likely exists. This zone also accounts for the relatively low hydraulic potential observed at M3. In this same area, Tributary B and Tributary C both infiltrate indicating the ability of the bedrock unit to accept water as there is no discharge of water from the overburden in areas of lower elevation north or south of Hwy. 7 on the Brydson Farm.	No Action Required		No Action Required
Burnside Hydrogeological Comments	46	- Is the recharge value of 150 mm realistic given the hummocky nature of the site, the relatively coarse grained deposits that overlie the bedrock in some areas and the closed drainage areas (D5, D6 and D7)	We included an area of slightly higher recharge where till was absent and closed depressions tend to enhance recharge. A value of 150 mm/year may be low given the estimated surplus water value of greater than 300 mm/year. The model is able to simulate the hydraulic head and pattern of groundwater flow to a reasonable degree. Altering small sections of the model to include depression focused recharge in small areas is unlikely to have a significant effect on this outcome. The purpose of the model is to provide an estimate of the gradients beneath the Northwest wetland and estimate the area of influence of the quarry such that potential impacts to natural heritage features and wells within that area of influence can be considered. It is my opinion that the model provides a reasonable estimate of gradients beneath the northwest wetland and area of influence.	No Action Required		No Action Required
Burnside Hydrogeological Comments	47	- How does the recharge used in the model created for the site compare to values used in the Source Water Protection work completed for the area by Golder and Aqua Resource?	The direct recharge to the bedrock aquifer in the Harden Model will be somewhat lower than recharge on other models such as the Gartner Lee Model and the Aqua Resource Model in that the Harden Model does not model the overburden layer and thus does not have any active drains in the overburden as other models will have. We have observed and measured significant volumes of groundwater flow in Tributaries A, B and C that emerge from the overburden along the southern edge of the Paris Moraine. This groundwater will have originated as infiltration, encountered a layer of lower permeability and emerged along the flank of the moraine from overburden sediments. A portion of this water re-emerges between the original spring source and Blue Springs Creek and where this occurs near to the site, we have increased recharge along the Tributary corridor commiserate with the measured loss of streamflow.	No Action Required		No Action Required
Burnside Hydrogeological Comments	48	- Figure H10 provides the predicted groundwater flow in the bedrock. How does this compare to the current flow direction?	The calibration of hydraulic potentials is provided in our report on Figure H8, confirming a good correlation to observed water levels. The static water levels available from the water well data base were kriged and the result is shown on the attached Figure R6 for an area near to the site and on Figure R7 in a regional perspective. A similar pattern of groundwater flow occurs in the model simulation.	No Action Required		No Action Required
Burnside Hydrogeological Comments	49	- The model is used to predict changes in bedrock water levels as a result of extraction in two areas of the site. What will the impacts be in the overburden?	The groundwater model was used to estimate the potential change in hydraulic potential in the bedrock aquifer only. This allows for a prediction of the potential impact to nearby water supplies, all reliant upon the bedrock aquifer. The Paris Moraine upgradient of the site is an area of regional groundwater recharge. A lower water level in the bedrock aquifer may depress the water table in the overburden as well, depending on the permeability of sediments overlying the bedrock. The significant heritage features that are related to water levels in the overburden are the Northwest wetland, the Rockwood Farm spring and the De Grandis Spring. The potential impact to the Northwest Wetland is addressed in a detailed water balance and mitigation is provided by way of an hydraulic barrier. The groundwater model predicts changes to bedrock water levels beneath the perennial Rockwood Farm spring and the ephemeral De Grandis Farm spring. Our reason for suggesting that there will not be a significant change in spring discharge is that the evidence available suggests that the spring discharge originates from permeable moraine sediments and not the bedrock. The overburden features are isolated from the bedrock water by the presence of a persistent low permeability silt layer The evidence includes; · Observations of groundwater seepage at the toe of slope on the Degrandis farm in an area of surficial silt till deposits. · Observation of significant elevation rise in the source area of the Rockwood Farm spring attributed to increased thickness of overburden · Observation of permeable surficial sediment conditions north of the De Grandis farm. · Loss of streamflow in the Allen Wetland · Presence of silt beneath Allen Wetland · Relatively low hydraulic head measured in the Allen Farm house well proximal to the spring · Permeable conditions measured in the De Grandis dug well · Anecdotal descriptions of clay encountered during excavation of DeGrandis Pond.	No Action Required		No Action Required
Burnside Hydrogeological Comments	50	- Many of the figure do not have legends and as a result the significance of the colours used is not always apparent.	Provided	Include modified figures into report via addendum.	Harden	
Burnside Hydrogeological Comments	51	- Tributary B is an ephemeral stream which was assigned a recharge value of 0.154 m/day. How was this value calculated? How was limited flow data for SW5/SW7 considered in the calculation?	The loss of water in Tributary B has been documented and varies between zero and 24 L/s over the site. The recharge was modelled at a constant rate of 5 L/s for Tributary B. Essentially all of the flow in Tributaries A and C infiltrates and losses of 8.5 L/s for Tributary C and 10 L/s for Tributary A were assigned to these streams. Thus, the annual recharge to the aquifer was calculated and distributed equally over the year along the model area representing the losing portions of the streams. The more complete data set from SW4 and SW3 were used for this calculation.	No Action Required		No Action Required
Burnside Hydrogeological Comments	52	- Burnside recommends that a thorough review of the model be completed by a groundwater modeller with experience in fractured rock geology.	There is limited potential for water level change in the bedrock let alone the overburden arising from the proposed mining activities. A maximum change of three metres can occur in the bedrock as there will be no dewatering of the site. The model uses an equivalent porous media model and not a fractured rock model in order to predict changes in the hydraulic potential of the bedrock aquifer. Complexities of a fractured aquifer are not considered in the model, and are not relevant to our analysis. To this end we have recommended a detailed water well survey prior to below water table extraction and ongoing monitoring in the nearby PSW's. Streamflow at RS1 will continue and if necessary a staff gauge in the De Grandis ponds will be added. Rather than undergoing a rigorous fractured rock modelling exercise, we have used a porous media model to project estimated changes in water levels. Ultimately, trends observed in monitoring data will be analysed and if it appears that an impact could occur to any natural heritage feature, mitigation of impacts including possible cessation of extraction could occur.	No Action Required		No Action Required
Burnside Hydrogeological Comments	53	The infiltration rates used in the groundwater model are less than the rates in the Gartner Lee Model (2004) which seems reasonable given the till layer overlying the bedrock. However, it is not clear if higher recharge rates in micro drainage area D7 would affect the interpretation of future impacts. Based on the 1m contours in Figure 3.4 it is also not clear why D5 and D6 are not considered as one micro-drainage area.	D6 is used to represent surface water drainage to the Northwest Wetland. D5 is a separate drainage area to a closed depression. Higher recharge rates could be used for micro drainage area D7. However, in the scale of the model, it will not affect the outcome.	No Action Required		No Action Required
Burnside Hydrogeological Comments	54	The bedrock surface is shown in Figure 3.5. The proposed extraction area should be added to this map. It appears that there are few (if any) bedrock monitoring wells within the two extraction areas. Given the heterogeneity of the bedrock, it is recommended that monitoring wells be installed within the extraction areas.	The extraction area has been added to Figure 3.5 and attached. We do not recommend additional bedrock monitoring wells in the extraction area as the pattern of hydraulic potentials is reasonably straightforward.	No Action Required pending further discussion with Burnside	Harden	
Burnside Hydrogeological Comments	55	The report indicates that in general the basal silt till is thin or absent above the bedrock near Tributary B. It is our opinion that there is insufficient information to conclude that the basal till is thin or absent near Tributary B. TP3, TP5 and TP11 did not encounter bedrock but did have finer grained materials. There is no discussion about the difference in effective "k" values between the till and the finer grained materials. This suggest that the water "lost" by Tributary B may be remaining in the overburden and may not reach the bedrock.	Monitoring Well MW11 is dry and is located 20 metres from Tributary B. Mini piezometers MP3 and MP4 are installed adjacent to Tributary B and have always been dry. Mini piezometers MP1 and MP2 have water in them and always indicate a losing stream. There are no fish in Tributary B and the flow of water in Tributary B is derived mainly from off-site sources. Tributary B has been channelized and originally did not flow from the site except under extreme flood conditions. Extraction will not occur within 20-30 metres of Tributary B and water loss by Tributary B is governed by the soils immediately below and adjacent to the Tributary. The only potential for loss will occur during the months that there is water in the tributary with the effect of causing the Tributary to cease flowing somewhat earlier than presently occurs. There is already a significant annual range in the period of time that Tributary B is dry .	No Action Required pending further discussion with Burnside		No Action Required pending further discussion with Burnside
Burnside Hydrogeological Comments March 13 2013 no comments received from County of Wellington, Novus Environmental	56	It is noted in the report that the Brydon Spring likely represents discharge directly from the bedrock and can be considered to be the re-emergence of Tributaries B and C. There are limited bedrock wells on the proposed quarry site and there is no data that confirms that the tributary loses water to the bedrock. Tracer testing should be considered to confirm this statement.	The Brydson Spring emerges some 400 metres from the proposed quarry and downstream from areas of measured losses of streamflow in Tributaries B and C. All of the lands farther downgradient of the Brydson Spring have numerous exposures of bedrock. There are no springs emerging from the side slopes along Hwy 7 nor are there springs in the Tributary B watercourse other than Brydson Spring. The water level in the bedrock well at the residence beside Tributary B is below the bedrock overburden contact as is observed at M4. The water level in the private residence across from M7 is also below the overburden/bedrock contact observed at M4. M7 was installed to an elevation just above the bedrock/overburden contact observed at M4 and a water table has never been measured at that location. Thus, it is reasonable to assume that recharge occurring in Tributaries B and C contribute to the bedrock aquifer. There is no reason to verify this opinion with a tracer test as water levels at the Brydson Spring will increase if anything as a result of the quarry.	No Action Required pending further discussion with Burnside		No Action Required pending further discussion with Burnside

Burnside Hydrogeological Comments	57	It is indicated that some monitors have up to 17 years of records and provides groundwater potentials for overburden and bedrock in Figures 3.16 and 3.17.....There also appears to be limited data to support the contours between MW1 and M7. Similarly there does not appear to be sufficient data presented in the report to support the assertion that "groundwater occurring within the overburden does so above the silt till as a silt layer generally in the northern portion of the site and percolates into the bedrock within the southern portion of the site. An isopach map of silt thickness would assist in demonstrating the limit of the till unit.	We have attached a map of basal silt/till thicknesses derived from the same data as presented in the borehole and test pits logs. From this we conclude that a silt/ till layer generally occurs throughout the site, although absent at M2, M11 and M12. The hydraulic potential of water levels in the bedrock aquifer are greater than the elevation of the overburden/bedrock contact only at stations M13D, M14D and M1D. At all other stations the potentiometric surface in the bedrock aquifer falls below the overburden/bedrock contact. M7 was installed to address the potential for water perched above a till layer near to M4. The bottom of monitor M7 has an elevation of 349.42 m AMSL and the till observed at M4 has an upper elevation of 350.46 m AMSL. Thus, proximal to M4 along the southern property boundary, there is no indication of a saturated condition above the bedrock. Also, monitors M11 and M12 installed to the top of the bedrock have never had water in them indicating that conditions allowing water to percolate into the bedrock exist at the site. The top of rock at W1 is 347 m AMSL. Test pit TP7 was excavated to a depth of 348.2 m AMSL with dry sand and gravel overlying a silty sand. Again, this provides limited opportunity for a saturated condition to occur above the bedrock.	Include Map of basal silt/till thicknesses in Report via addendum	Harden	
Burnside Hydrogeological Comments	58	An estimate of hydraulic conductivity and transmissivity based on data collected during short term pumping tests and falling head tests is provided. Based on the mapping provided, it appears that none of the bedrock wells tested are within the two proposed extraction areas. Onsite in-situ testing was completed in wells with limited screened intervals. The lack of data within the extraction areas results in several concerns: - Given the heterogeneity of the bedrock, is there the potential for zones of higher or lower k to be present. There are significant variations in flow (400 l/min at mushroom farm vs. 82 l/min at TW2	There is potential for areas of higher and lower hydraulic conductivity at this site as occurs throughout the dolostone bedrock aquifer in this area. The mandate of our study was to determine what the potential impact of developing an open water body at this site has on nearby water wells and Provincially Significant Wetlands. The maximum water level drawdown that can occur along the northern edge of the site is estimated to be three metres. This is based on a six metre overall difference in potentiometric elevation across the proposed extraction area. The potential impact to the nearest water well is estimated to be 1.6 metres. Given that the neighbour is withdrawing 400 litres per minute and drawing down his well by some 40 metres, a change of 1.6 metres will not have an effect on the nearest well's ability to obtain water from the bedrock. The groundwater model uses a hydraulic conductivity at the higher end of the spectrum resulting in a greater area of predicted impact than would occur with a lower hydraulic conductivity (see Freeze and Cherry, Figure 8.6). The maximum drawdown in a hydrostratigraphic unit will be approximately three metres at the edge of the quarry. There will not be a significant impact on any private water well.	No Action Required Pending discussion with Burnside		No Action Required Pending discussion with Burnside
Burnside Hydrogeological Comments	59	- The excavation will behave as a large diameter well open through the bedrock sequence. The onsite wells are screened over discrete intervals and hydraulic testing will not be representative of the entire bedrock sequence.	The on-site testing suggests a range in hydraulic conductivity in the bedrock of almost two orders of magnitude and in general represents hydraulic conductivities that occur near to the bedrock/overburden contact. The two wells that extend the full depth of the quarry (W1 and TW-2) as discussed in Section 3.6.2.1 of the report do not suggest a zone of significant hydraulic conductivity. The fact that the 60 m deep neighbour's well can only run intermittently at a rate of 400 litres per minute (88 imperial gallons per minute) indicates that a zone of high hydraulic conductivity is not present. The maximum drawdown from the extraction is in the order of three metres at the edge of the quarry and will be less at the nearest wetland and water well. The water levels in the wetlands are seasonally perched above and isolated from the bedrock water level by underlying silty soils.			
Burnside Hydrogeological Comments	60	The Guelph/Eramosa Study used significantly higher hydraulic conductivity values. Since the bedrock is heterogeneous significant variations in hydraulic conductivity can be expected. Additional data from within the extraction areas is needed to confirm on-site conditions.	The Guelph Eramosa Study used the following values: Upper Amabel 1 x 10-5 m/s Production Zone 5 x 10-4 Lower Amabel 1 x 10-5 m/s This was based on model calibration and pumping tests indicating transmissivity of 1368 m2/day. This high level of transmissivity is not observed in on-site wells tested (M2, W1) nor TW-2 in adjacent lot. As dewatering will not be occurring at this site, the presence/absence of heterogeneity in the bedrock aquifer is immaterial.	No Action Required pending further discussion with Burnside	Harden	
Burnside Hydrogeological Comments	61	Add stratigraphy to Figure 3.18	All monitors in this figure are drive points and as such, no stratigraphy is available.The geological information from nearby TP5 suggests that the soils in this area are a silty sand. No significant permeability contrast occurred in TP5 until a depth of 348.68 m AMSL where a gravel layer was encountered. The Figure 3.18 in the report shows graphically that there is a constant loss of water from Tributary B during both high and low water conditions.	No Action Required		No Action Required
Burnside Hydrogeological Comments	62	It is agreed that there does not appear to be any groundwater contribution to the Northwest wetland from the bedrock. The water level data in Fig. 3.19 and information in cross section B-B suggest that upward gradients in the overburden west of the wetland may provide discharge to the wetland in the spring when water levels are highest.	We concur that there is the potential for overburden groundwater to contribute water to the wetland during spring conditions. It is our opinion that this will not change. Although the potential exists, the actual movement of water into the wetland may not be occurring. I have attached Figure R9 with newly obtained water levels from the wetland and nearby monitors in 2012. The figure confirms that during the drought conditions, the water in the wetland was perched above the overburden groundwater in all directions. The retention of water in the wetland must be facilitated by the presence of a lower permeability layer along the base of the wetland. This shows the independence of the wetland from the shallow overburden system. Thus, even if minor changes in the shallow overburden system arise, an impact to the wetland will not necessarily occur.	No Action Required		No Action Required
Burnside Hydrogeological Comments	63	The water level in bedrock well 6707545 on cross section A-A is in the overburden. This well appears to be unconfined. There do not appear to be any bedrock wells in the vicinity of the De Grandis Property. If similar conditions exist on the De Grandis property, is there the potential that the maximum predicted drawdown of 0.6 m shown in Figure 4.3 could impact the Pond?	The same condition occurs at nearby on-site wells MW13D, MW14D and M1-D which have good geological profiles. The shallow wells adjacent to these deep wells confirm that a layer of lower permeability till or silt separate the bedrock from the overburden, allowing for saturated conditions to occur in the overburden. It is our interpretation that similar conditions occur at 6707545. The Rockwood Farm spring is located significantly closer to Well 6707545 than the De Grandis spring. Harden measured the water level at the Rockwood Farm well to be 354.80 m AMSL (slightly above the bedrock surface) and the elevation of the spring emergence is at approximately 361 m AMSL. This is more than a six meter difference in hydraulic potential over a relatively short lateral distance. Northward of the spring the ground elevation increases by almost twenty metres and the indication from nearby water well records is that this increase not reflected in the bedrock surface, thus the overburden thickness increases significantly north of the spring. Springs occur at the base of this topographical feature on both the De Grandis and Rockwood farm properties. It remains our opinion that the Rockwood Farm and De Grandis springs arise from an overburden source. Although there is not a drilled well at the De Grandis farm, there is a shallow dug well which provides an adequate water supply for the farm. In addition, on two occasions, the water level in the well and in the pond were identical.....In the fall of 2012 we worked with Ms. De Grandis on obtaining a permit to dig her pond deeper as the water levels were abnormally low. According to Ms. De Grandis, over the years sediment buildup in the pond has decreased spring discharge into the pond. The GRCA investigated the site and upon presenting an application will grant a deepening of the De Grandis Pond. Ms.De Grandis was present during the excavation of the ponds (originally a spring at the ground surface with a stone crock) and her recollection was that much of the pond was dug into "clay" and only along the northern edge was a significant spring encountered. We asked if bedrock was encountered and she did not observe rock at the bottom of the ponds. There are very stony fields northerly of the De Grandis farmstead providing ample opportunity for recharge and southerly movement of water in the overburden.	No Action Required		No Action Required
Burnside Hydrogeological Comments	64	Elevated nitrate concentrations (> 5 mg/l) were present in samples from bedrock wells M2 and M3. Both M2 and M3 are bedrock wells located at the north end of the hidden Quarry Site. The top of screen at M3 is near the bedrock/till contact and the top of screen at M2 is about 7 m below the bedrock/till contact. Neither well has a surface seal. As a result, it is not certain if there was a conduit created through the till when the wells were constructed. The current level of information does not allow the following concerns to be addressed: - What is the source of the nitrate?	M2 and M3 are located in the midst of a pine plantation downgradient of active farms. M2 is physically located at a superior elevation than the farms and overland flow to M2 will not occur. The only reasonable source of nitrate is the adjacent farm. M3 is also located in a surface water catchment that derives surface water from the pine plantation. The only reasonable source of nitrate in the aquifer is from the adjacent farm fields located upgradient of the site.	No Action Required		No Action Required
Burnside Hydrogeological Comments	65	- If the elevated nitrate is currently present in only the shallow bedrock, excavation of the bedrock will create a vertical connection between the shallow and deep fracture systems. What will be the impact to nearby domestic well quality?	A water sample was obtained from W1 which penetrates the entire thickness of the proposed quarry. The nitrate value for this well is 0.13 mg/L. Thus, there does not appear to be an overall issue with elevated nitrates at this site. Any bedrock water well in this area already presently mixes water from the entire exposed aquifer within the well, similar to the proposed quarry. When established, aquatic plant life in the quarry ponds will remove nutrients such as nitrogen and phosphorous contained in inflowing groundwater from beneath agricultural fields north of the site.	No Action Required		No Action Required
	66	- The final depth of extraction is not indicated. What are the impacts of mixing water from the underlying shale with the water from the dolostone?	The proposed quarry will be a minimum elevation of 320 m AMSL and shale was encountered in M2 at an elevation of 308.8 m AMSL, thus the bottom of the quarry will be at least 10 metres from the underlying shale unit. There will be no mixing of water from the shale unit arising from the proposed quarry activities.	No Action Required		No Action Required
	67	The proposed depth of extraction should be shown on all the cross sections with an additional cross section created to show the extraction area east of Tributary 5.	The proposed depth of extraction is to an approximate elevation of 320 m AMSL. Figure R10 is attached as a cross-section on the east side of Tributary B.	No Action Required		No Action Required
		The construction of a hydraulic barrier along the downgradient side of the onsite wetland is proposed.	The hydraulic barrier is a buried feature and in itself will not affect surface water flow.	No Action Required		No Action Required

March 13 2013 no comments received from County of Wellington, Novus Environmental

	68	- It is not clear from Fig. 4.2 how the location of the proposed barrier corresponds to the limits of micro drainage areas on Fig. 3.4. The scale of the contours on Fig 3.4 suggest that D5 and D6 are connected. The addition of the limits of extraction and the location of the proposed barrier to this Fig. would assist in confirmation that runoff to the wetland will not change.				
	69	The addition of wells and water level data to Figure 5.1 along with observed lithology is needed to ensure that the barrier is placed at the optimal location	Figure 5.1 is a schematic diagram of the various hydrologic components considered in the development of the water balance of the wetland and is not intended to represent on-the-ground conditions. Lithology has been observed at MW1-S, MW13S, MW14S and TP2 and suggest similar geological conditions of sandy sediments overlying a silt or till. Construction of the barrier will be supervised to key the barrier into the top of the silt/till unit. It is proposed that the barrier be installed as shown on Figure 4.2 of the Hydrogeology report. The location of the barrier was discussed with the biologist and was located as near to the wetland as possible to maximize barrier effectiveness without physically altering conditions within the wetland.	No Action Required		No Action Required
	70	Additional detail on how the width of the barrier was calculated should be provided.	The effectiveness of the barrier is a function of width and hydraulic conductivity. The width of the barrier is restricted along the southern edge of the wetland. Based on discussions with an excavation contractor, a trench with a 2.5 metre base was deemed to be the minimum size in order to minimize disturbance near to the wetland. The hydraulic conductivity then needed to be sufficiently low to retard the flux of water through the overburden.	No Action Required		No Action Required
	71	The statement that the creation of a waterbody will result in increased storage and will benefit downstream wells, springs, ponds or streams during drier conditions suggests that there is a connection between the bedrock beneath the site and downstream resources. As a result, any decrease in available water onsite or changes in water quality will potentially impact downgradient features.	The quarry will create a vertical connection within the bedrock aquifer just as every bedrock well presently does. The water quality tested at W1 which penetrates the entire thickness of the proposed quarry suggests that vertically integrated water quality is good. The same good quality water was obtained from nearby wells TW-1 and TW-2 which also penetrated the entire thickness of the proposed quarry to be extracted. Significant changes in water quality and quantity are not expected to occur at this site and JDCL has committed to conducting a pre-quarry survey of water quantity and quality of neighbouring wells to obtain baseline conditions.	Conduct Water Well Survey post approval.	Harden	
	72	There is not sufficient information on the bedrock in the extraction areas to allow for a reliable prediction of drawdown to be made. The vertical spacing and contribution of the water bearing fractures is not known and as a result, inflow into the pit may result in temporary dewatering of shallow fractures. The length of time for water levels to stabilize is not estimated. There is also a potential that bedrock water quality will be affected if cascading occurs within the extraction area.	There will be no active dewatering at this site and the potential impact of 'lake leveling effect' and aggregate removal from the site have been addressed in our report. There will be a dewatering of fractures near to the north quarry face and a depressurization of fractures within the area of influence of the quarry. The opposite will occur on the south face where water levels are expected to increase. This will be a small but permanent change in the groundwater system. The change will occur over several years, increasing as the quarry expands southward. There will be ample opportunity to observe and record water level changes in the bedrock aquifer, northwest wetland and private wells. Once quarrying has ceased, the final lake level equilibrium will be established within months. Extending the required monitoring for a period of one year will allow for verification of water level changes.	No Action Required Pending Discussion with Burnside	Harden	No Action Required Pending Discussion with Burnside
	73	The report indicates that there is downgradient of the Northwest Wetland groundwater flow in the silty sand layer and sand and gravel layer ceases and there is only groundwater found in the bedrock. There are no overburden monitoring wells downgradient of M1S/D and as a result, there is no evidence to confirm that there is no water in the overburden.	See Till Isopach Map response. It is our opinion that any water occurring above the till/silt layer near the southern portion of the site, does so intermittently. There are no natural heritage features or water wells reliant upon a perched water table.	No Action Required		No Action Required
Burnside Hydrogeological Comments	74	Northwest Wetland water balance should address the following:	On a year over year basis, our observation over almost two decades is that there is little water remaining in the wetland by September/October. Thus, a water balance prepared for the wetland should not show a year over year increase or decrease of water. Starting with observed hydraulic gradients, measured water levels and hydraulic conductivities obtained from wetland monitors, a water balance representing the aforementioned observation was prepared. The groundwater flux for the saturated sand and gravel upgradient of the wetland is somewhat different than down gradient of the wetland due to differences in hydraulic conductivity. Upgradient of the wetland, the hydraulic conductivity is estimated to be 5 x 10-5 m/s and downgradient it is estimated to be 3 x 10-5 m/s. These small differences are the main reason for groundwater flux differences in the water balance.	No Action Required		No Action Required
	75	- There is a difference between the flux of groundwater upgradient and downgradient of the wetland				
	76	- Is the increase unsaturated thickness due to variations in the elevations of the top of the till or is it a result of contribution by the wetland?	There is some variation in the elevation of the top of the till near to the wetland. The top of till elevation north of the wetland is 352.18 m AMSL at M13, 351.59 m AMSL at M14 and 351.64 m AMSL at M1. Thus the top of the till layer is approximately 0.5 metres higher north of the wetland resulting in lesser saturated thickness of sand and gravel to the north and greater thickness of saturated sand and gravel to the south of the wetland. The ground elevation south of the wetland rises and the elevation of the water table falls, thus there is an increase in the unsaturated thickness south of the wetland.	No Action Required		No Action Required
	77	- The design k of the barrier 1x10-7 m/s is Section 5.1.1.2 which is different than the value of 5 x 10-8 m/s in section 4.2.1.	The design hydraulic conductivity is 1 x 10-7 m/s. The statement in Section 4.2.1 is incorrect.	Correct Section 4.2.1 via Addendum	Harden	
	78	The predicted water level change in the aquifer for the nearest well will be 1.6 m. However, there are no wells within the proposed extraction areas that penetrate to the proposed depth of the quarry. As a result, the potentials for a connection with nearby domestic wells is not known.	There will be no dewatering at this site and thus the potential change in water level at the quarry will not be significant. The estimated water level change at the nearest water well is based on the model using a hydraulic conductivity of 1 x 10-5 m/s. Groundwater monitors M13D and M14D are located between the extraction area and the nearest neighbour. These monitors will be used to verify changes in the hydraulic potential.	No Action Required		No Action Required
	79	The extraction of the bedrock has the potential to connect shallow fractures with deeper fractures and as a result, there is the potential to cause changes in water quality in nearby domestic wells. Please comment.	Every water well constructed in the bedrock presently connects shallow aquifer water with deep aquifer water. The water sample obtained from the on-site well (W1) shows that the water quality, integrated over the proposed depth of the quarry, is good.	No Action Required		No Action Required
	80	There are no wells that provide an indication of water levels in the bedrock within the extraction areas. The monitoring network needs to be modified to provide additional information on water levels in the overburden south of the wetland and to provide a better understanding of where the significant water bearing fractures occur in the bedrock. We concur with the need to compete a well survey. Contingency measures should be tied into trigger levels for both water levels and water quality.	There are six groundwater monitors on the site that provide water levels in the bedrock aquifer. The potentiometric surface behaves in a predictable manner (northwest to southeast flow). Overburden water levels south of the wetland are measured in M6, M5, M1S, M14S and confirm the presence of water in the overburden. The potentiometric surface of the bedrock is also above the overburden/bedrock contact in those wells where there is water in the overburden. This is not the case for M4 or W1 and the fact that M7 is always dry and no water was observed at TP7 indicates that there is unlikely to be water above the bedrock in those areas. M4 is located immediately downgradient of the proposed extraction area and will be used as a long term monitor. Trigger levels with respect to water levels and water quality will be established.	Establish Trigger Levels for specific monitors	Harden	
	81	Wells in test pits not accurate	See response to Comment 34.	No Action Required		No Action Required
	82	Additional water levels in overburden south of wetland	There are no natural heritage features or wells associated with overburden water south of the wetland and there is no indication from existing monitoring network, testpit program, geological sampling that a significant amount of water exists in the overburden. See section on Till isopach.	No Action Required		No Action Required
	83	Significant Water Bearing Features in Bedrock	We understand that the Gasport Aquifer can have have significant permeability differences and thus there may be differences in the response in the bedrock aquifer to the 'lake-levelling' effect on the hydraulic potential in the aquifer. The maximum change in hydraulic potential is approximately three metres at the quarry edge and even if there are significant water bearing fractures, the maximum impact will not be greater than three metres at the quarry edge. We understand that if this were a pumping well or a dewatered quarry that there could be a significantly greater drawdown in the significant water bearing fractures, however, the passive nature of this quarry can only result in a muted response in the aquifer.	No Action Required		No Action Required

Meeting Notes - Hidden Quarry Meeting to Review Outstanding Comments with RJ Burnside staff

Thursday August 1, 2013, RJ Burnside office in Guelph

Attendance:
Don McNalty
Dave Hopkins
Domonique Evans
Don Scott
Stan Denhoed
Leigh Mugford
Greg Sweetnam

Don McNalty advised that the Township of G/E had approved of the meeting without having a representative present.

Copies of the Matrix of Comments were distributed and a revised set of site plans were given to Don McNalty.

Review of outstanding items:

Hydrogeology

Dave asked if Stan would be providing a revised report or addendum. Stan thought an addendum would be a better way to go.

Discussion of the M15 well:

- Stan explained what had gone on with creating M15.
- Stan was advised to make his points in the report clear for the public on water quality testing and conclusions, the presence/absence of karst feature, etc
- Don McNalty asked about what issues were being resolved with MOE GRCA etc so they were aware of overlapping issues or related and new issues.
- Stan advised that the only wells downstream were 5 in number and all in Milton. Greg said they would be responding to Halton regarding their well survey and monitoring program.
- Dave suggested that the information from this M15 report be utilized as much as possible to clarify comments received from the public and agencies. He asked if the Figure 7 graphical information could be compared to residential well depths to illustrate the relative location of the water bearing fractures and where residential wells were getting water from.
- Dave wanted to have clear discussion on absence of confining layer (Eramosa Fm)
- Blasting was discussed. Dave wanted to clarify how the effects of blasting the sinking cut and excavating rock might have on water levels and recovery rate. Stan explained how it would be handled.
- Matrix#72 – plot of domestic wells vs fractures, opportunity to deepen a shallow well if needed?
- Marix#60- hydraulic conductivity – the 10^{-4} zone in the model – what are the effects if it is not included – Stan says the prediction of water levels goes off, but there would be less impact predicted.

- Matrix54- Dave asked about M16 – a post approval well
    - Don McNalty asked if an adaptive management plan was to be created. Response was there is a list of contingency items – trigger levels but not a formal AMP and it has not been requested.

- Matrix#56-Brydson Spring – Dave asked if Stan could make clear the potential impact to the spring as the information relates there will be more water available to supply the spring yet the general public might intuitively think the opposite. Perhaps a cross sectional figure through the Brydson Spring would be helpful.

- Further Hydrogeology items:
    - Division of the M15 into three zones is to take place, with associated testing
    - Burnside team will review remaining items
    - It was agreed that tracer testing will not be required
    - The municipal well test is still planned to take place, tenders have been requested, this should not hold up the Burnside review comments and it is anticipated that the results of the testing would be done prior to the next public meeting.

Natural Environment

- GWS is working on the linkages issue as commented on by Peter Williams
- Don McNalty asked if the GWS report would have an addendum to be consistent…
- Manmade wetland comment – GWS working on that
- Domonique asked if the movement of the barrier under the berm would be confirmed in Stans report and on the site plans. Stan to re-visit water balance for new barrier configuration.
- Species at risk – Brown Bat comment – we gave Burnside copies of the MNR comments and GWS responses – Don McNalty suggested we send by email as well.

Traffic

- Don Scott advised he doesn't mind if the geotechnical evaluation and 6th line road design was done post approval with an agreement in place with the Township. It was agreed starting a geotech study now might be more disturbing at this stage.
- Burnside has completed a revised TIS and response to Burnside comments. JDC will forward to Burnside personnel.
- Greg advised he would be responding to Halton Region regarding traffic related issues.
- Don McNalty asked about the prospect of serving the market to the west (an issue raised by the public)– Greg responded that the overwhelming market demand and price lies in the GTA to the east including the JDC internal facilities. The Guelph Dolime Quarry would continue to supply markets to the west of Rockwood.
- the speed limit on the 6th line would likely be requested to be posted in the area from the quarry to Hwy 7. The redesign of the road would also take the appropriate speed into account.

General Comments

- Matrix #13 – Don Scott advised that the noise study would act as grounds to justify an exemption to the noise bylaw and that items such as discriminating or modified backup alarms on the loaders might also justify the exemption.
- Matrix#4 – we have an engineer to advise on the size of the septic field needed for the planned facility

- Fence inspection notes are on page 1 of the site plans

Agenda by L. Mugford JDC

Hidden Quarry Meeting to Review Outstanding Comments with RJ Burnside staff

Thursday August 1, 2013, RJ Burnside office in Guelph

Expected Attendance:
Don McNalty
Dave Hopkins
Domonique Evans
Don Scott
Stan Denhoed
Leigh Mugford
Greg Sweetnam

The meeting is to review progress on satisfying the comments made by RJ Burnside staff on the project. JDC will bring copies of the updated Hidden Quarry Site Plans, Comment Matrix sections detailing the RJ Burnside comments and relevant reports, ie the recent report on the M15 well by Harden Environmental and letter/revised TIS by Cole Engineering.

Review of Progress in Satisfying Outstanding Items (as listed in the JDC Comment Matrix)

Burnside General Comments

- Action has progressed on items, 6,7,9,10,11,14,15, for comment by RJ Burnside staff.
- Outstanding Items waiting on more information, 4,13

Archaeology Comments
- no new information required, comments should be sufficient

Air Quality Comments
- no information required, should be sufficient

Traffic Comments
- Cole Engineering has drafted responses to comments from RJ Burnside and MTO which relate to items, 20,21,23-27,29,30 for comment by RJ Burnside staff.

Natural Environment Comments
- comment 31 is being addressed with GRCA
- comment 32 no new information – comment should be sufficient
- comment 33 is being addressed with MNR

Hydrogeology

- Harden Environmental has created a report on the additional well M15. It is anticipated that items 54,58,60 and 72 will be addressed by this information.
- Items 55 and 56,57,71,80 may also be resolved at this discussion.

JAMES DICK CONSTRUCTION LIMITED

MAIL: P.O. Box 470, Bolton, Ontario. L7E 5T4
COURIER: 14442 Hwy. 50, Bolton, Ontario. L7E 3E2
TELEPHONE: (905) 857-3500 FAX: (905) 857-4833

May 8, 2013

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

RE: Hidden Quarry Drilling Program

Attention: Mr. Dave Hopkins, Hydrogeologist

Hi Dave,
As you know we are embarking on a drilling program designed in consultation with you and Stan Denhoed to answer outstanding comments you have on the Hidden Quarry. We will also make the monitoring data available to you during the pumping test of the Milne Street Well. You have been invited to attend the site during drilling and during the pump test.

We submitted responses to the Hydrogeology comments in the January 11, 2013 RJ Burnside letter from Jackie Kay in our Response Matrix on March 11, 2013 (Hydrogeology Section Attached). In the Response Matrix we provided additional information that we hope addresses many of the comments. The responses were coloured green where we believe the information provided should satisfy the response, and yellow where further discussion was thought to be helpful. You have also had the opportunity to meet with our hydrogeologist, Stan Denhoed, at your office and in the field. These meetings allowed for further information exchange and resolution of comments and have culminated in the additional drilling contemplated for next week. Thanks again for your input into the additional work as outlined in your Wed 08/05/2013 1:30 PM email.

We believe that the drilling will provide the information to resolve the following comments that were coloured yellow on the March 11 Response Matrix :

Comment 54. The bedrock surface is shown in Figure 3.5. The proposed extraction area should be added to this map. It appears that there are few (if any) bedrock monitoring wells within the two extraction areas. Given the heterogeneity of the bedrock, it is recommended that monitoring wells be installed within the extraction areas.

Comment 56. It is noted in the report that the Brydon Spring likely represents discharge directly from the bedrock and can be considered to be the re-emergence of Tributaries B and C. There are limited bedrock wells on the proposed quarry site and there is no data that confirms that the tributary loses

water to the bedrock. Tracer testing should be considered to confirm this statement.

Comment 60. The Guelph/Eramosa Study used significantly higher hydraulic conductivity values. Since the bedrock is heterogeneous significant variations in hydraulic conductivity can be expected. Additional data from within the extraction areas is needed to confirm on-site conditions.

Comment 72. There is not sufficient information on the bedrock in the extraction areas to allow for a reliable prediction of drawdown to be made. The vertical spacing and contribution of the water bearing fractures is not known and as a result, inflow into the pit may result in temporary dewatering of shallow fractures. The length of time for water levels to stabilize is not estimated. There is also a potential that bedrock water quality will be affected if cascading occurs within the extraction area.

Further to the above we understand that the requirement for tracer testing in Comment 56 is no longer required and that further discussion and information provided during meetings has also resolved the following comment coloured yellow on the Response Matrix:

Comment 55. The report indicates that in general the basal silt till is thin or absent above the bedrock near Tributary B. It is our opinion that there is insufficient information to conclude that the basal till is thin or absent near Tributary B. TP3, TP5 and TP11 did not encounter bedrock but did have finer grained materials. There is no discussion about the difference in effective "k" values between the till and the finer grained materials. This suggest that the water "lost" by Tributary B may be remaining in the overburden and may not reach the bedrock.

We interested in resolving all remaining comments that you have regarding the Hidden Quarry with respect to Hydrogeology. If you have any further concerns with the need for additional information from the site beyond what we have committed to do in the drilling/testing program next week, or if any further concerns remain in any of the responses that were coloured green on the Response Matrix, kindly call these to our attention so we can focus on addressing those matters. We want to get all additional requested field data wrapped up and, given that we will have equipment deployed in the field next week, now is an opportune time to do it.

Sincerely,
JAMES DICK CONSTRUCTION LIMITED

Greg Sweetnam, V.P. Resources

cc. Mike Davis, Jackie Kay, Stan Denhoed

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 Canada
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

November 12, 2013

Via: Email/Mail

Mr. Stan Denhoed, M.Sc., P.Eng.
Harden Environmental Services Ltd.
4622 Nassagaweya-Puslinch Townline Road,
R.R. 1
Moffat, ON L0P 1J0

Dear Mr. Denhoed:

Re: Summary of Drilling and Testing of New Well M15 at Hidden Quarry Site
File No.: 300032475.0000

Thank you for providing R.J. Burnside & Associates Limited (Burnside) with a copy of the June 7, 2013 Harden Environmental Services Ltd. (Harden) letter which documents the drilling and testing of new well M15 at the Hidden Quarry site. The Burnside comments are provided under the same section headings as used in the Harden letter.

2.2 Bedrock

Harden indicates that the uppermost bedrock encountered was the Niagara Falls Member of the Goat Island Formation and is not representative of the Eramosa Formation.

Burnside Comment

This is consistent with OGS Map P955 which indicates the Eramosa Formation extends just to the west of Rockwood and is not present beneath the Hidden Quarry Site.

Gasport Formation

The Gasport Formation is found between 10.03 and 48.50 mbgs (350.00 mamsl to 311.53 mamsl).

Burnside Comment

The extraction will occur in the Niagara Falls Member and the Gasport Formation with the proposed base of the quarry at 320 masl.

2.3 Descriptions of Core Breaks

Harden looked at each core break in the field and at their office and recorded only naturally occurring core breaks as either open or closed fractures. The highest concentrations of open fractures occur between a depth of 20 and 40 mbgs.

Burnside Comment

The bedrock extraction will occur from 10 to 40 mbgs. The upper 10 m of rock is not as fractured and may not fill with water as quickly as the rock from 20 to 40 mbgs resulting in temporary localized dewatering of the shallow fracture system.

3.0 Pumping Tests

Brief pumping tests were completed on M15 at rates of 2.1 L/s (for 60 minutes) and 4.2 L/s (30 minutes) with 1.21 m and 2.67 m of drawdown respectively. Wells M1D, M3 and M13D had no response to pumping. Water levels in M2 declined about 1.23 m. The pumping test data has been used to estimate the Transmissivity and hydraulic conductivity (K) of the bedrock aquifer.

Burnside Comment

A review of Figure 3.17 (Bedrock Groundwater Contours) in the Hydrogeological Investigation Report indicates that M2 is upgradient of M15 and M3 is crossgradient.

Water levels prior to the start of testing were as follows:

	Start
M15	350.69
M1D	352.34
M3	349.40
M13D	354.70
M2	not reported

The borehole log of M15 indicates bedrock was encountered at 9.55 mbgs and flow profiling indicates no flow below 41 m. As a result, the effective aquifer thickness is only 31.45 m which is less than indicated.

Using an average T of 60 m^2/day (from M15) and an aquifer thickness (b) of 31.45 m results in a K of 2.2×10^{-5} m/s which is very similar to that calculated by Harden.

The rapid response to pumping at M2 suggests there is a system of interconnected fractures aligned in a northwest direction. The lack of responses in MD, M3 or M13D could be simply due to the limited duration of the test or may indicate that the fracture system present at M2 and M15 is not present at the other locations.

Notation should be added to Figure 5 (Well M2 response)to indicate which portions of the graph represent the pumping test, flow profiling and pumping video.

Burnside Comment

Flow profiling and the pumping video do not indicate any flow below 45 m so there is no need to monitor this interval. Also, the proposed separation between the intermediate and deep monitors is only 2 m which is less than ideal to provide a good separation between the fractures. Burnside recommends the following be considered.

Monitoring Level (including 0.30 m of sand pack above screen)	Interval (mbgs)	
	From	To
Shallow	10	28
Seal	28	34
Intermediate	34	37
Seal	37	40
Deep	40	43

Burnside suggests that the screened interval be 0.3 m less than the monitored interval to allow for the placement of 0.3 m of sand between the top of the screen and the bentonite seal.

Once the multi-level well has been constructed and developed, in situ hydraulic conductivity and water quality testing should be completed.

8.0 Discussion

Based on the installation of M15, Harden offers the following comments regarding the hydrogeological conditions at the site:

1. There are no significant karst features identified in the geological profile. This is in keeping with the observations at M1, M2, M3, M4, M13D and M14D. The core obtained from M15 contains fractures, however, none suggest karstification of the dolostone aquifer.
2. Water bearing zones occur throughout the geological profile. The Gasport Formation is well known for its water bearing ability and this characteristic was confirmed at M15. Water bearing zones occur from the top of bedrock at an elevation of 350 mamsl to an elevation of 318 mamsl. There was no indication of preferential flow through the upper three metres of the geological profile.
3. Lateral hydraulic connectivity within the aquifer occurs at depth. There was a hydraulic response noted in monitor M2 to the pumping of M15. M2 and M15 fully penetrate the dolostone aquifer and the response in M2 verifies that water transmission will occur through the aquifer. This proves that M2 will be a useful monitor during the quarry operation to observe changes in the aquifer during extraction.
4. Hydraulic responses were not observed within the shallow bedrock at M1D, M13D or M3 whose completion elevations are all above 346 mamsl. These wells are completed in the upper 3 m of the bedrock. The lack of immediate hydraulic response is due to a relatively poor hydraulic connectivity between the shallow bedrock and deeper fractures; and poor lateral connectivity in the shallow zone. It is

anticipated that the shallow bedrock zone will ultimately experience a hydraulic response after a prolonged water level change. Although pumping periods were short, the response in the pumping well and in M2 were used to estimate transmissitivity of the aquifer. The near-well transmissivity is estimated to range from 50 m^2/day to 80 m^2/day. This correlates well to the bulk hydraulic conductivity used in the model for the dolostone aquifer. These values also correlate well to the hydraulic testing conducted on the adjacent Mudge property where transmissivity of the aquifer was found to range from 20 to 150 m^2/day.

Burnside Comment

Burnside concurs with the Harden discussion.

Under item 4, the lack of water level response in M1D, M3 and M13D while M15 was pumping appears to indicate a lack of hydraulic conductivity between the shallow bedrock and deeper fractures. However, the drawdown at M2 is consistent with the groundwater flow direction and may also indicate preferential alignment of water bearing fractures in a northwest direction.

9.0 Response to Burnside Comments

Harden provided updated responses to previous Burnside Comments 72, 60, 54 and 56.

Burnside Comments

72. Figure 7 provides a graphical presentation of the flow velocity. It indicates that 66% (2.78 L/s) of the flow is derived from fractures at 36 m and 41 mbgs with 30% (1.3 L/s) of flow found in the upper 36 m. There are several zones in the upper 36 m where there is no significant flow (i.e., from 19 to 26 m). As a result, as excavation proceeds between 19 and 26 m, water to make up the volume of rock removed will need to come from the bedrock between 10 and 19 mbgs. Burnside understands that this effect will decrease as each sinking cut is completed, however, the amount of drawdown during the initial cut should be quantified so that the impacts on nearby domestic wells can be realiably predicted.

60. The short term tests of M15 provide confirmation that the bulk hydraulic conductivity value used in the groundwater model is reasonable. Once the well is converted to a multi-level monitoring well, additional 'K' testing should be completed. Since the original groundwater model used a localized zone of higher 'K' to simulate conditions on the east side of the site, is there a benefit to including the low flow zone from 36 to 40 mbgs as a separate layer in the near site grid of the model. The Assessment of water quality impacts should consider the potential for nitrate, turbidity and surface water pathogens to move rapidly through fractures such as those seen at 36 and 41 mbgs in M15.

54. M15 was installed to address a concern with lack on onsite information on the bedrock formations. Once the multi-level monitor well is constructed and K tested and set up for long term monitor this comment will be satisfied.

56. Figure R8 indicates that there is a basal silt/till unit that is present throughout the site yet water from Tributary B is hypothesized to enter the bedrock at some point upstream of SW3. Since Harden indicates the water table is not present in the overburden throughout the entire site, there must be areas in the southern portion of the site where the silt unit is thin or absent. This was observed at M15 where granular sediments extended from the surface to the top of the bedrock.

Should you have any questions, please contact the undersigned.

Yours truly,

R.J. Burnside & Associates Limited

Dave Hopkins, P.Geo.
Hydrogeologist
DH:sd

cc: Ms. J. Sheppard, Township of Guleph/Eramosa (Hand Delivery)
Mr. D. McNalty, R.J. Burnside & Associates Limited (Email)
Cuesta Planning Consultants Inc. (Mail)
Mr. Greg Sweetnam, James Dick Construction Ltd. (Mail)

032475 Letter Denhoed.docx
12/11/2013 11:28 AM

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 Canada
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

November 12, 2013

Via: Email/Mail

Mr. Stan Denhoed, M.Sc., P.Eng.
Harden Environmental Services Ltd.
4622 Nassagaweya-Puslinch Townline Road
RR #1
Moffatt, ON L0P 1J0

Dear Mr. Denhoed:

Re: Hydrogeological Summary Report for Township of Guelph/Eramosa
File No.: 300032475.0000

Thank you for providing R.J. Burnside & Associates Limited (Burnside) with a copy of the Harden Environmental Services Ltd. (Harden) September 5, 2013 letter to review. The Burnside comments are provided below under the same headings used in the letter.

1.0 Karst

Harden indicates that a karst environment is not present in the area proposed to be mined by Hidden Quarry.

Burnside Comment

Burnside reviewed GIS mapping generated by the OGS as part of "Brunton, F.R. and Dodge, J.E.-P, 2008. Karst of Southern Ontario and Mantoulin Island, Ontario Geological Survey, Groundwater Resources, Study 5."

The mapping indicates the presense of karst features along the Eramosa River in Rockwood and near Blue Springs Creek to the south of the proposed quarry. There is no evidence to suggest that the site is in an area of karst terrain. Some scientists now refer to the water producing fractures in the bedrock as micro-karst but this is much different that the large cavernous conditions typically associated with karst.

2.0 Water Quality

Harden indicates that the proposed Hidden Quarry will result in the mixing of groundwater from various discrete fracture sources with an overall decrease in nitrate

concentrations already found in the shallow groundwater. The proposed subaqueous mining method will not result in the chemical degradation of groundwater quality.

Burnside Comment

Flow profiling indicated water in the upper 35 m of bedrock comes from three discrete zones with little flow between 19 and 36 mbgs. It appears that most of the nitrate is contributed from fractures in the upper 10 m of the bedrock. If the quarry does not encounter the deepest zone at 41 mbgs then about 30% of the water may not contribute to dilution. Although the depths and water production from fractures in the rock is heterogeneous, the water quality impacts should be calculated using the available information. Once M15 is equipped as a multi-level well, it should be purged and water quality samples collected to see if there are variations with depth. The nitrate contributed by the blasting materials should be quantified and included in the mass balance.

We concur with harden that water wells drilled in the bedrock access multiple fractures, however it is important to note that the Ontario Water Resources Act through the well Regulation 903 (Last amendment: O.Reg. 468/10) states in Section 14 that:

> "any annular space, other than annular space surrounding a well screen, is sealed to prevent any movement of water, natural gas, contaminants or other material between subsurface formations or between a subsurface formation and the ground surface"

The purpose of this section of the well regulation is to protect the good quality groundwater in the subsurface for use as potable sources. The fractures found at 36 and 41 m are currently secure sources of groundwater that are recharged over time by water moving into those formations. These deeper fractures are also the future water source for Rockwood Well 4 that will be constructed this year.

The excavation of the quarry into these fractures will cause the water in the deep fracture system to be under the influence of surface water and the associated bacteria and viruses such as Cryptospiridium and Giardia. Quarrying activities will result in constant mixing of the water in the quarry. The existing secure water quality in deep bedrock aquifer will therefore be changed to a surface water source for an unknown distance surrounding the quarry. This could result in the classification of Rockwood Well 4 as a GUDI water source.

Once the quarry is finished, there will be a large surface body directly in contact with the bedrock fracture system which may allow rapid movement of pathogens towards bedrock wells downgradient of the site.

As a result, there may be some benefit to restricting the extraction to the bedrock above 36 m in order to protect the lower fractures system.

3.0 Private Wells with Shallow Fracture Source of Water

Harden predicts a 1.6 m decline in the closest domestic well due to the quarry and indicates that testing of M15 suggests that the lack of water level response in M1, M3 and M13 is due to poor lateral shallow connectivity and poor connectivity to fractures at depth.

Burnside Comment

Analysis of the response observed at M2 indicates a total Transmissivity of 75 m^2/day. Further analysis of the data indicates a Storativity of only 0.00004. This relatively low Storativity results in the rapid (5 minutes) response at a relatively distant (125 m) location. Depressurization of the deep formation at M15 will result in rapid response over a large area. This Storativity is indicative of a confined aquifer system and is likely caused by response in the deeper fractures at 34 and 41 m.

Testing completed by Burnside on existing wells in Rockwood indicates that a well that penetrates the entire carbonate formation typically exhibits a Transmissivity in the range of 50 to 100 m^2/day. Wells that only access the fracture systems below 35 m exhibit Transmissivity of 25 to 50 m^2/day. M15 is consistent with these historical tests. It is important to note that the Transmissivity of an individual fracture or group of fractures cannot directly be converted into a hydraulic conductivity based on the entire bedrock thickness. The groundwater flow is much faster and can reach much further distances within an individual fracture than in a bulk porous media as predicted by a model. As a result, groundwater with elevated nitrate may move rapidly away from the quarry before dilution with deeper water can occur.

Currently, the total transmissivity of the fractures encountered by M15 has been estimated. Once individual monitors are installed opposite the fractures testing should be completed to assess the hydraulic properties of the individual fractures. Monitoring of water levels in this monitor well and the quarry itself can be used to predict off site impacts.

The pumping test did not continue for a period long enough for water levels to stabilize. Nearby wells (Rockwood Well 3) typically stabilize after approximately 12 hours of pumping in the deep bedrock fractures. Extrapolation of existing data to at least 12 hours allows an estimate of the actual response that will occur during quarrying activities. For example, extrapolation of the test of M15 to 12 hours would result in approximately 1.9 m of drawdown in M2. This data indicates that water levels in domestic well close to the site will be measurably impacted by onsite activities. As a result, wells with pumps set at shallow depths may experience water quantity issues. The six wells indicated on Figure 2 to be completed from 0 to 5 m below bedrock have the greatest potential to be impacted. The proposed domestic well survey plan should be combined with proactive well upgrades to ensure that no domestic water supplies are adversely impacted by the quarrying activities. Upgrades of nearby wells to include pitless adaptors and water level conduits should be included as part of the program to ease the monitoring process.

4.0 Groundwater Model Parameter – Hydraulic Conductivity

Harden indicates that the bulk hydraulic conductivity of the bedrock aquifer used by the groundwater model is 2.0×10^{-5} m/s.

Testing of M15 resulted in estimated hydraulic values ranging from 1.4×10^{-5} to 1.98×10^{-5} m/s.

Burnside Comment

Although a bulk value for hydraulic conductivity is useful in predicting the long term behaviour of water in the quarry, video flow profiling suggests that there are many metres of rock that are competent and contribute little in the way of groundwater flow. As a result, groundwater flow into the quarry may be highly variable with depth.

In-situ hydraulic conductivity of M15 when it is re-constructed as a multi-level well will help to refine the hydraulic conductivity estimates.

5.0 Brydson Spring and Blue Springs Creek

Harden indicates that there will be neither a significant quantity nor quality impact to waters discharging from the Brydson Spring and no change to groundwater quantity or groundwater quality discharging to Blue Springs Creek.

Burnside Comment

In the long term, there should be no impacts to Byrdson Spring. There may be some short term reductions in flow as the quarry fills with water following rock extraction.

6.0 Rock Extraction Water Level Change

Harden indicates that removal of rock from below the water table will simulate a pumping effect on the surrounding aquifer. Groundwater will flow into the quarry to fill the space previously occupied by rock.

The initial rock extraction will occur in a sinking cut with the dimensions of 25 x 50 m (1,250 m^2). Harden indicates the removal of this material from below the water table will cause the water levels in the quarry to decrease by 0.91 m/day. James Dick has committed to a maximum drawdown of 2.54 m in the sinking cut to be monitored daily with the rate of rock extraction moderated in the event that drawdown approaches 2.54 m.

Burnside Comment

There is significant potential for impacts from the proposed quarry activities on the groundwater resources in the surrounding area. There are several existing domestic water wells with unconfirmed pump installation depths and a municipal well that will be pumping 10 to 16 L/s when it is constructed. The combined impact of the quarry and the municipal well on the existing wells between the sites is difficult to assess in a heterogeneous carbonate aquifer.

Testing completed on M15 in 2013 showed that a pumping rate of 4.2 L/s resulted in drawdown of just under 1 m at a distance of 125 m in less than 100 minutes. This water level response was used to calculate a Transmissivity of 75 m^2/day. It was also determined that only 30% or only 1.3 L/s was derived from the bedrock above 35 m.

The description of how rock will be quarried indicates that a 25 m by 50 m strip will be mined vertically at a rate of 0.9 m/day. The daily volume of rock removed will be 1,145 m^3. If the area mined is below the water table, then removal of 1.145 m^3 of rock will require 1,145 m^3 of water to flow into the strip on a daily basis. This will necessitate a continuous flow of 13.3 L/s from the shallow bedrock fracture system 24 hours/day in order to maintain the pre-extraction water level. This will cause a measureable impact to existing domestic wells in the surrounding area during the initial days of the quarrying activities when all of the "make up" water is derived from the shallow fractures which may not be able to sustain the rate of flow into the excavation to keep if full of water. Once the first strip is quarried to the maximum depth and all of the water producing intervals are encountered, then the flow of 13.3 L/s may be sustainable. This will depend on the size and extent of the fracture system encountered.

Burnside recommends that in order to ensure that offsite impacts are minimized that:

1. The initial stages of excavation are completed at a rate that allows the water level to be maintained within 0.9 m of static conditions as predicted in the report. This would mean that at the beginning of the day removal of rock could only occur if water levels had returned to static levels. This would prevent a cumulative dewatering of the bedrock adjacent to the site.
2. All domestic wells within 500 m of the quarry site be inspected and tested to evaluate how susceptible they are to water level variations. Submersible pumps should then be set as deep as possible in the wells to ensure that they are not impacted by the quarry activities. The proposed monitoring program (Appendix A of your letter) for onsite wells and surface water stations is comprehensive, but should be expanded to include representative domestic wells.
3. Flow profiling at M15 indicated that a deeper fracture system provided about 66% of the flow. These fractures are separated from a shallow fracture system by several metres of rock which produces minimal water. If the deeper fracture set is providing water to a number of nearby domestic wells, James Dick may wish to maintain the base of the quarry above this level to ensure that an alternate water supply is available in the event that the shallow zone has water quality/quantity impacts due to quarry activities.

7.0 Aquitard

Harden indicates that the Eramosa Formation (a natural aquitard protecting the Goat Island and Gasport formation) is not present at the Hidden Quarry site.

Burnside Comment

Burnside concurs with Harden that the Eramosa Formation is not present at the Hidden Quarry site.

9.0 Monitoring Plans, Trigger Levels and Contingency Plan

Appendix A contains a revised monitoring program that was submitted to the MOE by Harden. The Burnside comments will follow the same headings as contained in the monitoring plan.

Burnside Comment

1.0 Onsite Monitoring Program

Groundwater Levels – These should be measured monthly year round (with exception of well listed below) in wells with manual levels and daily year round in wells with dataloggers.

Groundwater Levels – M2, M3, TP1, M13S10, M14SID, M15, M16. As a minimum, these should be measured hourly with the data logger during the first three months of extraction in order to ensure the maximum daily drawdown of 0.91 m is not exceeded and that any exceedance of the trigger levels can be quickly mitigated.

Surface Water Levels – SW5 and SW7 should be added to the list.

Surface Water Flow – SW5 and SW7 should be added to see if the extraction has any effect on when flow ceases in Tributary B.

Groundwater Quality – W1 should be added along with the most vulnerable wells identified in the pre-bedrock extraction water well survey (Section 4.0).

Surface Water Quality – Increase to semi-annual (spring and fall) at some time as groundwater sampling. Add northwest wetland and Tributary B (at SW4 and SW3) to confirm east and west ponds are not impacting surface water/groundwater. Add cryptosporidium and giardia to the list of parameters

2.0 Trigger Levels

The trigger levels proposed by Harden are designed to verify that water levels in the bedrock aquifer do not exceed predicted values and that the hydro-period of the northwest wetland does not change.

2.1 Trigger Levels for the Bedrock Aquifer

Harden uses the historical low levels in M1D, M2, M13D and M14D and the predicted water level change to establish conservative trigger levels.

Burnside Comment

Trigger levels should be established for M15 and M16 after monitoring begins. It is not clear how the trigger levels relate to the drawdown trigger of 2.54 m in the sinking cut. It is also not clear if the predicted change is following completion of extraction or is the maximum expected change.

2.2 Trigger Level for Northwest Wetland

The historical low value of 344.20 m AMSL at SW6 is the recommended trigger value with a warning level of 354.35 m AMSL. Harden recommends an increase in manual water level measurements to bi-weekly if the warning level is exceeded.

Burnside Comment

Burnside recommends daily water level monitoring begin 3 weeks prior to the initial overburden/bedrock extraction so pre-extraction trends can be established. Daily water level measurements should continue as long as weather conditions permit.

3.0 Contingency Measures

3.1 Groundwater Levels and Northwest Wetland

If a trigger level is breached Harden recommends the following measures be undertaken:

1. Confirmation of water levels with 24 hours.
2. Evaluation of precipitation, groundwater monitoring data and quarry activities to determine if quarry activities are responsible for the low water level observed.
3. If quarry activities are found to be responsible, the following actions will be considered and a response presented to the GRCA and the Township of Guelph/Eramosa:

- increase the length and/or width of barrier;
- decreased rate (or stopping) subaqueous extraction;
- change in configuration of mining or decrease in mining extent; and
- after timing of extraction to coincide with high seasonal groundwater levels.

Burnside Comment

Burnside recommends the following:

1. An onsite weather station be established as it can take significant time to obtain data from GRCA/Environment Canada.
2. A timeline be provided for the evaluation of data.
3. A decreased rate (or stopping) of subaqueous extraction be the initial response.
4. Increased monitoring be undertaken at other locations until the source of the trigger level exceedance is identified.

3.2 Groundwater Quality

Harden recommends semi-annual (summer) sampling for a variety of parameters. An increasing trend in the concentration of one or more elements will result in a study to determine the source of the water quality change. If the quarry is found to be responsible or there is a potential for impact to downgradient wells, James Dick Construction Ltd. will commence with the following actions:

1. Semi-annual testing of the water quality of private wells that could potentially be impacted by the quarry.
2. In the event that a water quality issue related to the quarry occurs, James Dick Construction Ltd. will remedy the issue by either providing the appropriate treatment in the home or drilling a new well and isolating the water supply to the deeper aquifer.

Burnside Comment

Burnside concurs with the proposed water quality monitoring program. It is recommended that the program begin at least a year prior to extraction so that existing conditions can be established. When a sufficient data set is available, Burnside recommends that any result above the ODWQS or above the 95th percentile result in actions 1 and 2 above. Surface water pathogens should be included in the list of quality parameters.

4.0 Pre-Bedrock Extraction Water Well Survey

Harden recommends that a detailed water well survey be completed prior to the extraction of bedrock resources.

Burnside Comment

The Harden plan is comprehensive and will provide valuable baseline information. Burnside recommends the results of the survey be used to select a number of domestic wells for inclusion in the water level monitoring program.

10.0 Well Complaint

Harden provided a proposed protocol for dealing with complaints about water well issues.

Burnside Comment

Burnside concurs with the proposed protocol. The Township of Guelph/Eramosa and the Ministry of the Environment should be advised when a complaint has been received and should be provided with the results of the independent investigation.

11.0 Next Steps (Next included in the Harden Report)

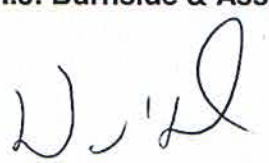
The following are the outstanding issues that need to be addressed:

- M15 should be constructed as a multilevel monitor with appropriate hydraulic conductivity and water quality testing completed. The groundwater model should be modified as necessary to incorporate the test results.
- Burnside will provide information on the construction and testing of Rockwood Well 4 to James Dick once it is available.
- The detailed domestic well survey should be completed so that pre quarrying improvements can be established.
- The potential for impacts from surface water pathogens should be quantified along with mitigation methods.
- The final depth of the quarry should be confirmed.
- Burnside comments should be addressed.

Should you have any question regarding the above, please contact the undersigned.

Yours truly,

R.J. Burnside & Associates Limited



Dave Hopkins, P.Geo.
Hydrogeologist
DH:sd

cc: Ms. J. Sheppard, Township of Guleph/Eramosa (Hand Delivery)
Mr. D. McNalty, R.J. Burnside & Associates Limited (Email)
Cuesta Planning Consultants Inc. (Mail)
Mr. Greg Sweetnam, James Dick Construction Ltd. (Mail)

Meeting Notes - Hidden Quarry Meeting to Review Outstanding Comments with RJ Burnside staff

Thursday November 28, 2013, RJ Burnside office in Guelph

Attendance:
Don McNalty
Dave Hopkins
Dominique Evans (partial)
Don Scott
Stan Denhoed
Leigh Mugford
Greg Sweetnam
Rod McClure
Saidur Rahman

Hydrogeology review

Nitrogen

- Stan discussed his review of the Nitrogen balance, and is using the extensive data from Brechin Quarry and Dolime Quarry to estimate the blasting efficiency we see in the field (97.7% and 98.5% in last 2 years).
- Stan estimates HQ will be more efficient and it will not be a significant source of N in the local water system (estimates 3mg/L)
- Stan has found data from Florida underwater blasting showing N <1mg/L
- Dave H commented that we need to have a response for residents that say they don't want any additional N or other residual materials in their water as a result of quarry activity.
- Stan showed a figure of the susceptible private wells, we can sample and get a baseline water quality on the wells of concern
- Stan mentioned the proposal for monitoring the local wells and the contingency plan that kicks in with the trigger levels as well.

Pathogens and Studies

- Dave H mentioned that the new GUDI rules will include pathogens, such as the mentioned cryptosporidium and giardia which prompted his comment in the latest letter.

- Stan/Greg brought up that there are some recent and local studies that recommend wells in the Amabel should have some sort of added protection as most are susceptible to the pathogens due to the inherent nature of the bedrock porosity. There are also studies that were contracted for by OSSGA on water and aggregate extraction (Blackport and the 'filtration study') that show that aggregate operations are not a threat to the water table resources.

Monitoring Report

- It was discussed that the township should receive a copy of annual water monitoring results. Greg indicated that is normally what JDCL does at other sites.

Quality

- Stan discussed that dissolved iron in the water infiltrating into the quarry would likely precipitate out due to the water chemistry in the quarry pond which would be considered a quality improvement.

- It was stated that most quarries have potential for the pathogen concern where they pump water to dewater the quarry or they are subaqueous as in HQ.

Seton/Milne Place/Well #4 – GUDI?

- Stan says that the prevailing wisdom that he has consulted states that there will not be a fully isolated connection through the fractures between the quarry and the new municipal well. It is too great a distance either cross gradient or downgradient for a continuous isolated fracture to exist. Thus the quarry should not be considered a cause to consider the future municipal well as GUDI. The entire SWP modelling regime would be considered inaccurate if it were the case.
- The Well#4 may be considered GUDI considering other factors such as the location proximity to other bedrock wells, septic systems, streams, etc
- It was thought by those in the room that waiting on the pump testing of well #4 would not matter and is not expected to reveal a connection as far as the quarry property goes.

0.9 vs 2.5m drawdown while mining

- Stan recommends the 2.5m drop at the mining face as a sufficient level to maintain an estimated 1.5m drop at the property line. The 0.9m suggestion from Burnside is considered too restrictive.
- Dave suggested confirming local well pump depths and pump rates.

Model

- Burnside asked if Stan can corroborate some of the predictions of the model Stan used as Burnside has to date avoided doing a peer review of the model itself. Stan says he can do this with the local hydrology data.

M15 Partitioning and testing

- Dave Jim and Stan will meet to plan for the partitioning of M15 and then Stan will test the levels for quality and head.
- M15 will also be monitored when the municipal well4 is pumped, which currently may be a few months into the future.

Quarry Monitoring Program

- Stan will be incorporating the suggestions of Burnside as he has with the other agencies into the monitoring plan.

Environmental Review

- Dominique confirmed that this part of the review is satisfied and they will inform Cuesta of this.

Traffic

- MTO is still reviewing the latest TIS – final MTO comments and TIS documents will be sent to Burnside.

6th Line Reconstruction

- Discussed creating a general agreement for the 6th line reconstruction. JDCL can forward a preliminary draft for review.
- Township engineering will forward the latest copy of their Standards.

Hidden Quarry Meeting
Dec 2. 2013
Stan Denhoed Harden Environmental– Dave Hopkins Burnside Engineering

(notes made by LM as per phone call from SD)

Partitioning of the M15 WELL at HQ

- Stan and Dave have discussed portioning the M15 well, agreed on the levels and how it should be done
- Stan can now proceed at any time to partition and sample M15 at his convenience
- He will sample for quality and head to determine the characteristics of the water at the isolated levels
- Reporting on this sooner rather than later may be advantageous in order to clear off all pending action items that might hold back Burnsides sign off
- The only remaining item would be the monitoring of the heads as Burnside does pump testing at the new Rockwood well 4
-
- Regarding the application Dave indicated they don't have any major technical issues with the hydro g and it appears the application would likely go in front of council with their blessing once the responses to their questions are dealt with
-

Harden Environmental Services Ltd.
4622 Nassagaweya-Puslinch Townline Road
R.R. 1, Moffat, Ontario, L0P 1J0
Phone: (519) 826-0099 Fax: (519) 826-9099

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

February 5, 2014

James Dick Construction Ltd.
Box 470
Bolton, Ontario,
L7E 5T4

Attention: Mr. Greg Sweetnam
Vice President – Resources

Dear Mr. Sweetnam:

Re: Timeline for Changes to Monitoring Plan

We are pleased to provide a timeline for changes made to the proposed monitoring plan for the Hidden Quarry. Changes were made in response to comments from the Grand River Conservation Authority, the Ministry of the Environment and consultants representing the Township of Guelph-Eramosa.

We have attached a copy of the most recent monitoring plan submitted to the Township of Guelph Eramosa in January 2014. We highlight the change made to the plan and colour code the changes per agency request as follows;

GRCA – Orange
MOE – Green
Township of Guelph-Eramosa - Magenta

Date	Agency Document	Changes Made to Monitoring Plan
September 2012	Level I and II Hydrogeology Report prepared by Harden Environmental	Original Monitoring Plan included as Section 6 of Report
April 15, 2013	MNR letter from Ian Thornton with comments on hydrogeology.	No changes to monitoring plan recommended.
January 13, 2013	GRCA letter from Fred Natalochny Comment 7 recommended additional groundwater quality	Groundwater monitors M15 and M16 were added to the monitoring plan.

Date	Agency Document	Changes Made to Monitoring Plan
	monitoring.	
July 3, 2013	MOE letter from Carl Slater. Comments 3 and 4 regarding Surface Water Monitoring and Comment 5 regarding Groundwater Monitoring	A revised monitoring plan was issued incorporating changes requested by the MOE.
November 12, 2013	R. J. Burnside Letter from David Hopkins (Hydrogeological Summary Report) Various comments made to amend monitoring program.	A revised monitoring program dated January 2014 was issued with response to Burnside.

We trust that this submission satisfies the request by Cuesta Planning on behalf of a local resident.

Sincerely,

Harden Environmental Services Ltd.

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

Harden Environmental Services Ltd.
4622 Nassagaweya-Puslinch Townline Road
R.R. 1, Moffat, Ontario, L0P 1J0
Phone: (519) 826-0099 Fax: (519) 826-9099

Groundwater Studies

Geochemistry

Phase I / II

Regional Flow Studies

Contaminant Investigations

OMB Hearings

Water Quality Sampling

Monitoring

Groundwater Protection Studies

Groundwater Modelling

Groundwater Mapping

HIDDEN QUARRY

REVISED MONITORING PROGRAM AND CONTINGENCY MEASURES (JANUARY 2014)

Colour Coding Scheme for Requested Agency Modifications to Monitoring Plan

Green – Ministry of the Environment

Orange – Grand River Conservation Authority

Magenta – Township of Guelph - Eramosa

1.0 ON-SITE MONITORING PROGRAM

Monitoring has been taking place at this site since 1995. An extensive database of background groundwater and surface water elevations and flow measurements has been developed. A detailed monitoring program will continue to ensure that sensitive features and surface water flows are maintained. The monitoring program is designed to identify trends towards unacceptable impacts early on to allow for time to implement contingence measures.

The monitoring program for this proposed pit/quarry involves the following activities:

- measuring groundwater levels,
- obtaining water quality samples,
- monitoring water levels in the on-site wetland and stream, and
- stream flow measurements.

We recommend the following monitoring program.

Parameter	Monitoring Locations	Frequency
Groundwater Levels	M1S/D, M2, M3, M4, M6, M13S/D,	Manually Monthly

Parameter	Monitoring Locations	Frequency
	M14S/D, MPN1, MPN2, MPS1, MPS2, MPE1, MPE2, MPW1, MPW2, TP1, TP8, TP9 MP1, MP2, MP3, MP4, M15, M16	Automatic Daily Measurement in M1D, M2, M3, M4, M15, M16 for year prior to and year following bedrock extraction with re-evaluation of monitoring frequency after 1st year of bedrock extraction.
Groundwater Levels	M2, M3, TP1, M13S/D, M14S/D, M15, M16	Hourly during first 3 months of extraction
Surface Water Level	Sinking Cut	Daily
Surface Water Level	SW14, SW5, SW7	Manually Monthly Coincident with groundwater monitoring
Surface Water Levels	SW6, SW4, SW8	Automated Water Level Readings (4 hour interval)
Surface Water Flow	SW4, SW8, SW3	Semi-Monthly April to November *coincident with groundwater monitoring
Groundwater Quality	W1,M2, M4, M15, M16	Semi-Annually
Surface Water Quality	West Pond, East Pond, Northwest	Semi –Annually

Parameter	Monitoring Locations	Frequency
	Wetland, Tributary B (SW4, SW3)	(Spring and Fall)
Climate	On-Site Weather Station at Scale House to include precipitation and temperature	Daily

Monitoring locations are shown on Figure C1.

2.0 TRIGGER LEVELS

Groundwater and surface water monitoring will be used at this site to a) verify that predictions of water level change in the bedrock aquifer do not exceed those predicted and b) verify that the hydro-period of the northwest wetland does not change. The water level measurements obtained as part of the monitoring program will be used to trigger contingency measures that may be necessary for the mitigation of a low water level in the northwest wetland, a lower than expected water level in the bedrock aquifer or an anomalous low flow level in Tributary B.

2.1 Trigger Levels for the Bedrock Aquifer

The greatest water level change in the bedrock aquifer is expected to occur to the north and northwest of the site. Water levels obtained from bedrock monitors M1D, M13D, M14D and M2 will be used to verify that actual water level changes do not exceed the predicted water level change. A warning level of 75% of the predicted change will be used to initiate bi-weekly manual measurements from the groundwater monitors.

Table 1: Trigger Levels for the Bedrock Aquifer

Monitor	Historical Low	Predicted Change	Warning Level	Trigger Level
M1D	350.58	0.8	349.98	349.78
M2	349.81	2.0	348.31	348.08
M13D	352.68	1.4	351.63	351.28
M14D	353.48	1.5	352.36	351.98
M15	TBD			

M16	TBD

TBD – to be determined

The historical water levels, warning level and trigger level are presented in Figures C2, C3, C4 and C5.

2.2 Trigger Level for Northwest Wetland and Allen Wetland

Water levels from Station SW6 will be used to trigger contingency measures for the northwest wetland. Historical monitoring has shown that the water level in the wetland is somewhat independent from adjacent groundwater levels and therefore any potential change in the hydro-period is best determined by the surface water level in the wetland.

Trigger levels and warning levels have been determined for three periods as follows:

Winter Trigger Level - lowest water level observed between December 1 and March 1

Spring Trigger Level - lowest water level observed between March 2 and June 15

Summer/Fall Trigger Level - lowest water level observed between June 16 and November 30.

A warning level is established 0.15 metres higher than the trigger level. The warning and trigger levels relative to historical water levels are shown on Figure C6.

Table 2: Trigger Levels for the Surface Water Features

Station	Winter		Spring		Fall	
	Warning	Trigger	Warning	Trigger	Warning	Trigger
Northwest Wetland (SW6)	354.35	354.20	354.48	354.33	354.38	354.23.
Allen Wetland (SW4)	The warning level will be a flow rate of less than 25 L/s occurring in May and the trigger level will be cessation of flow prior to June 22.					

Manual water level measurements will increase to bi-weekly if the warning level is exceeded.

3.0 CONTINGENCY MEASURES

3.1 Groundwater Levels and Northwest Wetland

If any trigger level is breached, the following measures will be taken;

1) Confirmation of water level within 24 hours. Increase monitoring to weekly until source of the trigger level exceedence is identified.

2) Within seven days conduct an evaluation of precipitation, groundwater monitoring data and quarry activities to determine if quarry activities are responsible for the low water level observed.

3) If quarry activities are found to be responsible, the following actions will be considered and a response presented to the GRCA and the Township of Guelph-Eramosa.

- decreased rate (or stopping) subaqueous extraction
- increase the length and/or width of barrier
- change in configuration of mining or decrease in mining extent
- alter timing of extraction to coincide with high seasonal groundwater levels.

3.2 Water Quality

The water quality program will commence at least one year prior to bedrock extraction.

Groundwater Monitors and the East and West Pond

The parameters that will be included in the semi-annual monitoring (summer) will be general chemistry, cryptosporidium, giardia, e-coli, TKN, ammonia, DOC, pH, temperature, anions and metals.

In the event that there is an increasing trend in the concentration of one or more elements or compound or if any quarry related contaminant is found above the Ontario Drinking Water Quality Standard or above the 95% percentile of results obtained, a study will be conducted to determine the source of the water quality change. If the quarry is found to be responsible and if there is a potential for impact to downgradient wells, James Dick Construction Ltd. will commence with the following actions;

1) Semi-annual testing of the water quality of private wells that could potentially be impacted by the quarry.

2) In the event that a water quality issue related to the quarry occurs, James Dick Construction Ltd. will remedy the issue by either providing the appropriate treatment in the home or drilling a new well and isolating the water supply to the deeper aquifer

Northwest Wetland

The northwest wetland water will be analyzed for nitrate, dissolved oxygen, temperature, conductivity and pH for a period of three years or upon completion of construction activities in the surface water catchment area of the northwest wetland whichever is longer.

4.0 PRE-BEDROCK EXTRACTION WATER WELL SURVEY

We recommend that a detailed water well survey be completed prior to the commencement of the extraction of bedrock resources. This survey will as a minimum include all wells in the shaded area shown on Figure C7. The well survey will include the following;

- construction details of the well (drilled, bored, sand point etc..)
- depth of well and depth of pump
- location of well relative to septic system
- static water level
- history of water quantity or quality issues
- comprehensive water sample including bacteriological analysis, general chemistry, anions and metals
- one hour flow test

The purpose of the survey is to have a baseline evaluation of both water quality and water quantity in nearby water wells. Should an issue arise with a local water well, the baseline data can be used as a reference against future measurements.

If there are domestic wells suitable for water level monitoring identified in the survey, they will be included in the water level monitoring program and monitored on a semi-annual basis.

If the survey indicates that modification(s) to the well are necessary either for continued monitoring or to minimize the potential for impact, the modifications will be made to the well at the expense of James Dick Construction Ltd.

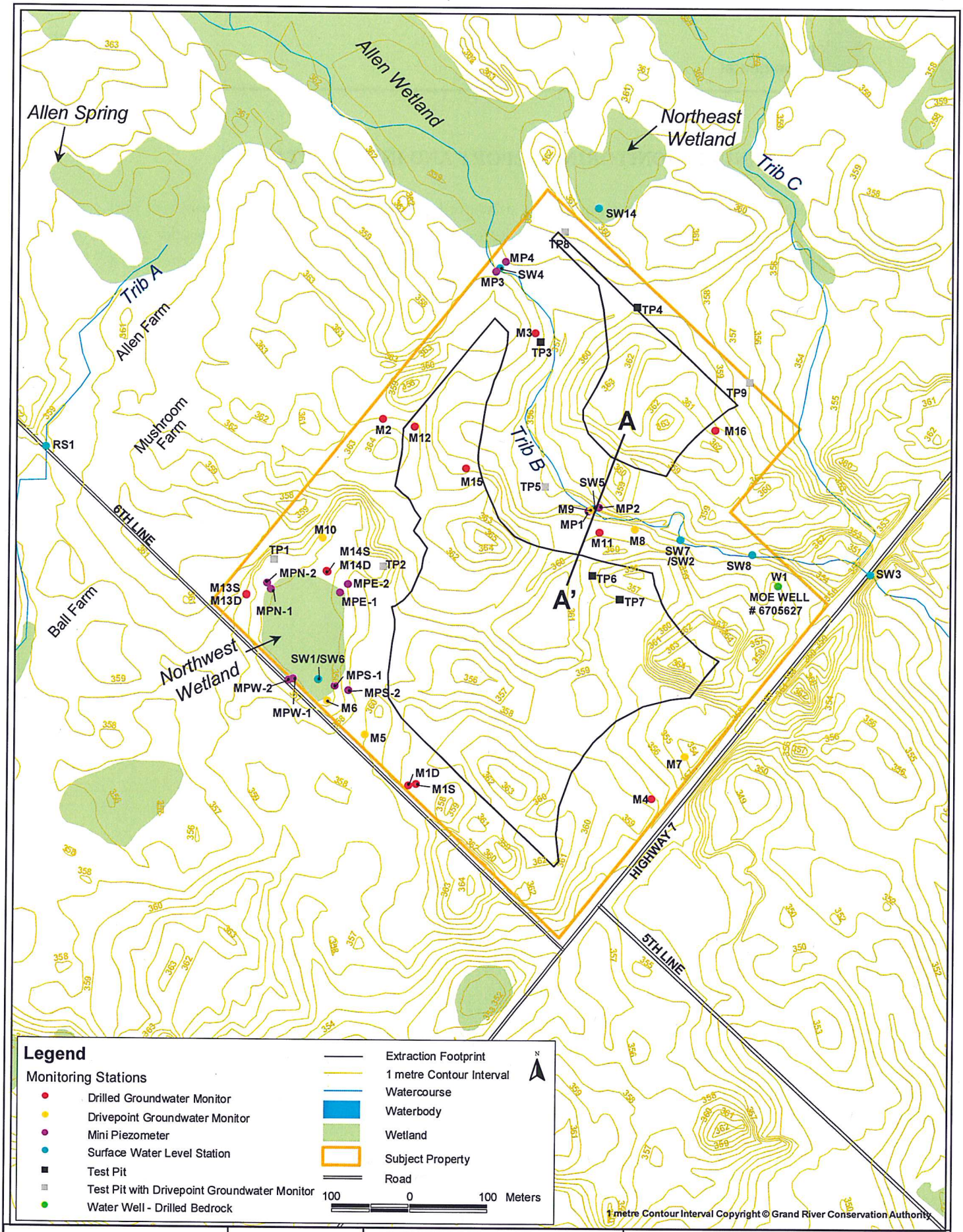
5.0 ANNUAL MONITORING REPORT AND INTERPRETATION

An annual report will be prepared and submitted to the Ministry of the Environment and the Ministry of Natural Resources on or before March 31st of the following calendar year. The report will be prepared by a qualified professional, either a professional engineer or a professional geoscientist.

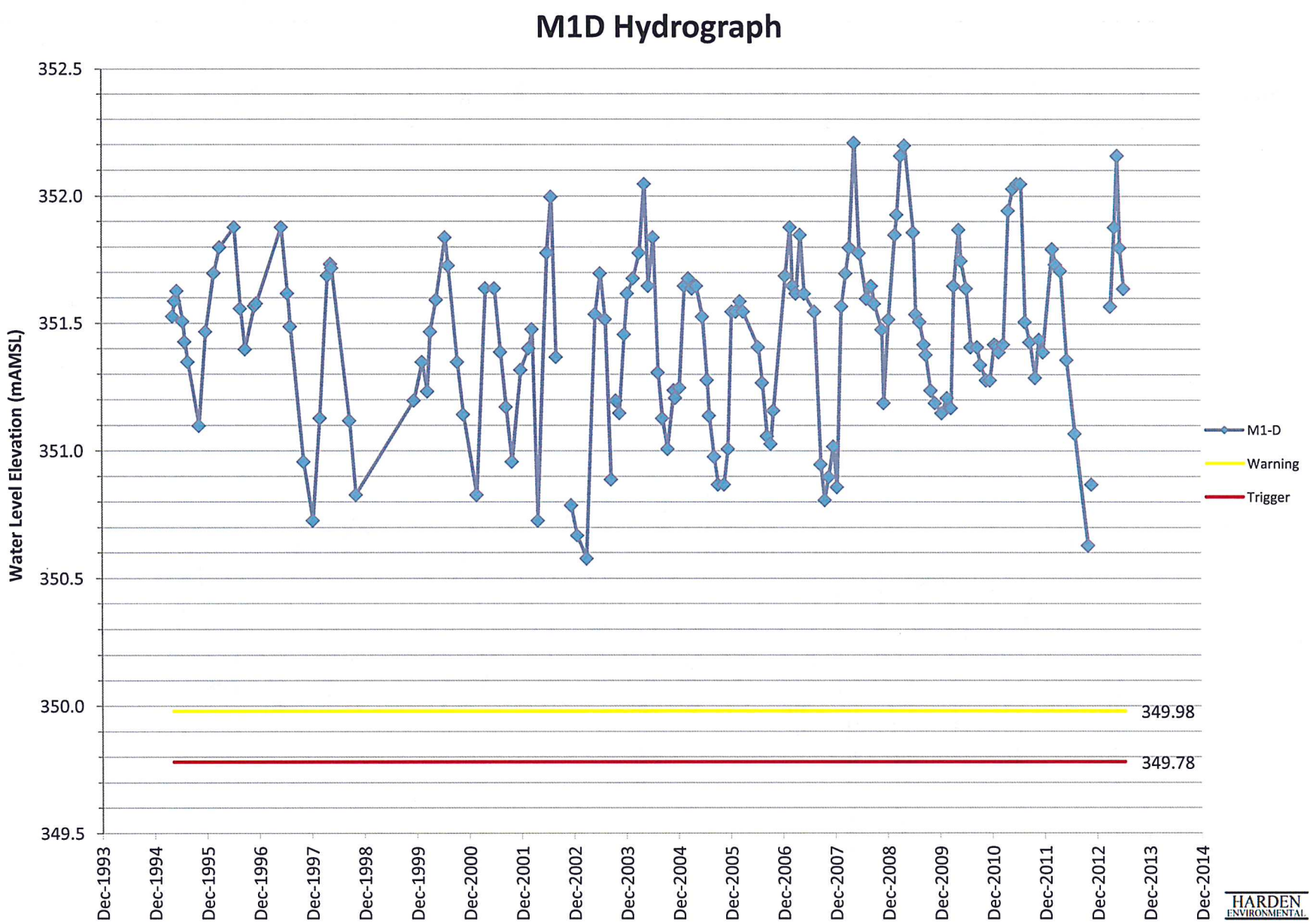
The monitoring report will include all historical monitoring data and an interpretation of the results with respect to potential impact to the quality and quantity of bedrock groundwater, hydro-period of the northwest wetland and streamflow loss from Tributary B.

6.0 Water Well Complaints

James Dick Construction Ltd. agrees to inform the Township of Guelph Eramosa and the Ministry of the Environment upon the receipt of a water well complaint and the results of any related investigation.

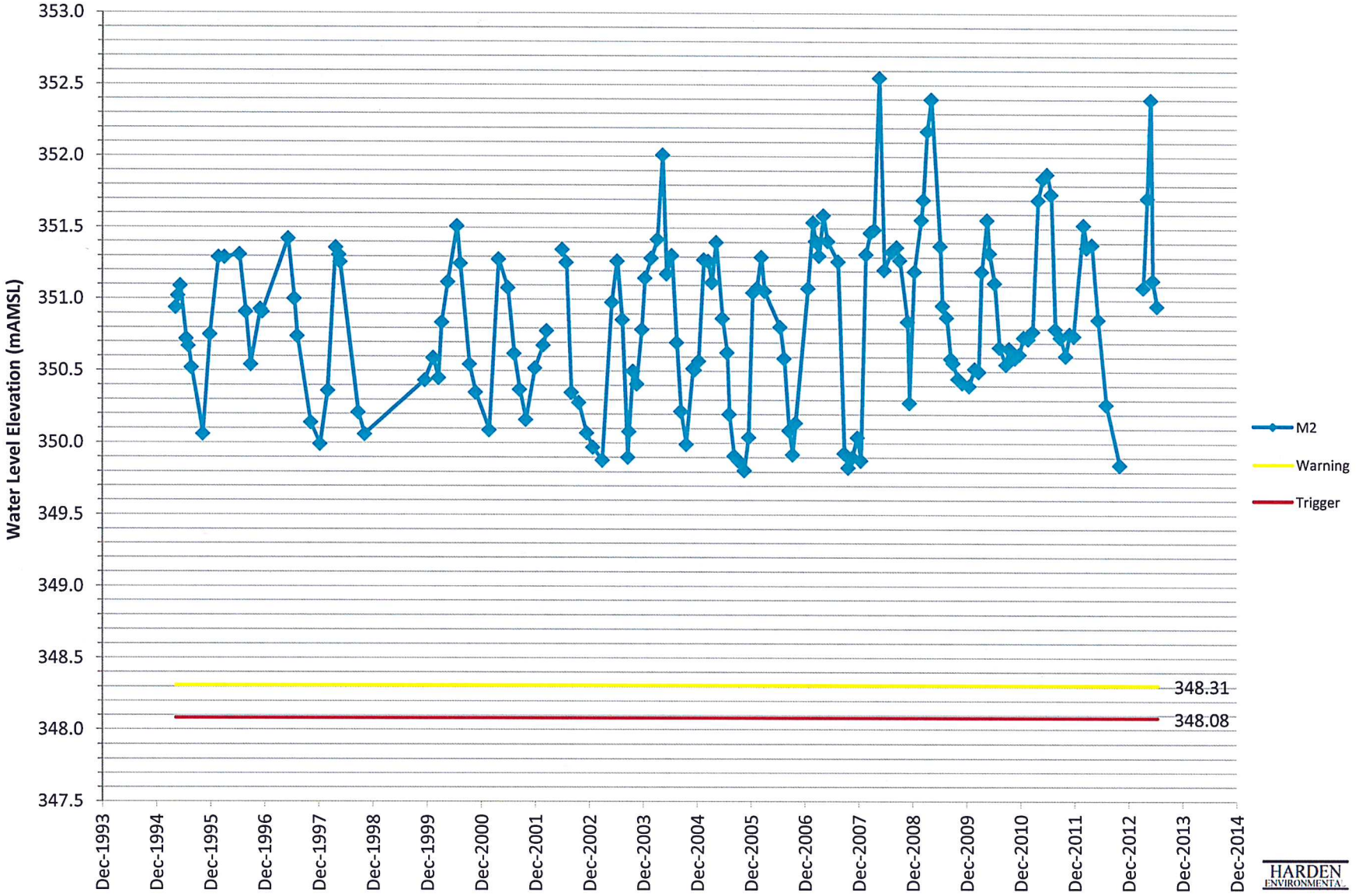


Harden Environmental Services Ltd.	**Project No:** 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	**Figure C1:**
	Date: Jul 2013	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	**Monitoring Locations**
	Drawn By: AR		



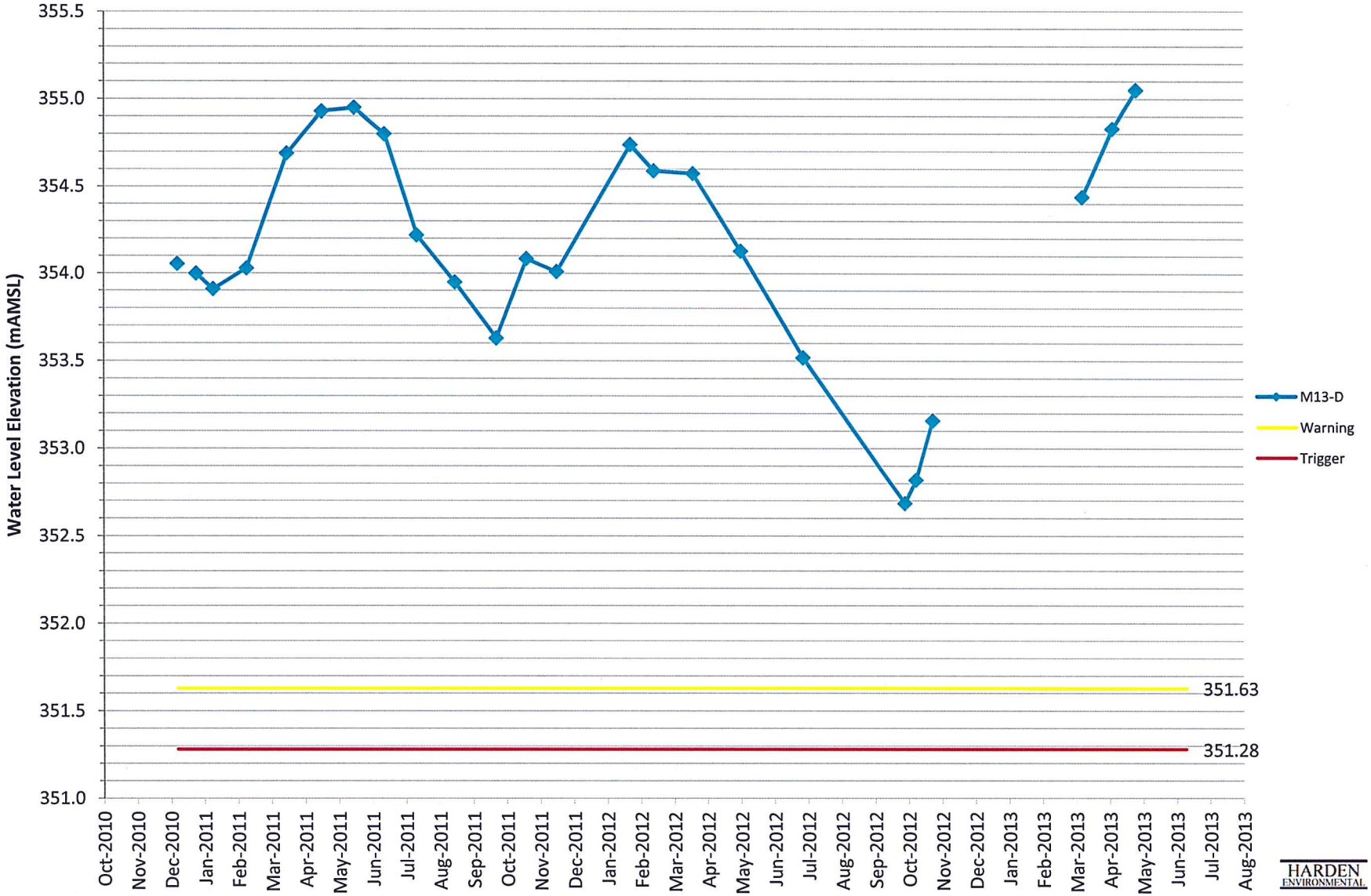
Harden Environmental Services Ltd.	**Project No:** 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	**Figure C2: M1D Trigger Level**
	Date: Jul 2013	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		

M2 Hydrograph



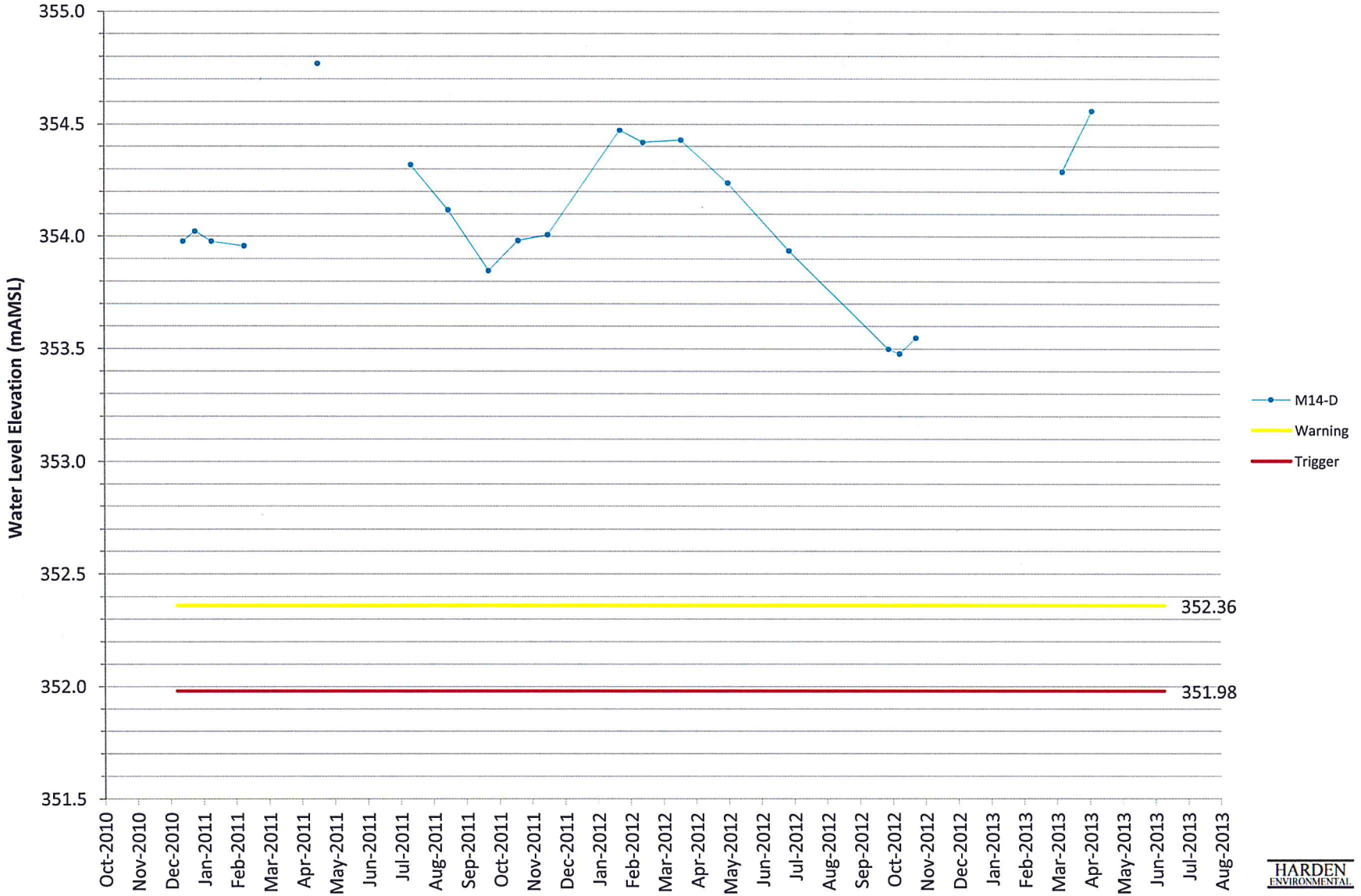
Harden Environmental Services Ltd.	**Project No:** 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	**Figure C3: M2 Trigger Level**
	Date: Jul 2013	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		

M13D Hydrograph



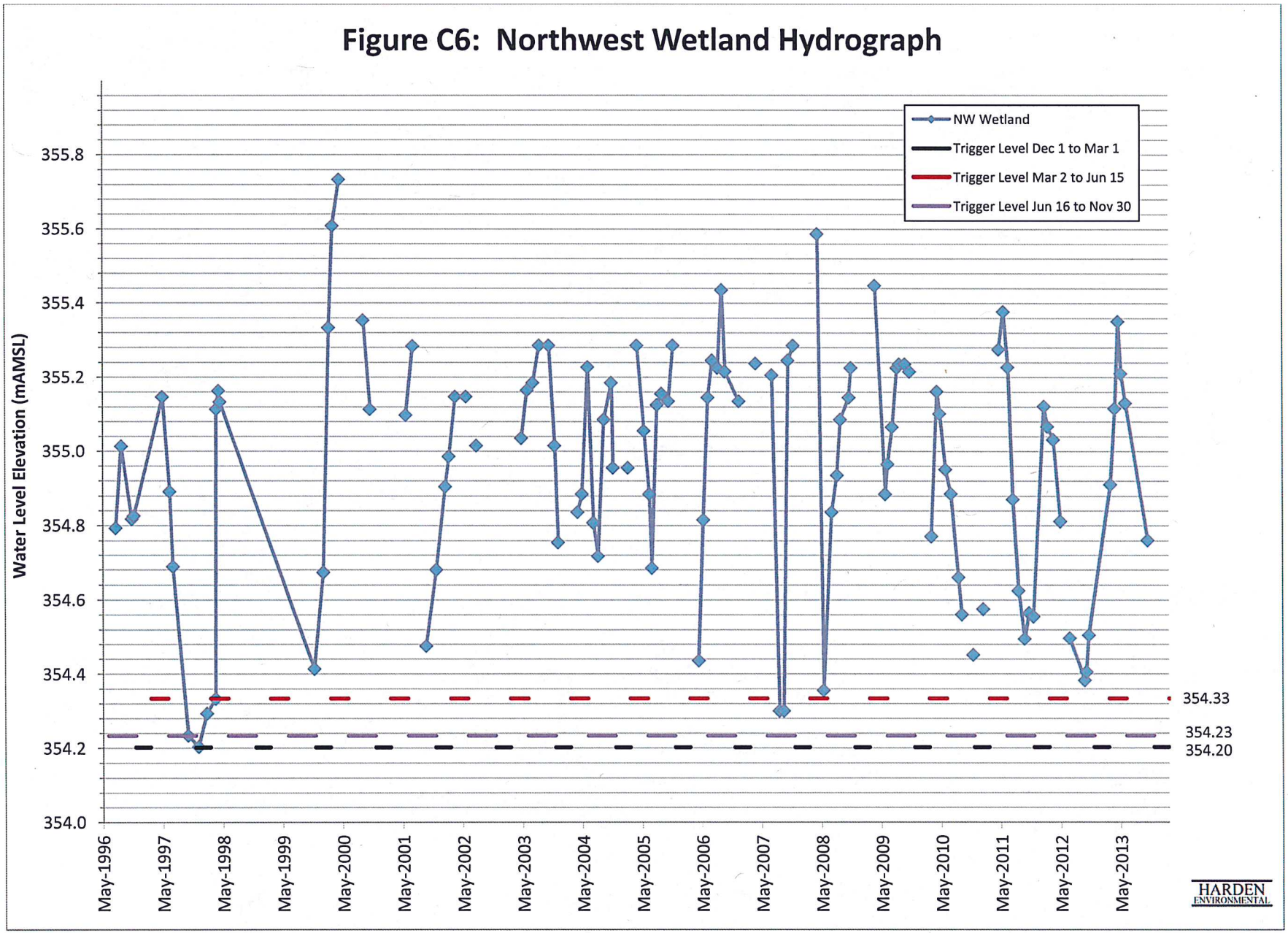
Harden Environmental Services Ltd.	**Project No:** 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	**Figure C4: M13D Trigger Level**
	Date: Jul 2013	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		

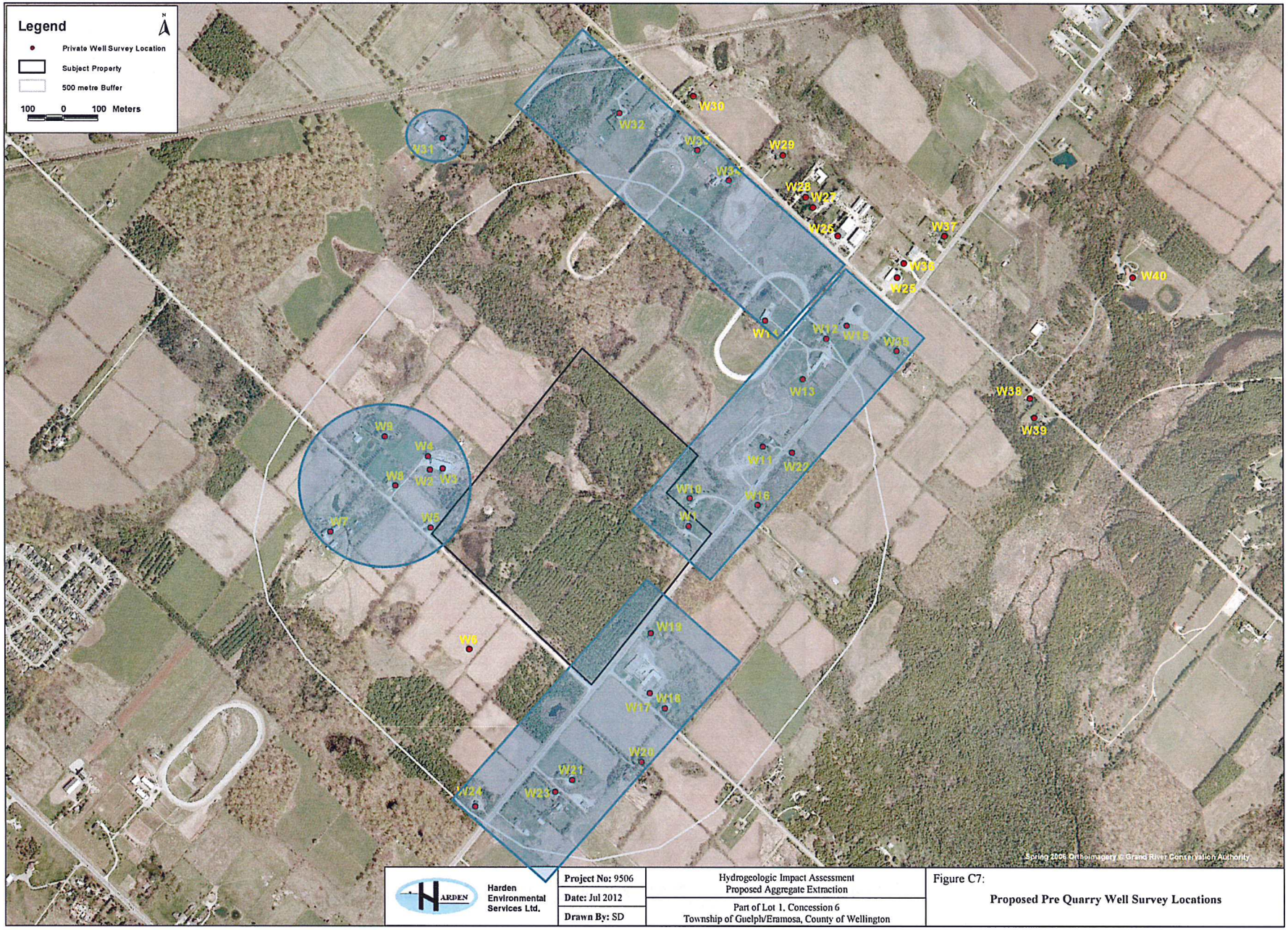
M14D Hydrograph



Harden Environmental Services Ltd.	**Project No:** 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	**Figure C5: M14D Trigger Level**
	Date: Jul 2013	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		

Figure C6: Northwest Wetland Hydrograph




Legend
Private Well Survey Location
Subject Property
500 metre Buffer
100 0 100 Meters
W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
W11
W12
W13
W14
W15
W16
W17
W18
W19
W20
W21
W22
W23
W24
W25
W26
W27
W28
W29
W30
W31
W32
W33
W34
W35
W36
W37
W38
W39
W40
Spring 2006 Orthoimagery © Grand River Conservation Authority
Harden Environmental Services Ltd.
Project No: 9506
Date: Jul 2012
Drawn By: SD
Hydrogeologic Impact Assessment
Proposed Aggregate Extraction
Part of Lot 1, Concession 6
Township of Guelph/Eramosa, County of Wellington
Figure C7:
Proposed Pre Quarry Well Survey Locations

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 Canada
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

April 8, 2014

Via: Email and Mail (sdenhoed@hardenv.com)

Mr. Stan Denhoed, M.Sc., P.Eng.
Sr. Hydrogeologist
Harden Environmental Services Limited
4622 Nassagaweya-Puslinch Townline Road
RR 1
Moffat ON L0P 1J0

Dear Mr. Denhoed:

Re: Harden Environmental Services Limited January 14, 2014 Letter – Response to Burnside Review of Summary of Drilling and Testing of New Well M15 at Hidden Quarry Site
File No.: 300032475.0000

Thank you for your letter of January 14, 2014 which provides your responses to the November 12, 2013 Burnside review of the Summary of Drilling and Testing of New Well M15 at the Hidden Quarry Site.

The level of on-site data has been improved. Additional assessment and background data collection is required to reduce the number of variables. Burnside recommends that the monitor well construction/testing/sampling and domestic well survey be completed as soon as possible to improve our understanding of the bedrock aquifer.

The Burnside responses below are ordered in the same number as your comments in the January 24, 2014 letter.

2.2 Bedrock

Burnside concurs with Harden that the Eramosa confining layer is not present at the site and that the extraction will occur in the Niagara Falls Member and Gas Port Formation.

2.3 Description of Core Breaks

Agreed.

3.0 Pumping Test

Burnside is satisfied with the Harden response. It is anticipated that the pre extraction monitoring program that will be conducted at the Site will assist in identifying which

fractures are inter connected and as a result which of the bedrock fractures may be impacted during the extraction of rock from the Quarry.

3.1 Flow Test

Burnside is satisfied by the Harden response. The pre-extraction monitoring program will assist in confirming that the maximum allowable dewatering of the bedrock of 2.5 m as developed by Harden is an appropriate value. It is anticipated that Harden/James Dick will provide additional detail on how the daily maximum drawdown will be monitored. It is expected that monitoring of water levels during the initial stages of the site works will be intensive (less than hourly). Once conditions are understood then monitoring events can reduce to the frequency indicated. For example, setting automatic water level recorders to 5 minute sampling intervals for the first month of quarrying activities will provide an excellent indication of the water level response at no additional cost.

6.0 Water Quality Results

The Burnside comment expressed concerns that the quarrying activities could impact current concentrations of nitrate, iron and also introduce surface water pathogens into the nearby groundwater system. The Harden response is broken down by nitrate, iron and surface water pathogens. Our response is provided below:

Nitrate

Harden provides examples from the Guelph Limestone (formerly Dolime Quarry), the Holcim Quarry in Milton Ontario and from two much larger quarries located in Florida. The examples provided by Harden indicate that the amount of nitrogen added from the explosives is generally less than 2 mg/L. Burnside trusts that the information provided by Harden is accurate and that the amount of nitrogen added from the explosives used in the quarrying process will have a small impact the down gradient well's water quality. Water samples obtained from the standing water in the Dolime quarry would be useful in this assessment as the nitrogen concentration in the discharge from a dewatering pump appears to be reduced by Dilution as the nitrogen in the discharge (0.24 to 0.65 mg/L) was much less than that measured in a sample collected within 4 hours of explosives detonation (1.9 mg/L).

Iron

Harden indicates that although samples of local groundwater contain reduced iron, the presence of a quarry with elevated concentrations of dissolved oxygen will result in the reduction of iron concentration in surface water and the groundwater down gradient of the quarry. In addition, the reduced iron will assist in the denitrification of the surface water. Burnside concurs with Harden that concentrations of iron in the groundwater will not be increased significantly down gradient of the quarry. However, there is the potential that oxygenated water entering the downgradient bedrock aquifer may result in changes to the existing downgradient water quality.

Nitrogen Mass Balance

Harden indicates that there are two sources of nitrogen at the proposed quarry. The first source is nitrogen imported to the site within the explosives used to liberate the rock. The second is nitrogen flowing onto the site in groundwater. The origin of this nitrogen is up-gradient farms which apply fertilizers (both commercial and natural) or generate manure. Harden provides a number of calculations to show the mass of nitrogen provided from the explosives, from groundwater inflow and the mass of nitrogen from up-gradient groundwater.

Burnside points out that the following factors could significantly affect the predictions made by Harden:

- The nitrate concentrations entering the quarry from the up-gradient direction may increase or decrease significantly seasonally.
- The nitrate concentration in the deep well M15 was 2 mg/L on May 24, 2013. This well is open across the entire bedrock sequence and as a result this nitrate value likely represents a mixing of water from all zones.
- The water produced from the individual fractures is based on the distribution of flows from M15; a more accurate understanding of the individual fracture characteristics including water quality, static water level and hydraulic conductivity will be obtained once the monitor well is constructed.

Burnside recommends that once M15 has been reconstructed as a multi-level monitor that water quality, water levels and hydraulic parameters be assessed in order to provide a more defensible prediction. We also note that there may be additional dilution that occurs due to precipitation which falls on the site.

Surface Water Pathogens

In their response Harden provides a list of sources of pathogens and indicates that the quarry does not represent the most likely source of surface water pathogens. Harden indicates that "*considering the elevated nitrate observed in water samples from Tributary B indicating contamination from up-gradient farming, more likely source of surface pathogens is water infiltrating into the bedrock from Tributary B. Also, the elevated nitrate concentrations in groundwater indicate that the overburden does not provide effective protection from anthropogenic activity.*" Harden should provide some commentary as to the impact of water fowl on the surface water in the quarry and how this may impact down-gradient wells.

In addition, Harden indicates that the mining is phased such that quarrying will commence in the northern portion of the site. This is the most distant part of the site from down-gradient water wells. The monitoring program is designed to determine if groundwater quality is being impacted by the quarry. Harden should provide additional detail on how the existing monitoring well network will provide sufficient early warning so that treatment systems can be installed in down-gradient domestic wells before unacceptable impacts to drinking water have occurred. In addition, once the door to door well survey has been completed, Harden should provide details on which of the three listed remedial options is the most appropriate for each individual well in the event that water quality is impacted. It is likely that given the small diameter of the existing

wells in the area that the use of a liner will be impractical. As a result, Harden will need to qualify if any existing wells can be deepened or whether the installation of water treatment equipment will be the preferred option.

7.0 Recommended Multi-level Installation Details

Agreed.

8.0 Discussion

No additional comment required. However, local residents continue to raise concerns with regards to the potential for karst features to be present on the site. This issue is discussed in the response to the January 14, 2014 Harden letter responding to the Burnside comments regarding the Hydrogeological Summary Report.

Section 9.0 Response to Burnside Comments

Comment 72

Harden has indicated that James Dick Construction Limited has agreed to limit the maximum drawdown in the excavation to 2.54 m below the historic low water level.

Burnside provides the following comments:

- The location of the drawdown measurement needs to be clearly defined and should actually be a monitoring well that is representative of water levels within the quarry limits and is completed as an open hole to 320 masl. In addition to monitoring pre extraction water levels for several years within the quarry limits, James Dick will need to monitor levels in nearby domestic wells to see how levels correlate with "quarry" water levels.
- The "historic low water level" requires additional clarification. As indicated above, the location of the water level measuring point needs to be defined as does the period of monitoring used to define the historic low water level. Harden predicts that a drawdown of 2.54 m in the quarry will result in 1.60 m of drawdown in the closest domestic well. Assuming that the historic low water level in the quarry corresponds to the historic low water level in the monitored domestic well, confirmation that an additional 1.6 m of drawdown in the domestic well will not impact it's use needs to be confirmed and the allowable drawdown in the quarry decreased as necessary.
- Harden should provide additional details on how the drawdown will be monitored and which wells will be used to decide what the water level is prior to extraction of the rock. Domestic wells to be monitored should also be identified. We understand from personal communication that the water level will be measured with a float connected to the excavation itself, but this approach needs to be documented.

Comment 60

Burnside agrees that the fracture distribution with depth can vary significantly in bedrock and two wells in close proximity can have different fracture patterns. However, we note that the reliability of the water found depths in MOE well records is subject to the

experience of the well contractor whereas the fracture depths in M15 were identified by both visual and flow measurements. Once M15 has been completed as a multi-level well it should be tested so that the results of the flow profiling can be verified and the nitrate values with depth confirmed. Similarly, well M16 should be completed as soon as possible. Hydraulic and water quality data from the multi-level wells should be assessed and the model revised if necessary.

Collection of both water level and water quality data should continue so that predictions regarding water quality and water level response can be confirmed/revised.

Comment 54

No Comment.

Comment 56

The Burnside letter suggested that there must be areas in the southern portion of the site where the silt unit is thin or absent which results in Tributary B entering the bedrock at some point upstream of SW3. Harden agreed with the Burnside comment. Burnside notes that concerned residents have suggested that the disappearance of Tributary B suggests that there are karst features beneath the site. It is not clear to Burnside whether Tributary B always disappears at the same point on a consistent basis or if the tributary dries up in the summer and as a result there is no flow in the tributary at the southern end of the site. It may be that the stream disappears because of the lack of a till layer over lying the bedrock combined with low flow allowing infiltration to become dominant over lateral flow. However, this should be confirmed in order to alleviate residents' concerns. Collection of water level data in the tributary at several locations with automatic recorders will provide an improved understanding of the tributary and will provide better baseline data for the assessment of impacts in the future.

Should you have any questions regarding the above, please contact the undersigned.

Yours truly,

R.J. Burnside & Associates Limited

Dave Hopkins
Sr. Hydrogeologist
DH:sd

cc Kim Wingrove, Township of Guelph Eramosa (Via: Email) (kwingrove@get.on.ca)
Saidur Rahman, Township of Guelph Eramosa (Via: Email)
(srahman@get.on.ca)
Leigh Mugford, James Dick Construction Ltd. (Via: Email)
(lmugford@jamesdick.com)

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 Canada
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

April 9, 2014

Via: Email and Mail (sdenhoed@hardenv.com)

Mr. Stan Denhoed, M.Sc., P.Eng.
Sr. Hydrogeologist
Harden Environmental Services Limited
Nassagaweya-Puslinch Townline
RR 1
Moffat ON L0P 1J0

Dear Mr. Denhoed:

Re: Harden Response to Burnside Review of Hydrogeological Summary Report
Hidden Quarry Site for Township of Guelph Eramosa
Letter Dated January 14, 2014
File No.: 300032475.0000

Thank you for your letter of January 14 2014 that provides your response to several issues and concerns addressed by R.J. Burnside & Associates Limited (Burnside) in our letter of November 12, 2013.

Burnside is primarily concerned with the impact of the proposed quarry on:

- Water levels in the upgradient domestic wells,
- The water quality in the down gradient domestic wells and,
- Rockwood Well 4

Although additional information has been provided in the latest letter, the predictions regarding the response of the fracture systems in the bedrock aquifer need to be confirmed through on going data collection and a thorough investigation of nearby domestic wells.

For consistency, our comments are presented using the same numbering as those contained in the Harden letter.

1.0 Karst

Burnside concurs with Harden that there is no evidence of cavernous karst features within the site. There have been a number of boreholes advanced into the underlying bedrock and as Harden indicates there is no evidence of cavernous karst features. However, the Rockwood area is identified by the Ontario Geological Survey as a Karst area and the water producing intervals in the bedrock are described as micro karst by some fractured bedrock specialists. It is Burnside's understanding that local residents

have expressed concern that Karst features may exist beneath the Site, primarily because of the disappearance of Tributary B. Harden has indicated that there can be flow in Tributary B entering the north end of the Site and under dry conditions there is no flow in the tributary as it exits the southern portion of the site. It is not clear to Burnside if the flow always terminates at the same point in Tributary B or whether there is some variation depending on weather conditions. Clarification of this would assist in understanding whether this is a "disappearing stream" or simply an intermittent stream that dries up during the summer months.

2.0 Water Quality

Harden had originally calculated a nitrate (nitrogen) mass balance in their response letter to Burnside comments on the M15 well drilling. Harden has now recalculated the nitrogen mass balance assuming that the lower 33% of the fractured bedrock does not contribute to dilution of nitrogen. As a result the anticipated nitrogen value has increased from 4.38 to 4.54 mg/L at the down gradient property line.

Burnside recommends that detailed water level and water quality data be obtained from M15 (and also M16) following completion as a multi-level monitor so that the assumptions used in the mass balance calculation can be verified. In particular, water quality data should be collected from the various screened intervals along with the other wells on site and applied to Table1.

Deeper Water Sources

The Burnside comments had suggested that the quarry would allow the shallow groundwater to mix with water from deeper zones in the bedrock. These deeper zones at 36 and 41 m are currently secure sources of groundwater that are recharged over time by water moving into those formations. Burnside indicates that the excavation of the quarry into these factures will cause the water in the deeper fracture system to be under the influence of surface water and associated bacteria and viruses such as cryptosporidium and giardia. The existing secure water supply in the deep bedrock aquifer will therefore be changed to a surface water source for an unknown distance from the quarry. Burnside indicated that once the quarry is finished, there will be a large surface water body directly in contact with the bedrock fracture system which may allow rapid movement of water pathogens towards bedrock wells down-gradient at the site.

Harden concurred that the quarry activities will result in the mixing of groundwater from various depths and indicates that test results from monitoring well M15 indicates that confining conditions occur at depth. This suggests that the water sources at depth are somewhat isolated from shallower groundwater sources unless exposed to anthropogenic contamination. Harden goes on to indicate that the majority of wells obtain water from the upper and middle portions of the aquifer exposing those wells to contamination from anthropogenic activities and possibly surface water already. Harden concludes that the quarry is being developed in an area already susceptible to contamination from the ground surface. Harden concurs that the mixing of water in the quarry will occur, however they note that this mixing already occurs in each bedrock well drilled in the area including the deep well servicing the mushroom farm. The aquifer is also exposed to surface contaminants from the Eramosa River Valley and the Blue Springs Creek Valley.

Burnside agrees that each individual well allows an opportunity for connection between the shallow and intermediate depths in the bedrock and as a result water quality in these wells will be impacted by anthropogenic sources. This is only true for the deep bedrock wells; the shallow bedrock wells in the area do not allow mixing. The quarry will connect a much larger number of fractures and will also allow the opportunity for pathogens and bacteria from waterfowl, other wildlife and near quarry runoff to directly enter the surface water body and ultimately the down-gradient water system. Although pathogens and bacteria can be dealt with by currently available home treatment technology it is Burnsides opinion that most residents would prefer to have a "clean" source of water that does not require treatment. As a result this was the intent of Burnside suggesting that the quarry stop at a somewhat shallower depth in order to allow the opportunity for impacted down gradient wells to obtain water from the deeper fracture systems.

GUDI Condition in Proposed Rockwood Well 4

Burnside has suggested that the quarry may result in the classification of future Well Number 4 as groundwater under the direct influence of surface water (GUDI). Harden provides a detailed assessment from excerpts from Ontario Regulation 178-03 and the conditions anticipated at the future Well Number 4. Harden concludes that proposed Well Number 4 will be flagged as potentially GUDI even in the absence of the proposed quarry, and that there are other potential sources of surface water contamination closer than the proposed quarry. Harden suggests that it is unlikely that fractures are isolated to the extent that interconnections to the bedrock surface will not occur between proposed Well Number 4 and the proposed quarry. Based on the information currently available, Burnside concurs with the Harden assessment of the GUDI status of future well 4. Once Well Number 4 has been constructed, testing will be undertaken to see whether there is any connection between pumping at the new well and water level responses at the quarry.

Pathogen Movement

Harden Figure 4 provides information showing the wells that are down-gradient from the quarry. Harden indicates that these are the only wells that have any risk of water quality impacts. It is Harden's opinion that the detailed monitoring program will identify chemical and bacteriological movement from the quarry and contingency measures are in place in the event that a local well is impacted. Harden indicates that recent testing of the Guelph Limestone Quarry found that the water met all the drinking water quality standards for a comprehensive suite of parameters.

It is Burnside's opinion that Harden should undertake a detailed well inventory and water quality assessment of the wells that surround the quarry. The assessment should include a sampling of wells in the spring and fall of 2014 in order to establish baseline conditions. Sampling should continue on a semi-annual basis until a sufficient baseline of data is established prior to quarry operations. Once sufficient baseline data has been collected an individual approach to addressing the potential for impact should be devised for each well. Burnside is of the opinion that wells within 500 m of the site that are located in pits or have buried well heads should be proactively upgraded so that the wells meet Ontario Regulation 903 and are easily monitored. Data collected from the

domestic well survey and re-construction and testing of M15 should be used to update the groundwater model and refine the predicted impacts.

Quarry Depth Limitation

The flow profiling at M15 indicates that there are significant fractures at elevations of 318 masl and 324 masl (42 and 36 m below ground surface respectively). The proposed quarry will extend to an elevation of 320 masl. Harden indicates that they do not think that limiting the depth of the quarry to an elevation greater than 324 masl will guarantee protection of the lower fracture set. They suggest that rather than limiting the depth of the quarry that mitigation of water quality issues be undertaken at the few down-gradient wells as they occur since there are proven effective measures designed specifically to address such water quality problems.

It is Burnsides opinion that most residents would prefer to have a safe secure source of water that does not require treatment rather than treating water that has been impacted by quarry activities. As a result, Burnside recommends that the current water quality be established for all of the wells within 500 m of the site and individual plans be devised to protect the water quality for each well.

3.0 Private Wells with Shallow Fracture Sources of Water

It is Burnside's contention that shallow wells have the greatest potential to be impacted by quarry activities. As a result, Harden identified the shallow wells on Figure 5 and indicates that none of the shallow wells are located up-gradient of the quarry. The shallow wells are located down-gradient of the quarry where water levels will rise. Harden indicates that with respect to wells that are up-gradient of the quarry it is their opinion that the magnitude of change will not affect the functioning of the domestic wells. Harden indicates that this opinion will be verified upon the completion of a detailed pre-bedrock extraction water well survey. If an up-gradient well is found, during a flow test, to have a drawdown near to the location of the pump then the pump will be set to a deeper depth.

Harden disagrees with Burnsides recommendation to proactively modify all existing well as a necessary step. In the case of wells that may currently be impacted by surface runoff such as those in well pits, the improvements to the well head may result in improved quality which would reduce the likelihood that the quarry operators will have to provide water quality treatment in the future.

The plan for protection of existing wells should be devised once the domestic well survey is completed.

4.0 Groundwater Model Parameter - Hydraulic Connectivity

In this section Harden uses data obtained from well M15 and the laws of super positioning in order to assess the potential impacts of drawdown in the quarry on neighbouring domestic wells. In order to estimate the magnitude of impact at the nearest private wells shown on Figure 6, Harden calculated the cumulative drawdown from each of six dewatering wells at each private well. The drawdown was estimated using the modified equilibrium equation (Cooper and Jacob, 1946). Harden also

includes a list of nine conditions that need to be met in order for the Cooper and Jacob method to be valid. Although many of the conditions are not met, it is Burnside's opinion that this method does provide additional support for the groundwater model used by Harden in the December 2012 report. Harden indicates that the analytical analysis confirms that:

- The results obtained from the model are reasonable;
- If a lower fracture set does not contribute water to the quarry the water will fill more slowly but the impact on local wells is similar to the full depth scenario; and
- The maximum drawdown in the nearest wells is always less than will occur in the quarry.

Burnside recommends that following reconstruction of M15 as a multi-level well, hydraulic and water quality data be collected from each of the screened intervals and used to improve the current interpretation of the hydrogeologic environment. Harden also indicates that their exercise supports the assertion that a shallower quarry will not result in significantly less impact. It was Burnside's suggestion that the quarry be terminated at a shallower depth in order to reduce the potential for the lower fractures to be impacted; thereby providing an opportunity for potentially impacted domestic wells to be drilled deeper.

5.0 Brydson Spring and Blue Springs Creek

Burnside's agrees with Harden's assertion that the 2.5 m water level change in the quarry will not change the water level along the Southern boundary. However, a lowered water level at the northern end of the site will result in a reduced hydraulic gradient and therefore discharge from the bedrock to the Brydson Spring may be reduced.

A spring flows because the water level in the ground is above grade. The degree that the water level is above grade could range from 0.1 to 10 m. A change in water levels less than 1 m can result in a reduction in flow. The conditions at this spring including flow volume and water quality should be characterized to establish a baseline condition and the spring should be included in the monitoring program.

6.0 Rock Extraction Water Level Change

Harden uses four pumping wells to simulate potential impacts to local wells during the initial rock excavation from the sinking cut. The simulation results in a maximum predicted drawdown of 0.87 m at the nearest well.

Burnside agrees that based on a maximum drawdown of 2.5 m in the sinking cut is not likely to result in significant impacts to nearby wells. However, it is unclear why the maximum drawdown cannot be the same as the depth of the sinking cut. This conservative value seems appropriate until the impacts predicted by the model can be confirmed.

Regardless of the maximum drawdown agreed to, it is Burnside's opinion that this value is the maximum total drawdown allowed, not the amount that is allowed with each

sinking cut. Details need to be provided regarding the location for monitoring the drawdown and also the method for establishing the pre extraction reference water level needs to be agreed upon.

Combined Impact from Rockwood Well No. 4 and Hidden Quarry

It is Burnside's opinion that the combined effect of the quarry and proposed Rockwood Well 4 cannot be predicted until M15 and the well are constructed and tested. The quarry will introduce bacteria into portions of the previously confined aquifer. Without detailed investigations there is no way to reliably predict the connection of fractures in the quarry with fractures found in domestic wells. The domestic well survey and water level/water quality monitoring program needs to be designed to identify the wells most likely to be impacted so they can be proactively protected.

7.0 Aquitard

Agreed

9.0 Monitoring Plan, Trigger Levels and Contingency Plan

The monitoring program should reference the pre extraction well survey that will include water quality/quantity testing and indicate the wells will be potentially involved in the monitoring program. Trigger levels for water quality and water levels should be established once baseline conditions are established. Investigation of the proposed pre-quarry well survey locations in Figure C-2 should be mandatory. Residents at wells W25 to W30 and W36 to W40 should be asked if they are willing to participate in the monitoring program.

1.0 On Site Monitoring Program

All of Burnside's suggestions have been incorporated into the monitoring program.

2.0 Trigger Levels

2.1 Trigger Levels for the Bedrock Aquifer

Agreed.

2.2 Trigger Level for Northwest Wetland

No comments.

3.0 Contingency Measures

3.1 Groundwater Levels and Northwest Wetland

Agreed.

3.2 Groundwater Quality

JDCL has agreed to Burnside's additions to the program.

4.0 Pre-Bedrock Extraction Water Well Survey

See comment under 3.0 Private Wells with Shallow Fracture Sources of Water.

10.0 Well Complaint

No comments.

11.0 Next Stages

Burnside agrees to the list of next steps but continues to request a reduction in the depth of the quarry and proactive improvements in surrounding existing wells based on the results of the well survey future documentation on this site should include detailed information on the domestic wells, construction and testing of M15/M16 and information on the Brydson Spring.

Yours truly,

R.J. Burnside & Associates Limited

David Hopkins
Sr. Hydrogeologist
DH:sd

cc Kim Wingrove, Township of Guelph Eramosa (Via: Email) (kwingrove@get.on.ca)
Saidur Rahman, Township of Guelph Eramosa (Via: Email) (srahman@get.on.ca)
Leigh Mugford, James Dick Construction Ltd. (Via: Email) (lmugford@jamesdick.com)

Leigh Mugford

From: Greg Sweetnam
Sent: Wednesday, April 06, 2016 2:09 PM
To: Leigh Mugford
Subject: FW: Comments on Hidden Quarry Application Uploaded to Guelph/Eramosa website
Attachments: MNR sign off registered letter.pdf

From: Greg Sweetnam
Sent: May-08-14 3:52 PM
To: 'Kimberly Wingrove'; Liz Howson; Huycke, Adam; Don McNalty; Doug Tripp; Jason Wagler
Cc: Kelsey Lang; Meaghen Reid; Council
Subject: RE: Comments on Hidden Quarry Application Uploaded to Guelph/Eramosa website

Hi Kimberly,
Kindly include the attached letter to the MNR section of your information posting in order to complete the record.
Thanks,
Greg

From: Kimberly Wingrove [mailto:kwingrove@get.on.ca]
Sent: May-07-14 12:53 PM
To: Liz Howson; Huycke, Adam; Don McNalty; Doug Tripp; Greg Sweetnam; Jason Wagler
Cc: Kelsey Lang; Meaghen Reid; Council
Subject: Comments on Hidden Quarry Application Uploaded to Guelph/Eramosa website

Good afternoon everyone. Please be advised that all formal comments received from agencies and consultants regarding studies related to the proposed Hidden Quarry zoning by-law amendment have now been grouped and posted on the Township of Guelph Eramosa web site at the following location:

http://www.get.on.ca/town-hall/notice/hidden-quarry-zba-09-12-reports,-information-and-presentations-available---new-info-posted

We hope that organizing the information in this manner will make it easier for everyone to access and review information. If you have any comments or feel that something has been missed in the summaries, please let me know.

Regards,

Kim Wingrove
Chief Administrative Officer
Township of Guelph Eramosa
T (519)856-9596 ext 105
C (519) 835-6720
kwingrove@get.on.ca
www.get.on.ca
Guelph/Eramosa Township

Leigh Mugford

From: Greg Sweetnam
Sent: Wednesday, July 09, 2014 10:27 AM
To: Leigh Mugford
Subject: FW: MOE Signoff Letter for Hidden Quarry
Attachments: MOE sign off letter.pdf

From: Greg Sweetnam
Sent: July-09-14 10:27 AM
To: Kimberly Wingrove (kwingrove@get.on.ca)
Cc: Liz Howson (howson@mshplan.ca)
Subject: MOE Signoff Letter for Hidden Quarry

Hi Guys,
Please find attached the MOE signoff letter dated October 10, 2013 as provided at our meeting of June 10, 2014, that should be posted on the Town's website.
The MOE letter dated July 3, 2013 (recently posted) is the initial comment letter and this one is the follow up after all of MOE's concerns had been resolved.
Thanks,
Greg

Greg Sweetnam, B.Sc.
Vice President, Resources
James Dick Construction Limited
James Dick Aggregates
Caledon Sand & Gravel Inc.
Assinck Limited
Telephone City Aggregates Inc.
Office (905) 857-3500
Cell (416) 997-5304
Fax (905) 857-9085
gsweetnam@jamesdick.com

Information on James Dick: www.jamesdick.com
Information on Aggregates: www.theholestory.ca

HUNTER and ASSOCIATES
Environmental and Engineering Consultants
www.hunter-gis.com
gisinfo@hunter-gis.com
35 Years of Service

May 20, 2014 Our File No.: 14-401

E-MAIL

Ms. Kim Wingrove
Chief Administrative Officer
Township of Guelph/Eramosa
8348 Wellington Road 124
P.O. Box 700
Rockwood, ON N0B 2K0

Re: Request for Supplementary Hidden Quarry ARA Application Data, Clarification and Confirmation
Pt W½ Lot 1, Con 6 (Eramosa), Guelph / Eramosa Township

Dear Ms. Wingrove,

I have undertaken a preliminary review of the ARA Site Plan Application for the Proposed Hidden Quarry ARA Site Plan Application in South Guelph/Ermosa Township and north Town of Milton on behalf of the Concerned Residents Coalition . Prior to preparation and submission of my formal review, I have a number of comments, *questions and requests for clarification for the Applicant with respect to the documents submitted in support of the application.*

A. Vertical Benchmarks (Harden September 2012 Report)

1. *What is the vertical geodetic benchmark used to reference the groundwater monitoring infrastructure and site features?*

2. *Are all infrastructure features, contour mapping and the Site Plan referenced to this same vertical benchmark network?*

B. Water Well Surveys (Harden September 2012 Report)

1. *What is the source of the MOE Water Well Record ground elevations in the Harden 2012 Report Appendix F - Table F1? Have any location corrections been applied?*

2. *Have ground elevations been adjusted for the referenced MOE Well Records in Appendix G - Table G1?*

3. *In Table G1, what is the source of the well depths and static water levels? Where 'btoc' is referenced, what is the 'stick up' to allow equation with the Water Well record ground elevation depth references?*

4. In Table G1 Site W22 (5198 Hwy 7) the well is reported to be in a 'pit' for survey dates of Oct 1995 and Nov 2011.

   How did the Applicant confirm this is MOE well No. 28-02047 ?

   My own inspection of W22 (5198 Highway 7) on April 19, 2014 indicates a front lawn well with Well Tag A126461. The corresponding log MOE 71-87172 was completed May 7, 2012 after the Applicant survey. The UTM coordinates also plot at the W22 location. The address on the record is reported as 5198 Hwy 7, however the driller has incorrectly entered the geographic County, Township and Lot and Con on the well record as submitted to MOE.

5. Well MOE 67-08195 completed June 10, 1985 contains a sketch dimensioned location at 150 ft north of Hwy 7 and 300 ft east of the 6th Line within the proposed Hidden Quarry property The stratigraphy, water founds and static levels are consistent with other wells on the property.

   Is the Applicant aware of this well? I do not see it in monitoring records; please explain.

6. Correspondence with the owner confirms that MOE Well No. 67-0745 is located at 4943 6th Line (W5), not at 4953 6th Line (W8) as indicated in Table G-1. A well record for W8 has not yet been found.

   How does this revised well location impact the Applicant's response to Burnside Hydrogeological Comment No 63 in the Hidden Quarry Comment Documentation?

   Please provide a copy of your Table G-1 well survey notes for the W8 site.

7. Table G1 reports surveying W31 (4970 7th Line) well on Oct 1995 and Mar 2012. A drilled well is reported located in front of the house. Well depth and static level are reported as unknown. No MOE # has been found.

   How is the Table G1 survey consistent with the well in use at the property or with the Harden (2012) Sec 3.6.1.1 pg 19 the and No 63 Response in the Hidden Quarry Comment Documentation which each describe a dug well at the property?

   Please explain and provide your detailed survey inspection field notes and sketches for the well at 4970 7th Line. A survey by an independent MOE licenced well technician may be required to correct the records.

8. Table G1 is unreliable and to be useful requires a rigorous on site well inspection and update including surveyed ground elevations, well depths and static water level observations at each well by an independent MOE licenced well technician.

C. Water Level Monitoring Data - Appendix B

1. *Please provide the digital spreadsheet (.xls) for Table B2 and B4 updated to May 2014. Also corresponding updated Hydrographs as available.*

2. *Please provide a copy of the Harden (1998) Report as referenced in Sec 2.5 Hydraulic Testing pg 7 (Harden 2012).*

D. Surface Water Flow Data - Appendix C

1. Please provide Table C1 with updated monitoring to April 2014 in digital spreadsheet form. Also corresponding Fig C1 Hydrographs as available.

E. Geology

1. *Does the Applicant have any information on the formational dip of the bedrock strata (top of Cabot Head) at the Hidden Quarry site?*

2. The Applicant has identified Goat Island Formation above 350 m asl in Borehole M15 at Hidden Quarry site.

   Is Goat Island present in other site boreholes where the bedrock surface is higher than about 350 m asl?

3. *Please provide a copy of the preliminary assignment of the unsubdivided Ambel Formation in borehole M2 into Goat Island, Gasport, Irondequoit, Rockway and Merritton Formations and any comments from Dr Brunton (Harden 2012, Sec 3.5.1, pg 15).*

4. *Please provide a copy of the MW-08-T3-06 well log as referenced in Harden 2012, Sec 3.5.1, pg 15).*

5. *Will the Goat Island Rock be separated from or blended into the commercial crushed rock aggregate produced in the proposed quarry?*

6. *What preparation of the weathered bedrock surface will be required to provide a staging area for underwater blasting preparation at Hidden Quarry?*

7. The Sept 2012 Site Plan Notes specify maximum extraction depth at 317 m asl (pg 3 of 5) and the figures on pg 4 of 5 specify the floor of the rehabilitated quarry lake at 320 m asl. The

Applicant response in the Hidden Quarry comment documentation says the minimum depth will be 320 m asl.

8. *What quarry depth has the Applicant's Hydrogeologist recommended?*

F. Vertical Hydraulic Gradients (Bedrock)

1. The Applicant's bedrock flow test for Well M15 (Harden July 15, 2013 Letter Appendix B Sec 3.1 pg 6) indicated that approximately one third of the well yield was obtained from various fractures between elevation 350 m asl to above 324 m asl and two thirds of the well yield was obtained from a single set of fractures at 324 m asl and from a fracture at 318 m asl (one third each).

2. The Applicant also reported poor hydraulic connectivity between the shallow bedrock and deeper fractures at M15. The lower part of the borehole below about 315 m asl including the Cabot Head formation contact at 308.5 m asl was described as not an active part of the flow system.

3. *Does the Applicant have any comparative observations of shallow vs deeper aquifer hydraulic heads (vertical gradients) in the proposed Site Plan Extraction Area?*

4. *Will the higher yield deeper aquifer from 324 to 318 m asl be the primary control for quarry pond water levels and the upgradient propagation of quarry drawdown impacts?*

5. *Does the Applicant have any observations at all of the hydraulic heads in the 324 to 318 m asl deep aquifer zone? What aquifer zones do the static levels observed in Monitors M2 and M4 actually represent?*

6. *Is the 324 to 318 m asl fractured rock aquifer zone in M15 coincident with the aquifer discharge zone on the lower slopes and floor of the Blue Spring Creek Valley to the south?*

7. *When will the Hidden Quarry Comment Documentation (Mar 13, 2013) be updated to reflect the results from the M15 hydrogeological testing and the extended on site groundwater monitoring?*

G. Amabel (Gasport) Hydrogeology

1. Brunton (2007) described the Amabel (Gasport) in the Guelph area as containing a high porosity section of cavernous interconnected voids known locally as the "Production Zone". Extensive

groundwater flows in vertical and horizontal karst influenced joints. Groundwater moves upwards from the interface of the Cabot Head shales into the overlying Amabel (Gasport) 'Production Zone' and downward from the interface aquifer zones (overburden bedrock) contact.

2. Brunton (2009) later described the Gasport formation as possessing excellent to poor secondary porosity and permeability and karst conduit development.

3. Gartner Lee (2004) referred to the Amabel Aquifer 'Production Zone' in Fig 2-3 and in the Appendix A cross-sections for 'Rockford' production wells.

4. *Would you agree that the vertical interval from 324 to 318 m asl in borehole M-15 is part of Brunton's and Gartner Lee's regional 'Production Zone' Aquifer?*

5. *What would the Applicant estimate the specific yield of M15 and the potential capacity of a production well if located at Hidden Quarry M15?*

H. Groundwater Modelling

1. *Please provide copies of the database input files. Please also provide the water and observation well files including static water level observation dates for the area within 1500 m of the proposed quarry site boundaries.*

2. *Is it fair to say that the modelling is based primarily on 'kriged' multi season 'open hole' water well static level data with a general bias towards shallower bedrock water wells?*

3. *What is the statistical variability of the 'predicted water levels' and 'maximum predicted water level change' estimated in Fig 10 and Fig 11 of the Modelling Report? Is ± 5 m a fair estimate for Fig 10? What about Fig 11?*

4. *Is there sufficient unique regional hydraulic data to model the hydraulic heads of the deep aquifer as identified in the Hidden Quarry site for the elevation interval between 324 and 318 m asl?*

5. *Considering that there will be a water deficit within the quarry pond footprint due to evaporation increases, where will the water come from that raises the Applicant predicted groundwater levels and increases flows on the downgradient side of the quarry?*

6. *Will the upgradient groundwater divides move away from the quarry with reduced water level elevation to capture more water from adjacent catchments?*

7. The Applicant's M4 and a number of water wells along the Highway 7 southern limit of the proposed Hidden Quarry consistently demonstrate static water levels in the 345± m asl range despite varying depths.

8. The Sept 21, 2012 Site Plan Notes (pg 4 of 5) predicts the west quarry final lake level at 348.6 m asl and the east quarry lake at 348.4 m asl. However the wetland creation Notes (pg 4 of 5) estimate final quarry pond water tables at ± 346 to 349 m asl.

9. *The Harden (2012) Fig 3.17 shows a water level decline across the quarry extraction limits from 354 to 347 m asl (7 m difference). Appendix H Fig 11 shows a drawdown of 1.8 m on the north extraction limit and a rise of about 1.2 m at the south limit. Where did the other 4 m of the pre-quarry vertical gradient go?*

I. Over-Estimated Quarry Pond Levels / Underestimated Upgradient Drawdowns

1. *Has the Applicant overestimated the final quarry pond levels and underestimated the bedrock aquifer drawdowns upgradient of the quarry?*

2. *Are the average late summer / early fall water low levels more likely to be in the 346 m asl range consistent with the lower limit shown in the Site Plan Rehabilitation Notes (pg 4 of 5)?*

3. The Harden (2012) Fig 3.17 plot referenced above is based mainly on spring season (May 31, 2011) high water levels. *Please provide a corresponding late summer / early fall plot using 'same date' data.*

4. *Will the actual drawdowns be sufficient during dry season to interfere with bored and shallow bedrock wells and streams (and ponds) fed by bedrock springs up to 1 km or more upgradient of the quarry?*

5. *Based on the Applicant predicted increased quarry water level at 348.6 m asl, will the forested kettle depression located on private property immediately south of MW4 and Highway 7 experience root zone flooding and dieback?*

J. Dry Quarry Drilling Platform

1. The site boreholes and groundwater modelling for the West pond water level at 248.6 m asl indicate that the bedrock surface in part of the Hidden Quarry may be permanently underwater at the time of phased initiation or during bedrock quarrying.

2. The Harden (2012) Report Sec 3.5.1 pg 16 describes a bedrock low in the southeast corner of the site. MOE Well 28-05483 indicates a bedrock surface at 340.9 m asl far below the Applicant's predicted 348.6 m asl West Pond water level at the south limit of the quarry (Harden 2012 Report Sec 4.2.2 pg 29). The existing groundwater tables are lower than the Site Plan specified minimum water level of 348 m asl (Note 15, pg 2 of 5).

3. *How does the Applicant propose to create a dry staging platform for drilling and blasting? Will positive or passive dewatering be required?*

4. *Has the Applicant considered progressively mining from the southeast upgradient into the higher northwest water tables of the site?*

5. *Will adaptive management based on southerly site quarrying with a more gradual drawdown of northerly boundary groundwater monitors be more effective than initiating quarrying in the deeper water to the north as proposed on the Sept 2012 Site Plans (pg 2 of 5)?*

K. Clean Quarry Water

1. The Sept 2012 Site Plan (Note 18, pg 2 of 5) specifies that wash water silt may be deposited in quarry ponds (Note 18) pg 2 of 5.

2. The Sept 2012 Site Plan Quarry Rehabilitation Notes (pg 3 of 5) propose to push stockpiled soil and overburden from the perimeter berms into the quarried area.

3. The Site Plan Quarry Lake Area and Quarry Face Notes (pg 4 of 5) specify that boulders, stones, screening piles, unsold aggregates and soils may be dumped over the quarry face but at least 20% of the quarry face is to remain barren and untreated.

4. *Does the Applicant propose to waste the silty till overburden spoil or place imported fill in the quarry excavation?*

5. *How does the Applicant propose to maintain clear clean unobstructed groundwater flow to nearby domestic and commercial wells through the life cycle of the quarry excavation ?*

6. *Will the quarry walls become clogged with silt turbidity or be barricaded by lower permeability waste spoil ?*

7. *Will the Site Plans specify that a Permit to Take Water and an Environmental Compliance Approval to Discharge Wash Water is required?*

L. Warnock Lake - Caledon Sand and Gravel Pit - Hydraulic Barriers

1. The Harden Sept 2012 Report Sec 4.2.1 pg 29 holds out Warnock Lake as a successful use of hydraulic barriers.

2. *Please provide Warnock Lake supporting technical information - say pre and post extraction hydroperiod monitoring and historical aerial imagery to support this observation.*

3. *What will stop groundwater flows around the ends of the proposed northwest wetland hydraulic barrier in the proposed Hidden Quarry?*

M. Guelph Dolime Quarry (Appendix E Water Quality Results)

1. The Harden Sept 2012 Appendix E Fig 1 Sampling Location illustrates a rock drill operating from a dry platform.

   Is this dry platform maintained by dewatering (sump reference in the title of Table 1)? What are the depths of rock drilling? Is this dry drilling platform the top of the 'Gasport' Formation?

2. The Applicant has identified the Guelph Limestone Quarry as a positive water quality analogue (Harden (2012) Appendix E Table 1) for underwater quarrying at the proposed Hidden Quarry. This analogue is apparently based on a 'single grab' water sample' from a sump at a location specified in Fig 1 and taken following a blast on Feb 15, 2012.

3. *Please provide a certified copy of the Laboratory Analytical Report(s) for this Feb 15, 2012 sample.*

4. The Applicant has characterized this sample as meeting Ontario Drinking Water Standards (Harden 2012 Sec 5.4.2, pg 40).

5. However this single grab sample (Appendix E Table 1) illustrates Provincial Water Quality Objective criteria exceedances for Cobalt, Lead and Zinc (Note Zinc (revised) as 20 µg/L). Total Ammonia -N concentration is at about 80%, Unionized Ammonia at 25 % and Nitrate at about 12 % of the PWQO. Benzene is reported at a trace amount. *Please comment.*

7. Hardness, Alkalinity, pH, Sulphate, Total Organic Carbon, Organic Nitrogen, Colour, Total Dissolved Solids, Total Suspended Solids, Oil and Grease and Pathogens were not reported in Appendix E Table 1. Many of these parameters are likely to be elevated in an active quarry environment with frequent blasting especially if the underwater quarry is used for washwater silt and overburden disposal.

8. The Total Ammonia and Total Kjeldahl Nitrogen at the Dolime Quarry are elevated above the Hidden Quarry pre-development groundwater at M15 at 0.06 mg/L and 0.20 mg/L) respectively (Appendix B to Harden July 15, 2013 letter to James Dick Construction Ltd).

   Total Ammonia-N is reported as Non-Detectible at Harden W1 (MOE 67-05627)

9. There is a known direct relationship between the ammonia and nitrate levels and the amount of undetonated explosives in the rock through which water flows (Revey 1996).

   Are the Nitrogen parameters in this Dolime Quarry grab sample elevated due to incomplete detonation or combustion of explosives in a wet environment? Was the blast 'smoke' produced orange or white in colour in the Feb 12, 2012 detonation?

10. The difference between Total Kjeldahl Nitrogen (0.7 mg/L) and Total Ammonia N (0.39 mg/L) in Table 1 indicates that Organic Nitrogen in the grab sample is 0.31 mg/L. This value exceeds by 2x the Ontario Drinking Water Standards (2006) of 0.15 mg/L for Organic Nitrogen.

11. *What blasting management protocols are employed at Guelph Dolime Quarry to minimize spillage, reduce product leaching and reduce undetonated explosives and incomplete combustion. How deep are the drill holes? What 'sleep' times typically occur? What is the frequency of blasting? What blasting agents are used?*

12. This single grab sample is not sufficient as an analogue to establish a Water Quality comfort level for underwater blasting and quarrying at the Hidden Quarry.

13. *I request that the Applicant discloses all Water Quality Compliance Monitoring for the Guelph Dolime Quarry and provides additional immediate post blast water quality sampling and analysis for the parameters in para 7 above and the BTEX suite.*

14. *I request a site inspection, together with other CRC members who may be interested, of the Dolime Quarry at the time of and following an underwater blast event.*

N. De Grandis Ponds (Headwater Source of Tributary B - Brydson Creek) and the Provincially Significant Allen Wetlands

1. Ms. De Grandis, based on first hand observational experience, advises that the ponds constructed by her family were limited in depth to 1 to 2 m due to the presence of underlying bedrock (platform). Bedrock outcrop was visible during pond construction. At the time of pond expansion in the mid 1970's the excavation contractor advised that blasting would be required to further deepen the ponds.

2. The presence of a bedrock platform is further evidenced by large angular surface boulder 'float' on the silt till pasture fields to the west of the De Grandis farmstead and ponds. Ms. De Grandis also advises that post hole installation is difficult in this area due to the presence of rock.

3. Ms. De Grandis advises that the pond bottoms have a number of active springs which may be seen bubbling to the surface in the spring and early summer seasons.

4. When the pond was stocked, Rainbow Trout would seek these cool upwelling refugia in summer. The ponds seldom completely freeze over in the winter because of warm upwelling groundwater from the bedrock aquifer. The ponds are used summer and winter by water fowl. Snapping turtles, a species of conservation concern, are also present.

5. In effect precursor springs and the expanded pond excavation breached the surface exposed basal silt till mantle on the bedrock allowing upwelling of bedrock aquifer water and flow to Tributary B.

6. The granular deposits overlying the basal silt till evident at the Hidden Quarry Site are absent from the De Grandis pond area. I have not observed granular deposits or significant water inflow (seepage) around the shores of the De Grandis ponds.

7. The available GRCA contour mapping places the De Grandis Pond water levels at about 362 +/- m asl and therefore the bedrock platform surface at about 360 m asl, slightly lower than that observed along nearby 7th Line to the east.

8. The closest bedrock drilled well to the east (MOE 67-11476) is at a severance at the northeast corner of Lot 2, Conc 6 at the front of the De Grandis township lot where the bedrock surface is reported at 363 +/- and the water level at 364.6 m asl based on the GRCA contour ground elevation of 367.0 m asl.

   The closest bedrock well to the west (MOE 67-06762) in the E1/2 Lot 3, Con 5 just west of the 6th Line reports bedrock at 364 m asl.

   The bedrock surface generally ascends (or steps) northerly from Highway 7 along the 6th and 7th line.

9. The Applicant's groundwater modelling taken at face value predicts an average drawdown of about 60 cm in the bedrock aquifer under the De Grandis Ponds and 'dug well'.

10. This magnitude of drawdown may be anticipated to impact the shallow farm supply (80 cows + calves) well and to significantly diminish the headwater source outflow from the De Grandis ponds to the Allen wetlands and Tributary B. The shallow De Grandis ponds under the Hidden Quarry drawdown regime may be anticipated to quickly convert to wetland versus open water habitat.

11. *Has the bedrock outcrop / subcrop evidence at the De Grandis farm area been considered in the Applicant Hydrogeological Investigation and reporting?*

12. *What evidence does the Applicant have to support its hypothesis apparently based on extrapolated data from the Hidden Quarry site that the De Grandis ponds, the source of Tributary B, are perched above the basal silty till and fed by upper overburden granular aquifers?*

    This condition likely exists on the W½ Lot 3 of the De Grandis Farm where the topographically high Paris Moraine deposits are prominent but not on the E½ of Lot 2 and adjacent Lot 3.

13. *How are the groundwater model predicted bedrock water level contours calibrated in the De Grandis Pond area?*

14. *Similarly what geological evidence does the Applicant have that the Allen Spring is not a bedrock spring?*

15. The Applicant predicts bedrock aquifer drawdowns at 80 cm at the Allen Spring vicinity.

    Is this drawdown likely sufficient to terminate dry season discharge to streamflow at this location?

16. The Allen spring is utilized to maintain water levels in the farmstead landscape ponds as well as to sustain flow to Tributary A.

17. *Is the applicant willing to construct boreholes and sentry observation wells in the vicinity of the Allen Spring and the De Grandis ponds in support of its application?*

O. Stream Corridor Setbacks

1. *Please provide a digital copy of the UTM geographic coordinate string for the GRCA field staked setback base line and the proposed setback limit.*

P. Natural Environment Report (August 2012)

1. *Please verify the last paragraph statements on pg 57 (Sec 6.0) related to total aggregate tonnage resources and that only 20% of the aggregate resource occurring below the water table.*

2. *If site boreholes confirm the evidence of a bedrock platform and bedrock springs at the De Grandis ponds and at the Allen Springs, how would this change the Sec 7.1 (pg 58) statements attributed to Harden Environmental (2012) .*

3. *How would this loss of bedrock spring flow influence the sustainability of the Provincially Significant Allen Wetland and Tributary A and B - Brydson Creek?*

Q. ARA Site Plans

1. The only ARA Site Plans I currently have access to are low resolution uncertified .pdf versions as available from the Township web site. These Site Plans were prepared by Stovel and Associates Inc and plotted about Sept 12, 2012.

2. Pg 5 of 5 is missing from the Site Plans on the Township website.

3. These Site Plan versions are at best difficult to read and in some cases illegible even when enlarged to 'D' size (see Water Well Table on pg 1 of 5).

4. *Please provide us with a complete set of up-to-date digital AutoCAD .dwg or equivalent high resolution Site Plan files or legible hard copy for formal comment.*

Thank you for your consideration and the prompt reply of the Applicant.

Yours truly,

Garry T. Hunter, M.A.Sc., P.Eng.
President
Hunter and Associates

cc:
Concerned Residents Coalition
Greg Sweetnam (JDCL)
Leigh Mugford (JDCL)
Stan Denhoed (Harden Associates)
Rob Stovel (Stovel and Associates)
Ian Hagman (MNR)
Lorraine Norminton (MNR)
Al Murray (MNR)
Oleg Ivanov (MNR)
Sarah deBartoli (MNR)
Rosa Stewart (MOE)
Jane Glassco (MOE)
Lynnette Armour (MOE)
Fred Natolochny (GRCA)
Jason Wagler (GRCA)
Aldo Salis (Wellington County)
Adam Huycke (Halton Region)
Brian Hudson (Halton Region)
Barb Koopmans (Town of Milton)
Jordan Dolson (GET)
Kelsey Lang (GET)

JAMES DICK CONSTRUCTION LIMITED

MAIL: P.O. Box 470, Bolton, Ontario. L7E 5T4
COURIER: 14442 Hwy. 50, Bolton, Ontario. L7E 3E2
TELEPHONE: (905) 857-3500 FAX: (905) 857-4833

July 8, 2014

Township of Guelph Eramosa

Attention: **Ms. Liz Howson**
MSH Ltd.

RE: Response to Township Regarding CRC Representative Gary Hunter Questions

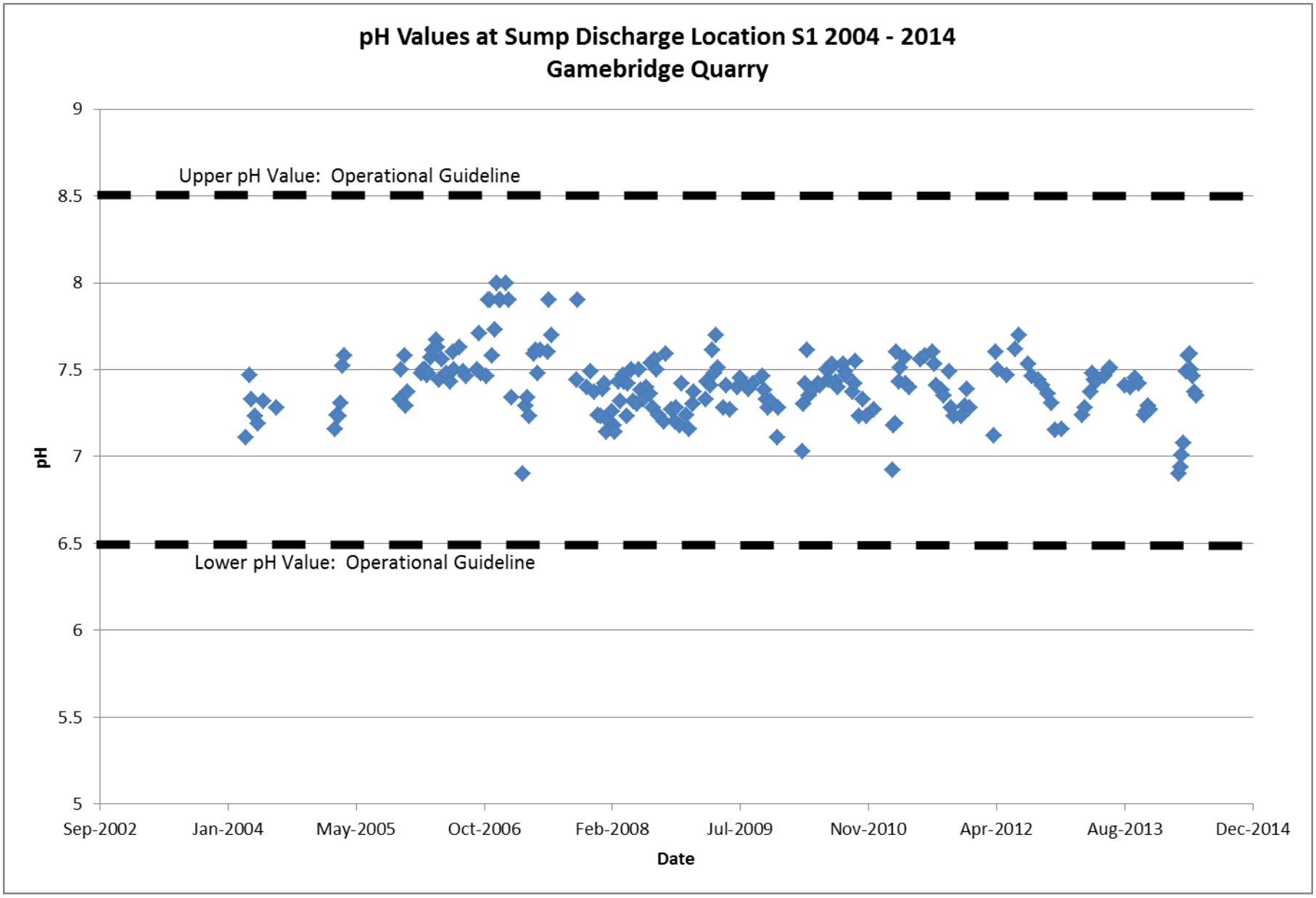
Dear Liz,

Please find attached a spreadsheet that we have compiled for the Township to assist you as you formulate your planning opinion. We have had our team, primarily Mr. Denhoed of Harden Environmental Services Limited, to respond to the various inquiries of Mr. Hunter. The responses should assist in providing you additional information and, in some cases, clarity where the application was misunderstood by the CRC reviewer.

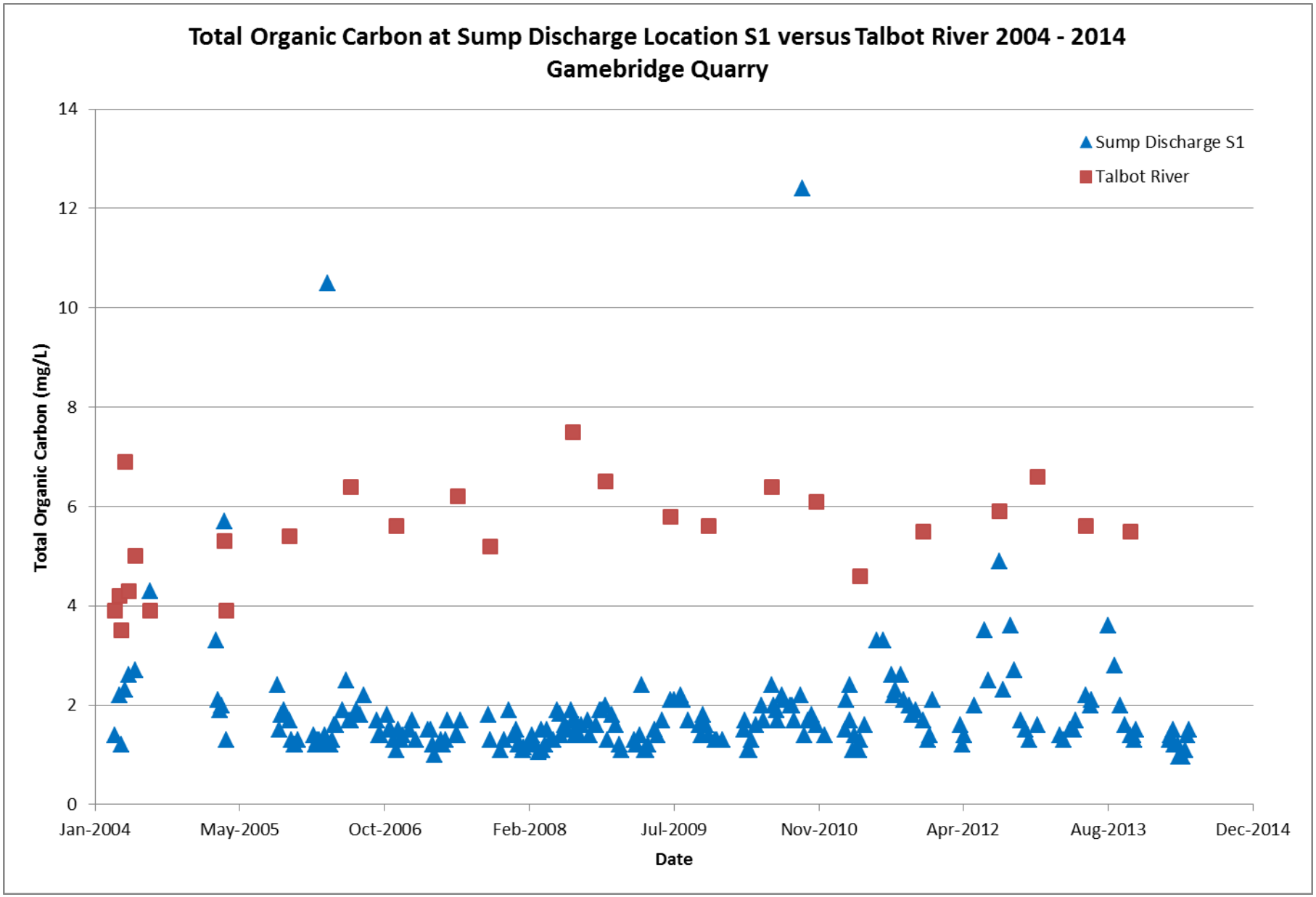
Please note that while we are responding to these inquiries to facilitate the township in their review of comments submitted by the public, we do not consider the queries of Mr. Hunter to fall within the Peer Review Process of the Township. R.J. Burnside and Associates is the Peer Reviewer in this area and they should be allowed to come to an independent opinion based on their expertise. We do consider these comments relevant in the Planning Process and this response is provided in that context.

Sincerely,
JAMES DICK CONSTRUCTION LIMITED

Greg Sweetnam



Harden Environmental Services Ltd.	**Project No:** 9506 **Date:** Jul 2014 **Drawn By:** AR	Hydrogeologic Impact Assessment Proposed Aggregate Extraction Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	**Figure 1: pH Values at Sump Discharge Gamebridge Quarry**



Harden Environmental Services Ltd.	**Project No:** 9506 **Date:** Jul 2014 **Drawn By:** AR	Hydrogeologic Impact Assessment Proposed Aggregate Extraction Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	**Figure 2: Total Organic Carbon Gamebridge Quarry**

Attention: Aaron Warkentin
Harden Environmental
4622 Nassagaweya-Puslinch Twnl
Moffat, ON
L0P 1J0

Report Date: 2012/02/24

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B222699
Received: 2012/02/16, 08:46

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Methylnaphthalene Sum	1	2012/02/16	2012/02/22	CAM SOP - 00301	EPA 8270
Perchlorate in water	1	2012/02/17	2012/02/21	CAM SOP-00451	EPA 331.0/6850 (mod)
Petroleum Hydro. CCME F1 & BTEX in Water	1	N/A	2012/02/22	CAM SOP-00315	CCME CWS
Petroleum Hydrocarbons F2-F4 in Water	1	2012/02/21	2012/02/21	CAM SOP-00316	CCME Hydrocarbons
Total Metals Analysis by ICPMS	1	N/A	2012/02/22	CAM SOP-00447	EPA 6020
Total Ammonia-N	1	N/A	2012/02/22	CAM SOP-00441	US GS I-2522-90
Nitrate (NO3) and Nitrite (NO2) in Water (1)	1	N/A	2012/02/23	CAM SOP-00440	SM 4500 NO3I/NO2B
PAH Compounds in Water by GC/MS (SIM)	1	2012/02/17	2012/02/21	CAM SOP-00318	EPA 8270
Total Kjeldahl Nitrogen in Water	1	2012/02/22	2012/02/23	CAM SOP-00454	EPA 351.2 Rev 2
Volatile Organic Compounds in Water	1	N/A	2012/02/21	CAM SOP-00226	EPA 8260 modified

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited by SCC (Lab ID 97) for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other

Attention: Aaron Warkentin
Harden Environmental
4622 Nassagaweya-Puslinch Twnl
Moffat, ON
L0P 1J0

Report Date: 2012/02/24

CERTIFICATE OF ANALYSIS

warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

ANDREW TURNER, Project Manager
Email: ATurner@maxxam.ca
Phone# (800) 268-7396 Ext:233

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 2

Harden Environmental

Maxxam Job #: B222699
Report Date: 2012/02/24

RESULTS OF ANALYSES OF WATER

Maxxam ID		MN9623		
Sampling Date		2012/02/15 16:00		
	Units	**SUMP**	**RDL**	**QC Batch**
Inorganics				
Total Ammonia-N	mg/L	0.39	0.05	2768497
Total Kjeldahl Nitrogen (TKN)	mg/L	0.7	0.1	2770291
Nitrite (N)	mg/L	0.05	0.01	2768472
Nitrate (N)	mg/L	1.2	0.1	2768472
Nitrate + Nitrite	mg/L	1.2	0.1	2768472
Miscellaneous Parameters				
Perchlorate (CLO4)	ug/L	ND	0.05	2767145

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental

Maxxam Job #: B222699
Report Date: 2012/02/24

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID			MN9623		
Sampling Date			2012/02/15 16:00		
	Units	**Criteria**	**SUMP**	**RDL**	**QC Batch**
Metals					
Total Aluminum (Al)	mg/L	-	0.016	0.0050	2770314
Total Antimony (Sb)	mg/L	**0.02**	0.00090	0.00050	2770314
Total Arsenic (As)	mg/L	**0.1**	0.0016	0.0010	2770314
Total Barium (Ba)	mg/L	-	0.051	0.0020	2770314
Total Beryllium (Be)	mg/L	**0.011**	ND	0.00050	2770314
Total Bismuth (Bi)	mg/L	-	ND	0.0010	2770314
Total Boron (B)	mg/L	**0.2**	0.056	0.010	2770314
Total Cadmium (Cd)	mg/L	**0.0002**	ND	0.00010	2770314
Total Calcium (Ca)	mg/L	-	120	0.20	2770314
Total Chromium (Cr)	mg/L	-	ND	0.0050	2770314
Total Cobalt (Co)	mg/L	**0.0009**	**0.0013**	0.00050	2770314
Total Copper (Cu)	mg/L	**0.005**	0.0019	0.0010	2770314
Total Iron (Fe)	mg/L	**0.3**	ND	0.10	2770314
Total Lead (Pb)	mg/L	**0.005**	**0.0055**	0.00050	2770314
Total Lithium (Li)	mg/L	-	ND	0.0050	2770314
Total Magnesium (Mg)	mg/L	-	32	0.050	2770314
Total Manganese (Mn)	mg/L	-	0.026	0.0020	2770314
Total Molybdenum (Mo)	mg/L	**0.04**	0.0069	0.00050	2770314
Total Nickel (Ni)	mg/L	**0.025**	0.014	0.0010	2770314
Total Potassium (K)	mg/L	-	3.5	0.20	2770314
Total Silicon (Si)	mg/L	-	3.6	0.050	2770314
Total Selenium (Se)	mg/L	**0.1**	ND	0.0020	2770314
Total Silver (Ag)	mg/L	**0.0001**	ND	0.00010	2770314
Total Sodium (Na)	mg/L	-	80	0.10	2770314
Total Strontium (Sr)	mg/L	-	1.1	0.0010	2770314
Total Tellurium (Te)	mg/L	-	ND	0.0010	2770314
Total Thallium (Tl)	mg/L	**0.0003**	0.000056	0.000050	2770314
Total Tin (Sn)	mg/L	-	ND	0.0010	2770314
Total Titanium (Ti)	mg/L	-	ND	0.0050	2770314
Total Tungsten (W)	mg/L	**0.030**	ND	0.0010	2770314

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: ONTARIO PROVINCIAL WATER QUALITY OBJECTIVES
Ref. to MOEE Water Management document dated Feb.1999

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental

Maxxam Job #: B222699
Report Date: 2012/02/24

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID			MN9623		
Sampling Date			2012/02/15 16:00		
	Units	**Criteria**	**SUMP**	**RDL**	**QC Batch**
Total Uranium (U)	mg/L	**0.005**	0.0020	0.00010	2770314
Total Vanadium (V)	mg/L	**0.006**	ND	0.00050	2770314
Total Zinc (Zn)	mg/L	**0.03**	**0.057**	0.0050	2770314
Total Zirconium (Zr)	mg/L	**0.004**	ND	0.0010	2770314

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: ONTARIO PROVINCIAL WATER QUALITY OBJECTIVES
Ref. to MOEE Water Management document dated Feb.1999

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental

Maxxam Job #: B222699
Report Date: 2012/02/24

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID			MN9623		
Sampling Date			2012/02/15 16:00		
	Units	**Criteria**	**SUMP**	**RDL**	**QC Batch**
Calculated Parameters					
Methylnaphthalene, 2-(1-)	ug/L	-	ND	0.071	2766069
Polyaromatic Hydrocarbons					
Biphenyl	ug/L	**0.2**	ND	0.050	2768173
Acenaphthene	ug/L	-	ND	0.050	2768173
Acenaphthylene	ug/L	-	ND	0.050	2768173
Anthracene	ug/L	**0.0008**	ND	0.050	2768173
Benzo(a)anthracene	ug/L	**0.0004**	ND	0.050	2768173
Benzo(a)pyrene	ug/L	-	ND	0.010	2768173
Benzo(b/j)fluoranthene	ug/L	-	ND	0.050	2768173
Benzo(g,h,i)perylene	ug/L	**0.00002**	ND	0.050	2768173
Benzo(k)fluoranthene	ug/L	**0.0002**	ND	0.050	2768173
Chrysene	ug/L	**0.0001**	ND	0.050	2768173
Dibenz(a,h)anthracene	ug/L	**0.002**	ND	0.050	2768173
Fluoranthene	ug/L	**0.0008**	ND	0.050	2768173
Fluorene	ug/L	**0.2**	ND	0.050	2768173
Indeno(1,2,3-cd)pyrene	ug/L	-	ND	0.050	2768173
1-Methylnaphthalene	ug/L	**2**	ND	0.050	2768173
2-Methylnaphthalene	ug/L	**2**	ND	0.050	2768173
Naphthalene	ug/L	**7**	ND	0.050	2768173
Phenanthrene	ug/L	**0.03**	ND	0.030	2768173
Pyrene	ug/L	-	ND	0.050	2768173
Surrogate Recovery (%)					
D10-Anthracene	%	-	89		2768173
D14-Terphenyl (FS)	%	-	96		2768173
D8-Acenaphthylene	%	-	86		2768173

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: ONTARIO PROVINCIAL WATER QUALITY OBJECTIVES
Ref. to MOEE Water Management document dated Feb.1999

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental

Maxxam Job #: B222699
Report Date: 2012/02/24

VOLATILE ORGANICS BY GC/MS (WATER)

Maxxam ID			MN9623		
Sampling Date			2012/02/15 16:00		
	Units	**Criteria**	**SUMP**	**RDL**	**QC Batch**
Volatile Organics					
Acetone (2-Propanone)	ug/L	-	ND	10	2767160
Benzene	ug/L	**100**	0.11	0.10	2767160
Bromodichloromethane	ug/L	**200**	ND	0.10	2767160
Bromoform	ug/L	**60**	ND	0.20	2767160
Bromomethane	ug/L	**0.9**	ND	0.50	2767160
Carbon Tetrachloride	ug/L	-	ND	0.10	2767160
Chlorobenzene	ug/L	**15**	ND	0.10	2767160
Chloroform	ug/L	-	ND	0.10	2767160
Dibromochloromethane	ug/L	**40**	ND	0.20	2767160
1,2-Dichlorobenzene	ug/L	**2.5**	ND	0.20	2767160
1,3-Dichlorobenzene	ug/L	**2.5**	ND	0.20	2767160
1,4-Dichlorobenzene	ug/L	**4**	ND	0.20	2767160
Dichlorodifluoromethane (FREON 12)	ug/L	-	ND	0.50	2767160
1,1-Dichloroethane	ug/L	**200**	ND	0.10	2767160
1,2-Dichloroethane	ug/L	**100**	ND	0.20	2767160
1,1-Dichloroethylene	ug/L	**40**	ND	0.10	2767160
cis-1,2-Dichloroethylene	ug/L	**200**	ND	0.10	2767160
trans-1,2-Dichloroethylene	ug/L	**200**	ND	0.10	2767160
1,2-Dichloropropane	ug/L	**0.7**	ND	0.10	2767160
cis-1,3-Dichloropropene	ug/L	-	ND	0.20	2767160
trans-1,3-Dichloropropene	ug/L	**7**	ND	0.20	2767160
Ethylbenzene	ug/L	**8**	ND	0.10	2767160
Ethylene Dibromide	ug/L	**5**	ND	0.20	2767160
Hexane	ug/L	-	ND	0.50	2767160
Methylene Chloride(Dichloromethane)	ug/L	**100**	ND	0.50	2767160
Methyl Isobutyl Ketone	ug/L	-	ND	5.0	2767160
Methyl Ethyl Ketone (2-Butanone)	ug/L	**400**	ND	5.0	2767160
Methyl t-butyl ether (MTBE)	ug/L	**200**	ND	0.20	2767160
Styrene	ug/L	**4**	ND	0.20	2767160
1,1,1,2-Tetrachloroethane	ug/L	**20**	ND	0.10	2767160

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: ONTARIO PROVINCIAL WATER QUALITY OBJECTIVES
Ref. to MOEE Water Management document dated Feb.1999

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental

Maxxam Job #: B222699
Report Date: 2012/02/24

VOLATILE ORGANICS BY GC/MS (WATER)

Maxxam ID			MN9623		
Sampling Date			2012/02/15 16:00		
	Units	**Criteria**	**SUMP**	**RDL**	**QC Batch**
1,1,2,2-Tetrachloroethane	ug/L	**70**	ND	0.20	2767160
Tetrachloroethylene	ug/L	**50**	ND	0.10	2767160
Toluene	ug/L	**0.8**	ND	0.20	2767160
1,1,1-Trichloroethane	ug/L	**10**	ND	0.10	2767160
1,1,2-Trichloroethane	ug/L	**800**	ND	0.20	2767160
Trichloroethylene	ug/L	**20**	ND	0.10	2767160
Vinyl Chloride	ug/L	**600**	ND	0.20	2767160
p+m-Xylene	ug/L	**-**	ND	0.10	2767160
o-Xylene	ug/L	**40**	ND	0.10	2767160
Xylene (Total)	ug/L	**-**	ND	0.10	2767160
Trichlorofluoromethane (FREON 11)	ug/L	**-**	ND	0.20	2767160
Surrogate Recovery (%)					
4-Bromofluorobenzene	%	-	94		2767160
D4-1,2-Dichloroethane	%	-	106		2767160
D8-Toluene	%	-	103		2767160

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: ONTARIO PROVINCIAL WATER QUALITY OBJECTIVES
Ref. to MOEE Water Management document dated Feb.1999

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental

Maxxam Job #: B222699
Report Date: 2012/02/24

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		MN9623		
Sampling Date		2012/02/15 16:00		
	Units	**SUMP**	**RDL**	**QC Batch**
BTEX & F1 Hydrocarbons				
F1 (C6-C10)	ug/L	ND	25	2770026
F1 (C6-C10) - BTEX	ug/L	ND	25	2770026
F2-F4 Hydrocarbons				
F2 (C10-C16 Hydrocarbons)	ug/L	ND	100	2768808
F3 (C16-C34 Hydrocarbons)	ug/L	ND	100	2768808
F4 (C34-C50 Hydrocarbons)	ug/L	ND	100	2768808
Reached Baseline at C50	ug/L	Yes		2768808
Surrogate Recovery (%)				
1,4-Difluorobenzene	%	99		2770026
4-Bromofluorobenzene	%	100		2770026
D10-Ethylbenzene	%	105		2770026
D4-1,2-Dichloroethane	%	103		2770026
o-Terphenyl	%	107		2768808

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental

Maxxam Job #: B222699
Report Date: 2012/02/24

Test Summary

Maxxam ID MN9623 **Collected** 2012/02/15
Sample ID SUMP **Shipped**
Matrix Water **Received** 2012/02/16

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Methylnaphthalene Sum	CALC	2766069	2012/02/22	2012/02/22	AUTOMATED STATCHK
Perchlorate in water	LCMS	2767145	2012/02/17	2012/02/21	JANET DALISAY
Petroleum Hydro. CCME F1 & BTEX in Wat	HSGC/MSFD	2770026	N/A	2012/02/22	SUNG HO KIM
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	2768808	2012/02/21	2012/02/21	JOLANTA KAWZOWICZ
Total Metals Analysis by ICPMS	ICP/MS	2770314	N/A	2012/02/22	AREFA DABHAD
Total Ammonia-N	LACH/NH4	2768497	N/A	2012/02/22	ALINA DOBREANU
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2768472	N/A	2012/02/23	BAVANI KAILAYA
PAH Compounds in Water by GC/MS (SIM)	GC/MS	2768173	2012/02/17	2012/02/21	YUAN ZHOU
Total Kjeldahl Nitrogen in Water	AC	2770291	2012/02/22	2012/02/23	CHANDRA NANDLAL
Volatile Organic Compounds in Water	P&T/MS	2767160	N/A	2012/02/21	VIVEK AKOLKAR

Maxxam ID MN9623 Dup **Collected** 2012/02/15
Sample ID SUMP **Shipped**
Matrix Water **Received** 2012/02/16

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Perchlorate in water	LCMS	2767145	2012/02/17	2012/02/21	JANET DALISAY
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	2768808	2012/02/21	2012/02/21	JOLANTA KAWZOWICZ
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2768472	N/A	2012/02/23	BAVANI KAILAYA
Total Kjeldahl Nitrogen in Water	AC	2770291	2012/02/22	2012/02/23	CHANDRA NANDLAL

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental

Maxxam Job #: B222699
Report Date: 2012/02/24

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental
Attention: Aaron Warkentin
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report

Maxxam Job Number: WB222699

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2767145	JDA	Matrix Spike						
		[MN9623-01]	Perchlorate (CLO4)	2012/02/21		101	%	75 - 115
		Spiked Blank	Perchlorate (CLO4)	2012/02/21		100	%	75 - 115
		Method Blank	Perchlorate (CLO4)	2012/02/21	ND, RDL=0.05		ug/L	
		RPD [MN9623-01]	Perchlorate (CLO4)	2012/02/21	NC		%	20
2767160	VAK	Matrix Spike	4-Bromofluorobenzene	2012/02/21		102	%	70 - 130
			D4-1,2-Dichloroethane	2012/02/21		107	%	70 - 130
			D8-Toluene	2012/02/21		100	%	70 - 130
			Acetone (2-Propanone)	2012/02/21		112	%	60 - 140
			Benzene	2012/02/21		96	%	70 - 130
			Bromodichloromethane	2012/02/21		95	%	70 - 130
			Bromoform	2012/02/21		97	%	70 - 130
			Bromomethane	2012/02/21		96	%	60 - 140
			Carbon Tetrachloride	2012/02/21		91	%	70 - 130
			Chlorobenzene	2012/02/21		92	%	70 - 130
			Chloroform	2012/02/21		97	%	70 - 130
			Dibromochloromethane	2012/02/21		95	%	70 - 130
			1,2-Dichlorobenzene	2012/02/21		91	%	70 - 130
			1,3-Dichlorobenzene	2012/02/21		92	%	70 - 130
			1,4-Dichlorobenzene	2012/02/21		92	%	70 - 130
			Dichlorodifluoromethane (FREON 12)	2012/02/21		96	%	60 - 140
			1,1-Dichloroethane	2012/02/21		94	%	70 - 130
			1,2-Dichloroethane	2012/02/21		99	%	70 - 130
			1,1-Dichloroethylene	2012/02/21		99	%	70 - 130
			cis-1,2-Dichloroethylene	2012/02/21		94	%	70 - 130
			trans-1,2-Dichloroethylene	2012/02/21		91	%	70 - 130
			1,2-Dichloropropane	2012/02/21		101	%	70 - 130
			cis-1,3-Dichloropropene	2012/02/21		108	%	70 - 130
			trans-1,3-Dichloropropene	2012/02/21		105	%	70 - 130
			Ethylbenzene	2012/02/21		104	%	70 - 130
			Ethylene Dibromide	2012/02/21		98	%	70 - 130
			Hexane	2012/02/21		109	%	70 - 130
			Methylene Chloride(Dichloromethane)	2012/02/21		96	%	70 - 130
			Methyl Isobutyl Ketone	2012/02/21		118	%	70 - 130
			Methyl Ethyl Ketone (2-Butanone)	2012/02/21		109	%	60 - 140
			Methyl t-butyl ether (MTBE)	2012/02/21		115	%	70 - 130
			Styrene	2012/02/21		87	%	70 - 130
			1,1,1,2-Tetrachloroethane	2012/02/21		91	%	70 - 130
			1,1,2,2-Tetrachloroethane	2012/02/21		97	%	70 - 130
			Tetrachloroethylene	2012/02/21		85	%	70 - 130
			Toluene	2012/02/21		91	%	70 - 130
			1,1,1-Trichloroethane	2012/02/21		88	%	70 - 130
			1,1,2-Trichloroethane	2012/02/21		95	%	70 - 130
			Trichloroethylene	2012/02/21		86	%	70 - 130
			Vinyl Chloride	2012/02/21		90	%	70 - 130
			p+m-Xylene	2012/02/21		99	%	70 - 130
			o-Xylene	2012/02/21		101	%	70 - 130
			Trichlorofluoromethane (FREON 11)	2012/02/21		87	%	70 - 130
		Spiked Blank	4-Bromofluorobenzene	2012/02/21		101	%	70 - 130
			D4-1,2-Dichloroethane	2012/02/21		101	%	70 - 130
			D8-Toluene	2012/02/21		102	%	70 - 130
			Acetone (2-Propanone)	2012/02/21		120	%	60 - 140
			Benzene	2012/02/21		98	%	70 - 130
			Bromodichloromethane	2012/02/21		94	%	70 - 130
			Bromoform	2012/02/21		97	%	70 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental
Attention: Aaron Warkentin
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: WB222699

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2767160	VAK	Spiked Blank	Bromomethane	2012/02/21		102	%	60 - 140
			Carbon Tetrachloride	2012/02/21		97	%	70 - 130
			Chlorobenzene	2012/02/21		95	%	70 - 130
			Chloroform	2012/02/21		100	%	70 - 130
			Dibromochloromethane	2012/02/21		95	%	70 - 130
			1,2-Dichlorobenzene	2012/02/21		94	%	70 - 130
			1,3-Dichlorobenzene	2012/02/21		96	%	70 - 130
			1,4-Dichlorobenzene	2012/02/21		97	%	70 - 130
			Dichlorodifluoromethane (FREON 12)	2012/02/21		105	%	60 - 140
			1,1-Dichloroethane	2012/02/21		97	%	70 - 130
			1,2-Dichloroethane	2012/02/21		98	%	70 - 130
			1,1-Dichloroethylene	2012/02/21		105	%	70 - 130
			cis-1,2-Dichloroethylene	2012/02/21		96	%	70 - 130
			trans-1,2-Dichloroethylene	2012/02/21		95	%	70 - 130
			1,2-Dichloropropane	2012/02/21		101	%	70 - 130
			cis-1,3-Dichloropropene	2012/02/21		107	%	70 - 130
			trans-1,3-Dichloropropene	2012/02/21		104	%	70 - 130
			Ethylbenzene	2012/02/21		99	%	70 - 130
			Ethylene Dibromide	2012/02/21		96	%	70 - 130
			Hexane	2012/02/21		122	%	70 - 130
			Methylene Chloride(Dichloromethane)	2012/02/21		95	%	70 - 130
			Methyl Isobutyl Ketone	2012/02/21		107	%	70 - 130
			Methyl Ethyl Ketone (2-Butanone)	2012/02/21		112	%	60 - 140
			Methyl t-butyl ether (MTBE)	2012/02/21		106	%	70 - 130
			Styrene	2012/02/21		88	%	70 - 130
			1,1,1,2-Tetrachloroethane	2012/02/21		93	%	70 - 130
			1,1,2,2-Tetrachloroethane	2012/02/21		94	%	70 - 130
			Tetrachloroethylene	2012/02/21		94	%	70 - 130
			Toluene	2012/02/21		95	%	70 - 130
			1,1,1-Trichloroethane	2012/02/21		93	%	70 - 130
			1,1,2-Trichloroethane	2012/02/21		94	%	70 - 130
			Trichloroethylene	2012/02/21		91	%	70 - 130
			Vinyl Chloride	2012/02/21		96	%	70 - 130
			p+m-Xylene	2012/02/21		100	%	70 - 130
			o-Xylene	2012/02/21		102	%	70 - 130
			Trichlorofluoromethane (FREON 11)	2012/02/21		92	%	70 - 130
		Method Blank	4-Bromofluorobenzene	2012/02/21		90	%	70 - 130
			D4-1,2-Dichloroethane	2012/02/21		101	%	70 - 130
			D8-Toluene	2012/02/21		104	%	70 - 130
			Acetone (2-Propanone)	2012/02/21	ND, RDL=10		ug/L	
			Benzene	2012/02/21	ND, RDL=0.10		ug/L	
			Bromodichloromethane	2012/02/21	ND, RDL=0.10		ug/L	
			Bromoform	2012/02/21	ND, RDL=0.20		ug/L	
			Bromomethane	2012/02/21	ND, RDL=0.50		ug/L	
			Carbon Tetrachloride	2012/02/21	ND, RDL=0.10		ug/L	
			Chlorobenzene	2012/02/21	ND, RDL=0.10		ug/L	
			Chloroform	2012/02/21	ND, RDL=0.10		ug/L	
			Dibromochloromethane	2012/02/21	ND, RDL=0.20		ug/L	
			1,2-Dichlorobenzene	2012/02/21	ND, RDL=0.20		ug/L	
			1,3-Dichlorobenzene	2012/02/21	ND, RDL=0.20		ug/L	
			1,4-Dichlorobenzene	2012/02/21	ND, RDL=0.20		ug/L	
			Dichlorodifluoromethane (FREON 12)	2012/02/21	ND, RDL=0.50		ug/L	
			1,1-Dichloroethane	2012/02/21	ND, RDL=0.10		ug/L	
			1,2-Dichloroethane	2012/02/21	ND, RDL=0.20		ug/L	
			1,1-Dichloroethylene	2012/02/21	ND, RDL=0.10		ug/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental
Attention: Aaron Warkentin
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: WB222699

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2767160	VAK	Method Blank	cis-1,2-Dichloroethylene	2012/02/21	ND, RDL=0.10		ug/L	
			trans-1,2-Dichloroethylene	2012/02/21	ND, RDL=0.10		ug/L	
			1,2-Dichloropropane	2012/02/21	ND, RDL=0.10		ug/L	
			cis-1,3-Dichloropropene	2012/02/21	ND, RDL=0.20		ug/L	
			trans-1,3-Dichloropropene	2012/02/21	ND, RDL=0.20		ug/L	
			Ethylbenzene	2012/02/21	ND, RDL=0.10		ug/L	
			Ethylene Dibromide	2012/02/21	ND, RDL=0.20		ug/L	
			Hexane	2012/02/21	ND, RDL=0.50		ug/L	
			Methylene Chloride(Dichloromethane)	2012/02/21	ND, RDL=0.50		ug/L	
			Methyl Isobutyl Ketone	2012/02/21	ND, RDL=5.0		ug/L	
			Methyl Ethyl Ketone (2-Butanone)	2012/02/21	ND, RDL=5.0		ug/L	
			Methyl t-butyl ether (MTBE)	2012/02/21	ND, RDL=0.20		ug/L	
			Styrene	2012/02/21	ND, RDL=0.20		ug/L	
			1,1,1,2-Tetrachloroethane	2012/02/21	ND, RDL=0.10		ug/L	
			1,1,2,2-Tetrachloroethane	2012/02/21	ND, RDL=0.20		ug/L	
			Tetrachloroethylene	2012/02/21	ND, RDL=0.10		ug/L	
			Toluene	2012/02/21	ND, RDL=0.20		ug/L	
			1,1,1-Trichloroethane	2012/02/21	ND, RDL=0.10		ug/L	
			1,1,2-Trichloroethane	2012/02/21	ND, RDL=0.20		ug/L	
			Trichloroethylene	2012/02/21	ND, RDL=0.10		ug/L	
			Vinyl Chloride	2012/02/21	ND, RDL=0.20		ug/L	
			p+m-Xylene	2012/02/21	ND, RDL=0.10		ug/L	
			o-Xylene	2012/02/21	ND, RDL=0.10		ug/L	
			Xylene (Total)	2012/02/21	ND, RDL=0.10		ug/L	
			Trichlorofluoromethane (FREON 11)	2012/02/21	ND, RDL=0.20		ug/L	
		RPD	Acetone (2-Propanone)	2012/02/21	NC		%	30
			Benzene	2012/02/21	10.4		%	30
			Bromodichloromethane	2012/02/21	NC		%	30
			Bromoform	2012/02/21	NC		%	30
			Bromomethane	2012/02/21	NC		%	30
			Carbon Tetrachloride	2012/02/21	NC		%	30
			Chlorobenzene	2012/02/21	NC		%	30
			Chloroform	2012/02/21	NC		%	30
			Dibromochloromethane	2012/02/21	NC		%	30
			1,2-Dichlorobenzene	2012/02/21	NC		%	30
			1,3-Dichlorobenzene	2012/02/21	NC		%	30
			1,4-Dichlorobenzene	2012/02/21	NC		%	30
			1,1-Dichloroethane	2012/02/21	NC		%	30
			1,2-Dichloroethane	2012/02/21	NC		%	30
			1,1-Dichloroethylene	2012/02/21	NC		%	30
			cis-1,2-Dichloroethylene	2012/02/21	NC		%	30
			trans-1,2-Dichloroethylene	2012/02/21	NC		%	30
			1,2-Dichloropropane	2012/02/21	NC		%	30
			cis-1,3-Dichloropropene	2012/02/21	NC		%	30
			trans-1,3-Dichloropropene	2012/02/21	NC		%	30
			Ethylbenzene	2012/02/21	11.6		%	30
			Ethylene Dibromide	2012/02/21	NC		%	30
			Methylene Chloride(Dichloromethane)	2012/02/21	NC		%	30
			Methyl Isobutyl Ketone	2012/02/21	NC		%	30
			Methyl Ethyl Ketone (2-Butanone)	2012/02/21	NC		%	30
			Methyl t-butyl ether (MTBE)	2012/02/21	NC		%	30
			Styrene	2012/02/21	NC		%	30
			1,1,1,2-Tetrachloroethane	2012/02/21	NC		%	30
			1,1,2,2-Tetrachloroethane	2012/02/21	NC		%	30
			Tetrachloroethylene	2012/02/21	NC		%	30

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental
Attention: Aaron Warkentin
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: WB222699

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2767160	VAK	RPD	Toluene	2012/02/21	NC		%	30
			1,1,1-Trichloroethane	2012/02/21	NC		%	30
			1,1,2-Trichloroethane	2012/02/21	NC		%	30
			Trichloroethylene	2012/02/21	NC		%	30
			Vinyl Chloride	2012/02/21	NC		%	30
			p+m-Xylene	2012/02/21	12.5		%	30
			o-Xylene	2012/02/21	NC		%	30
			Xylene (Total)	2012/02/21	12.5		%	30
2768173	YZ	Matrix Spike	D10-Anthracene	2012/02/21		92	%	50 - 130
			D14-Terphenyl (FS)	2012/02/21		61	%	50 - 130
			D8-Acenaphthylene	2012/02/21		87	%	50 - 130
			Biphenyl	2012/02/21		80	%	50 - 130
			Acenaphthene	2012/02/21		91	%	50 - 130
			Acenaphthylene	2012/02/21		89	%	50 - 130
			Anthracene	2012/02/21		94	%	50 - 130
			Benzo(a)anthracene	2012/02/21		91	%	50 - 130
			Benzo(a)pyrene	2012/02/21		75	%	50 - 130
			Benzo(b/j)fluoranthene	2012/02/21		70	%	50 - 130
			Benzo(g,h,i)perylene	2012/02/21		74	%	50 - 130
			Benzo(k)fluoranthene	2012/02/21		74	%	50 - 130
			Chrysene	2012/02/21		86	%	50 - 130
			Dibenz(a,h)anthracene	2012/02/21		80	%	50 - 130
			Fluoranthene	2012/02/21		95	%	50 - 130
			Fluorene	2012/02/21		91	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2012/02/21		76	%	50 - 130
			1-Methylnaphthalene	2012/02/21		72	%	50 - 130
			2-Methylnaphthalene	2012/02/21		72	%	50 - 130
			Naphthalene	2012/02/21		79	%	50 - 130
			Phenanthrene	2012/02/21		92	%	50 - 130
			Pyrene	2012/02/21		97	%	50 - 130
		Spiked Blank	D10-Anthracene	2012/02/21		102	%	50 - 130
			D14-Terphenyl (FS)	2012/02/21		98	%	50 - 130
			D8-Acenaphthylene	2012/02/21		91	%	50 - 130
			Biphenyl	2012/02/21		93	%	50 - 130
			Acenaphthene	2012/02/21		99	%	50 - 130
			Acenaphthylene	2012/02/21		93	%	50 - 130
			Anthracene	2012/02/21		98	%	50 - 130
			Benzo(a)anthracene	2012/02/21		97	%	50 - 130
			Benzo(a)pyrene	2012/02/21		91	%	50 - 130
			Benzo(b/j)fluoranthene	2012/02/21		83	%	50 - 130
			Benzo(g,h,i)perylene	2012/02/21		87	%	50 - 130
			Benzo(k)fluoranthene	2012/02/21		87	%	50 - 130
			Chrysene	2012/02/21		81	%	50 - 130
			Dibenz(a,h)anthracene	2012/02/21		97	%	50 - 130
			Fluoranthene	2012/02/21		105	%	50 - 130
			Fluorene	2012/02/21		96	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2012/02/21		90	%	50 - 130
			1-Methylnaphthalene	2012/02/21		87	%	50 - 130
			2-Methylnaphthalene	2012/02/21		89	%	50 - 130
			Naphthalene	2012/02/21		94	%	50 - 130
			Phenanthrene	2012/02/21		101	%	50 - 130
			Pyrene	2012/02/21		108	%	50 - 130
		Method Blank	D10-Anthracene	2012/02/21		97	%	50 - 130
			D14-Terphenyl (FS)	2012/02/21		101	%	50 - 130
			D8-Acenaphthylene	2012/02/21		87	%	50 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental
Attention: Aaron Warkentin
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: WB222699

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2768173	YZ	Method Blank	Biphenyl	2012/02/21	ND, RDL=0.050		ug/L	
			Acenaphthene	2012/02/21	ND, RDL=0.050		ug/L	
			Acenaphthylene	2012/02/21	ND, RDL=0.050		ug/L	
			Anthracene	2012/02/21	ND, RDL=0.050		ug/L	
			Benzo(a)anthracene	2012/02/21	ND, RDL=0.050		ug/L	
			Benzo(a)pyrene	2012/02/21	ND, RDL=0.010		ug/L	
			Benzo(b/j)fluoranthene	2012/02/21	ND, RDL=0.050		ug/L	
			Benzo(g,h,i)perylene	2012/02/21	ND, RDL=0.050		ug/L	
			Benzo(k)fluoranthene	2012/02/21	ND, RDL=0.050		ug/L	
			Chrysene	2012/02/21	ND, RDL=0.050		ug/L	
			Dibenz(a,h)anthracene	2012/02/21	ND, RDL=0.050		ug/L	
			Fluoranthene	2012/02/21	ND, RDL=0.050		ug/L	
			Fluorene	2012/02/21	ND, RDL=0.050		ug/L	
			Indeno(1,2,3-cd)pyrene	2012/02/21	ND, RDL=0.050		ug/L	
			1-Methylnaphthalene	2012/02/21	ND, RDL=0.050		ug/L	
			2-Methylnaphthalene	2012/02/21	ND, RDL=0.050		ug/L	
			Naphthalene	2012/02/21	ND, RDL=0.050		ug/L	
			Phenanthrene	2012/02/21	ND, RDL=0.030		ug/L	
			Pyrene	2012/02/21	ND, RDL=0.050		ug/L	
		RPD	Acenaphthene	2012/02/21	NC		%	30
			Acenaphthylene	2012/02/21	NC		%	30
			Anthracene	2012/02/21	NC		%	30
			Benzo(a)anthracene	2012/02/21	NC		%	30
			Benzo(a)pyrene	2012/02/21	NC		%	30
			Benzo(b/j)fluoranthene	2012/02/21	NC		%	30
			Benzo(g,h,i)perylene	2012/02/21	NC		%	30
			Benzo(k)fluoranthene	2012/02/21	NC		%	30
			Chrysene	2012/02/21	NC		%	30
			Dibenz(a,h)anthracene	2012/02/21	NC		%	30
			Fluoranthene	2012/02/21	NC		%	30
			Fluorene	2012/02/21	NC		%	30
			Indeno(1,2,3-cd)pyrene	2012/02/21	NC		%	30
			1-Methylnaphthalene	2012/02/21	21.4		%	30
			2-Methylnaphthalene	2012/02/21	20.3		%	30
			Naphthalene	2012/02/21	28.0		%	30
			Phenanthrene	2012/02/21	NC		%	30
			Pyrene	2012/02/21	NC		%	30
2768472	BAV	Matrix Spike						
		[MN9623-01]	Nitrite (N)	2012/02/23		96	%	80 - 120
			Nitrate (N)	2012/02/23		87	%	80 - 120
		Spiked Blank	Nitrite (N)	2012/02/23		93	%	85 - 115
			Nitrate (N)	2012/02/23		94	%	85 - 115
		Method Blank	Nitrite (N)	2012/02/23	ND, RDL=0.01		mg/L	
			Nitrate (N)	2012/02/23	ND, RDL=0.1		mg/L	
		RPD [MN9623-01]	Nitrite (N)	2012/02/23	NC		%	25
			Nitrate (N)	2012/02/23	2.9		%	25
2768497	ADB	Matrix Spike	Total Ammonia-N	2012/02/22		99	%	80 - 120
		Spiked Blank	Total Ammonia-N	2012/02/22		102	%	85 - 115
		Method Blank	Total Ammonia-N	2012/02/22	ND, RDL=0.05		mg/L	
		RPD	Total Ammonia-N	2012/02/22	NC		%	20
2768808	JKA	Matrix Spike	o-Terphenyl	2012/02/21		107	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2012/02/21		98	%	50 - 130
			F3 (C16-C34 Hydrocarbons)	2012/02/21		98	%	50 - 130
			F4 (C34-C50 Hydrocarbons)	2012/02/21		91	%	50 - 130
		Spiked Blank	o-Terphenyl	2012/02/21		107	%	50 - 130

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental
Attention: Aaron Warkentin
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: WB222699

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2768808	JKA	Spiked Blank	F2 (C10-C16 Hydrocarbons)	2012/02/21		83	%	70 - 130
			F3 (C16-C34 Hydrocarbons)	2012/02/21		96	%	70 - 130
			F4 (C34-C50 Hydrocarbons)	2012/02/21		87	%	70 - 130
		Method Blank	o-Terphenyl	2012/02/21		105	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2012/02/21	ND, RDL=100		ug/L	
			F3 (C16-C34 Hydrocarbons)	2012/02/21	ND, RDL=100		ug/L	
			F4 (C34-C50 Hydrocarbons)	2012/02/21	ND, RDL=100		ug/L	
		RPD [MN9623-04]	F2 (C10-C16 Hydrocarbons)	2012/02/21	NC		%	30
			F3 (C16-C34 Hydrocarbons)	2012/02/21	NC		%	30
			F4 (C34-C50 Hydrocarbons)	2012/02/21	NC		%	30
2770026	SHK	Matrix Spike	1,4-Difluorobenzene	2012/02/23		100	%	70 - 130
			4-Bromofluorobenzene	2012/02/23		102	%	70 - 130
			D10-Ethylbenzene	2012/02/23		110	%	70 - 130
			D4-1,2-Dichloroethane	2012/02/23		103	%	70 - 130
			F1 (C6-C10)	2012/02/23		81	%	70 - 130
		Spiked Blank	1,4-Difluorobenzene	2012/02/22		101	%	70 - 130
			4-Bromofluorobenzene	2012/02/22		100	%	70 - 130
			D10-Ethylbenzene	2012/02/22		106	%	70 - 130
			D4-1,2-Dichloroethane	2012/02/22		103	%	70 - 130
			F1 (C6-C10)	2012/02/22		108	%	70 - 130
		Method Blank	1,4-Difluorobenzene	2012/02/22		98	%	70 - 130
			4-Bromofluorobenzene	2012/02/22		99	%	70 - 130
			D10-Ethylbenzene	2012/02/22		103	%	70 - 130
			D4-1,2-Dichloroethane	2012/02/22		103	%	70 - 130
			F1 (C6-C10)	2012/02/22	ND, RDL=25		ug/L	
			F1 (C6-C10) - BTEX	2012/02/22	ND, RDL=25		ug/L	
		RPD	F1 (C6-C10)	2012/02/22	NC		%	30
			F1 (C6-C10) - BTEX	2012/02/22	NC		%	30
2770291	C_N	Matrix Spike [MN9623-03]	Total Kjeldahl Nitrogen (TKN)	2012/02/23		96	%	80 - 120
		QC Standard	Total Kjeldahl Nitrogen (TKN)	2012/02/23		99	%	85 - 115
		Spiked Blank	Total Kjeldahl Nitrogen (TKN)	2012/02/23		94	%	85 - 115
		Method Blank	Total Kjeldahl Nitrogen (TKN)	2012/02/23	ND, RDL=0.1		mg/L	
		RPD [MN9623-03]	Total Kjeldahl Nitrogen (TKN)	2012/02/23	3.1		%	20
2770314	ADA	Matrix Spike	Total Aluminum (Al)	2012/02/22		103	%	80 - 120
			Total Antimony (Sb)	2012/02/22		104	%	80 - 120
			Total Arsenic (As)	2012/02/22		103	%	80 - 120
			Total Barium (Ba)	2012/02/22		102	%	80 - 120
			Total Beryllium (Be)	2012/02/22		102	%	80 - 120
			Total Bismuth (Bi)	2012/02/22		103	%	80 - 120
			Total Boron (B)	2012/02/22		99	%	80 - 120
			Total Cadmium (Cd)	2012/02/22		102	%	80 - 120
			Total Calcium (Ca)	2012/02/22		NC	%	80 - 120
			Total Chromium (Cr)	2012/02/22		102	%	80 - 120
			Total Cobalt (Co)	2012/02/22		101	%	80 - 120
			Total Copper (Cu)	2012/02/22		NC	%	80 - 120
			Total Iron (Fe)	2012/02/22		106	%	80 - 120
			Total Lead (Pb)	2012/02/22		102	%	80 - 120
			Total Lithium (Li)	2012/02/22		103	%	80 - 120
			Total Magnesium (Mg)	2012/02/22		NC	%	80 - 120
			Total Manganese (Mn)	2012/02/22		101	%	80 - 120
			Total Molybdenum (Mo)	2012/02/22		107	%	80 - 120
			Total Nickel (Ni)	2012/02/22		101	%	80 - 120
			Total Potassium (K)	2012/02/22		104	%	80 - 120
			Total Silicon (Si)	2012/02/22		101	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental
Attention: Aaron Warkentin
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: WB222699

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2770314	ADA	Matrix Spike	Total Selenium (Se)	2012/02/22		101	%	80 - 120
			Total Silver (Ag)	2012/02/22		101	%	80 - 120
			Total Sodium (Na)	2012/02/22		101	%	80 - 120
			Total Strontium (Sr)	2012/02/22		NC	%	80 - 120
			Total Tellurium (Te)	2012/02/22		101	%	80 - 120
			Total Thallium (Tl)	2012/02/22		102	%	80 - 120
			Total Tin (Sn)	2012/02/22		104	%	80 - 120
			Total Titanium (Ti)	2012/02/22		110	%	80 - 120
			Total Tungsten (W)	2012/02/22		108	%	80 - 120
			Total Uranium (U)	2012/02/22		104	%	80 - 120
			Total Vanadium (V)	2012/02/22		105	%	80 - 120
			Total Zinc (Zn)	2012/02/22		102	%	80 - 120
			Total Zirconium (Zr)	2012/02/22		108	%	80 - 120
		Spiked Blank	Total Aluminum (Al)	2012/02/22		105	%	80 - 120
			Total Antimony (Sb)	2012/02/22		107	%	80 - 120
			Total Arsenic (As)	2012/02/22		103	%	80 - 120
			Total Barium (Ba)	2012/02/22		105	%	80 - 120
			Total Beryllium (Be)	2012/02/22		105	%	80 - 120
			Total Bismuth (Bi)	2012/02/22		104	%	80 - 120
			Total Boron (B)	2012/02/22		101	%	80 - 120
			Total Cadmium (Cd)	2012/02/22		105	%	80 - 120
			Total Calcium (Ca)	2012/02/22		103	%	80 - 120
			Total Chromium (Cr)	2012/02/22		104	%	80 - 120
			Total Cobalt (Co)	2012/02/22		103	%	80 - 120
			Total Copper (Cu)	2012/02/22		104	%	80 - 120
			Total Iron (Fe)	2012/02/22		108	%	80 - 120
			Total Lead (Pb)	2012/02/22		104	%	80 - 120
			Total Lithium (Li)	2012/02/22		104	%	80 - 120
			Total Magnesium (Mg)	2012/02/22		106	%	80 - 120
			Total Manganese (Mn)	2012/02/22		104	%	80 - 120
			Total Molybdenum (Mo)	2012/02/22		105	%	80 - 120
			Total Nickel (Ni)	2012/02/22		103	%	80 - 120
			Total Potassium (K)	2012/02/22		103	%	80 - 120
			Total Silicon (Si)	2012/02/22		104	%	80 - 120
			Total Selenium (Se)	2012/02/22		103	%	80 - 120
			Total Silver (Ag)	2012/02/22		102	%	80 - 120
			Total Sodium (Na)	2012/02/22		103	%	80 - 120
			Total Strontium (Sr)	2012/02/22		103	%	80 - 120
			Total Tellurium (Te)	2012/02/22		105	%	80 - 120
			Total Thallium (Tl)	2012/02/22		101	%	80 - 120
			Total Tin (Sn)	2012/02/22		107	%	80 - 120
			Total Titanium (Ti)	2012/02/22		108	%	80 - 120
			Total Tungsten (W)	2012/02/22		107	%	80 - 120
			Total Uranium (U)	2012/02/22		105	%	80 - 120
			Total Vanadium (V)	2012/02/22		105	%	80 - 120
			Total Zinc (Zn)	2012/02/22		105	%	80 - 120
			Total Zirconium (Zr)	2012/02/22		108	%	80 - 120
		Method Blank	Total Aluminum (Al)	2012/02/22	0.0085, RDL=0.0050		mg/L	
			Total Antimony (Sb)	2012/02/22	ND, RDL=0.00050		mg/L	
			Total Arsenic (As)	2012/02/22	ND, RDL=0.0010		mg/L	
			Total Barium (Ba)	2012/02/22	ND, RDL=0.0020		mg/L	
			Total Beryllium (Be)	2012/02/22	ND, RDL=0.00050		mg/L	
			Total Bismuth (Bi)	2012/02/22	ND, RDL=0.0010		mg/L	
			Total Boron (B)	2012/02/22	ND, RDL=0.010		mg/L	
			Total Cadmium (Cd)	2012/02/22	ND, RDL=0.00010		mg/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental
Attention: Aaron Warkentin
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: WB222699

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2770314	ADA	Method Blank	Total Calcium (Ca)	2012/02/22	ND, RDL=0.20		mg/L	
			Total Chromium (Cr)	2012/02/22	ND, RDL=0.0050		mg/L	
			Total Cobalt (Co)	2012/02/22	ND, RDL=0.00050		mg/L	
			Total Copper (Cu)	2012/02/22	ND, RDL=0.0010		mg/L	
			Total Iron (Fe)	2012/02/22	ND, RDL=0.10		mg/L	
			Total Lead (Pb)	2012/02/22	ND, RDL=0.00050		mg/L	
			Total Lithium (Li)	2012/02/22	ND, RDL=0.0050		mg/L	
			Total Magnesium (Mg)	2012/02/22	ND, RDL=0.050		mg/L	
			Total Manganese (Mn)	2012/02/22	ND, RDL=0.0020		mg/L	
			Total Molybdenum (Mo)	2012/02/22	ND, RDL=0.00050		mg/L	
			Total Nickel (Ni)	2012/02/22	ND, RDL=0.0010		mg/L	
			Total Potassium (K)	2012/02/22	ND, RDL=0.20		mg/L	
			Total Silicon (Si)	2012/02/22	ND, RDL=0.050		mg/L	
			Total Selenium (Se)	2012/02/22	ND, RDL=0.0020		mg/L	
			Total Silver (Ag)	2012/02/22	ND, RDL=0.00010		mg/L	
			Total Sodium (Na)	2012/02/22	ND, RDL=0.10		mg/L	
			Total Strontium (Sr)	2012/02/22	ND, RDL=0.0010		mg/L	
			Total Tellurium (Te)	2012/02/22	ND, RDL=0.0010		mg/L	
			Total Thallium (Tl)	2012/02/22	ND, RDL=0.000050		mg/L	
			Total Tin (Sn)	2012/02/22	ND, RDL=0.0010		mg/L	
			Total Titanium (Ti)	2012/02/22	ND, RDL=0.0050		mg/L	
			Total Tungsten (W)	2012/02/22	ND, RDL=0.0010		mg/L	
			Total Uranium (U)	2012/02/22	ND, RDL=0.00010		mg/L	
			Total Vanadium (V)	2012/02/22	ND, RDL=0.00050		mg/L	
			Total Zinc (Zn)	2012/02/22	ND, RDL=0.0050		mg/L	
			Total Zirconium (Zr)	2012/02/22	ND, RDL=0.0010		mg/L	
		RPD	Total Aluminum (Al)	2012/02/22	NC		%	20
			Total Antimony (Sb)	2012/02/22	NC		%	20
			Total Arsenic (As)	2012/02/22	NC		%	20
			Total Barium (Ba)	2012/02/22	4.4		%	20
			Total Beryllium (Be)	2012/02/22	NC		%	20
			Total Bismuth (Bi)	2012/02/22	NC		%	20
			Total Boron (B)	2012/02/22	0.2		%	20
			Total Cadmium (Cd)	2012/02/22	NC		%	20
			Total Calcium (Ca)	2012/02/22	5.1		%	20
			Total Chromium (Cr)	2012/02/22	NC		%	20
			Total Cobalt (Co)	2012/02/22	NC		%	20
			Total Copper (Cu)	2012/02/22	4.1		%	20
			Total Iron (Fe)	2012/02/22	NC		%	20
			Total Lead (Pb)	2012/02/22	NC		%	20
			Total Lithium (Li)	2012/02/22	NC		%	20
			Total Magnesium (Mg)	2012/02/22	3.4		%	20
			Total Manganese (Mn)	2012/02/22	NC		%	20
			Total Molybdenum (Mo)	2012/02/22	NC		%	20
			Total Nickel (Ni)	2012/02/22	5.3		%	20
			Total Potassium (K)	2012/02/22	3.4		%	20
			Total Silicon (Si)	2012/02/22	3.4		%	20
			Total Selenium (Se)	2012/02/22	NC		%	20
			Total Silver (Ag)	2012/02/22	NC		%	20
			Total Sodium (Na)	2012/02/22	4.2		%	20
			Total Strontium (Sr)	2012/02/22	1.6		%	20
			Total Tellurium (Te)	2012/02/22	NC		%	20
			Total Thallium (Tl)	2012/02/22	NC		%	20
			Total Tin (Sn)	2012/02/22	NC		%	20
			Total Titanium (Ti)	2012/02/22	NC		%	20

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Harden Environmental
Attention: Aaron Warkentin
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: WB222699

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2770314	ADA	RPD	Total Tungsten (W)	2012/02/22	NC		%	20
			Total Uranium (U)	2012/02/22	5.4		%	20
			Total Vanadium (V)	2012/02/22	NC		%	20
			Total Zinc (Zn)	2012/02/22	NC		%	20
			Total Zirconium (Zr)	2012/02/22	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B222699

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

ADAM ROBINSON, Technical Service

BRAD NEWMAN, Scientific Specialist

FLOYD MAYEDE, Senior Analyst

JEEVARAJ JEEVARATRNAM, Senior Analyst

MAMDOUH SALIB, Analyst, Hydrocarbons

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Evaluation of Three Hydraulic Barriers in Southern Ontario

Prepared for: James Dick Construction Ltd.
February, 2001
File: 9603

HARDEN
ENVIRONMENTAL

4622 Nassagaweya-Puslinch
Townline Rd.
R.R.#1 Moffat, Ontario
L0P 1J0

HARDEN ENVIRONMENTAL

HARDEN ENVIRONMENTAL SERVICES LTD
SPECIALIZING IN GROUNDWATER

R.R. 1, MOFFAT
ONTARIO
L0P 1J0, CANADA
TELEPHONE (519) 826-0099
FACSIMILE (519) 826-9099
E-MAIL SDENHOED@HARDENV.COM
WEB PAGE HTTP://WWW.HARDENV.COM/

Our File: 9603

March 8, 2001

James Dick Construction Ltd.
Box 470
Bolton, Ontario
L7E 5T4

Attention: Mr. Gregory Sweetnam
Property Manager

Dear Mr. Sweetnam,

Re: Barrier Performance Report

We are pleased to present our evaluation of groundwater barriers installed at two sand and gravel pits in Southern Ontario. The barriers are effective in protecting adjacent surface water features.

Sincerely,

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

Introduction

Hydraulic barriers are becoming common features on site plans for aggregate extraction operations. Barriers are features designed to protect groundwater sensitive areas such as wetlands or fisheries. A hydraulic barrier is typically constructed by removing natural geologic material (e.g. sand and gravel) that has a relatively high hydraulic conductivity, and replacing it with geologic materials (e.g. silt or clay) that has a relatively low hydraulic conductivity.

This barrier performance report is an evaluation of the effectiveness of three such hydraulic barriers in southern Ontario. The purpose of the barriers installed at Heritage Lake Pit is to protect Mill Creek and MacCrimmon Creek from hydrogeological impact due to pit operations (Figure 1). The barrier installed at Caledon Sand and Gravel Pit is intended to maintain pre-extraction groundwater levels around Warnock Lake (Figure 2).

Site Descriptions

Heritage Lake Pit

Located in Puslinch Township the site occupies approximately 33 hectare. The site is licensed for a maximum extraction of 500,000 tonnes/year. When removed from below the water table, this volume of material translates into an equivalent water displacement of 6 L/s (98 gal/min). The predominant overburden material is an outwash gravel deposit with a hydraulic conductivity of approximately 10^{-3} m/s. Beneath the sand and gravel deposits lies Wentworth Till, a sandy, stony, silt till. The Wentworth Till overlies the porous, fine-grained dolostone bedrock of the Guelph Formation. Although the till is an effective aquitard, it is not continuous over the entire site. The barriers are necessary during active extraction to minimize impacts to Mill Creek and MacCrimmon Creek the located at distances of 120 m and 650 m, respectively. Post extraction, the influence of the barriers on groundwater flow will be evaluated and the barrier configuration altered if necessary.

Caledon Sand and Gravel Pit

Caledon Sand and Gravel extracts material from the Caledon Meltwater Channel and from the Paris Moraine. Sand and gravel are the dominant materials ranging in hydraulic conductivities from 10^{-2} to 10^{-4} m/s. Relatively continuous lenses of till underlie the sand and gravel. Regionally, the thickness of the overburden ranges from 20 to 75 m overtop of dolostone bedrock of the Manitoulin Formation. The barrier is required post-extraction to address the potential of causing additional water loss from Warnock Lake.

Barrier Construction

Heritage Lake Pit

Construction of the barrier walls was carried out in the period of 24 August to 26 September 1998. The barriers are located between the extractive operations and both Mill Creek and MacCrimmon Creek. The barriers, constructed of a mixture of bentonite, on-site granular material and silt pond fines, were installed to a depth ranging from 2 m to 14 m, concluding 0.5 m into a low permeability soil stratum. During construction, samples of the barrier were taken and testing indicated a hydraulic conductivity of 1.8×10^{-8} cm/s. The barrier locations are shown in Figure 1. The East-West barrier is approximately 750 m long and the North-South barrier is approximately 400 m long.

Caledon Sand and Gravel

Construction of the barrier wall commenced in the Spring of and was 95% completed by October 2000. The barrier is situated between pit operations and Warnock Lake. The core of the barrier is constructed with silt and granular material from on site washing operations. The base of the barrier is 11 m wide, and terminates in natural till. The hydraulic conductivity of the barrier is estimated to be 10^{-8} cm/s. The barrier location is shown on Figure 2. The barrier is approximately 750 m long. A cross-section of the barrier is illustrated in Figure 3.

Barrier Performance Evaluation

The performance of the barrier walls is based on their ability to maintain a greater hydraulic head gradient across the barrier compared to pre-barrier conditions.

Heritage Lake Pit

The hydraulic head distribution across the North-South Barrier on April 24, July 31 and October 11, 2000, is shown in Figure 4. The hydraulic gradient across the barrier is greater than occurred in the natural sand and gravel and water level fluctuations on the MacCrimmon Creek side of the barrier are small relative to the extraction side. A comparison of seasonal water levels before and after barrier installation suggests that groundwater levels continue to fluctuate within pre-barrier limits on the MacCrimmon Creek side of the barrier. The hydraulic head values for the East-West Barrier on September 29 and October 11, 2000, are shown in Figure 5. Water levels on the Mill Creek side of the barrier appear unaffected, despite a lowering of the water levels in the extraction area.

Caledon Sand and Gravel

The hydraulic head distribution across the barrier on May 19, June 28, and November 29, 2000 is illustrated in Figure 6. The dashed lines in this figure show the hydraulic gradient before the

barrier was installed, on May 23, 1996 and August 20, 1997. Before the barrier was installed a small hydraulic gradient was present from 98-2 to 94-2. The available data shows that the seasonal changes in Warnock Lake water levels occur, and remain comparable to historical levels.

Conclusions

The hydraulic barriers installed at Heritage Lake Pit and Caledon Sand and Gravel are effective in maintaining hydraulic separation between pit operations and the groundwater system outside of the barriers. It is found that properly designed and constructed hydraulic barriers are providing adequate protection to the streams and wetlands at the Heritage Lake Pit and the Caledon Sand and Gravel sites.

Stan Denhoed, P.Eng, M.Sc.
Principal

Dru Heagle, M.Sc.
Hydrogeologist

References

Alston Associates Inc., 1998. Geotechnical Design and Construction Inspection, Barrier Walls Proposed Heritage Lake Development, Puslinch Township, Ontario. Reference No. 98-076.

Blackport Hydrogeology Inc., 2000. Threshold Discussion, Heritage Lake Pit, Puslinch Township, Ontario. Reference No. 001031.

England Naylor Engineering Ltd., 1994. Hydrological Investigation Proposed Heritage Lake Residential Subdivision Part of Lots 23, 24, 25, Concession 2, Puslinch Township. Reference No. 0402G1.R01.

Harden Environmental Services Ltd., 2000. Caledon Sand and Gravel 1998/1999 Monitoring Report. File 9401.

MacNaughton, Hermsen, Britton, Clarkson Planning Ltd., 1996. Caledon Sand and Gravel Site Plan, 1996.

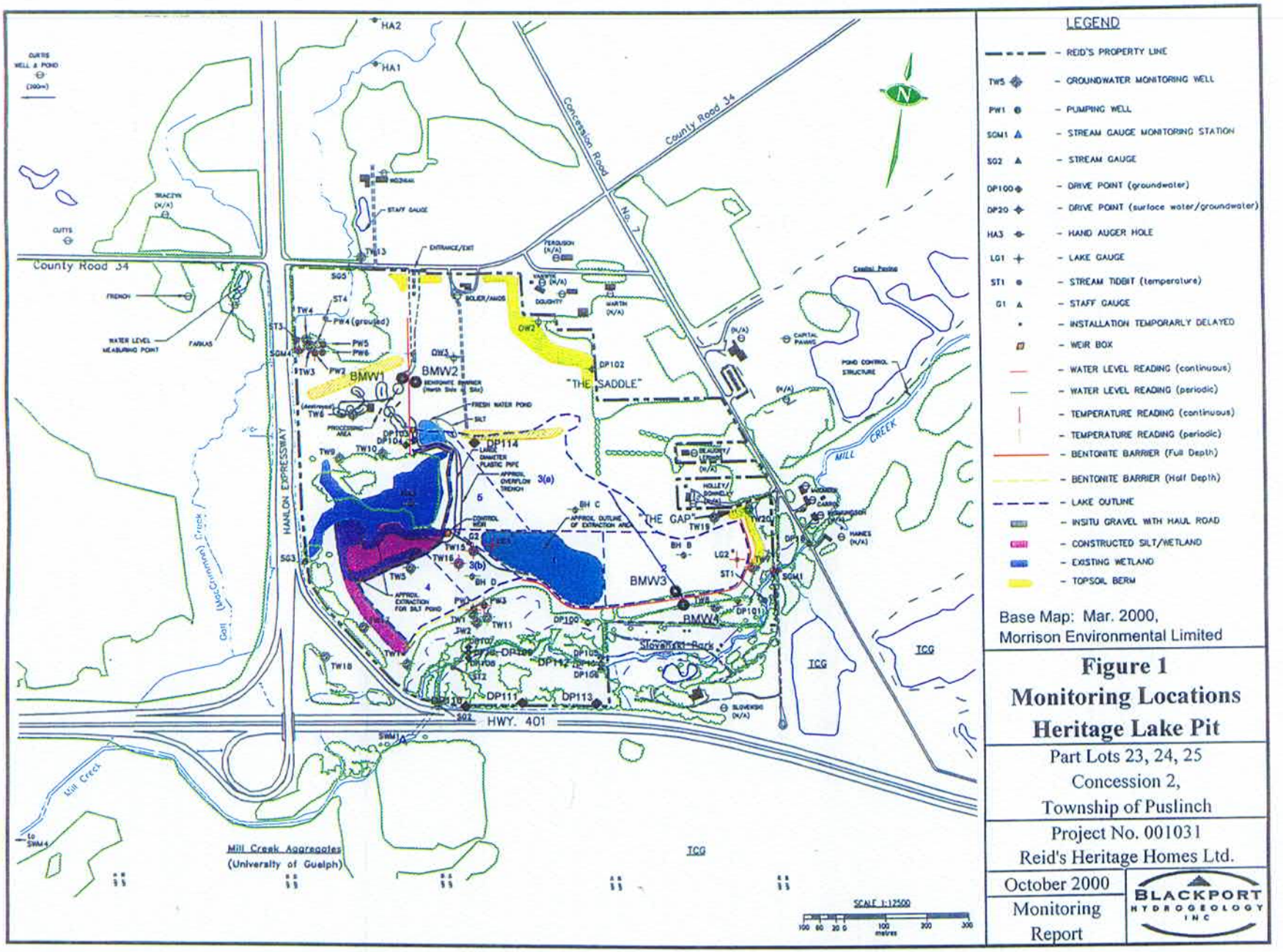


Figure 1. Barrier and Monitoring Well Locations, Heritage Lake Pit. Source: Blackport Hydrogeology Inc., 2000.

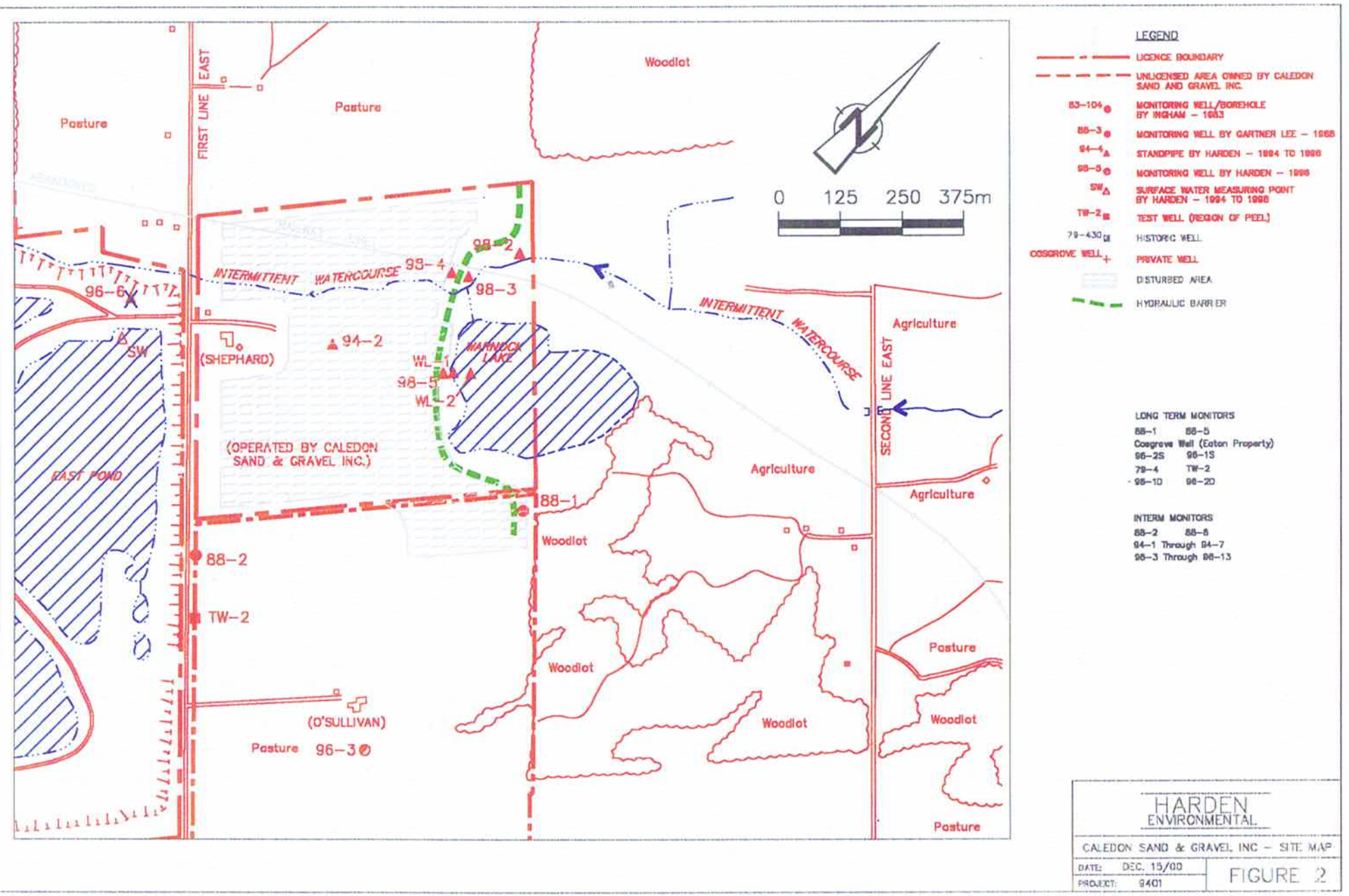
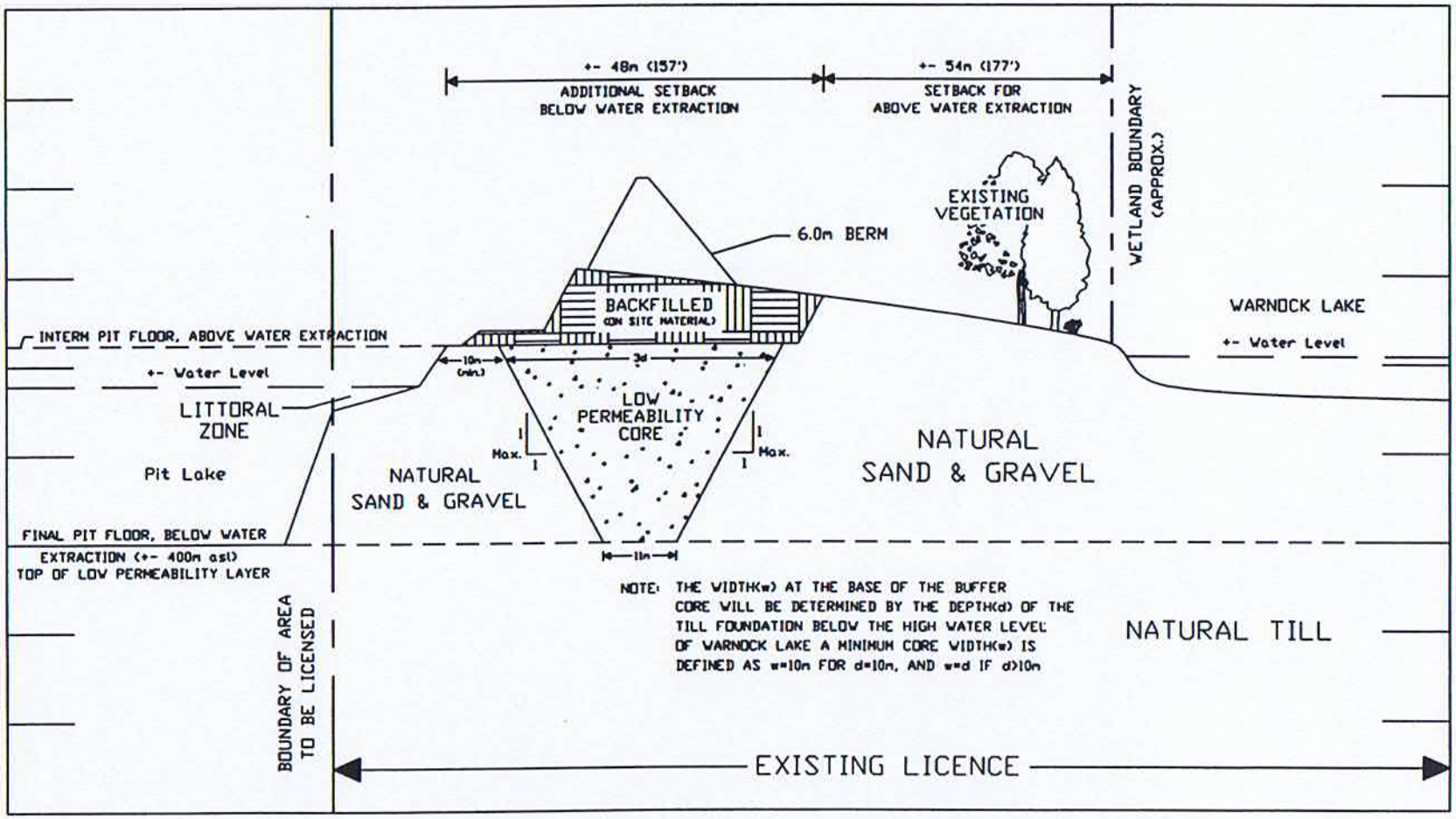


Figure 2. Barrier and Monitroing Well Locations, Caledon Sand & Gravel



HARDEN ENVIRONMENTAL	
CSG - WARNOCK LAKE BARRIER	
DATE: SEP. 22, 2000	DRAWN BY: CP
PROJECT: 9401	

gure 3. Warnock Lake Hydraulic Barrier Cross-Section

Source: MacNaughton, Hermsen, Britton, Clarkson Planning Ltd., 1996.

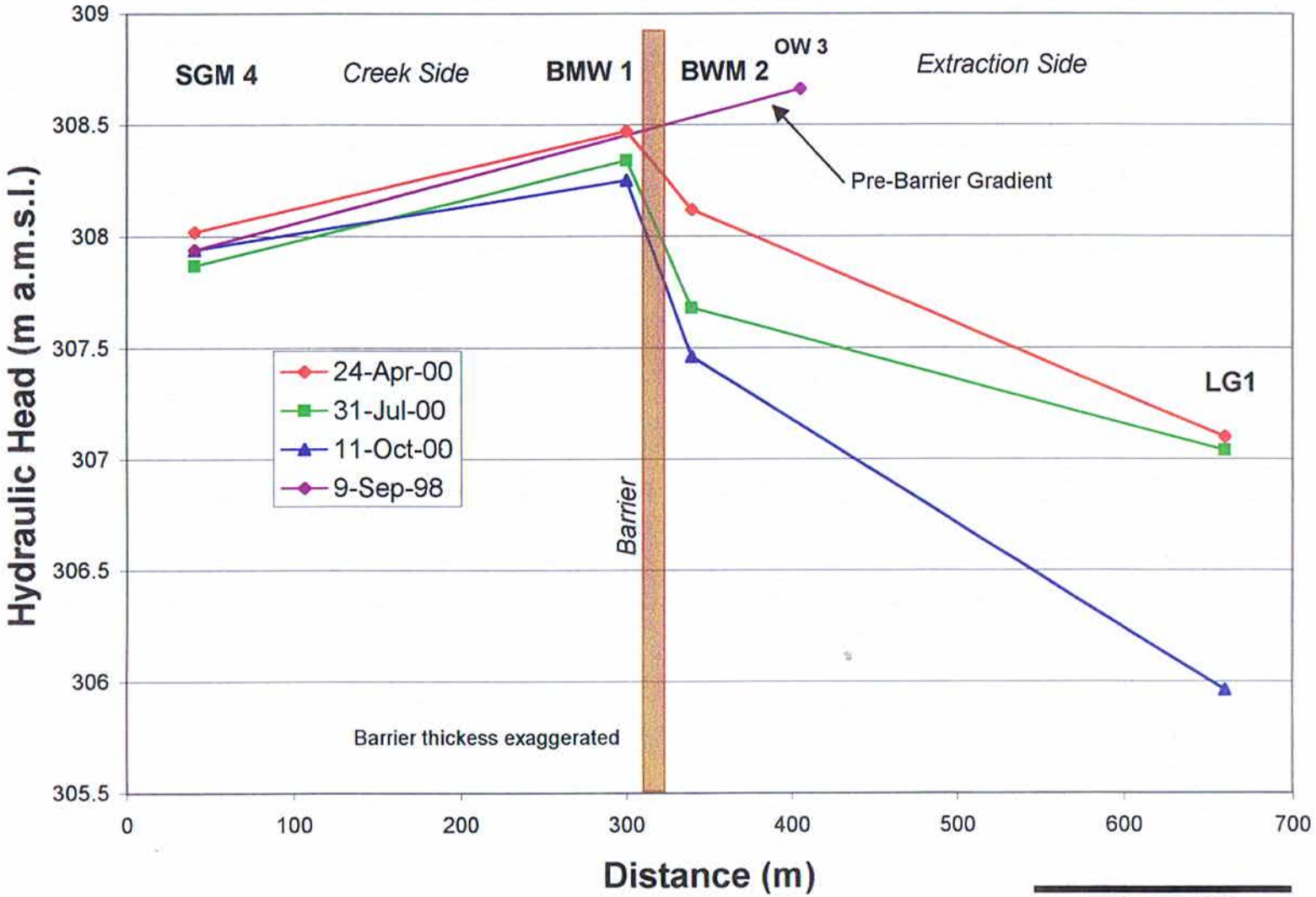


Figure 4. Hydraulic Head Values Across North-South Barrier Heritage Lake Pit

HARDEN
ENVIRONMENTAL

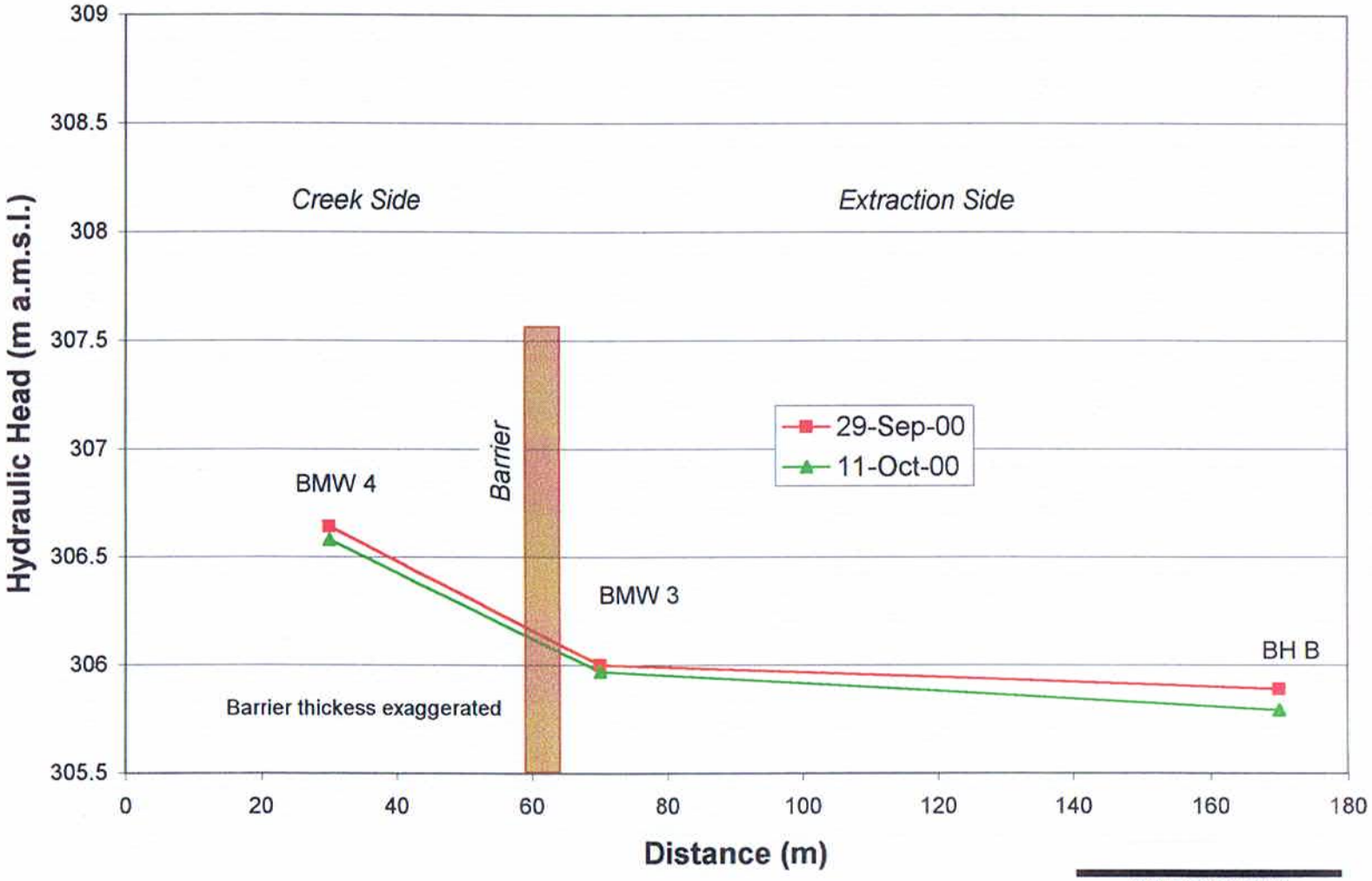


Figure 5. Hydraulic Head Values Across East-West Barrier Heritage Lake Pit

HARDEN
ENVIRONMENTAL

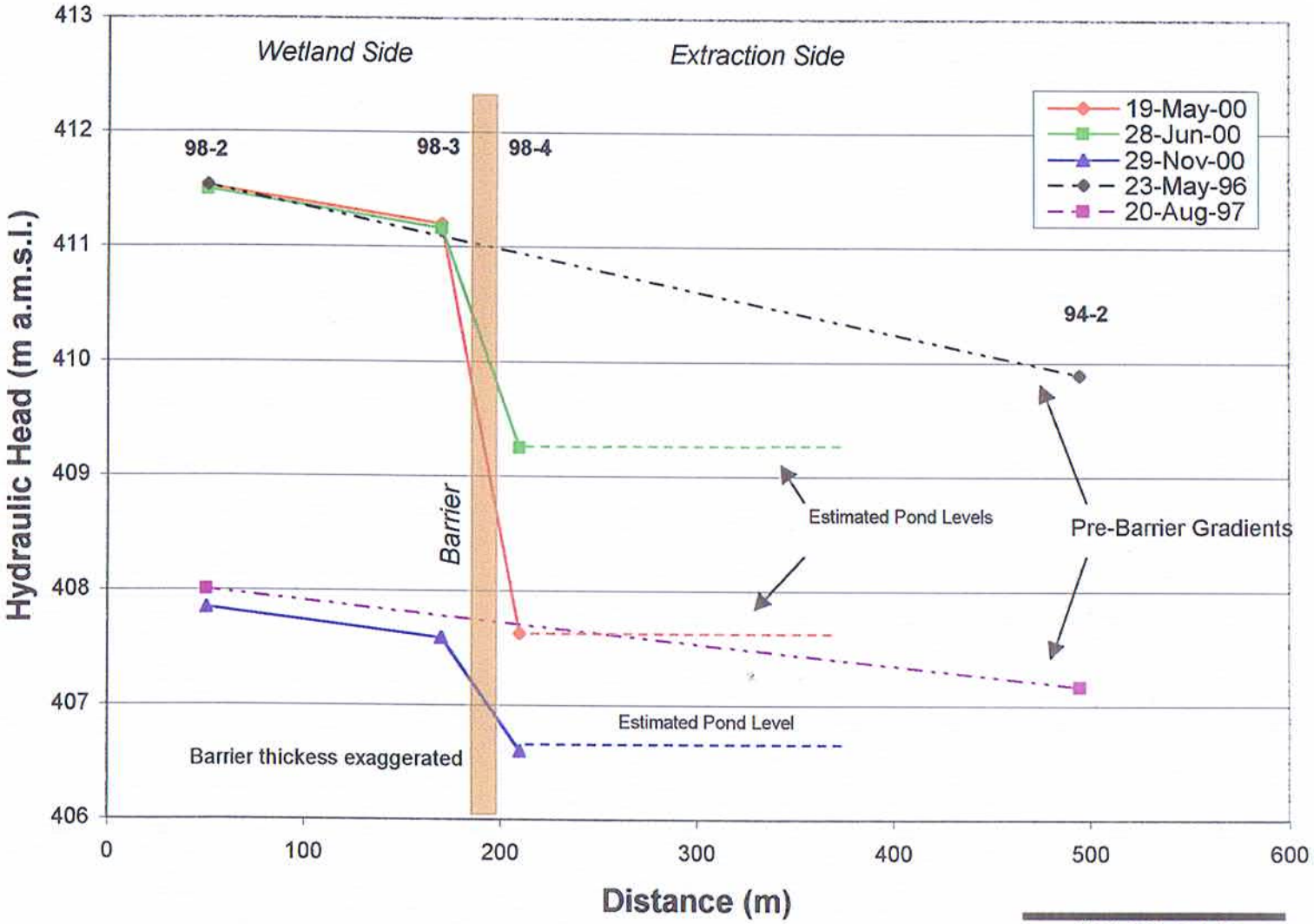


Figure 6. Hydraulic Gradients Across Warnock Lake Barrier Caledon Sand and Gravel

HARDEN ENVIRONMENTAL

Hidden Quarry - Response to Township regarding CRC Hunter Queries July-08-14

#	Contact	Date	Question	Response	Action Item
1	Gary Hunter	20-May-14	What is the vertical geodetic benchmark used to reference the groundwater monitoring infrastructure and site features?	The groundwater monitors and water wells included in the level survey used a benchmark known as the 1978 Southern Ontario Adjustment available from the Ministry of Transport Ontario. The vertical benchmark is based on the Canadian Geodetic Vertical Datum 1928 (CGVD28). The actual benchmark used was DHO PRECISE BM 700-87 ELEVATION 347.587 m AMSL.	None
2	Gary Hunter	20-May-14	Are all infrastructure features, contour mapping and the Site Plan referenced to this same vertical benchmark network?	The contour mapping is based on the 1 m contour interval available from the GRCA. No vertical benchmark is noted in the meta data for this layer other than being a projection of NAD83/UTM Zone 17N. As shown on Figure 3.5, all purple coloured well locations and yellow colour monitoring well locations were surveyed with a common vertical datum based on the MTO benchmark.	None
3	Gary Hunter	20-May-14	What is the source of the MOE Water Well Record ground elevations in the Harden 2012 Report Appendix F - Table F1? Have any location corrections been applied?	The ground elevations are obtained from the MOE Water Well Information System (WWIS). No elevation or location corrections have been applied in this table.	None
4	Gary Hunter	20-May-14	Have ground elevations been adjusted for the referenced MOE Well Records in Appendix G Table G1?	There are no ground elevations referenced on Table G1. Of the wells listed in Table G1, the following have been level-surveyed relative to the on-site monitors; W1, W3, W4, W8,W10, W12, W13, W14, W17, W18, W19, W25 and W26	None
5	Gary Hunter	20-May-14	In Table G1, what is the source of the well depths and static water levels? Where 'btoc' is referenced, what is the 'stick up' to allow equation with the Water Well record ground elevation depth references?	Well depths and static water levels are field measurements where value is provided. When the homeowner provided an approximate depth this is noted as such. Stick-up measurements were made on the following wells: W1, W2, W3, W4, W8, W12, W13, W14, W16, W25 and W26.	None
6	Gary Hunter	20-May-14	In Table G1 Site W22 (5198 Hwy 7) the well is reported to be in a 'pit' for survey dates of Oct 1995 and Nov 2011. How did the Applicant confirm this is MOE well No. 28-02047 ?	MOE Licenced Well Technicians visited the site on those occasions and found the 4" well to be in a pit. The age of the well based on site interview with the owner and the diameter of the well led us to assign the MOE well number to the well.	None
7	Gary Hunter	20-May-14	Well MOE 67-08195 completed June 10, 1985 contains a sketch dimensioned location at 150 ft north of Hwy 7 and 300 ft east of the 6th Line within the proposed Hidden Quarry property. The stratigraphy, water founds and static levels are consistent with other wells on the property. Is the Applicant aware of this well? I do not see it in monitoring records; please explain.	This well does not exist at this location. It was plotted on Figure 2.6 for completeness and then was removed from consideration in all subsequent discussions and evaluations. The original well record has the well located in Concession 5, Lot 1 and the overburden is approximately 2 metres thick. This does not correlate to any on-site investigations. The well owner given as Joseph Scarola was never an owner of this property.	None
8	Gary Hunter	20-May-14	Correspondence with the owner confirms that MOE Well No. 67-0745 is located at 4943 6th Line (W5), not at 4953 6th Line (W8) as indicated in Table G-1. A well record for W8 has not yet been found. How does this revised well location impact the Applicant's response to Burnside? Please provide a copy of your Table G-1 well survey notes for the W8 site.	We have no knowledge of well No. 67-0745 and do not reference this well anywhere in our documents. Based on our well survey and discussions with Mr. Mike Bonus (the home owner at the time of survey) at 4953 6th Line the previous owner was Mr. Glendenning matching the name on the water well record. The resident at 4943 6th Line has on three occasions refused to particpate in our well survey. If the well record has been incorrectly assigned and should be assigned to 4943 6th Line, there is no change in our intepretation of potential impact to the well yield. The well record shows that water was found at 18.8 m and there is a static water level of 4.57 metres. Pumping at a rate of 15 gallons per minute resulted in a drawdown of 1.52 metres. This confirms that the well is a high volume producing well with low water level change when stressed.	None
9	Gary Hunter	20-May-14	Table G1 reports surveying W31 (4970 7th Line) well on Oct 1995 and Mar 2012. A drilled well is reported located in front of the house. Well depth and static level are reported as unknown. No MOE # has been found. How is the Table G1 survey consistent with the well in use at the property or with the Harden (2012) Sec 3.6.1.1 pg 19 the and No 63 Response in the Hidden Quarry Comment Documentation which each describe a dug well at the property? Please explain and provide your detailed survey inspection field notes and sketches for the well at 4970 7th Line. A survey by an independent MOE licenced well technician may be required to correct the records.	When visisted in 1995 the owner indicated that the well was drilled and did not provide access to the well as the concrete well cover was in poor condition. The same answer was provided in 2011. It was not until 2012 that access was permitted to the well by Ms. Degrandis and it was found to be a shallow dug well. A licensed MOE well technician did survey the well on each occasion.	None
10	Gary Hunter	20-May-14	Table G1 is unreliable and to be useful requires a rigorous on site well inspection and update including surveyed ground elevations, well depths and static water level observations at each well by an independent MOE licenced well technician.	A detailed well survey has been agreed to by James Dick Construction Ltd. This will be carried out by a licensed well technician.	None
11	Gary Hunter	20-May-14	Please provide the digital spreadsheet (.xls) for Table B2 and B4 updated to May 2014. Also corresponding updated Hydrographs as available.	Tables submitted show data back to the 1990's. Data collection will occur according to the monitoring program and all data will be presented in the monitoring reports.	None
12	Gary Hunter	20-May-14	Please provide a copy of the Harden (1998) Report as referenced in Sec 2.5 Hydraulic Testing pg 7 (Harden 2012).	Available as a public document from the Township of Guelph Eramosa for East Half of Lot 1, Concession 6, Township of Guelph-Eramosa. Property is owned by Graham and Charlotte Mudge.	None
13	Gary Hunter	20-May-14	Please provide Table C1 with updated monitoring to April 2014 in digital spreadsheet form. Also corresponding Fig C1 Hydrographs as available.	Tables submitted show data back to the 1990's. Data collection will occur according to the monitoring program and all data will be presented in the monitoring reports.	None
14	Gary Hunter	20-May-14	Does the Applicant have any information on the formational dip of the bedrock strata (top of Cabot Head) at the Hidden Quarry site?	The top of shale was encountered at an elevation of 308.52 m AMSL in M15 and 308.81 m AMSL in M2. The regional dip of the bedrock strata is estimated to be 0.2 to 0.3%, dipping towards the south west.	None
15	Gary Hunter	20-May-14	The Applicant has identified Goat Island Formation above 350 m asl in Borehole M15 at Hidden Quarry site. Is Goat Island present in other site boreholes where the bedrock surface is higher than about 350 m asl?	Bedrock was encountered at higher elevations in M2, M12 and TP9. It is possible that the Goat Island formation is present at those locations.	None
16	Gary Hunter	20-May-14	Please provide a copy of the preliminary assignment of the unsubdivided Ambel Formation in borehole M2 into Goat Island, Gasport, Irondequoit, Rockway and Merritton Formations and any comments from Dr Brunton (Harden 2012, Sec 3.5.1, pg 15).	The Harden 2012 report states that there has been no assignment of the core into the new nomenclature suggested by Frank Brunton.	None
17	Gary Hunter	20-May-14	Please provide a copy of the MW-08-T3-06 well log as referenced in Harden 2012, Sec 3.5.1, pg 15).	This is available from the City of Guelph and or the Grand River Conservation Authority. We do not have permission to distribute.	None
18	Gary Hunter	20-May-14	Will the Goat Island Rock be separated from or blended into the commercial crushed rock aggregate produced in the proposed quarry?	The Goat Island, where present in trace amounts, will not be mined in a separate bench and will be blended into the appropriate products.	None
19	Gary Hunter	20-May-14	What preparation of the weathered bedrock surface will be required to provide a staging area for underwater blasting preparation at Hidden Quarry?	No special preparation is required.	None
20	Gary Hunter	20-May-14	The Sept 2012 Site Plan Notes specify maximum extraction depth at 317 m asl (pg 3 of 5) and the figures on pg 4 of 5 specify the floor of the rehabilitated quarry lake at 320 m asl. The Applicant response in the Hidden Quarry comment documentation says the minimum depth will be 320 m asl. What quarry depth has the Applicant's Hydrogeologist recommended?	No recommendation with respect to final depth were made by Harden Environmental Services Ltd. The current mining elevation of 327 MASL is a compromise made by the operator to leave undisturbed rock at depth and is a practical depth of extraction for equipment currenly employed by the operator. Burnside suggested that the quarry depth should be adjusted to avoid the deeper fracture set. The operator has agreed to this.	None

21	Gary Hunter	20-May-14	The Applicant's bedrock flow test for Well M15 (Harden July 15, 2013 Letter Appendix B Sec 3.1 pg 6) indicated that approximately one third of the well yield was obtained from various fractures between elevation 350 m asl to above 324 m asl and two thirds of the well yield was obtained from a single set of fractures at 324 m asl and from a fracture at 318 m asl (one third each).	No comment.	None
22	Gary Hunter	20-May-14	The Applicant also reported poor hydraulic connectivity between the shallow bedrock and deeper fractures at M15. The lower part of the borehole below about 315 m asl including the Cabot Head formation contact at 308.5 m asl was described as not an active part of the flow system. Does the Applicant have any comparative observations of shallow vs deeper aquifer hydraulic heads (vertical gradients) in the proposed Site Plan Extraction Area?	M15 is located within the Site Plan extraction area. Hydrualic potentials for four individual sections of the aquifer are provided in the Harden Environmental response to R. J. Burnside on June 10, 2014	None
23	Gary Hunter	20-May-14	Will the higher yield deeper aquifer from 324 to 318 m asl be the primary control for quarry pond water levels and the upgradient propagation of quarry drawdown impacts?	No. James Dick Construction Ltd. has agreed to limit quarry depth to 327 m AMSL.	None
24	Gary Hunter	20-May-14	Does the Applicant have any observations at all of the hydraulic heads in the 324 to 318 m asl deep aquifer zone? What aquifer zones do the static levels observed in Monitors M2 and M4 actually represent?	Yes. M15 was converted into a multi-level monitoring station with hydraulic heads measured in the fractures identified at 324 and 318m AMSL. This information is provided in Harden , June 10, 2014. The vertical head profile shows very little difference, with both vertically downward and upward gradients observed betwen fractures. The static water levels in M2 and M4 represent average hydraulic potential over the open borehole between the bottom of the well and the bottom of the well seal shown on the borehole records.	None
25	Gary Hunter	20-May-14	Is the 324 to 318 m asl fractured rock aquifer zone in M15 coincident with the aquifer discharge zone on the lower slopes and floor of the Blue Spring Creek Valley to the south?	The elevation of Blue Springs Creek nearest to the site is approximaetly 330 m AMSL and where it crosses beneath 5th Line Nassagaweya has an elevation of approximatley 325 m AMSL. Therefore, these fractures are lower than the ground surface in the Blue Springs Creek valley.	None
26	Gary Hunter	20-May-14	When will the Hidden Quarry Comment Documentation (Mar 13, 2013) be updated to reflect the results from the M15 hydrogeological testing and the extended on site groundwater monitoring?	All testing of M15 has been included in correspondence with R.J. Burnside and Associates.	None
27	Gary Hunter	20-May-14	Would you agree that the vertical interval from 324 to 318 m asl in borehole M-15 is part of Brunton's and Gartner Lee's regional 'Production Zone' Aquifer?	There is no 'production zone aquifer' identified as a separate aquifer within the Gasport Formation. Our review of the Brunton (OFR 6226) confirms that the term 'production zone ' was not used to describe any portion of the Gasport aquifer. A 'production zone' was identifed by Gartner Lee as a higher yielding section of the formerly unsubdivided Amabel aquifer. We agree that the fractures identified at 324 and 318 m AMSL in M15 could fall within the 'production zone' of the Gasport Aquifer.	None
28	Gary Hunter	20-May-14	What would the Applicant estimate the specific yield of M15 and the potential capacity of a production well if located at Hidden Quarry M15?	Similar to the Municipal wells TW3 and TW4.	None
29	Gary Hunter	20-May-14	Please provide copies of the database input files. Please also provide the water and observation well files including static water level observation dates for the area within 1500 m of the proposed quarry site boundaries.	Appendix H describes the input parameters. MOE well data is available for the area.	None
30	Gary Hunter	20-May-14	Is it fair to say that the modelling is based primarily on 'kriged' multi season 'open hole' water well static level data with a general bias towards shallower bedrock water wells?	The statement is inaccurate. The modeling output is not based on any water levels. The groundwater model output is based on the assigned parameters of recharge, hydraulic conductivity and porosity (storage) and the vertical and horizontal constraints assigned within the model (i.e. boundary conditions).	None
31	Gary Hunter	20-May-14	What is the statistical variability of the 'predicted water levels' and 'maximum predicted water level change' estimated in Fig 10 and Fig 11 of the Modelling Report? Is ± 5 m a fair estimate for Fig 10? What about Fig 11?	There is no statistical variability in the outcome of the model. The values presented in Figures H10 and H11 represent unique values based on a certain set of model input values.	None
32	Gary Hunter	20-May-14	Is there sufficient unique regional hydraulic data to model the hydraulic heads of the deep aquifer as identified in the Hidden Quarry site for the elevation interval between 324 and 318 m asl?	It is well accepted that the Gasport Aquifer can be modelled as a continuum. The fractures located between 324 m AMSL and 318 m AMSL will not be intersected by the quarry.	None
33	Gary Hunter	20-May-14	Considering that there will be a water deficit within the quarry pond footprint due to evaporation increases, where will the water come from that raises the Applicant predicted groundwater levels and increases flows on the downgradient side of the quarry?	It is estimated that there will be an additional capture of 3600 m3 of water in microdrainage area D1 and 2500 m3 of water in microdrainage area D2. The estimated increase in evaporation at the site is 18,765 m3 resulting in an overall loss of 12,665 m3 annually. To put this into perspective, the annual precipitation at the site has historically ranged from 243,712 m3 to 482,854 m3. Thus the change in evaporation is insignificant relative to the variability in precipitation. The extraction of the rock creates a space within the aquifer with infinite transmissivity. This results in the same hydraulic potential in the quarry pond despite groundwater potentials decreasing northwest to southeast by several metres in the adjacent aquifer. The magnitude of the hydraulic potential in the pond has been shown via the modeling effort and as observed at several existing gravel pit ponds to be somewhat of an average between the pre-extrction upgradient and downgradient hydraulic potentials in the aquifer. This effect results in a drawdown at the upgradient side of the quarry and a potentiometric surface rise in the downgradient side of the quarry. The "increased" flow downgradient is a very localized effect and results from adjacent aquifer water flowing into the quarry pond in the northern half of the pond needing to flow out of the southern half of the pond.	None
34	Gary Hunter	20-May-14	Will the upgradient groundwater divides move away from the quarry with reduced water level elevation to capture more water from adjacent catchments?	The Eramosa River/Blue Springs Creek groundwater shed divide occurs at a hydrualic potential of approximatley 365 m AMSL or 15 metres greater in hydraulic potential than occurs at the site. The watersheds are very large and any potential disturbance to the groundwater shed divide is small and local to the proposed quarry. Any diversion of water from the Eramosa River to the Blue Springs Creek watershed will not be measureable.	None
35	Gary Hunter	20-May-14	The Sept 21, 2012 Site Plan Notes (pg 4 of 5) predicts the west quarry final lake level at 348.6 m asl and the east quarry lake at 348.4 m asl. However the wetland creation Notes (pg 4 of 5) estimate final quarry pond water tables at ± 346 to 349 m asl.	It appears that Hunter has misunderstood this Site Plan Note. The elevations (+/- 346 to 349 masl) refer to the bottom of the wetlands not the pond water elevation. These elevations are noted as it is desireable to have 0- 2m of water in the wetland areas.	None
36	Gary Hunter	20-May-14	The Harden (2012) Fig 3.17 shows a water level decline across the quarry extraction limits from 354 to 347 m asl (7 m difference). Appendix H Fig 11 shows a drawdown of 1.8 m on the north extraction limit and a rise of about 1.2 m at the south limit. Where did the other 4 m of the pre-quarry vertical gradient go?	As indicated in our report, the maximum water level decline in the quarry is 2.45 m at the northern edge and a rise of 2.81 at the southern edge for a total change of 5.26 metres. The reason that this does not add up to 7 metres is that the final predicted water level determined by the model equalizes inputs to the pond with outputs. For example, only a small portion of the proposed pond perimeter is presently exposed to the lower hydraulic potential of 347 m AMSL and thus has less of an influence on the final water level. If the quarry edges were parallel to the groundwater equipotentials, then the final water level in the pond would be a statistical mean of the pre and post hydruaulic potentials.	None
37	Gary Hunter	20-May-14	Has the Applicant overestimated the final quarry pond levels and underestimated the bedrock aquifer drawdowns upgradient of the quarry?	No. A scientifically sound approach was used to estimate the final quarry pond level and bedrock aquifer water level changes upgradient of the site.	None
38	Gary Hunter	20-May-14	Are the average late summer / early fall water low levels more likely to be in the 346 m asl range consistent with the lower limit shown in the Site Plan Rehabilitation Notes (pg 4 of 5)?	It is not reasonable to expect the final water level in the West Pond to be in the order of 346 m AMSL. The lowest historical water level recorded in M4 at the southern edge of the licensed area is 345.5 m AMSL and the lowest historical water level in M1D located near the upper edge of the proposed quarry is 350.63 m AMSL. The final water level in the West Pond will stabilize somewhat above the mean of these two values (348.6 m AMSL) . Hunter has misread the notes on Page 4 of 5 as they pertain to the floor elevation of the wetland, not the water level of the quarry pond.	None

39	Gary Hunter	20-May-14	The Harden (2012) Fig 3.17 plot referenced above is based mainly on spring season (May 31, 2011) high water levels. Please provide a corresponding late summer / early fall plot using 'same date' data.	A substantial quantity of data has been presented including late summer and fall. Please refer to the tables in the report.	None
40	Gary Hunter	20-May-14	Will the actual drawdowns be sufficient during dry season to interfere with bored and shallow bedrock wells and streams (and ponds) fed by bedrock springs up to 1 km or more upgradient of the quarry?	It is our professional opinion, as expressed in our report, that springs, ponds and shallow dug wells upgradient of the site will not be affected by the anticipated change in bedrock water levels. A high degree of monitoring as requested by the Township of Guelph Eramasa and the Ministry of the Environment has been agreed to by James Dick Construction Ltd. to verify this opinion. Phase 1 of the quarry extraction is predicted to have a negligable impact on bedrock water levels upgradient of the site thus providing a significant period of time to obtain additional baseline information to be gathered prior to potential water level changes occuring in the bedrock upgradient.	None
41	Gary Hunter	20-May-14	Based on the Applicant predicted increased quarry water level at 348.6 m asl, will the forested kettle depression located on private property immediately south of MW4 and Highway 7 experience root zone flooding and dieback?	The kettle depression has an estimated minimum elevation of 349 m AMSL according to the one metre contour interveal mapping provided by the GRCA. As shown on Figure 3.17 the potentiometric surface has an elevation of approximately 346 m AMSL. The predicted water level rise beneath the kettle depression, as shown on Figure 4.3 is approximately one metre. Therefore, root zone flooding is not predicted to occur.	None
42	Gary Hunter	20-May-14	How does the Applicant propose to create a dry staging platform for drilling and blasting? Will positive or passive dewatering be required?	The dry platform is either formed by the surface of the bedrock, or where the surface of the bedrock is submerged, by a layer of shot rock. No dewatering will occur. Drilling will occur to a maximum of 327 masl.	None
43	Gary Hunter	20-May-14	Has the Applicant considered progressively mining from the southeast upgradient into the higher northwest water tables of the site?	Various scenarios have been considered and the current phasing as presented is the preferred approach.	None
44	Gary Hunter	20-May-14	Will adaptive management based on southerly site quarrying with a more gradual drawdown of northerly boundary groundwater monitors be more effective than initiating quarrying in the deeper water to the north as proposed on the Sept 2012 Site Plans (pg 2 of 5)?	No. The greatest water level change occurs when mining Phase 3 (southern half of the quarry on the west side of Tributary B). The mining of Phase 1 (northern half of the west side of Tributary B) results in a predicted water level change of less than five centimetres beneath the Allen and De Grandis properties.	None
45	Gary Hunter	20-May-14	Does the Applicant propose to waste the silty till overburden spoil or place imported fill in the quarry excavation?	There is no proposal to import any offsite fill or snow onto the property. Native onsite soils may be used for wetland and habitat creation in the pond.	None
46	Gary Hunter	20-May-14	How does the Applicant propose to maintain clear clean unobstructed groundwater flow to nearby domestic and commercial wells through the life cycle of the quarry excavation ?	The quarry ponds are stillwater features and therefore the majority of deposition of rock fines will occur in the quarry ponds themselves. Groundwater flow occurs very slowly and any turbidity entering the aqufier downgradient of the site will settle out of the water. The mobilzation of fine particles in the Gasport Aquifer and was observed during thepumping of M15 and also in other Gasport aquifer wells. This shows that the flow rate in the aquifer is too slow to mobilize fine particles. No obstructions to southerly groundwater flow are being proposed at this quarry (e.g. barrier walls) and therefore groundwater flow will continue to occur as it presently does. Approximately half of the overall bedrock thickness will remain undisturbed and water will continue to flow beneath the quarry as it does today.	None
47	Gary Hunter	20-May-14	Will the quarry walls become clogged with silt turbidity or be barricaded by lower permeability waste spoil ?	Our experience with other quarries is that quarry walls do not become clogged with silty turbidity and we do not anticipate any clogging of fractures at this quarry. Fine-grained material generated by the extraction of the overburden will be used in rehabilitation above-the-water-table, where needed for wetlands within the quarry pond or removed from the site to be used in products produced elsewhere.	None
48	Gary Hunter	20-May-14	Will the Site Plans specify that a Permit to Take Water and an Environmental Compliance Approval to Discharge Wash Water is required?	Any permits required by the MOE are governed by other legislation. The site plan makes note of permits that may be required.	None
49	Gary Hunter	20-May-14	Please provide Warnock Lake supporting technical information - say pre and post extraction hydroperiod monitoring and historical aerial imagery to support this observation.	The attached report "Evaluation of Three Hydraulic Barriers in Southern Ontario" (Harden Environmental, 2001) shows pre and post water level monitoring confirming barrier effectiveness at Warnock Lake and Heritage Lake.	"Evaluation of Three Hydraulic Barriers in Southern Ontario" (Harden Environmental, 2001) attached.
50	Gary Hunter	20-May-14	What will stop groundwater flows around the ends of the proposed northwest wetland hydraulic barrier in the proposed Hidden Quarry?	Groundwater must flow around the ends of the proposed hydraulic barrier. The purpose of the hydraulic barrier is to cause water levels to rise and flow around the barrier. The barrier is positioned parallel to groundwater flow and similar to an obstruction in a stream, will cause the water level to rise and flow around the obstruction. Our observation is that there is significant groundwater flow in the overburden sand and gravel on the upgradient side of the wetland and therefore we have included an overflow structure at 355.8 m AMSL to prevent excessive flooding of this wetland.	None
51	Gary Hunter	20-May-14	The Harden Sept 2012 Appendix E Fig 1 Sampling Location illustrates a rock drill operating from a dry platform. Is this dry platform maintained by dewatering (sump reference in the title of Table 1)? What are the depths of rock drilling? Is this dry drilling platform the top of the 'Gasport' Formation?	The dry platform is either formed by the surface of the bedrock, or where the surface of the bedrock is submerged, by a layer of shot rock. No dewatering will occur. Drilling will occur to a maximum of 327 masl.	None
52	Gary Hunter	20-May-14	Please provide a certified copy of the Laboratory Analytical Report(s) for this Feb 15, 2012 sample.	See attached.	Maxaam Validated Certificate of Analysis attached.
53	Gary Hunter	20-May-14	However this single grab sample (Appendix E Table 1) illustrates Provincial Water Quality Objective criteria exceedances for Cobalt, Lead and Zinc (Note Zinc (revised) as 20 µg/L). Total Ammonia -N concentration is at about 80%, Unionized Ammonia at 25 % and Nitrate at about 12 % of the PWQO. Benzene is reported at a trace amount. Please comment.	Cobalt, lead and zinc naturally occur in the Eramosa Formation being extracted at the Guelph Limestone Quarry. We concur that Total Ammonia - N, un-ionized ammonia and nitrate do not exceed Provincial Water Quality Objectives. The source of benzene in trace amounts could be derived from many sources including the naturally bituminous Eramosa Formation or from traffic on Highways 7 and 6 adjacent to the quarry.	None

54	Gary Hunter	20-May-14	Hardness, Alkalinity, pH, Sulphate, Total Organic Carbon, Organic Nitrogen, Colour, Total Dissolved Solids, Total Suspended Solids, Oil and Grease and Pathogens were not reported in Appendix E Table 1. Many of these parameters are likely to be elevated in an active quarry environment with frequent blasting especially if the underwater quarry is used for washwater silt and overburden disposal.	There is no proposal to emplace any fill, other than for wetland creation, in the pond. Hunter has not provided any data to substantiate his opinion that Hardness, Alkalinity, pH, sulphate, Total Organic Carbon, Organic Nitrogen, Colour, Total Dissolved Solids, Total Suspended Solids, Oil and Grease or Pathogens are likely to be elevated in an active quarry environment. Our reported findings are that in an active quarry environment hardness, alkalinity, pH, sulphate, TOC, Organic Nitrogen, Colour, TDS, TSS, Oil and Grease and pathogens are not elevated as a result of quarry activity. Hardness is naturally elevated in the Gasport Aquifer and is un-related to quarry activities. For example, 100% of the samples tested for Hardness by the City of Guelph in 2013 exceeded the Maximum Acceptable Concentration in the Annual & Summary Report available on-line. The Aesthetic/Operational standard for Alkalinity is 30 to 500 mg/L. As mainly a measure of the concentrations of carbonate and bicarbonate in the water, alkalinity will be naturally elevated in the Gasport Aquifer. The quarry activity will not introduce alkalinity to the water and the natural buffering capacity of the water will regulate the concentrations of carbonate and bicarbonate in the water. A total of 219 samples were obtained from an active limestone quarry near Brechin, Ontario. Blasting is conducted at the quarry. The attached Figure 1 shows the range of pH in the sump water at the quarry. As expected, because of the high buffering capacity of limestone and dolostone, the pH of the discharge water remains within the Ontario Drinking Water Operational Guideline of 6.5 to 8.5 pH units. There is no justification in the suggestion that pH will be elevated in the Hidden Quarry pond water or downgradient in the groundwater. Total Organic Carbon (TOC)is a measure of the dissolved and particulate carbon in the water. Again, a total of 219 samples tested for Total Organic Carbon in quarry sump water in Gamebridge, Ontario, found that the quarry water has lower TOC than the nearby natural waters of the Talbot River (26 samples) (attached Figure 2). There is no source of organic carbon in the quarry environment in comparison to the natural environment where wetlands, lakes and streams will contain elevated TOC. Organic Nitrogen is used to measure the concentration of nitrogen attached to organic molecules. Groundwater samples obtained from the Hidden Quarry site from stations M2, M15-3 and M3 and surface water samples obtained from stations SW4, SW11 and SW3 contained higher concentrations of organic nitrogen than samples obtained from the Guelph Limestone site following a blast. There is no reason to expect that the Colour of the water will be affected by the quarry activities. Unlike natural surface waters which dissolve organic matter, the quarry pond will be relatively sterile and the dissolution of the rock does not affect the colour of the water. Total Dissolved Solds will not necessarily increase. The action of the quarry is to remove dolostone from below-the-water table thereby decreasing the volume of rock interacting with the water. Total Suspended Solids (TSS) may increase in close proximity to the excavating equipment. There is no environmental consequence of having higher TSS in the quarry pond proximal to the excavating equipment. A total of 227 oil and grease samples were obtained at the Gamebridge Quarry. None exceeded the MOE Specified Daily Effluent Limit of 30 mg/L. Of the 227 samples, oil and grease was not detected in 190 samples, and of the 37 samples where oil and grease was detected, the average result was 1.3 mg/L with a maximum value of 7.7 mg/L. This water was discharged to the Talbot River with no consequence. Pathogens were not found in the Guelph Limestone quarry water sample obtained on April 16, 2014. Samples obtained from Tributary A (at RS1) and Tributary B (at SW4) near to the proposed quarry contained E. coli (Appendix C, Harden Response to Burnside Review, June 10 2014).	pH and TOC figures attached.
55	Gary Hunter	20-May-14	The Total Ammonia and Total Kjeldahl Nitrogen at the Dolime Quarry are elevated above the Hidden Quarry pre-development groundwater at M15 at 0.06 mg/L and 0.20 mg/L respectively (Appendix B to Harden July 15, 2013 letter to James Dick Construction Ltd). Total Ammonia-N is reported as Non-Detectible at Harden W1 (MOE 67-05627).	Subsequent samples from Guelph Limestone Quarry as reported to R.J. Burnside and Associates on June 10, 2014 show that ammonia is not present before or after a blast. Ammonia will not persist in the oxygenated quarry pond water and is therefore not an environmental threat. The additional samples from Gueplh Limestone Quarry also show that the quarry water has less TKN than samples obtained from M3, M2 and M15-II. With respect to Total Nitrogen, water samples from M3, M2, M15-III, M15-II, SW4 and SW8 exceed those obtained from the quarry in February 2012.	
56	Gary Hunter	20-May-14	There is a known direct relationship between the ammonia and nitrate levels and the amount of undetonated explosives in the rock through which water flows (Revey 1996). Are the Nitrogen parameters in this Dolime Quarry grab sample elevated due to incomplete detonation or combustion of explosives in a wet environment? Was the blast 'smoke' produced orange or white in colour in the Feb 12, 2012 detonation?	There is no evidence to suggest that nitrogen chemicals are elevated in the Guelph Limestone Quarry samples. A review of several quarry sites is provided in the Harden January 14, 2014 response to R.J. Burnside that shows that nitrogen chemicals are not an issue in quarry water discharge.	None
57	Gary Hunter	20-May-14	The difference between Total Kjeldahl Nitrogen (0.7 mg/L) and Total Ammonia N (0.39 mg/L) in Table 1 indicates that Organic Nitrogen in the grab sample is 0.31 mg/L. This value exceeds by 2x the Ontario Drinking Water Standards (2006) of 0.15 mg/L for Organic Nitrogen.	Organic Nitrogen does not have an Ontario Drinking Water Standard. There is an Operational Guideline of 0.15 mg/L, but this is a guideline, not a standard. None of the present M15 samples pass the guideline. None of the northern wells on-site pass the guideline (one is 10x the guideline) due to off-site contamination of the groundwater. None of the stream samples pass the guideline. Biological activity such as plant growth in the rehabilitated wetlands, will assist in the improvement of water quality presently impaired by farming activities upgradient of the Hidden Quarry site.	None
58	Gary Hunter	20-May-14	What blasting management protocols are employed at Guelph Dolime Quarry to minimize spillage, reduce product leaching and reduce undetonated explosives and incomplete combustion. How deep are the drill holes? What 'sleep' times typically occur? What is the frequency of blasting? What blasting agents are used?	At the Guelph Limestone Quarry, JDCL uses waterproof emulsions, blast tubes and excellent hygiene to minimize spillage, leaching and incomplete combustion. Explosives are used within manufacturers specifications for sleep times. Depths vary but we have seen these techniques up to 35m. The Guelph Limestone Quarry blasts generally once a week during peak operations, but only about 22 times per year. Each event has a duration of about one second.	None
59	Gary Hunter	20-May-14	This single grab sample is not sufficient as an analogue to establish a Water Quality comfort level for underwater blasting and quarrying at the Hidden Quarry.	Additional samples were obtained and reported to R.J. Burnside and Associates in the Harden Environmental June 10, 2014 letter.	None
60	Gary Hunter	20-May-14	I request that the Applicant discloses all Water Quality Compliance Monitoring for the Guelph Dolime Quarry and provides additional immediate post blast water quality sampling and analysis for the parameters in para 7 above and the BTEX suite.	Additional samples were obtained and reported to R.J. Burnside and Associates in the Harden Environmental June 10, 2014 letter.	None
61	Gary Hunter	20-May-14	I request a site inspection, together with other CRC members who may be interested, of the Dolime Quarry at the time of and following an underwater blast event.	The operator takes this request under advisement and will consider this request.	None
62	Gary Hunter	20-May-14	Has the bedrock outcrop / subcrop evidence at the De Grandis farm area been considered in the Applicant Hydrogeological Investigation and reporting?	We visited the De Grandis property on no less than five occasions and potential impacts to the De Grandis dug well and pond were carefully considered in our assessment. We mention the De Grandis property on twenty-eight occasions in our report and dedicate Section 5.3.2 to potential impacts to the De Grandis property. The geological conditions observed at the De Grandis property were given a significant amount of consideration. Similar boulder conditions occur on the Hidden Quarry site as shown on the cover page of the report. These are not bedrock/subcrop conditions as the overburden is approximately ten metres thick. These are glacial remnants and similar large boulders are found elsewhere at the height of the Paris Moraine. For example, on the Nassagaweya-Puslinch Townline between the 25th Sideroad and the 20th Sideroad there are numerous very large boulders found at the height of the Paris Moraine and between 30 and 40 metres above the bedrock.	None

63	Gary Hunter	20-May-14	What evidence does the Applicant have to support its hypothesis apparently based on extrapolated data from the Hidden Quarry site that the De Grandis ponds, the source of Tributary B, are perched above the basal silty till and fed by upper overburden granular aquifers? This condition likely exists on the W½ Lot 3 of the De Grandis Farm where the topographically high Paris Moraine deposits are prominent but not on the E½ of Lot 2 and adjacent Lot 3.	None of our opinions in regards to the De Grandis well and pond are based on extrapolated data from the Hidden Quarry site. There are several lines of evidence that form our opinion in regards to overburden source of water for the Degrandis Ponds. 1) The geological mapping provided by the Ontario Geological Survey as shown on our Figure 3.6 identifies the surficial quaternary geology as Kames and Eskers. These geological deposits are widely accepted as being relatively permeable with relatively high infiltration. Additional work conducted by Abigail Burt (2011) as shown on our Figure 3.7 also confirms the potential for the Port Stanley till in this area, a till that pre-dates the eskers and kame deposits. 2) Soil samples obtained from the Allen property in close proximity to the De Grandis ponds identify a silty glacial till in samples A8, A11 and A12. 3) Ms. De Grandis identified a spring west of her farm house, occuring at higher elevation, at the base of the moraine feature. Hunter agrees that this spring may have a source derived from the moraine sediments 4) Streamflow measurements confirm downward hydrualic gradients between surface water station SW9 and SW4 shown on Figure 2.4. therefore, shortly after discharging from the De Grandis pond, the hydraulic gradients are downward beneath Tributary B. 5) The De Grandis well is a shallow dug well in the overburden and is a high yielding well from an unconfined source. 6) The description of the pond excavation by Ms. Degrandis was that the pond was dry, digging through 'clay'. When the known spring located along the north shore of the pond was excavated, this resulted in a source of water for the pond. 6) On our visit to the De Grandis farm, Ms. De Grandis identifed several springs located in shallow water along the north shore of the pond. 7) The water quality of the De Grandis shallow dug well is indicative of a shallow, unconfined source. Therefore, none of the scientific or anecdotal information supports a bedrock source of water on the De Grandis farm.	None
64	Gary Hunter	20-May-14	How are the groundwater model predicted bedrock water level contours calibrated in the De Grandis Pond area?	The baseline groundwater conditions, used to calibrate the groundwater model before predictions are made, were obtained from regional water well record data, on-site monitoring well data and private water well survey information.	None
65	Gary Hunter	20-May-14	Similarly what geological evidence does the Applicant have that the Allen Spring is not a bedrock spring?	1) The water level of the Allen Spring is approximately six metres above the bedrock water level in the Allen well. The static water level in the Allen well should be flowing artesian if the bedrock water levels were six metres higher. 2) The elevation of the bedrock at the Allen Farm well is approximately 354 m AMSL and at the Harden test site 352 m AMSL (See Figure 3.5) whereas the spring has an elevation of approximatley 361 m AMSL 3) the description in the well record of the 5.5 metres of overburden is clay with gravel and stones 4) Hunter concedes that the spring conditions in the west half of Lot 3 are likely to be from permeable sediments overlying silty till sedimients.	None
66	Gary Hunter	20-May-14	The Applicant predicts bedrock aquifer drawdowns at 80 cm at the Allen Spring vicinity. Is this drawdown likely sufficient to terminate dry season discharge to streamflow at this location?	Historical seasonal water level changes in the Hidden Quarry bedrock water level of up to two metres have been measured and the Allen Spring has never gone dry. Water taking by the mushroom farmer resulting in a drawdown of approximately fifty metres in the bedrock have not affected spring flow from the Allen Spring. It is therefore, our opinion that the predicted 80 cm change in bedrock water levels at the Allen Spring will not affect discharge from the spring.	None
67	Gary Hunter	20-May-14	Is the applicant willing to construct boreholes and sentry observation wells in the vicinity of the Allen Spring and the De Grandis ponds in support of its application?	There is no requirement for offsite monitoring at these locations. SW4 is a surrogate monitoring site that corelates to flow coming from De Grandis pond and RS1 quantifies flow coming from the Allen Spring.	None
68	Gary Hunter	20-May-14	Please provide a digital copy of the UTM geographic coordinate string for the GRCA field staked setback base line and the proposed setback limit.	The setbacks are graphically shown on the updated site plan.	None
69	Gary Hunter	20-May-14	Please verify the last paragraph statements on pg 57 (Sec 6.0) related to total aggregate tonnage resources and that only 20% of the aggregate resource occurring below the water table.	This is a typo. It will be corrected in Final GWS Report referenced on the site plan.	None
70	Gary Hunter	20-May-14	If site boreholes confirm the evidence of a bedrock platform and bedrock springs at the De Grandis ponds and at the Allen Springs, how would this change the Sec 7.1 (pg 58) statements attributed to Harden Environmental (2012) .	See responses 62 and 63 above.	None
71	Gary Hunter	20-May-14	How would this loss of bedrock spring flow influence the sustainability of the Provincially Significant Allen Wetland and Tributary A and B - Brydson Creek?	Based on the evidence available including our observations and measurements in the Provincially Significant Wetland indicate that a cessation of flow from the De Grandis pond would not have an effect on the sustainability of the wetland. The basis for this opinion is 1) The berm separating the open water in the De Grandis ponds and the PSW has been breached, allowing for a relatively free flow of water. It appears that when intact, the berm would have retained a significant volume of water resulting in a premature cessation of stream flow to the PSW, there is no obvious effect of this loss of flow to the wetland, 2) Cessation of flow from the De Grandis ponds is an annual occurance and the wetland is conditioned for this occurence 3) The soil beneath the PSW is a sandy silt till and there are drainage ditches dug through the wetland as evidence of attempts to remove water from the wetland (i.e. the wetland retains stormwater and direct precipitation). Therefore, direct precipitation and runoff are significant contributers to the PSW.	None
72	Gary Hunter	20-May-14	Please provide us with a complete set of up-to-date digital AutoCAD .dwg or equivalent high resolution Site Plan files or legible hard copy for formal comment.	June 6, 2014 site plans available on Township Website. http://www.get.on.ca/uploads/userfiles/files/planning/hidden-quarry-site-plans-2014-06-06.pdf	June 6 2014 Site Plan PDF available on Township website

Leigh Mugford

From: Jason Wagler <jwagler@grandriver.ca>
Sent: July-29-14 4:39 PM
To: Kimberly Wingrove (kwingrove@get.on.ca); 'jason.mclay@ontario.ca'
Cc: 'aldos@wellington.ca'; Leigh Mugford; Greg Sweetnam; 'adam.huycke@halton.ca'; 'carley.dixon@rjburnside.com'; 'howson@mshplan.ca'
Subject: Hidden Quarry - GRCA comments
Attachments: Hidden Quarry - GRCA Comments - July 29, 2014.pdf

Hi Kimberly and Jason:

Attached are GRCA's comments for Hidden Quarry based on the submission of revised materials, received July 2014. Please let me know if you have any questions. Thank you.

Jason Wagler, MCIP, RPP
Resource Planner
Grand River Conservation Authority
400 Clyde Rd, Cambridge ON N1R 5W6
(519) 621-2763 x2320
www.grandriver.ca

400 Clyde Road, P.O. Box 729 Cambridge, ON N1R 5W6

Phone: 519.621.2761 **Toll free:** 866.900.4722 **Fax:** 519.621.4844 **Online:** www.grandriver.ca

July 29, 2014

Ms. Kimberly Wingrove
Township of Guelph/Eramosa
8348 Wellington Road 124
P.O Box 124
Rockwood, ON
N0B 2K0

Mr. Jason McLay
Ministry of Natural Resources
1 Stone Road West
Guelph, ON
N1G 4Y2

Dear Ms. Wingrove & Mr. McLay:

Re: Review of Revised Materials
Proposed Hidden Quarry - 634745 Ontario Limited (James Dick Construction)
Class A, Category 2 Pit and Quarry License Application and Zoning By-law Amendment Application ZBA 09/12 (Hidden Quarry)
Lot 1, Concession 6, Former Township of Eramosa
8352 Highway 7, Township of Guelph/Eramosa

Grand River Conservation Authority (GRCA) staff has reviewed the following revised materials provided in support of the proposed Hidden Quarry:

- Response Letter to GRCA Comments, prepared by James Dick Construction Limited, dated July 10, 2014;
- Pages 1 to 5, Hidden Quarry Site Plans, prepared by Stovel & Associates, dated July 14, 2014.

Based on the submission of the above noted materials, our comments dated July 8, 2014 have been addressed as follows:

1. The notes on the revised Operations Plan now include the appropriate fisheries timing window for the culvert construction.

2. The established Trigger Levels and Contingency Measures have been added to the plans under a single table on Page 4.

3. We note that reference to White Ash species has been removed from the plans. We also note that tree protection fencing has been added under the Sediment and Erosion Control section and a note has been added to the Operations Plan indicating that no tree removals will take place during the bird breeding period of May 15-July 31.

At this time, GRCA has no further comments on the application. As such, GRCA has no objection to the application being taken forward for consideration.

GRCA would be open to review and comment on any additional information circulated by the Township.

Please contact Jason Wagler at 519-621-2763 ext. 2320 if you have any questions or require clarification of the above.

Yours truly,

Jason Wagler MCIP RPP
Resource Planner
Grand River Conservation Authority

cc. MSH Planning c/o Liz Howson
County of Wellington c/o Aldo Salis
Regional Municipality of Halton c/o Adam Huycke
Burnside c/o Carley Dixon
James Dick Construction c/o Greg Sweetnam & Leigh Mugford – Box 470 Bolton ON L7E 5T4

HUNTER and ASSOCIATES
Environmental and Engineering Consultants
www.hunter-gis.com
gisinfo@hunter-gis.com
35 Years of Service

Aug 5, 2014 Our File No.: 14-401

Ms. Kim Wingrove E-MAIL
Chief Administrative Officer
Township of Guelph/Eramosa
8348 Wellington Road 124
P.O. Box 700
Rockwood, ON N0B 2K0

Re: Addendum to May 20, 2014 Request for Supplementary Hidden Quarry ARA Application Data, Clarification and Confirmation on behalf of the Concerned Residents Coalition (CRC) of Township of Guelph/Eramosa and Town of Milton
Pt W½ Lot 1, Con 6 (Eramosa), Guelph / Eramosa Township

Dear Ms. Wingrove,

This letter is submitted on behalf of the CRC as an addendum to my letter of May 20, 2014 and identifies further deficiencies in the Applicant Site Plans. With the exception of the now updated legible ARA Site Plans (June 6, 2014) as available on the GET web site, there has been no direct response by the Applicant to my May 20, 2014 correspondence.

My additional comments and identified deficiencies are summarized below.

R. Fish Community and Aquatic Habitat Baseline Survey of Brydson Creek

1. The Grand River Conservation Authority Fisheries Management Plan (pg 76) describes the 'pristine' Blue Springs Creek as a Cold Water Tributary to the Grand River supporting a headwater coldwater fish community. The Authority fish population management objectives include management for native brook trout and the protection of wild, mature genetic stocks of fish. The Applicant has not recognized this Plan.

2. Groundwater recharge and flow through the proposed Hidden Quarry site in part sustains the groundwater discharge zones along the Brydson Creek coldwater headwater tributary to Blue Springs Creek. My May 20, 2014 letter outlined a number of related Hydrogeology concerns. No response has been provided.

3. A fish community and aquatic habitat baseline survey is required downstream of the quarry towards Blue Springs Creek. CRC can assist with access permissions by the Applicant's fisheries biologists.

S. Rock Quality

1. The Ministry of Northern Development and Mines in April 2014 re-issued Bedrock Resources Mapping for Dufferin County. This mapping reduced the 'Gasport' target aggregate rock area from about 15,000 to 5,000 acres. This area reduction was based on the Ministry re-classification of the Melancthon MegaQuarry drill core which was 'out of specification' for high quality concrete aggregate.

2. The Applicant has not provided any Hidden Quarry rock quality tests to confirm the suitability of the in situ bedrock for the intended aggregate production purposes in support of aggregate licencing. The testing program should include Ontario Provincial Standards Specifications requirements for Portland cement concrete aggregates for structures, pavements, curbs and gutters and hot mix asphalt aggregates and the CSA test for accelerated mortar bar expansion.

T. Transportation

1. The Site Plans do not include additional lane provision for early morning queuing outside the 6th Line pit entrance and continued safe functioning of the 6th Line for local resident access and egress.

2. During the proposed 6th Line reconstruction to the proposed quarry entrance, the Applicant has not considered re-aligning Eramosa 6th and Nassagaweya 5th Lines into a single intersection at Highway 7 to better accommodate truck turning lanes and future traffic signalization for improved operational safety.

U. Blasting

1. The Applicant has not specified the chemical composition of the proposed blasting agents and / or emulsions to be employed.

2. The Site Plan Spills Contingency and Responses Notes (pg 2 of 5) do not address incidental spills of explosive materials.

3. Operational protocols to minimize spillage and incomplete (non-ideal) detonations have not been proposed.

4. How will incidental 'fly rock' be controlled at nearby receptors and along Highway 7 and the 6th Line? Will road warning signage and / or closures be required during proximal blast events?

V. Vacant Lots of Record

1. The Applicant has not included Vacant Lots of Record and Virtual Receptors in its Blasting, Noise and Air Quality Reports. These properties when building permits are issued will also require on-site water wells.

2. An updated Teranet or MPAC tax parcel map or equivalent is required to assess the number of existing vacant parcels in proximity to the proposed quarry.

W. Equestrian Exercise Tracks

1. There are two equestrian exercise tracks with portions less than 250 m distant from the quarry limit.

2. The Applicant has not addressed the implications of quarry operations including periodic blasting and vibrations on equestrian activities.

X. Surface and Groundwater Monitoring

The following increased surface and groundwater monitoring is proposed compared to the monitoring specified in the Jan 6, 2014 Site Plans. Corresponding update of Site Plan notes is required.

1. The Applicant Site Plans dated June 6, 2014 do not propose groundwater level monitoring outside the proposed quarry property limits where drawdown (or flooding) complaints from neighbours are likely to originate (Note: An operational drawdown in the order of 7 m due to hydraulic gradient flattening, may occur at the proposed extraction limit).

2. To correct this monitoring deficiency five sentry observation wells are proposed each with independent piezometers screened in the shallow dolostone bedrock above about 340 m asl and in the deep dolostone bedrock 'production zone' below about 225 m asl to assess vertical hydraulic gradients and the accuracy of the Applicants groundwater modelling predictions under operational conditions.

3. These sentry observation wells are proposed 250 to 500 m distance from the proposed quarry extraction limit at the following locations:

    a) on the 6th Line (Eramosa) south of Tributary A and the Allen driveway entrance.

b) on the field edge east of the De Grandis ponds and south of the driveway.

c) adjacent to Highway 7 about 400 m east of the quarry property limit.

d) adjacent to Highway 7 about 300 m west of the quarry property limit.

e) near the 5th Line (Nassagaweya) about 300 m south of the quarry property limit.

4. The proposed bedrock observation wells within the proposed quarry property are mainly open hole and do not provide bedrock vertical hydraulic gradient information. A number of these wells including M15 are located in the proposed extraction area and are not suitable as long term baseline groundwater monitors.

5. Four deep supplementary groundwater observation wells cased to and screened below about 325 m asl at the top of the 'production aquifer' zone are proposed on the quarry perimeter at

    a) the northeast corner

    b) at the northwest corner

    c) adjacent to existing shallow observation well M4.

    d) in the southeast corner near Tributary B

6. Complementary shallow bedrock wells are also required on the quarry perimeter at the above four deep well locations. Existing nearby shallow open hole observation wells outside the extraction area, where present, may be used.

7. The deep and shallow observation wells at existing monitor M4 and the new shallow and deep observation wells in the southeast corner of the quarry are proposed to be used to monitor downgradient shallow and deep bedrock groundwater quality on a monthly basis. Water quality monitoring will specifically include Pathogens, Oil and Grease, Benzene, Turbidity, Colour, Total Dissolved Solids, Organic Nitrogen, Total Organic Carbon, Un-ionized Ammonia, Total Ammonia, Total Kjeldahl Nitrogen, pH, Alkalinity, Hardness, Cobalt, Zinc, Lead, Arsenic, Molybdenum, Manganese, Selenium, Chromium and general chemistry parameters including Calcium, Magnesium, Sodium, Chloride and Sulphate.

8. The domestic water well baseline infrastructure, water level and quality surveys and complaint protocols need to be specified on the Site Plans for regulatory clarity. Considering the potential

drawdowns and downgradient water quality implications, the domestic water well baseline surveys should extend a minimum of 750 m distance from the quarry property boundary.

9. 'Baseline' refers to pre-extraction conditions. A monthly baseline monitoring period of three years is considered appropriate for all observation wells prior to initiation of extraction.

10. Water Quality and Quantity Monitoring Results to be provided to the Concerned Residents Coalition or other designated Citizen Liaison Committee for audit on a quarterly basis.

V. Brydson Creek Base Flow Monitoring

1. The existing weirs on Brydson Creek are proposed to be utilized to monitor surface flows on a monthly basis. Water quality is proposed to be monitored at time of low flow on an annual basis. CRC will arrange for regular access permission for monitoring purposes.

Thank you for your consideration and encouraging the Applicant to respond to the comments contained herein and in my prior May 20, 2014 correspondence prepared on behalf of the CRC.

Yours truly,

Garry T. Hunter, M.A.Sc., P.Eng.
President
Hunter and Associates

cc:
Concerned Residents Coalition (CRC)
Greg Sweetnam (JDCL)
Leigh Mugford (JDCL)
Stan Denhoed (Harden Associates)
Rob Stovel (Stovel and Associates)
Al Murray (MNR)
Ian Hagman (MNR)
Lorraine Norminton (MNR)
Oleg Ivanov (MNR)
Graham Buck (MNR)
Ian Thornton (MNR)
Kristy Sutherland (MNR)
Rosa Stewart (MOE)
Jane Glassco (MOE)
Craig Fowler (MOE)
Lynnette Armour (MOE)
Crystal Allan (GRCA)
Fred Natolochny (GRCA)
Jason Wagler (GRCA)
Aldo Salis (Wellington County)
Ron Glenn (Halton Region)
Adam Huycke (Halton Region)
Brian Hudson (Halton Region)
Barb Koopmans (Town of Milton)
Meaghen Reid (GET)
Jordan Dolson (GET)
Kelsey Lang (GET)
Liz Howson (Macaulay Shiomi Howson Ltd)

JAMES DICK CONSTRUCTION LIMITED

MAIL: P.O. Box 470, Bolton, Ontario. L7E 5T4
COURIER: 14442 Hwy. 50, Bolton, Ontario. L7E 3E2
TELEPHONE: (905) 857-3500 FAX: (905) 857-4833

August 15, 2014

Township of Guelph Eramosa

Attention: **Ms. Liz Howson**
MSH Ltd.

RE: Response to Township Regarding CRC Representative Gary Hunter Questions

Dear Liz,

Please find attached a spreadsheet that we have compiled in Response to the August 5, 2014 "Addendum" from Garry Hunter. As with the previous submission this spreadsheet has been compiled for the Township to assist you as you formulate your planning opinion. We have had our team respond to the various issues (which are wide ranging), in Mr. Hunter's addendum. The hydrogeology responses have been compiled with the input of Mr. Denhoed of Harden Environmental Services Limited.

As with our previous submission regarding Mr. Hunter's questions, we are responding to these inquiries to facilitate the township in their review of comments submitted by the public. We do not consider the queries of Mr. Hunter to fall within the Peer Review Process of the Township. R.J. Burnside and Associates is the Peer Reviewer in the disciplines of Hydrogeology and Traffic and they should be allowed to come to an independent opinion based on their expertise. We do consider these comments relevant in the Planning Process and this response is provided in that context.

Sincerely,
JAMES DICK CONSTRUCTION LIMITED

Greg Sweetnam

Hidden Quarry - Response to Township regarding CRC Hunter Queries

Comments 1-72 Responded to July 8, 2014
Comments 73-98 Responded to August 15, 2014

#	Contact	Date	Question	Response	Action Item
1	Garry Hunter	20-May-14	What is the vertical geodetic benchmark used to reference the groundwater monitoring infrastructure and site features?	The groundwater monitors and water wells included in the level survey used a benchmark known as the 1978 Southern Ontario Adjustment available from the Ministry of Transport Ontario. The vertical benchmark is based on the Canadian Geodetic Vertical Datum 1928 (CGVD28). The actual benchmark used was DHO PRECISE BM 700-87 ELEVATION 347.587 m AMSL.	None
2	Garry Hunter	20-May-14	Are all infrastructure features, contour mapping and the Site Plan referenced to this same vertical benchmark network?	The contour mapping is based on the 1 m contour interval available from the GRCA. No vertical benchmark is noted in the meta data for this layer other than being a projection of NAD83/UTM Zone 17N. As shown on Figure 3.5, all purple coloured well locations and yellow colour monitoring well locations were surveyed with a common vertical datum based on the MTO benchmark.	None
3	Garry Hunter	20-May-14	What is the source of the MOE Water Well Record ground elevations in the Harden 2012 Report Appendix F - Table F1? Have any location corrections been applied?	The ground elevations are obtained from the MOE Water Well Information System (WWIS). No elevation or location corrections have been applied in this table.	None
4	Garry Hunter	20-May-14	Have ground elevations been adjusted for the referenced MOE Well Records in Appendix G Table G1?	There are no ground elevations referenced on Table G1. Of the wells listed in Table G1, the following have been level-surveyed relative to the on-site monitors; W1, W3, W4, W8,W10, W12, W13, W14, W17, W18, W19, W25 and W26	None
5	Garry Hunter	20-May-14	In Table G1, what is the source of the well depths and static water levels? Where 'btoc' is referenced, what is the 'stick up' to allow equation with the Water Well record ground elevation depth references?	Well depths and static water levels are field measurements where value is provided. When the homeowner provided an approximate depth this is noted as such. Stick-up measurements were made on the following wells: W1, W2, W3, W4, W8, W12, W13, W14, W16, W25 and W26.	None
6	Garry Hunter	20-May-14	In Table G1 Site W22 (5198 Hwy 7) the well is reported to be in a 'pit' for survey dates of Oct 1995 and Nov 2011. How did the Applicant confirm this is MOE well No. 28-02047 ?	MOE Licenced Well Technicians visited the site on those occasions and found the 4" well to be in a pit. The age of the well based on site interview with the owner and the diameter of the well led us to assign the MOE well number to the well.	None
7	Garry Hunter	20-May-14	Well MOE 67-08195 completed June 10, 1985 contains a sketch dimensioned location at 150 ft north of Hwy 7 and 300 ft east of the 6th Line within the proposed Hidden Quarry property. The stratigraphy, water founds and static levels are consistent with other wells on the property. Is the Applicant aware of this well? I do not see it in monitoring records; please explain.	This well does not exist at this location. It was plotted on Figure 2.6 for completeness and then was removed from consideration in all subsequent discussions and evaluations. The original well record has the well located in Concession 5, Lot 1 and the overburden is approximately 2 metres thick. This does not correlate to any on-site investigations. The well owner given as Joseph Scarola was never an owner of this property.	None
8	Garry Hunter	20-May-14	Correspondence with the owner confirms that MOE Well No. 67-0745 is located at 4943 6th Line (W5), not at 4953 6th Line (W8) as indicated in Table G-1. A well record for W8 has not yet been found. How does this revised well location impact the Applicant's response to Burnside? Please provide a copy of your Table G-1 well survey notes for the W8 site.	We have no knowledge of well No. 67-0745 and do not reference this well anywhere in our documents. Based on our well survey and discussions with Mr. Mike Bonus (the home owner at the time of survey) at 4953 6th Line the previous owner was Mr. Glendenning matching the name on the water well record. The resident at 4943 6th Line has on three occasions refused to particpate in our well survey. If the well record has been incorrectly assigned and should be assigned to 4943 6th Line, there is no change in our intepretation of potential impact to the well yield. The well record shows that water was found at 18.8 m and there is a static water level of 4.57 metres. Pumping at a rate of 15 gallons per minute resulted in a drawdown of 1.52 metres. This confirms that the well is a high volume producing well with low water level change when stressed.	None
9	Garry Hunter	20-May-14	Table G1 reports surveying W31 (4970 7th Line) well on Oct 1995 and Mar 2012. A drilled well is reported located in front of the house. Well depth and static level are reported as unknown. No MOE # has been found. How is the Table G1 survey consistent with the well in use at the property or with the Harden (2012) Sec 3.6.1.1 pg 19 the and No 63 Response in the Hidden Quarry Comment Documentation which each describe a dug well at the property? Please explain and provide your detailed survey inspection field notes and sketches for the well at 4970 7th Line. A survey by an independent MOE licenced well technician may be required to correct the records.	When visisted in 1995 the owner indicated that the well was drilled and did not provide access to the well as the concrete well cover was in poor condition. The same answer was provided in 2011. It was not until 2012 that access was permitted to the well by Ms. Degrandis and it was found to be a shallow dug well. A licensed MOE well technician did survey the well on each occasion.	None
10	Garry Hunter	20-May-14	Table G1 is unreliable and to be useful requires a rigorous on site well inspection and update including surveyed ground elevations, well depths and static water level observations at each well by an independent MOE licenced well technician.	A detailed well survey has been agreed to by James Dick Construction Ltd. This will be carried out by a licensed well technician.	None
11	Garry Hunter	20-May-14	Please provide the digital spreadsheet (.xls) for Table B2 and B4 updated to May 2014. Also corresponding updated Hydrographs as available.	Tables submitted show data back to the 1990's. Data collection will occur according to the monitoring program and all data will be presented in the monitoring reports.	None
12	Garry Hunter	20-May-14	Please provide a copy of the Harden (1998) Report as referenced in Sec 2.5 Hydraulic Testing pg 7 (Harden 2012).	Available as a public document from the Township of Guelph Eramosa for East Half of Lot 1, Concession 6, Township of Guelph-Eramosa. Property is owned by Graham and Charlotte Mudge.	None
13	Garry Hunter	20-May-14	Please provide Table C1 with updated monitoring to April 2014 in digital spreadsheet form. Also corresponding Fig C1 Hydrographs as available.	Tables submitted show data back to the 1990's. Data collection will occur according to the monitoring program and all data will be presented in the monitoring reports.	None
14	Garry Hunter	20-May-14	Does the Applicant have any information on the formational dip of the bedrock strata (top of Cabot Head) at the Hidden Quarry site?	The top of shale was encountered at an elevation of 308.52 m AMSL in M15 and 308.81 m AMSL in M2. The regional dip of the bedrock strata is estimated to be 0.2 to 0.3%, dipping towards the south west.	None
15	Garry Hunter	20-May-14	The Applicant has identified Goat Island Formation above 350 m asl in Borehole M15 at Hidden Quarry site. Is Goat Island present in other site boreholes where the bedrock surface is higher than about 350 m asl?	Bedrock was encountered at higher elevations in M2, M12 and TP9. It is possible that the Goat Island formation is present at those locations.	None
16	Garry Hunter	20-May-14	Please provide a copy of the preliminary assignment of the unsubdivided Ambel Formation in borehole M2 into Goat Island, Gasport, Irondequoit, Rockway and Merritton Formations and any comments from Dr Brunton (Harden 2012, Sec 3.5.1, pg 15).	The Harden 2012 report states that there has been no assignment of the core into the new nomenclature suggested by Frank Brunton.	None
17	Garry Hunter	20-May-14	Please provide a copy of the MW-08-T3-06 well log as referenced in Harden 2012, Sec 3.5.1, pg 15).	This is available from the City of Guelph and or the Grand River Conservation Authority. We do not have permission to distribute.	None
18	Garry Hunter	20-May-14	Will the Goat Island Rock be separated from or blended into the commercial crushed rock aggregate produced in the proposed quarry?	The Goat Island, where present in trace amounts, will not be mined in a separate bench and will be blended into the appropriate products.	None
19	Garry Hunter	20-May-14	What preparation of the weathered bedrock surface will be required to provide a staging area for underwater blasting preparation at Hidden Quarry?	No special preparation is required.	None
20	Garry Hunter	20-May-14	The Sept 2012 Site Plan Notes specify maximum extraction depth at 317 m asl (pg 3 of 5) and the figures on pg 4 of 5 specify the floor of the rehabilitated quarry lake at 320 m asl. The Applicant response in the Hidden Quarry comment documentation says the minimum depth will be 320 m asl. What quarry depth has the Applicant's Hydrogeologist recommended?	No recommendation with respect to final depth were made by Harden Environmental Services Ltd. The current mining elevation of 327 MASL is a compromise made by the operator to leave undisturbed rock at depth and is a practical depth of extraction for equipment currenly employed by the operator. Burnside suggested that the quarry depth should be adjusted to avoid the deeper fracture set. The operator has agreed to this.	None

21	Garry Hunter	20-May-14	The Applicant's bedrock flow test for Well M15 (Harden July 15, 2013 Letter Appendix B Sec 3.1 pg 6) indicated that approximately one third of the well yield was obtained from various fractures between elevation 350 m asl to above 324 m asl and two thirds of the well yield was obtained from a single set of fractures at 324 m asl and from a fracture at 318 m asl (one third each).	No comment.	None
22	Garry Hunter	20-May-14	The Applicant also reported poor hydraulic connectivity between the shallow bedrock and deeper fractures at M15. The lower part of the borehole below about 315 m asl including the Cabot Head formation contact at 308.5 m asl was described as not an active part of the flow system. Does the Applicant have any comparative observations of shallow vs deeper aquifer hydraulic heads (vertical gradients) in the proposed Site Plan Extraction Area?	M15 is located within the Site Plan extraction area. Hydrualic potentials for four individual sections of the aquifer are provided in the Harden Environmental response to R. J. Burnside on June 10, 2014	None
23	Garry Hunter	20-May-14	Will the higher yield deeper aquifer from 324 to 318 m asl be the primary control for quarry pond water levels and the upgradient propagation of quarry drawdown impacts?	No. James Dick Construction Ltd. has agreed to limit quarry depth to 327 m AMSL.	None
24	Garry Hunter	20-May-14	Does the Applicant have any observations at all of the hydraulic heads in the 324 to 318 m asl deep aquifer zone? What aquifer zones do the static levels observed in Monitors M2 and M4 actually represent?	Yes. M15 was converted into a multi-level monitoring station with hydraulic heads measured in the fractures identified at 324 and 318m AMSL. This information is provided in Harden , June 10, 2014. The vertical head profile shows very little difference, with both vertically downward and upward gradients observed betwen fractures. The static water levels in M2 and M4 represent average hydraulic potential over the open borehole between the bottom of the well and the bottom of the well seal shown on the borehole records.	None
25	Garry Hunter	20-May-14	Is the 324 to 318 m asl fractured rock aquifer zone in M15 coincident with the aquifer discharge zone on the lower slopes and floor of the Blue Spring Creek Valley to the south?	The elevation of Blue Springs Creek nearest to the site is approximaetly 330 m AMSL and where it crosses beneath 5th Line Nassagaweya has an elevation of approximatley 325 m AMSL. Therefore, these fractures are lower than the ground surface in the Blue Springs Creek valley.	None
26	Garry Hunter	20-May-14	When will the Hidden Quarry Comment Documentation (Mar 13, 2013) be updated to reflect the results from the M15 hydrogeological testing and the extended on site groundwater monitoring?	All testing of M15 has been included in correspondence with R.J. Burnside and Associates.	None
27	Garry Hunter	20-May-14	Would you agree that the vertical interval from 324 to 318 m asl in borehole M-15 is part of Brunton's and Gartner Lee's regional 'Production Zone' Aquifer?	There is no 'production zone aquifer' identified as a separate aquifer within the Gasport Formation. Our review of the Brunton (OFR 6226) confirms that the term 'production zone ' was not used to describe any portion of the Gasport aquifer. A 'production zone' was identifed by Gartner Lee as a higher yielding section of the formerly unsubdivided Amabel aquifer. We agree that the fractures identified at 324 and 318 m AMSL in M15 could fall within the 'production zone' of the Gasport Aquifer.	None
28	Garry Hunter	20-May-14	What would the Applicant estimate the specific yield of M15 and the potential capacity of a production well if located at Hidden Quarry M15?	Similar to the Municipal wells TW3 and TW4.	None
29	Garry Hunter	20-May-14	Please provide copies of the database input files. Please also provide the water and observation well files including static water level observation dates for the area within 1500 m of the proposed quarry site boundaries.	Appendix H describes the input parameters. MOE well data is available for the area.	None
30	Garry Hunter	20-May-14	Is it fair to say that the modelling is based primarily on 'kriged' multi season 'open hole' water well static level data with a general bias towards shallower bedrock water wells?	The statement is inaccurate. The modeling output is not based on any water levels. The groundwater model output is based on the assigned parameters of recharge, hydraulic conductivity and porosity (storage) and the vertical and horizontal constraints assigned within the model (i.e. boundary conditions).	None
31	Garry Hunter	20-May-14	What is the statistical variability of the 'predicted water levels' and 'maximum predicted water level change' estimated in Fig 10 and Fig 11 of the Modelling Report? Is ± 5 m a fair estimate for Fig 10? What about Fig 11?	There is no statistical variability in the outcome of the model. The values presented in Figures H10 and H11 represent unique values based on a certain set of model input values.	None
32	Garry Hunter	20-May-14	Is there sufficient unique regional hydraulic data to model the hydraulic heads of the deep aquifer as identified in the Hidden Quarry site for the elevation interval between 324 and 318 m asl?	It is well accepted that the Gasport Aquifer can be modelled as a continuum. The fractures located between 324 m AMSL and 318 m AMSL will not be intersected by the quarry.	None
33	Garry Hunter	20-May-14	Considering that there will be a water deficit within the quarry pond footprint due to evaporation increases, where will the water come from that raises the Applicant predicted groundwater levels and increases flows on the downgradient side of the quarry?	It is estimated that there will be an additional capture of 3600 m3 of water in microdrainage area D1 and 2500 m3 of water in microdrainage area D2. The estimated increase in evaporation at the site is 18,765 m3 resulting in an overall loss of 12,665 m3 annually. To put this into perspective, the annual precipitation at the site has historically ranged from 243,712 m3 to 482,854 m3. Thus the change in evaporation is insignificant relative to the variability in precipitation. The extraction of the rock creates a space within the aquifer with infinite transmissivity. This results in the same hydraulic potential in the quarry pond despite groundwater potentials decreasing northwest to southeast by several metres in the adjacent aquifer. The magnitude of the hydraulic potential in the pond has been shown via the modeling effort and as observed at several existing gravel pit ponds to be somewhat of an average between the pre-extrction upgradient and downgradient hydraulic potentials in the aquifer. This effect results in a drawdown at the upgradient side of the quarry and a potentiometric surface rise in the downgradient side of the quarry. The "increased" flow downgradient is a very localized effect and results from adjacent aquifer water flowing into the quarry pond in the northern half of the pond needing to flow out of the southern half of the pond.	None
34	Garry Hunter	20-May-14	Will the upgradient groundwater divides move away from the quarry with reduced water level elevation to capture more water from adjacent catchments?	The Eramosa River/Blue Springs Creek groundwater shed divide occurs at a hydraulic potential of approximatley 365 m AMSL or 15 metres greater in hydraulic potential than occurs at the site. The watersheds are very large and any potential disturbance to the groundwater shed divide is small and local to the proposed quarry. Any diversion of water from the Eramosa River to the Blue Springs Creek watershed will not be measureable.	None
35	Garry Hunter	20-May-14	The Sept 21, 2012 Site Plan Notes (pg 4 of 5) predicts the west quarry final lake level at 348.6 m asl and the east quarry lake at 348.4 m asl. However the wetland creation Notes (pg 4 of 5) estimate final quarry pond water tables at ± 346 to 349 m asl.	It appears that Hunter has misunderstood this Site Plan Note. The elevations (+/- 346 to 349 masl) refer to the bottom of the wetlands not the pond water elevation. These elevations are noted as it is desireable to have 0- 2m of water in the wetland areas.	None
36	Garry Hunter	20-May-14	The Harden (2012) Fig 3.17 shows a water level decline across the quarry extraction limits from 354 to 347 m asl (7 m difference). Appendix H Fig 11 shows a drawdown of 1.8 m on the north extraction limit and a rise of about 1.2 m at the south limit. Where did the other 4 m of the pre-quarry vertical gradient go?	As indicated in our report, the maximum water level decline in the quarry is 2.45 m at the northern edge and a rise of 2.81 at the southern edge for a total change of 5.26 metres. The reason that this does not add up to 7 metres is that the final predicted water level determined by the model equalizes inputs to the pond with outputs. For example, only a small portion of the proposed pond perimeter is presently exposed to the lower hydraulic potential of 347 m AMSL and thus has less of an influence on the final water level. If the quarry edges were parallel to the groundwater equipotentials, then the final water level in the pond would be a statistical mean of the pre and post hydruaulic potentials.	None
37	Garry Hunter	20-May-14	Has the Applicant overestimated the final quarry pond levels and underestimated the bedrock aquifer drawdowns upgradient of the quarry?	No. A scientifically sound approach was used to estimate the final quarry pond level and bedrock aquifer water level changes upgradient of the site.	None
38	Garry Hunter	20-May-14	Are the average late summer / early fall water low levels more likely to be in the 346 m asl range consistent with the lower limit shown in the Site Plan Rehabilitation Notes (pg 4 of 5)?	It is not reasonable to expect the final water level in the West Pond to be in the order of 346 m AMSL. The lowest historical water level recorded in M4 at the southern edge of the licensed area is 345.5 m AMSL and the lowest historical water level in M1D located near the upper edge of the proposed quarry is 350.63 m AMSL. The final water level in the West Pond will stabilize somewhat above the mean of these two values (348.6 m AMSL) . Hunter has misread the notes on Page 4 of 5 as they pertain to the floor elevation of the wetland, not the water level of the quarry pond.	None

39	Garry Hunter	20-May-14	The Harden (2012) Fig 3.17 plot referenced above is based mainly on spring season (May 31, 2011) high water levels. Please provide a corresponding late summer / early fall plot using 'same date' data.	A substantial quantity of data has been presented including late summer and fall. Please refer to the tables in the report.	None
40	Garry Hunter	20-May-14	Will the actual drawdowns be sufficient during dry season to interfere with bored and shallow bedrock wells and streams (and ponds) fed by bedrock springs up to 1 km or more upgradient of the quarry?	It is our professional opinion, as expressed in our report, that springs, ponds and shallow dug wells upgradient of the site will not be affected by the anticipated change in bedrock water levels. A high degree of monitoring as requested by the Township of Guelph Eramasa and the Ministry of the Environment has been agreed to by James Dick Construction Ltd. to verify this opinion. Phase 1 of the quarry extraction is predicted to have a negligable impact on bedrock water levels upgradient of the site thus providing a significant period of time to obtain additional baseline information to be gathered prior to potential water level changes occuring in the bedrock upgradient.	None
41	Garry Hunter	20-May-14	Based on the Applicant predicted increased quarry water level at 348.6 m asl, will the forested kettle depression located on private property immediately south of MW4 and Highway 7 experience root zone flooding and dieback?	The kettle depression has an estimated minimum elevation of 349 m AMSL according to the one metre contour interveal mapping provided by the GRCA. As shown on Figure 3.17 the potentiometric surface has an elevation of approximately 346 m AMSL. The predicted water level rise beneath the kettle depression, as shown on Figure 4.3 is approximately one metre. Therefore, root zone flooding is not predicted to occur.	None
42	Garry Hunter	20-May-14	How does the Applicant propose to create a dry staging platform for drilling and blasting? Will positive or passive dewatering be required?	The dry platform is either formed by the surface of the bedrock, or where the surface of the bedrock is submerged, by a layer of shot rock. No dewatering will occur. Drilling will occur to a maximum of 327 masl.	None
43	Garry Hunter	20-May-14	Has the Applicant considered progressively mining from the southeast upgradient into the higher northwest water tables of the site?	Various scenarios have been considered and the current phasing as presented is the preferred approach.	None
44	Garry Hunter	20-May-14	Will adaptive management based on southerly site quarrying with a more gradual drawdown of northerly boundary groundwater monitors be more effective than initiating quarrying in the deeper water to the north as proposed on the Sept 2012 Site Plans (pg 2 of 5)?	No. The greatest water level change occurs when mining Phase 3 (southern half of the quarry on the west side of Tributary B). The mining of Phase 1 (northern half of the west side of Tributary B) results in a predicted water level change of less than five centimetres beneath the Allen and De Grandis properties.	None
45	Garry Hunter	20-May-14	Does the Applicant propose to waste the silty till overburden spoil or place imported fill in the quarry excavation?	There is no proposal to import any offsite fill or snow onto the property. Native onsite soils may be used for wetland and habitat creation in the pond.	None
46	Garry Hunter	20-May-14	How does the Applicant propose to maintain clear clean unobstructed groundwater flow to nearby domestic and commercial wells through the life cycle of the quarry excavation ?	The quarry ponds are stillwater features and therefore the majority of deposition of rock fines will occur in the quarry ponds themselves. Groundwater flow occurs very slowly and any turbidity entering the aqufier downgradient of the site will settle out of the water. The mobilzation of fine particles in the Gasport Aquifer and was observed during thepumping of M15 and also in other Gasport aquifer wells. This shows that the flow rate in the aquifer is too slow to mobilize fine particles. No obstructions to southerly groundwater flow are being proposed at this quarry (e.g. barrier walls) and therefore groundwater flow will continue to occur as it presently does. Approximately half of the overall bedrock thickness will remain undisturbed and water will continue to flow beneath the quarry as it does today.	None
47	Garry Hunter	20-May-14	Will the quarry walls become clogged with silt turbidity or be barricaded by lower permeability waste spoil ?	Our experience with other quarries is that quarry walls do not become clogged with silty turbidity and we do not anticipate any clogging of fractures at this quarry. Fine-grained material generated by the extraction of the overburden will be used in rehabilitation above-the-water-table, where needed for wetlands within the quarry pond or removed from the site to be used in products produced elsewhere.	None
48	Garry Hunter	20-May-14	Will the Site Plans specify that a Permit to Take Water and an Environmental Compliance Approval to Discharge Wash Water is required?	Any permits required by the MOE are governed by other legislation. The site plan makes note of permits that may be required.	None
49	Garry Hunter	20-May-14	Please provide Warnock Lake supporting technical information - say pre and post extraction hydroperiod monitoring and historical aerial imagery to support this observation.	The attached report "Evaluation of Three Hydraulic Barriers in Southern Ontario" (Harden Environmental, 2001) shows pre and post water level monitoring confirming barrier effectiveness at Warnock Lake and Heritage Lake.	"Evaluation of Three Hydraulic Barriers in Southern Ontario" (Harden Environmental, 2001) attached.
50	Garry Hunter	20-May-14	What will stop groundwater flows around the ends of the proposed northwest wetland hydraulic barrier in the proposed Hidden Quarry?	Groundwater must flow around the ends of the proposed hydraulic barrier. The purpose of the hydraulic barrier is to cause water levels to rise and flow around the barrier. The barrier is positioned parallel to groundwater flow and similar to an obstruction in a stream, will cause the water level to rise and flow around the obstruction. Our observation is that there is significant groundwater flow in the overburden sand and gravel on the upgradient side of the wetland and therefore we have included an overflow structure at 355.8 m AMSL to prevent excessive flooding of this wetland.	None
51	Garry Hunter	20-May-14	The Harden Sept 2012 Appendix E Fig 1 Sampling Location illustrates a rock drill operating from a dry platform. Is this dry platform maintained by dewatering (sump reference in the title of Table 1)? What are the depths of rock drilling? Is this dry drilling platform the top of the 'Gasport' Formation?	The dry platform is either formed by the surface of the bedrock, or where the surface of the bedrock is submerged, by a layer of shot rock. No dewatering will occur. Drilling will occur to a maximum of 327 masl.	None
52	Garry Hunter	20-May-14	Please provide a certified copy of the Laboratory Analytical Report(s) for this Feb 15, 2012 sample.	See attached.	Maxaam Validated Certificate of Analysis attached.
53	Garry Hunter	20-May-14	However this single grab sample (Appendix E Table 1) illustrates Provincial Water Quality Objective criteria exceedances for Cobalt, Lead and Zinc (Note Zinc (revised) as 20 µg/L). Total Ammonia -N concentration is at about 80%, Unionized Ammonia at 25 % and Nitrate at about 12 % of the PWQO. Benzene is reported at a trace amount. Please comment.	Cobalt, lead and zinc naturally occur in the Eramosa Formation being extracted at the Guelph Limestone Quarry. We concur that Total Ammonia - N, un-ionized ammonia and nitrate do not exceed Provincial Water Quality Objectives. The source of benzene in trace amounts could be derived from many sources including the naturally bituminous Eramosa Formation or from traffic on Highways 7 and 6 adjacent to the quarry.	None

54	Garry Hunter	20-May-14	Hardness, Alkalinity, pH, Sulphate, Total Organic Carbon, Organic Nitrogen, Colour, Total Dissolved Solids, Total Suspended Solids, Oil and Grease and Pathogens were not reported in Appendix E Table 1. Many of these parameters are likely to be elevated in an active quarry environment with frequent blasting especially if the underwater quarry is used for washwater silt and overburden disposal.	There is no proposal to emplace any fill, other than for wetland creation, in the pond. Hunter has not provided any data to substantiate his opinion that Hardness, Alkalinity, pH, sulphate, Total Organic Carbon, Organic Nitrogen, Colour, Total Dissolved Solids, Total Suspended Solids, Oil and Grease or Pathogens are likely to be elevated in an active quarry environment. Our reported findings are that in an active quarry environment hardness, alkalinity, pH, sulphate, TOC, Organic Nitrogen, Colour, TDS, TSS, Oil and Grease and pathogens are not elevated as a result of quarry activity. Hardness is naturally elevated in the Gasport Aquifer and is un-related to quarry activities. For example, 100% of the samples tested for Hardness by the City of Guelph in 2013 exceeded the Maximum Acceptable Concentration in the Annual & Summary Report available on-line. The Aesthetic/Operational standard for Alkalinity is 30 to 500 mg/L. As mainly a measure of the concentrations of carbonate and bicarbonate in the water, alkalinity will be naturally elevated in the Gasport Aquifer. The quarry activity will not introduce alkalinity to the water and the natural buffering capacity of the water will regulate the concentrations of carbonate and bicarbonate in the water. A total of 219 samples were obtained from an active limestone quarry near Brechin, Ontario. Blasting is conducted at the quarry. The attached Figure 1 shows the range of pH in the sump water at the quarry. As expected, because of the high buffering capacity of limestone and dolostone, the pH of the discharge water remains within the Ontario Drinking Water Operational Guideline of 6.5 to 8.5 pH units. There is no justification in the suggestion that pH will be elevated in the Hidden Quarry pond water or downgradient in the groundwater. Total Organic Carbon (TOC)is a measure of the dissolved and particulate carbon in the water. Again, a total of 219 samples tested for Total Organic Carbon in quarry sump water in Gamebridge, Ontario, found that the quarry water has lower TOC than the nearby natural waters of the Talbot River (26 samples) (attached Figure 2). There is no source of organic carbon in the quarry environment in comparison to the natural environment where wetlands, lakes and streams will contain elevated TOC. Organic Nitrogen is used to measure the concentration of nitrogen attached to organic molecules. Groundwater samples obtained from the Hidden Quarry site from stations M2, M15-3 and M3 and surface water samples obtained from stations SW4, SW11 and SW3 contained higher concentrations of organic nitrogen than samples obtained from the Guelph Limestone site following a blast. There is no reason to expect that the Colour of the water will be affected by the quarry activities. Unlike natural surface waters which dissolve organic matter, the quarry pond will be relatively sterile and the dissolution of the rock does not affect the colour of the water. Total Dissolved Solds will not necessarily increase. The action of the quarry is to remove dolostone from below-the-water table thereby decreasing the volume of rock interacting with the water. Total Suspended Solids (TSS) may increase in close proximity to the excavating equipment. There is no environmental consequence of having higher TSS in the quarry pond proximal to the excavating equipment. A total of 227 oil and grease samples were obtained at the Gamebridge Quarry. None exceeded the MOE Specified Daily Effluent Limit of 30 mg/L. Of the 227 samples, oil and grease was not detected in 190 samples, and of the 37 samples where oil and grease was detected, the average result was 1.3 mg/L with a maximum value of 7.7 mg/L. This water was discharged to the Talbot River with no consequence. Pathogens were not found in the Guelph Limestone quarry water sample obtained on April 16, 2014. Samples obtained from Tributary A (at RS1) and Tributary B (at SW4) near to the proposed quarry contained E. coli (Appendix C, Harden Response to Burnside Review, June 10 2014).	pH and TOC figures attached.
55	Garry Hunter	20-May-14	The Total Ammonia and Total Kjeldahl Nitrogen at the Dolime Quarry are elevated above the Hidden Quarry pre-development groundwater at M15 at 0.06 mg/L and 0.20 mg/L respectively (Appendix B to Harden July 15, 2013 letter to James Dick Construction Ltd). Total Ammonia-N is reported as Non-Detectible at Harden W1 (MOE 67-05627).	Subsequent samples from Guelph Limestone Quarry as reported to R.J. Burnside and Associates on June 10, 2014 show that ammonia is not present before or after a blast. Ammonia will not persist in the oxygenated quarry pond water and is therefore not an environmental threat. The additional samples from Guelph Limestone Quarry also show that the quarry water has less TKN than samples obtained from M3, M2 and M15-II. With respect to Total Nitrogen, water samples from M3, M2, M15-III, M15-II, SW4 and SW8 exceed those obtained from the quarry in February 2012.	
56	Garry Hunter	20-May-14	There is a known direct relationship between the ammonia and nitrate levels and the amount of undetonated explosives in the rock through which water flows (Revey 1996). Are the Nitrogen parameters in this Dolime Quarry grab sample elevated due to incomplete detonation or combustion of explosives in a wet environment? Was the blast 'smoke' produced orange or white in colour in the Feb 12, 2012 detonation?	There is no evidence to suggest that nitrogen chemicals are elevated in the Guelph Limestone Quarry samples. A review of several quarry sites is provided in the Harden January 14, 2014 response to R.J. Burnside that shows that nitrogen chemicals are not an issue in quarry water discharge.	None
57	Garry Hunter	20-May-14	The difference between Total Kjeldahl Nitrogen (0.7 mg/L) and Total Ammonia N (0.39 mg/L) in Table 1 indicates that Organic Nitrogen in the grab sample is 0.31 mg/L. This value exceeds by 2x the Ontario Drinking Water Standards (2006) of 0.15 mg/L for Organic Nitrogen.	Organic Nitrogen does not have an Ontario Drinking Water Standard. There is an Operational Guideline of 0.15 mg/L, but this is a guideline, not a standard. None of the present M15 samples pass the guideline. None of the northern wells on-site pass the guideline (one is 10x the guideline) due to off-site contamination of the groundwater. None of the stream samples pass the guideline. Biological activity such as plant growth in the rehabilitated wetlands, will assist in the improvement of water quality presently impaired by farming activities upgradient of the Hidden Quarry site.	None
58	Garry Hunter	20-May-14	What blasting management protocols are employed at Guelph Dolime Quarry to minimize spillage, reduce product leaching and reduce undetonated explosives and incomplete combustion. How deep are the drill holes? What 'sleep' times typically occur? What is the frequency of blasting? What blasting agents are used?	At the Guelph Limestone Quarry, JDCL uses waterproof emulsions, blast tubes and excellent hygiene to minimize spillage, leaching and incomplete combustion. Explosives are used within manufacturers specifications for sleep times. Depths vary but we have seen these techniques up to 35m. The Guelph Limestone Quarry blasts generally once a week during peak operations, but only about 22 times per year. Each event has a duration of about one second.	None
59	Garry Hunter	20-May-14	This single grab sample is not sufficient as an analogue to establish a Water Quality comfort level for underwater blasting and quarrying at the Hidden Quarry.	Additional samples were obtained and reported to R.J. Burnside and Associates in the Harden Environmental June 10, 2014 letter.	None
60	Garry Hunter	20-May-14	I request that the Applicant discloses all Water Quality Compliance Monitoring for the Guelph Dolime Quarry and provides additional immediate post blast water quality sampling and analysis for the parameters in para 7 above and the BTEX suite.	Additional samples were obtained and reported to R.J. Burnside and Associates in the Harden Environmental June 10, 2014 letter.	None
61	Garry Hunter	20-May-14	I request a site inspection, together with other CRC members who may be interested, of the Dolime Quarry at the time of and following an underwater blast event.	The operator takes this request under advisement and will consider this request.	None
62	Garry Hunter	20-May-14	Has the bedrock outcrop / subcrop evidence at the De Grandis farm area been considered in the Applicant Hydrogeological Investigation and reporting?	We visited the De Grandis property on no less than five occasions and potential impacts to the De Grandis dug well and pond were carefully considered in our assessment. We mention the De Grandis property on twenty-eight occasions in our report and dedicate Section 5.3.2 to potential impacts to the De Grandis property. The geological conditions observed at the De Grandis property were given a significant amount of consideration. Similar boulder conditions occur on the Hidden Quarry site as shown on the cover page of the report. These are not bedrock/subcrop conditions as the overburden is approximately ten metres thick. These are glacial remnants and similar large boulders are found elsewhere at the height of the Paris Moraine. For example, on the Nassagaweya-Puslinch Townline between the 25th Sideroad and the 20th Sideroad there are numerous very large boulders found at the height of the Paris Moraine and between 30 and 40 metres above the bedrock.	None

63	Garry Hunter	20-May-14	What evidence does the Applicant have to support its hypothesis apparently based on extrapolated data from the Hidden Quarry site that the De Grandis ponds, the source of Tributary B, are perched above the basal silty till and fed by upper overburden granular aquifers? This condition likely exists on the W½ Lot 3 of the De Grandis Farm where the topographically high Paris Moraine deposits are prominent but not on the E½ of Lot 2 and adjacent Lot 3.	None of our opinions in regards to the De Grandis well and pond are based on extrapolated data from the Hidden Quarry site. There are several lines of evidence that form our opinion in regards to overburden source of water for the Degrandis Ponds. 1) The geological mapping provided by the Ontario Geological Survey as shown on our Figure 3.6 identifies the surficial quaternary geology as Kames and Eskers. These geological deposits are widely accepted as being relatively permeable with relatively high infiltration. Additional work conducted by Abigail Burt (2011) as shown on our Figure 3.7 also confirms the potential for the Port Stanley till in this area, a till that pre-dates the eskers and kame deposits. 2) Soil samples obtained from the Allen property in close proximity to the De Grandis ponds identify a silty glacial till in samples A8, A11 and A12. 3) Ms. De Grandis identified a spring west of her farm house, occuring at higher elevation, at the base of the moraine feature. Hunter agrees that this spring may have a source derived from the moraine sediments 4) Streamflow measurements confirm downward hydrualic gradients between surface water station SW9 and SW4 shown on Figure 2.4. therefore, shortly after discharging from the De Grandis pond, the hydraulic gradients are downward beneath Tributary B. 5) The De Grandis well is a shallow dug well in the overburden and is a high yielding well from an unconfined source. 6) The description of the pond excavation by Ms. Degrandis was that the pond was dry, digging through 'clay'. When the known spring located along the north shore of the pond was excavated, this resulted in a source of water for the pond. 6) On our visit to the De Grandis farm, Ms. De Grandis identifed several springs located in shallow water along the north shore of the pond. 7) The water quality of the De Grandis shallow dug well is indicative of a shallow, unconfined source. Therefore, none of the scientific or anecdotal information supports a bedrock source of water on the De Grandis farm.	None
64	Garry Hunter	20-May-14	How are the groundwater model predicted bedrock water level contours calibrated in the De Grandis Pond area?	The baseline groundwater conditions, used to calibrate the groundwater model before predictions are made, were obtained from regional water well record data, on-site monitoring well data and private water well survey information.	None
65	Garry Hunter	20-May-14	Similarly what geological evidence does the Applicant have that the Allen Spring is not a bedrock spring?	1) The water level of the Allen Spring is approximately six metres above the bedrock water level in the Allen well. The static water level in the Allen well should be flowing artesian if the bedrock water levels were six metres higher. 2) The elevation of the bedrock at the Allen Farm well is approximately 354 m AMSL and at the Harden test site 352 m AMSL (See Figure 3.5) whereas the spring has an elevation of approximatley 361 m AMSL 3) the description in the well record of the 5.5 metres of overburden is clay with gravel and stones 4) Hunter concedes that the spring conditions in the west half of Lot 3 are likely to be from permeable sediments overlying silty till sedimients.	None
66	Garry Hunter	20-May-14	The Applicant predicts bedrock aquifer drawdowns at 80 cm at the Allen Spring vicinity. Is this drawdown likely sufficient to terminate dry season discharge to streamflow at this location?	Historical seasonal water level changes in the Hidden Quarry bedrock water level of up to two metres have been measured and the Allen Spring has never gone dry. Water taking by the mushroom farmer resulting in a drawdown of approximately fifty metres in the bedrock have not affected spring flow from the Allen Spring. It is therefore, our opinion that the predicted 80 cm change in bedrock water levels at the Allen Spring will not affect discharge from the spring.	None
67	Garry Hunter	20-May-14	Is the applicant willing to construct boreholes and sentry observation wells in the vicinity of the Allen Spring and the De Grandis ponds in support of its application?	There is no requirement for offsite monitoring at these locations. SW4 is a surrogate monitoring site that corelates to flow coming from De Grandis pond and RS1 quantifies flow coming from the Allen Spring.	None
68	Garry Hunter	20-May-14	Please provide a digital copy of the UTM geographic coordinate string for the GRCA field staked setback base line and the proposed setback limit.	The setbacks are graphically shown on the updated site plan.	None
69	Garry Hunter	20-May-14	Please verify the last paragraph statements on pg 57 (Sec 6.0) related to total aggregate tonnage resources and that only 20% of the aggregate resource occurring below the water table.	This is a typo. It will be corrected in Final GWS Report referenced on the site plan.	None
70	Garry Hunter	20-May-14	If site boreholes confirm the evidence of a bedrock platform and bedrock springs at the De Grandis ponds and at the Allen Springs, how would this change the Sec 7.1 (pg 58) statements attributed to Harden Environmental (2012) .	See responses 62 and 63 above.	None
71	Garry Hunter	20-May-14	How would this loss of bedrock spring flow influence the sustainability of the Provincially Significant Allen Wetland and Tributary A and B - Brydson Creek?	Based on the evidence available including our observations and measurements in the Provincially Significant Wetland indicate that a cessation of flow from the De Grandis pond would not have an effect on the sustainability of the wetland. The basis for this opinion is 1) The berm separating the open water in the De Grandis ponds and the PSW has been breached, allowing for a relatively free flow of water. It appears that when intact, the berm would have retained a significant volume of water resulting in a premature cessation of stream flow to the PSW, there is no obvious effect of this loss of flow to the wetland, 2) Cessation of flow from the De Grandis ponds is an annual occurance and the wetland is conditioned for this occurence 3) The soil beneath the PSW is a sandy silt till and there are drainage ditches dug through the wetland as evidence of attempts to remove water from the wetland (i.e. the wetland retains stormwater and direct precipitation). Therefore, direct precipitation and runoff are significant contributers to the PSW.	None
72	Garry Hunter	20-May-14	Please provide us with a complete set of up-to-date digital AutoCAD .dwg or equivalent high resolution Site Plan files or legible hard copy for formal comment.	June 6, 2014 site plans available on Township Website. http://www.get.on.ca/uploads/userfiles/files/planning/hidden-quarry-site-plans-2014-06-06.pdf	June 6 2014 Site Plan PDF available on Township website
73	Garry Hunter	05-Aug-14	R. Fish Community and Aquatic Habitat Baseline Survey of Brydson Creek 1. The Grand River Conservation Authority Fisheries Management Plan (pg 76) describes the 'pristine' Blue Springs Creek as a Cold Water Tributary to the Grand River supporting a headwater coldwater fish community. The Authority fish population management objectives include management for native brook trout and the protection of wild, mature genetic stocks of fish. The Applicant has not recognized this Plan.	James Dick Construction has agreed in correspondence (Harden response to Burnside June 10, 2014), providing that permission is given by the owner, to conduct flow and water quality testing of the spring to establish baseline conditions at the Brydson Spring. The hydraulic potential at the southern edge of the quarry will increase, thereby increasing the hydraulic gradient between the quarry and the spring. As such, the hydraulic gradient is maintained at current or higher levels and there will be no detrimental change to the Brydson Spring. SW3 is a monitoring station within 100 m downgradient of the Hidden Quarry Property. In this way SW3 is a good proxy monitoring location for Brydson Spring. In addition, the volume of water stored in the quarry will moderate seasonal groundwater level change, thereby providing a more stable source of water during drier conditions. It is likely that the infiltrating waters of Tributary B and C contribute significantly to the Brydson Spring discharge. Since flow in Tributary B and C will not be affected by the quarry operation, no change in the outflow from Brydson Spring will occur. As such, no fish habitat monitoring along the lower reaches of Brydson Creek is necessary or recommended. The Grand River Conservation Authority is aware of the Brydson Spring and has not recommended any biological or water quality/quantity monitoring of the spring. In correspondence dated April 7, 2014, R.J Burnside and Associates, the GET Peer Review consultant on the Natural Environment, also concurred that the application had satisfied all of their concerns, and no fisheries monitoring in the Brydson Creek was reccommended. MOE has also indicated in correspondence dated October 10 2013 that the proposed monitoring plan is appropriate for ascertaining and addressing potential surface water impacts from quarrying activities.	None
74	Garry Hunter	05-Aug-14	2. Groundwater recharge and flow through the proposed Hidden Quarry site in part sustains the groundwater discharge zones along the Brydson Creek coldwater headwater tributary to Blue Springs Creek. My May 20, 2014 letter outlined a number of related Hydrogeology concerns. No response has been provided.	Please see responses to May 20,2014 letter submitted to the Township July 8, 2014.	None
75	Garry Hunter	05-Aug-14	3. A fish community and aquatic habitat baseline survey is required downstream of the quarry towards Blue Springs Creek. CRC can assist with access permissions by the Applicant's fisheries biologists.	Please see respone to Comment 73 above.	None

76	Garry Hunter	05-Aug-14	S. Rock Quality 1. The Ministry of Northern Development and Mines in April 2014 re-issued Bedrock Resources Mapping for Dufferin County. This mapping reduced the 'Gasport' target aggregate rock area from about 15,000 to 5,000 acres. This area reduction was based on the Ministry re-classification of the Melancthon MegaQuarry drill core which was 'out of specification' for high quality concrete aggregate.	The mapping of the resource in Dufferin County is not relevant to the submission of this application.	None
77	Garry Hunter	05-Aug-14	2. The Applicant has not provided any Hidden Quarry rock quality tests to confirm the suitability of the in situ bedrock for the intended aggregate production purposes in support of aggregate licencing. The testing program should include Ontario Provincial Standards Specifications requirements for Portland cement concrete aggregates for structures, pavements, curbs and gutters and hot mix asphalt aggregates and the CSA test for accelerated mortar bar expansion.	Test data on the resource to confirm quality is not a submission requirement to apply for a licence. The core that has been drilled from this source is easily identified as the highest quality Amabel (Gasport) dolostone. A professional geologist has logged the core and identified it as such in the Hidden Quarry technical reports. James Dick Quality Assurance staff have extensive experience in recognizing and classifying high quality crushed stone and are satisfied that the resource on site is a very high quality deposit.	None
78	Garry Hunter	05-Aug-14	T. Transportation 1. The Site Plans do not include additional lane provision for early morning queuing outside the 6th Line pit entrance and continued safe functioning of the 6th Line for local resident access and egress.	Trucks are not permitted to arrive at the quarry before normal operating hours. Truckers are progressively diciplined for arriving early and asked not to return. Having said this, gates are opened in advance of quarry opening so queing on the roadway will not be an issue. James Dick operates other aggregate site in Ontario and queing out on the road is not an issue. Further, there is adequate space for trucks to pull off the 6th line into the entrance, or turn around, even if the gates are locked. Cole Engineering reports that existing background traffic on this road is extremely low, generally no higher than 6 vehicles per hour in each direction.	None
79	Garry Hunter	05-Aug-14	2. During the proposed 6th Line reconstruction to the proposed quarry entrance, the Applicant has not considered re-aligning Eramosa 6th and Nassagaweya 5th Lines into a single intersection at Highway 7 to better accommodate truck turning lanes and future traffic signalization for improved operational safety.	As the proposed levels of traffic are very low, there is no identified need for this. MTO, the road authority on Highway 7, has not indicated this as a requirement. MTO does not object to the rezoning application as it stands.	None
80	Garry Hunter	05-Aug-14	U. Blasting 1. The Applicant has not specified the chemical composition of the proposed blasting agents and / or emulsions to be employed.	See response to comment 58 above as well as extensive information presented demonstrating the lack of effect of explosives on water quality.	None
81	Garry Hunter	05-Aug-14	2. The Site Plan Spills Contingency and Responses Notes (pg 2 of 5) do not address incidental spills of explosive materials.	The spills contingency plan is applicable to spills of the raw materials that make up explosive emulsions. Incidental spills of explosive material does not occur given the blasting proceedure employed by JDCL. All residual explosives generated by site hygiene are added to the explosive column prior to the shot being collared.	None
82	Garry Hunter	05-Aug-14	3. Operational protocols to minimize spillage and incomplete (non-ideal) detonations have not been proposed.	Water proof emulsions are excellent materials to use in sub aqueous environments. Incomplete combustion of these products has essentially been eliminated in our blasting operations. Blasting agents are handled with a high level of hygiene and incidental spillage at surface is controlled and cleaned up immediately. Measures such as hole sleeves and blasting tubes serve to further isolate the explosives from the environment and are used as required. Blasters and explosive suppliers are trained in how to deal with any spills of these materials, and the Spills Contingency Plan would be equally applicable . The water monitoring program will ensure that nitrogen compounds remain within guidelines.	None
83	Garry Hunter	05-Aug-14	4. How will incidental 'fly rock' be controlled at nearby receptors and along Highway 7 and the 6th Line? Will road warning signage and / or closures be required during proximal blast events?	Flyrock is controlled through appropriate blast design at our quarries to contain blasted rock in the working extraction area. Since most of the resource is below water at this site it will not contribute to airborne material. The surface rock above water will be controlled through blast design, appropriate to the blast location. No special measures are required for adjacent roads or properties.	None
84	Garry Hunter	05-Aug-14	V. Vacant Lots of Record 1. The Applicant has not included Vacant Lots of Record and Virtual Receptors in its Blasting, Noise and Air Quality Reports. These properties when building permits are issued will also require on-site water wells.	All studies have been completed according to industry standards. Provincial criteria must be met at all receptors now or in the future.	None
85	Garry Hunter	05-Aug-14	2. An updated Teranet or MPAC tax parcel map or equivalent is required to assess the number of existing vacant parcels in proximity to the proposed quarry.	See response to Comment 84 above.	None
86	Garry Hunter	05-Aug-14	W. Equestrian Exercise Tracks 1. There are two equestrian exercise tracks with portions less than 250 m distant from the quarry limit.	There will no impact on the use of equestrian exercise tracks. Many tracks are currently located in close proximity to quarries in Ontario. For example, in Flamborough, many exercise tracks are located in proximity to large quarries, including Flamborogh Downs. The two tracks identified near the Hidden Quarry are both located in close proximity to the industrial area to the East of the Hidden Quarry. One track is currently within the industrial area and it has been partially redeveloped into a storage facility with a 4 acre gravel yard immediately adjacent to the track. The second track, owned by Kingshot is currently located 120m from the Industrual Park. The tracks themselves are typically constructed from Equestrian Track Sand, a product made in sand and gravel pits. James Dick is a manufacturer of Equestrian Track Sand and has supplied many tracks and riding arenas, including Woodbine Race Track and the Royal Winter Fair.	None
87	Garry Hunter	05-Aug-14	2. The Applicant has not addressed the implications of quarry operations including periodic blasting and vibrations on equestrian activities.	See response to Comment 86 above.	None

88	Garry Hunter	05-Aug-14	X. Surface and Groundwater Monitoring The following increased surface and groundwater monitoring is proposed compared to the monitoring specified in the Jan 6, 2014 Site Plans. Corresponding update of Site Plan notes is required. 1. The Applicant Site Plans dated June 6, 2014 do not propose groundwater level monitoring outside the proposed quarry property limits where drawdown (or flooding) complaints from neighbours are likely to originate (Note: An operational drawdown in the order of 7 m due to hydraulic gradient flattening, may occur at the proposed extraction limit).	See response to Hydrogeological concerns above. Comment 36 specifically addresses gradient flattening, above. As indicated in the Harden Report, the maximum water level decline in the quarry is 2.45 m at the northern edge and a rise of 2.81 at the southern edge.	None
89	Garry Hunter	05-Aug-14	2. To correct this monitoring deficiency five sentry observation wells are proposed each with independent piezometers screened in the shallow dolostone bedrock above about 340 m asl and in the deep dolostone bedrock 'production zone' below about 225 m asl to assess vertical hydraulic gradients and the accuracy of the Applicants groundwater modelling predictions under operational conditions.	Given the low level of impact from the site, no ongoing offsite monitoring is required. James Dick Construction Ltd. has agreed to install additional groundwater monitoring locations along the southern property line (i.e. approximately mid-way between M7 and SW3 and west of M4) prior to extraction in this area. The installations will be multi-level to adequately represent groundwater levels and quality throughout the bedrock profile. JDCL has also agreed to incorporate the Voluntary Well Survey for properties within 500m of the quarry. These measures, coupled with the robust Monitoring Program will be sufficient to ensure all impacts from the quarry remain within acceptable levels. The program has been peer reviewed by various agencies including MNR, MOE and the GRCA. All these agencies have been satisfied.	None
90	Garry Hunter	05-Aug-14	3. These sentry observation wells are proposed 250 to 500 m distance from the proposed quarry extraction limit at the following locations: a) on the 6th Line (Eramosa) south of Tributary A and the Allen driveway entrance. b) on the field edge east of the De Grandis ponds and south of the driveway. c) adjacent to Highway 7 about 400 m east of the quarry property limit. d) adjacent to Highway 7 about 300 m west of the quarry property limit. e) near the 5th Line (Nassagaweya) about 300 m south of the quarry property limit.	See response to Comment 89 above.	None
91	Garry Hunter	05-Aug-14	4. The proposed bedrock observation wells within the proposed quarry property are mainly open hole and do not provide bedrock vertical hydraulic gradient information. A number of these wells including M15 are located in the proposed extraction area and are not suitable as long term baseline groundwater monitors.	See responses above concerning multi-level monitors.	None
92	Garry Hunter	05-Aug-14	5. Four deep supplementary groundwater observation wells cased to and screened below about 325 m asl at the top of the 'production aquifer' zone are proposed on the quarry perimeter at a) the northeast corner b) at the northwest corner c) adjacent to existing shallow observation well M4. d) in the southeast corner near Tributary B	See responses above concerning multi-level monitors.	None
93	Garry Hunter	05-Aug-14	6. Complementary shallow bedrock wells are also required on the quarry perimeter at the above four deep well locations. Existing nearby shallow open hole observation wells outside the extraction area, where present, may be used.	See responses above concerning multi-level monitors.	None
94	Garry Hunter	05-Aug-14	7. The deep and shallow observation wells at existing monitor M4 and the new shallow and deep observation wells in the southeast corner of the quarry are proposed to be used to monitor downgradient shallow and deep bedrock groundwater quality on a monthly basis. Water quality monitoring will specifically include Pathogens, Oil and Grease, Benzene, Turbidity, Colour, Total Dissolved Solids, Organic Nitrogen, Total Organic Carbon, Un-ionized Ammonia, Total Ammonia, Total Kjeldahl Nitrogen, pH, Alkalinity, Hardness, Cobalt, Zinc, Lead, Arsenic, Molybdenum, Manganese, Selenium, Chromium and general chemistry parameters including Calcium, Magnesium, Sodium, Chloride and Sulphate.	See responses above concerning multi-level monitors and the Monitoring Program.	None
95	Garry Hunter	05-Aug-14	8. The domestic water well baseline infrastructure, water level and quality surveys and complaint protocols need to be specified on the Site Plans for regulatory clarity. Considering the potential drawdowns and downgradient water quality implications, the domestic water well baseline surveys should extend a minimum of 750 m distance from the quarry property boundary.	James Dick Construction Ltd. has agreed to undertake a voluntary detailed well inventory and water quality assessment of wells within 500 m of the quarry, for residents who consent to give access to their wells for this purpose. This will be conducted to establish baseline water quality and quantity conditions. Harden Environmental has already undertaken three such studies as summarized in attached Table 9 and Figure 10. Since 1995, Harden has surveyed forty local residents and has on at least one occasion, visited every residence within 500 metres of the quarry. James Dick Construction Ltd. has agreed to upgrade wells, those in pits or buried, to facilitate water level monitoring of up-gradient wells, if agreed to by the home owner. Based on previous surveys, this will include wells W5, W8 and possibly W7. Down-gradient wells and those distant from the quarry are not expected to experience any significant water level change or will likely see a small increase in water level. Water quality samples can be obtained from the existing plumbing system. Residents at locations W25 to W30 and W36 to W40 (W38,39 and 40 located in Halton Region) will be asked if they are willing to participate in the voluntary baseline monitoring program. These wells are beyond the 500 metre distance and unlikely to be impacted by the quarry. However, a one-time baseline survey will be conducted. There will be a minimum period of two years after the quarry is given approval before below-water-table extraction can commence. This provides ample opportunity to obtain seasonal water quality data as recommended by Burnside and Associates.	None
96	Garry Hunter	05-Aug-14	9. 'Baseline' refers to pre-extraction conditions. A monthly baseline monitoring period of three years is considered appropriate for all observation wells prior to initiation of extraction.	See response to Comment 95 above. There is already two decades of data for on-site monitors and therefore seasonal fluctuations in the bedrock aquifer is well documented. Private well surveys have also been performed in 1995, 1998, 2011 and 2012. A flow test will be conducted at each residence thereby determining the operational drawdown in the private well. Where the operational drawdown in the well plus a seasonal fluctuation is determined to be close to the pump level, a recommendation to lower the pump will be made. According to data available from water well records and previous water well surveys the small change in water level will not affect the operation of any private water well.	None

97	Garry Hunter	05-Aug-14	10. Water Quality and Quantity Monitoring Results to be provided to the Concerned Residents Coalition or other designated Citizen Liaison Committee for audit on a quarterly basis.	The Annual Monitoring Reports will be filed with the MNR, the County of Wellington and the Township of Guelph/Eramosa.	None
98	Garry Hunter	05-Aug-14	V. Brydson Creek Base Flow Monitoring 1. The existing weirs on Brydson Creek are proposed to be utilized to monitor surface flows on a monthly basis. Water quality is proposed to be monitored at time of low flow on an annual basis. CRC will arrange for regular access permission for monitoring purposes.	See response to Comment 73 above.	None