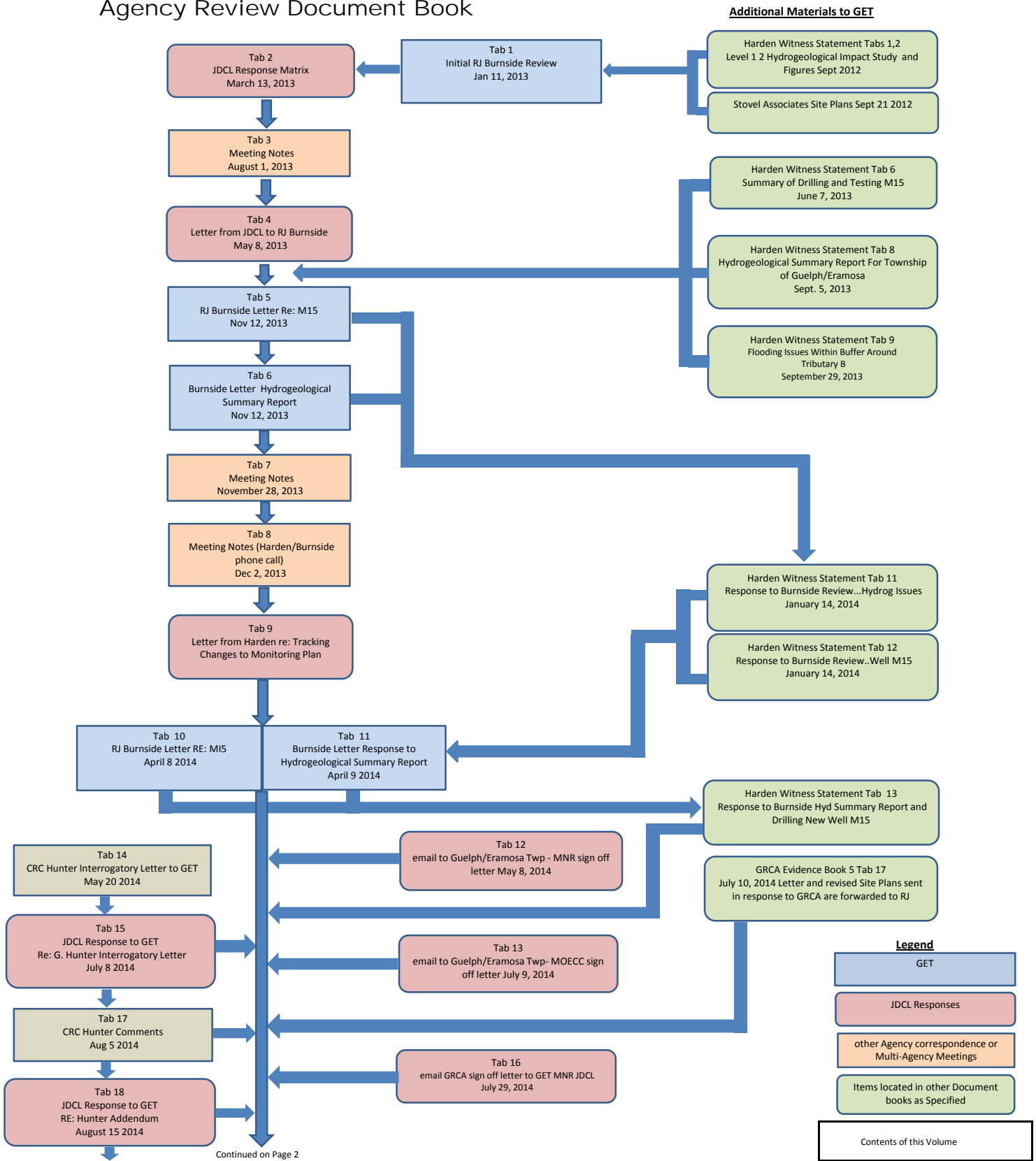
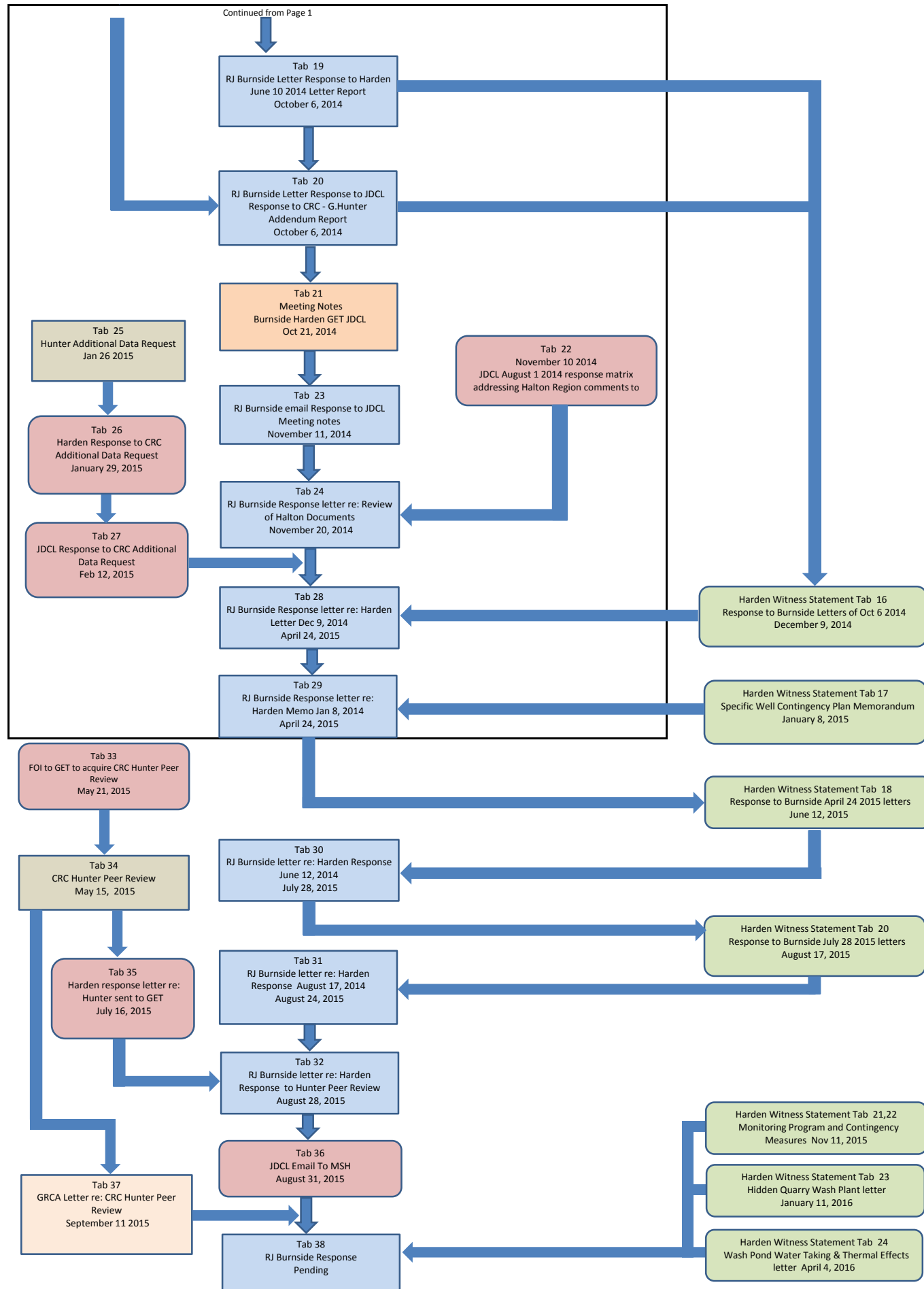


Guelph/Eramosa Township Hydrogeology Agency Review Document Book



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Township of Guelph/Eramosa

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BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

October 6, 2014

Via: Email

Mr. Stan Denhoed, M.Sc., P.Eng.
Harden Environmental Services Ltd.
4622 Nassagewaya-Puslinch Townline Road
RR 1
Moffatt ON N0P 1J0

Dear Mr. Denhoed:

**Re: Harden Letter of June 10, 2014
Project No.: 300032475.0000**

Thank you for your June 10, 2014 letter which provided a response to the following two R.J. Burnside & Associates Limited (Burnside) letters:

- 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, (Burnside letter dated April 8, 2014).
- Harden Response to Burnside Review of Hydrogeological Summary Report, (Burnside letter dated April 9, 2014).

These letters were prepared by Burnside in response to the January 14, 2014 Harden letters.

As indicated by Harden in their June 10, 2014 letter, the primary concerns that Burnside has with the Hidden Quarry application are the following:

1. Water levels in the up-gradient domestic wells
2. Water quality in the down-gradient domestic wells
3. Rockwood Well Number 4

Harden indicates that the largest water level decline in up-gradient wells will be in the order of 1.6 m and it is their opinion that a water change of this magnitude will not adversely affect the availability of water for any domestic wells. Harden indicates that a rigorous on-site monitoring program will be initiated to confirm their opinion. Also, Harden indicates that James Dick Construction Limited (JDCL) has agreed to conduct a voluntary private well survey commencing well in advance of any below water table extraction. Harden suggests that the combination of these two programs will allow for the early detection of possible changes in the potentiometric elevation on the site and in neighbouring wells. Harden indicates that water quality in the down-gradient wells will be discussed at length in their June 10, 2014 submission. They also state that the Quarry will not affect the GUDI status of Rockwood Well Number 4 and that JDCL has agreed to provide the use of multi-level well M15 for monitoring during the pumping test of

Rockwood Well Number 4. Harden then categorizes the concerns into eight areas of interest. These are:

1. Karst
2. Groundwater Parameters-Hydraulic Connectivity-M15 intervals
3. Nitrate Balance
4. Deeper Water Sources and Water Quality
5. Local Well Survey
6. Quarry Depth Limitation
7. Brydson Spring and Blue Springs Creek
8. Sinking Cut-Monitoring and Historical Low Water Level

The information provided by Harden on each of the 8 issues will be summarized below followed by the Burnside response.

1.0 Karst

Tributary B is a small stream which enters the Hidden Quarry site near the northeast property boundary and proceeds in a generally southerly direction exiting near the southeast corner of the site. The tributary runs between the two portions of the site that are proposed to be quarried. There are a number of monitoring stations along the tributary with SW4 located at the point where the tributary enters the property near the north boundary and SW3 situated where the creek passes beneath Highway 7 to the south of the site. The tributary has been monitored fairly regularly since 2005. Harden notes that Tributary B loses all of its water, i.e., no flow at SW3 when the incoming flow at SW4 is less than approximately 20 L/s. As a result, the stream loses all of its water before it leaves the south end of the site. The loss of water from Tributary B has led to concerns that the stream could be influenced by underlying karstic bedrock. Harden suggests that the stream is not influenced by karstic bedrock due to the following observations:

- a) Tributary B is not in direct contact with the underlying bedrock anywhere on the site.
- b) Tributary B is physically separated from the underlying bedrock by several meters of permeable unconsolidated sediments. Jim Baxter of R.J. Burnside & Associates Limited was present for the drilling of M15 (within 30 m of Tributary B) where there was approximately 10 m of unconsolidated sediments comprised mainly of coarse aggregate.
- c) The water table is found to be several meters below the tributary streambed.

Harden proposes to instrument two locations on the stream (SW4 and SW8) with continuous water level monitoring devices. Harden concludes that there is no indication of large contiguous karst features underlying the site and further more given the fact that the site will not be dewatered, karst geology is not an operational, water supply or safety issue at this site.

Burnside Response

Burnside has reviewed the borehole logs for the numerous wells on-site that penetrate the bedrock. Although there is evidence of fracturing in the bedrock, there is no evidence of karstic features such as caverns, large fractures etc. M15 was cored and a detailed examination of the bedrock and a down hole video did not reveal any karstic features. However, considering the fact that karstic features are common in the Rockwood area, including at Rockwood Well 3, it would not be unexpected to encounter occasional karstic features in the area of excavation.

The installation of continuous water level devices will assist in confirming the relationship between flow rates less than 20 L/s at SW4 and cessation of flow before the SW3 station. The water table is found to be several meters below the tributary streambed confirming that a downward gradient or losing stream condition exists.

2.0 Groundwater Parameter – Hydraulic Connectivity

Well M15 was reconstructed as a multi-level monitoring station on May 1 and 2, 2014 with 4 monitoring intervals. The screened intervals are summarized in Table 2 of the Harden letter and shown graphically in Figure 3 which was attached to the letter.

Burnside Response

Burnside reviewed the original proposal by Harden as to how to reconstruct M15 and is in agreement with the intervals selected to be screened.

2.1 Groundwater Elevation Multi-Level M15

Harden collected water levels from M15 on four occasions in May 2014. The water level data indicates that the water levels are found within a narrow range with the lowest water levels observed in M15-II which is an interval across a known fracture. The highest water levels were found in the upper 2 intervals which suggest a downward gradient between M15-II and M15-III and an upward gradient from M15-I (the deepest well) and M15-II. It appears that water movement in the well is both upwards and downwards towards the fractures located at approximately 36 m below ground surface (bgs). Harden indicates that the vertical profile gives no suggestion of a significant connection to lower hydraulic potential areas such as Brydson Spring or higher potential areas up-gradient of the site and that the data shows that significant water level changes will not occur as a result of making vertical hydraulic connections within the quarry.

Burnside Response

Well M15 was retrofitted on May 1 and 2, 2014 and water level data was collected on May 1, 2, 5 and 6, 2014. Ideally additional water level data will be collected to confirm that the water levels were not influenced by the water that was already in place in the open hole M15. Since water levels in M15-III and M15-IV are almost identical, it suggests that the fracture systems are connected. Collection of additional water level and water quality data should assist in improving the understanding of the vertical movement of groundwater in the bedrock.

2.2 Hydraulic Testing in Multi-Level M15

Hydraulic testing of M15 was conducted on May 6, 2014. The testing was conducted both by adding a slug of water to the test interval (falling head test) and recording the response and by removing a physical slug from the test interval (rising head test) and recording the response. The highest values for hydraulic connectivity were found in M15-I and M15-II, both of which are below the proposed level of the quarry. Harden indicates that approximately 75% of the flow to the well comes from the aquifer represented by test intervals M15-I and m15-II.

Burnside Response

The use of a variety of methods to obtain values for hydraulic conductivity has resulted in similar estimates of hydraulic conductivity. Harden should provide some commentary on how the hydraulic connectivity found at M15-II relates to the high connectivity zone used in layer 1 of the original modeling. It appears that this higher connectivity zone found in M15-II is below the base of the quarry and it is not clear how this may impact the interpretation of the geology that was used to create the original model.

Since the water levels at M15-IV and M15-III are so similar, it would have been helpful to monitor water levels in both wells when the rising and falling head tests were completed in order to see whether there was any connectivity between the wells. This would also help confirm the integrity of the well seal. This data likely exists and if so should be reported.

2.3 Combined Impact of Future Rockwood Well Number 4 and Hidden Quarry

Harden indicates that hydrogeologic work presented by both Gartner Lee and Aqua Resource and their modeling of the capture zone of future Well 4 indicate that the primary source area for the new well will be north and east of the well which does not include the area of Hidden Quarry. Harden also indicates that the Quarry will become a large reservoir of water and therefore will become a positive boundary condition for the expanding cone of influence of the well and for local wells. This will end up resulting in a lessening of the impact on Well Number 4 on aquifer levels local to the quarry.

Burnside Response

Burnside concurs with Harden that the Hidden Quarry site should likely not have a negative impact on Rockwood Well Number 4. Monitoring of wells within the quarry during the pumping test for Well 4 will be used to assess the degree of connection (if any) between the new well and the bedrock aquifer in the area of the proposed quarry.

2.4 Water Quality Testing in Multi-Level M15

Water quality samples were collected by Harden for each of the test intervals in new multi-level M15. Harden indicates that a minimum of 6 well volumes were removed from each of the test intervals prior to water quality samples being collected. The highest concentration of nitrate (3.17 mg/L) were found in M15-III with the lowest concentration (1.62 mg/L) found in the sample from M15-I. Nitrate was also present in M15-II (2.19 mg/L) and in M15-IV (1.96 mg/L). Highest values of TKN (0.9 mg/L) were found in M15-III with concentrations much lower (0.19 to 0.28 mg/L) in the other 3 intervals. Harden concludes that the fact that the highest TKN, DOC

and nitrate concentrations occur in M15-III suggests that this intermediate depth fracture set interacts with shallow fracture sets resulting in the movement of chemicals lower within the aquifer. The lower concentrations seen in M15-I and M15-II suggest that there is some degree of isolation between the fracture sets although the mere presence of TKN, DOC and nitrate within these lower fractures suggest interconnectivity between the lower and upper fracture sets.

Burnside Response

The water quality sampling indicated the greatest anthropogenic effects occur in well M15-III with concentrations of nitrate, DOC and TKN lowest in the deepest screen (M15-I). Additional water quality sampling undertaken concurrently with sampling of other monitors on site will assist in establishing the pre quarry water quality at the site. Monitoring of water levels in M15-IV while pumping M15-III will assist in assessing the degree of connection between fractures. Water levels should be recorded at all monitoring well locations during the next round of sampling to further confirm the extent of vertical connection and confirm well integrity.

3.0 Nitrate Balance M15 Results and Re-testing of Guelph Limestone Quarry

3.1 Guelph Limestone Quarry Water Quality Sampling

Harden collected four additional water samples from the Guelph Limestone Quarry (formerly Dolime Quarry) in order to evaluate the water quality impact following blasting at the site. Samples were collected on April 28, 2014 12 min 78 min and 15 hr after the blast and analyzed for nitrate, nitrite, TKN and ammonia. Total ammonia and nitrite were not detected in any of the samples. Concentrations of TKN increased immediately after the blast in samples collected at 12 min and 78 min, but then returned to below pre-blast concentrations in the 78 hr sample. Concentrations of nitrate remained relatively stable between 0.44 and 0.47 mg/L in all samples. Harden indicates that the elevated TKN in samples following the blast is likely related to organic nitrogen being stirred up from organic material in the pond. Once this material settled the TKN concentrations returned to normal. Harden also indicates that a sample collected on an occasion in 2012 from the Guelph Limestone Quarry was analyzed for other parameters including volatile organic compounds, petroleum hydrocarbons and polyaromatic hydrocarbons. This previous sample met all of the Ontario Drinking Water Quality Standards.

Burnside Response

The data presented by Harden indicates that subaqueous blasting at the Guelph Limestone Quarry did not result in any appreciable increase in nitrate concentration. It would appear that background levels in the quarry are about 0.5 mg/L. Harden should clarify the following to provide assurance that the results are directly applicable to the Hidden Quarry:

- How does the active dewatering in the quarry impact the background nitrate concentrations?
- Is the mass of nitrate in the explosive and the volume of water in the quarry comparable to what will be seen at Hidden quarry? It would appear that the volume of water at the Guelph Limestone quarry is much greater than what will be seen at the Hidden Quarry thereby diluting the mass of nitrogen in the explosives.

3.2 Nitrogen Compounds in Groundwater and Surface Water

Harden has collected 16 groundwater and surface water samples since February 2012 at the Guelph Limestone Quarry Pond. Results indicate that the pond quality is generally better than either the groundwater flowing into the Hidden Quarry site or surface water flowing into the Hidden Quarry site. In all circumstances, the Ontario Drinking Water Quality Standards for nitrate or nitrite are not exceeded, however their operational guideline for organic nitrogen was exceeded in every water type.

Burnside Response

Nitrate in groundwater samples from wells at the Hidden Quarry site range in concentration from 0.9 mg/L at M13D to as high as 5.2 mg/L at M3. Nitrate concentrations are 4.64 mg/L at SW4 and 4.53 mg/L at SW8. The nitrate concentrations in all samples collected from the Guelph Limestone Quarry are below the laboratory detection limit. The low levels of nitrate at the Guelph Limestone Quarry pond appear to confirm Harden's assertion that blasting at the Hidden Quarry site will not result in adverse levels of nitrate in the surface water. However, the amount of nitrate should be converted from mg/L to a mass that can then be applied to the anticipated volume of water in the proposed quarry to allow for a concentration in mg/L to be calculated. This is mentioned in the notes associated with Table 7, however details are not provided.

3.3 Revised Nitrate Prediction

Harden previously provided a water quality balance for nitrate in their January 14, 2014 letter. This has been revised based on the recent testing of the Guelph Limestone Quarry and the water quality testing of the multiple wells at M15. Revisions include:

- Distributing the nitrogen concentration evenly throughout the aquifer.
- Allowing mixing in the upper middle portions of the aquifer due to the revised quarry elevation 327 m asl.
- Reducing the introduction of nitrogen to the quarry pond by blasting activities as indicated by the recent Guelph Limestone Quarry sampling.
- Including dilution from infiltrating precipitation as suggested by R.J. Burnside & Associates Limited.
- Revised mass balance as presented in Table 7 of the letter and the resultant change is a reduction in nitrate from 4.38 mg/L where it enters the property to 3.67 mg/L where it leaves the property.

Harden indicates that the observed reduction in nitrate across the site is already more significant than presented in Table 7 suggesting that de-nitrification is already occurring in the aquifer. Harden also indicates that biological activity in the future quarry ponds will also utilize nitrogen and therefore the nitrogen concentration down-gradient of the quarry boundary will continue to be less than that entering the quarry property.

Burnside Response

The previous nitrogen balance was provided by Harden in their letter (Response to Burnside review of Drilling and Testing of new well M15 at Hidden Quarry Site) of January 14, 2014. The rationale presented in the letter indicates that 894 kg of nitrogen residue will be available for dissolution in the water. Although it appears that no nitrate was added to the Guelph Limestone quarry following blasting, some additional detail on the fate of the nitrogen should be provided.

4.0 Deeper Water Sources and Water Quality

JDCL has agreed to limit the depth of the Quarry to an elevation of 327 m asl. Harden indicates that the drilling of M15 has confirmed a significant water bearing fractures occur beneath the depth of the proposed quarry and that Rockwood Well Number 3 obtains water from fractures below this elevation.

Burnside Response

The reduced depth of the quarry provides an additional level of opportunity for any domestic wells that may be impacted from a quality/quantity perspective due to quarrying operations. This will allow wells that are shallow to be drilled into the deeper fracture system thus providing a better opportunity of maintaining a good water supply. The detailed domestic well survey to be completed by JDCL should include confirmation of existing well depths so that the potential for drilling a deeper well on a specific lot can be established.

4.1 Current State of Local Water Supplies and Vulnerability of the Aquifer

Samples collected by Harden on April 8, 2014 had significant levels of both E.coli and total coliform in Tributaries A, B and C. Samples collected on the same day from the Guelph Limestone Quarry did not contain giardia, cryptosporidium or E.coli, however total coliform was detected.

Harden attributes the E.coli in the streams to farming activities such as cattle yards and manure spreading. Harden suggests that although the Hidden Quarry is closer to the five down-gradient wells than the farm fields, cattle yards and horse facilities, Tributaries A, B and C will deliver contaminants to the lands just north of Highway 7 where these contaminants infiltrate and enter the bedrock aquifer underlying the sand and gravel. Harden also indicates that samples collected from proxy sites demonstrates that the water quality in quarries is generally far better than that found in tributaries A, B and C at the Hidden Quarry site that the stored volume of water in the quarry offers at least 20 times more dilution than the existing bedrock aquifer. Based on this evidence Harden concludes that the Hidden Quarry will not be a major source of potential bacteriological contamination in this area.

Burnside Response

The location of the Guelph Limestone Quarry does not lend itself to being a recipient of significant E.coli since it is located largely within an urbanized area. Although there are some agricultural uses on the land to the northwest, any run off from these lands will likely enter the Speed River prior to impacting the quarry lands. In addition there is active dewatering in the Guelph Limestone Quarry which will draw water from the surrounding aquifer into the quarry. It

is not known how this may impact the water quality in the quarry. Although the west quarry pond may have significant dilution potential,

To date water quality samples have been collected from monitoring wells on the Hidden quarry site and no samples have been collected from nearby domestic wells. The current water quality in down-gradient wells should be assessed as part of the quarry application process since it appears likely that they may already have elevated nitrate levels. This will allow for existing impacts from current land uses to be quantified and will provide baseline water quality data so that future impacts (if any) from the quarry can be quantified and remediated if necessary.

4.2 Recent Research and Susceptibility of Local Wells to Contamination

Harden indicates that recent work at the University of Guelph Arkell Research Station suggests that there is significant bacteriological contamination of the underlying bedrock aquifer despite being overlain by over 12 m of glacial sediments. Harden indicates that this suggests that the aquifer down-gradient of Tributary A, B, or C or where glacial sediments are known to be less than 10 m thick are already susceptible to contamination originating from surface water infiltration. Other recent research cited by Harden indicates that a recent study found that 97 % of wells tested in southern Wellington County have some indication of sewage derived contamination. The conclusion of this investigation was that *“all well types completed in the fractured bedrock aquifers of southern Wellington County are susceptible to contamination with at least one type of organic waste water contaminant regardless of the wells construction, depth, surrounding land use, overburden thickness”*. Harden concludes that groundwater contamination from human activities is already occurring in this area. However, Harden also suggests that other mechanisms such as sunlight, biological activity and the dilution potential of the quarry will result in improved water quality in the aquifer.

Burnside Response

It is not clear whether comparison with the Arkell site is appropriate given that the research station is an intensive chick and swine research facility and as a result likely produces significant amounts of manure in comparison to some of the agricultural activities currently in the area of the Hidden Quarry. The fact that all wells in the area are deemed to be susceptible to contamination reinforces the fact that a comprehensive pre-quarrying baseline study needs to be undertaken in order to establish the current water quality and capacity. This is important as it will protect both the proponent and homeowner from any quality claims that may occur in the future. This study should be undertaken prior to approval in order to quantify how many wells (if any) have current water quality issues and which wells may be adversely impacted by any water quality changes that result from quarry operations.

4.3 Waterfowl Use of Hidden Quarry Pond

Harden indicates that the use of the east and west pond by waterfowl will be limited by characteristics of the pond such as deep water, rocky shoreline and dense shoreline vegetation as discussed by GWS Ecological Research and Forestry Services. Harden also indicates that waterfowl were observed in the Guelph Limestone Pond at the time of the water quality sampling for E.coli, cryptosporidium and giardia. None of these bacteria were detected in the water. Harden concludes that the natural introduction of nutrients and bacteria by water fowl and wild mammals will not occur at a significant level.

Burnside Response

JDCL should configure the ponds and adjacent shoreline to discourage the use of the ponds by waterfowl.. However, it is still possible that the quarry pond will become home to a number of animals following the end of extraction activities. This may increase the potential for giardia and cryptosporidium to enter the water system. This should be considered as part of the monitoring program.

4.4 Water Quality Early Warning and Mitigation

Harden indicates that there are a number of on-site monitoring wells that will be utilized to provide an assessment of water quality changes well in advance of any water moving off site. Harden indicates that even after 4 years of quarrying north and west of Tributary B the only private wells down-gradient of the extraction are W10 and W16. The drilling of well M16 will not occur until after the quarry license has been approved. However there will be several years of activity on the west side of Tributary B before the quarry on the east side is commenced which will allow ample time for baseline conditions to be established. Harden indicates that water well surveys immediately down gradient of the site have been undertaken at various times since 1995 and that none of the 5 wells immediately down-gradient of the site meet current O. Reg. 903 standards. However Harden indicates that although the wells do not comply with O. Reg. 903, they do not need to be accessed for water quality assessment since the water will be taken from plumbing fixtures. Baseline water quality and quantity assessments of wells W10, W16, W17, W18 and W19 will be undertaken as part of the overall private wells survey. Proactive modifications or retrofitting of these down-gradient wells such that they are only taking water from the deeper fracture sets will be undertaken at the request of the landowner. Harden also recommends that UV systems be installed at no cost to the landowners. Harden concludes that there will remain access to abundant high quality domestic water supplies at all receptors.

Burnside Comment

It is Burnside's opinion that it is preferable for residents to refrain from the need to use water treatment systems if possible. As a result Burnside recommends that the condition of the closest down gradient wells be investigated as part of the on-going studies in support of the quarry application. The assessment should include detailed documentation of the surface condition of the well, the depth of the pump, a brief pumping test to quantify the well yield and collection of water quality samples. The potential to deepen the well to access the deeper fracture system below 327 m asl should be evaluated. The survey should also identify the repairs needed in order to bring all wells in compliance to O. Reg. 903. Compliance with O. Reg. 903 decreases the chances that water quality impairment is being caused by the condition of the well which will make future evaluation of water quality easier. If the quarry application is approved, then the necessary repairs/retrofits to these wells should be undertaken within one month of license approval. Burnside also suggests that drilling of well M16 be undertaken as part of the approval process as it will provide additional data on the eastern portion of the property where there are limited deep monitoring wells.

5.0 Local Well Survey

JDCL agreed to undertake a voluntary detailed well survey and water quality assessment of wells within 500 m of the quarry. This will be conducted to establish baseline water quality and quantity conditions. Harden Environmental indicates they have already undertaken 3 such studies as summarized in the current letter. JDCL has agreed to upgrade wells, those in pits or buried to facilitate water level monitoring of up-gradient wells, if agreed to by the homeowner. Harden indicates that based on previous surveys, this will include well 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 have a higher water level, and thus regular water level monitoring is not needed and water quality can be obtained from the existing plumbing system. Harden indicates there will be minimum period of 2 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 R.J. Burnside & Associates Limited.

Burnside Response

Burnside recommends that all wells to be monitored be upgraded as required. Burnside recommends that water level and water quality samples be collected from those wells immediately down-gradient of the pit. We also recommend that the well heads be retrofitted to bring them in compliance with O. Reg. 903. This will ensure that any water quality issues in the future are not a result of well construction and will make it easier to resolve any future interference claims if they arise.

6.0 Quarry Depth Limitation

JDCL has agreed to limit the depth of the quarry to a minimum elevation of 327 amsl.

Burnside Response

The original proposal was for extraction to 320 m asl. The revised extraction depth will provide a greater opportunity to deepen domestic wells in the event of a change in water quality/quantity.

7.0 Brydson Spring and Blue Springs Creek

Harden indicates that the quarry will not result in any reduction in flow in the Brydson Spring and that it is likely that the infiltration of waters of Tributary B and C contribute significantly to the Brydson Spring discharge. Since the flow in Tributary B and C will not be affected by the quarry operation, no change in the outflow from Brydson Spring will occur. JDCL has agreed, providing that permission is given by the owner, to conduct flow and water quality testing of the spring to establish baseline conditions.

Burnside Response

Conducting baseline flow and quality monitoring of the Brydson Spring will help to address concerns raised by both the GRCA and Halton Region.

8.0 Rock Extraction Water Level Change Monitoring

JDCL has agreed to limit the depth of the quarry to an elevation of 327 m asl. The elevation of the water table in the sinking cut is approximately 350 m asl. Harden proposes to use M3 as a reference elevation resulting in a minimum allowable water level in the sinking cut of 346.83 AMSL. JDCL proposes to hang a buoy from a tether with the buoy floating in the water until the water level falls below an elevation of 346.83 amsl at which point extraction will stop until water levels recover. JDCL has agreed to install a dedicated monitoring well as an open hole to 327 AMSL in the quarry limits. This well will be installed as M17.

Burnside Response

Information in the original Harden submission indicates that well M3 is only screened to a depth of 350 amsl which is indicated to be the elevation of the water table in the sinking cut. As a result it is not clear whether this well is an appropriate monitor to use to establish the low water level in the sinking cuts as it is completed within the upper portion of the bedrock at the water table elevation and there is still 23 m of bedrock to the base of the pit. Burnside recommends that a hole at the site be extended down to a depth of 327 amsl and be completed as an open hole in order to mimic the conditions within the quarry. Burnside concurs that the installation of M17 is an appropriate idea however it does not appear on Figure 2 as indicated by Harden.

8.1 Historic Low Water Level

Harden expects that there will be a maximum water level change at the quarry edge of 2.45 m and 1.6 m at the nearest private well. This quarry induced change is in addition to the natural variation in water levels. Therefore when water levels are at their natural low (as obtained from historic water level data) an additional 1.6 m of water level change is anticipated at the nearest well. JDCL has agreed to conduct a voluntary detailed private well survey to determine if any well could be impacted by the predicated change in water level, either modify the well or decrease the level of drawdown in the quarry as necessary. Harden includes a detailed monitoring plan in Appendix E of the letter.

Burnside Response

Burnside recommends that the well survey be done as part of the quarry approval process with a short term test designed to mimic typical domestic use completed. This will allow an assessment of typical water level declines under normal use. The current pump settings should also be confirmed so that assurances can be provided to homeowners that the 1.6 m change in low water levels will not impact the ability of the well to meet their normal domestic needs. If necessary the pump should be lowered to provide an appropriate margin of safety. An individual well construction drawing should be prepared for each well. A rating system should be developed that can be used to calculate the likelihood and type of impact (if any) from the quarry for each well. A detailed contingency plan is needed so that a formalized method to respond to well interference complaints is in place.

8.2 Monitoring Plan Revisions

A variety of changes to the monitoring plan have been made by Harden, primarily in accordance with requests from the GRCA to provide more rigorous monitoring of surface water features. Harden indicates they have provided the location of the well M17 on Figure C1.

Burnside Response

Burnside could not locate well M17 on Figure C1. The comments below pertain to the monitoring program provided in Appendix E of the Harden letter:

- Burnside recommends that well M3 be deepened to 327 m asl and completed as an open hole which will allow it to monitor water levels in the sinking cut. Currently this well is completed to a depth of 350 m asl with approximately 23 m of bedrock between the bottom of the well and the bottom of the sinking cut. As a result, it is possible that this well does not provide a true indication of water levels throughout the entire bedrock sequence. The table on page 2 of the monitoring program should include a section on domestic wells. At this point the domestic wells to be monitored should include the closest wells both up-gradient and down-gradient of the pit with semi-annual water quality monitoring and daily water level monitoring with dataloggers. The table should include a notation that the program will be modified following the baseline survey.
- Section 2.1 of the monitoring program includes the trigger levels for the bedrock aquifer and with the levels for M15 and M16 to be determined. Burnside recommends that monitoring begin at M15 as soon as possible in order to establish water levels for a number of seasons so that a reliable true historical low water level can be established. Similarly, M16 should be installed as soon as possible so that a meaningful pre-extraction water level database can be established.
- Protection of water quality/quantity in domestic wells should be a primary objective of the monitoring program. Since fractures in bedrock are heterogeneous, water levels on the site may not be representative of levels in domestic wells completed at similar depths. Rather than expanding the on-site monitoring network, Burnside recommends that a rigorous domestic well monitoring program be set up with trigger levels for each well and a well specific contingency plan.

2.3 Trigger Levels for Sinking Cut

Harden proposes to use a floating buoy as a visual indicator that the water level is being maintained above 346.83 amsl. Burnside recommends that a logger be installed with internet based access so that the water level in the sinking cut can be verified by authorized users who are independent of JDCL. It is recommended that the Township of Guelph/Eramosa be one of these authorized users. Provisions should be detailed in the monitoring program for notification of interested parties in the event that extraction needs to stop due to a decline of water levels below 346.83 amsl.

3.0 Contingency Measures

Harden provides protocols to be followed in the event that a trigger level for groundwater levels and the northwest wetland water levels are exceeded.

Burnside Response

Harden should provide a timeline for notification of the Township and GRCA following the investigation of the trigger level breach. We also suggest under item 2 that the wording be changed from "within 7 days conduct an evaluation" to "within 7 days complete an evaluation".

Each of the recommended actions under item 3) are appropriate, but a decreased rate (or stopping) extraction should occur while the other options are investigated or put in place. As an example, it is anticipated that increasing the length and/or width of the barrier may take some time to implement and impacts will need to be reduced to below trigger levels while the work is completed.

3.2 Water Quality

Harden indicates that if the Quarry is found to be responsible for a water quality change then semi-annual testing of water quality of private wells that could be potentially impacted by the quarry will occur. In addition Harden indicates that in the event that a water quality issue related to the quarry occurs, JDCL will remedy the issue by providing the appropriate treatment, drilling a new well or isolating the water supply to the deeper aquifer.

Burnside Response

There needs to be clarification provided for the term "*A water quality issue related to the quarry occurs*". As with water levels, there is likely to be variation in water quality over time which will not necessarily be due to quarrying activities. As a result, baseline seasonal water quality must be established in all domestic wells within 500 m of the quarry prior to commencement of quarrying activities. Once the baseline is established then it is important that the parameters to be assessed and the limits allowed be established prior to the beginning of any extraction activities. The water quality data should be used in conjunction with the well information collected (as discussed in response 8.1) to identify wells to be included in the long term monitoring program.

4.0 Pre-Bedrock Extraction Water Well Survey

Details are provided regarding the information to be collected as part of the pre-extraction well survey. Wells that are identified for inclusion in the monitoring program will be modified as necessary by JDCL to permit continued monitoring.

Burnside Response

The condition of the well casing (visual inspection only) and lid should be documented as part of the well survey. Similarly the drainage around the well head should be delineated

5.0 Annual Monitoring Report and Interpretation

Harden indicates an annual report will be prepared and submitted to the Ministry of Environment and the Ministry of Natural Resources on or before March 31 of the following calendar year.

Burnside Response

The Township of Guelph/Eramosa should also be provided with a copy of this report.

9.0 Additional Work

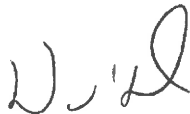
The proposed quarry has the potential to impact water levels and water quality in nearby domestic wells. There is also the potential that changes in flow could be observed in the Brydson Spring. Although many of the domestic wells have been visited, there has been no detailed data collected. Burnside recommends that the following additional data be provided as part of the application:

- A detailed well survey needs to be completed for all domestic wells within 500 m of the proposed quarry (and wells along 7th line to the East). The survey should include measurement of well depth, static water level, pump setting along with descriptions and photographs of well condition and accessibility for monitoring. Water quality samples should be collected. The results of the survey should be used to prepare a contingency plan for each well in the event water quality/quantity is impacted by the quarry. In particular, wells that could be deepened to access fractures below 327 amsl should be identified. Wells that require repairs to allow for monitoring or to prevent surface water intrusion should be identified.
- New wells M16 and M17 should be drilled and evaluated in the same fashion as M15.
- The Brydson spring should be investigated with a flow monitoring program implemented so that the pre-quarry base flow relationship between the spring and Tributary B can be established.
- Water quality samples should be collected from the on-site monitors and surface water features at the same time as the domestic well samples to allow for water quality to be compared.

If you have any questions regarding these comments please contact the undersigned.

Yours truly,

R.J. Burnside & Associates Limited



David Hopkins, P.Geo.
Senior Hydrogeologist
DH:sd

cc: Ms. Kim Wingrove, Township of Guelph/Eramosa (Via: Email)
cc: Mr. Greg Sweetnam, B.Sc., James Dick Construction (Via: Email)



October 6, 2014

Via: Email

Ms. Kim Wingrove
CAO
The Township of Guelph/Eramosa
P.O. Box 700
Rockwood, ON N0B 2K0

Dear Ms. Wingrove:

**Re: Response to CRC Representative Gary Hunter, August 5, 2014 "Addendum"
Project No.: 300032745.0000**

At your request, R.J. Burnside & Associates Limited (Burnside) completed a brief review of a spreadsheet prepared by James Dick Construction Limited in response to an August 5, 2014 "Addendum" from Mr. Gary Hunter. Mr. Hunter has been retained by the Concerned Residents Coalition (CRC) to provide peer review comments on a number of the technical reports prepared by JDCL in support of ZBA 09112 (Hidden Quarry). Burnside has reviewed the comments related to hydrogeology and found the JDCL responses to be appropriate. A significant number of comments are related to domestic wells and as a result, the detailed domestic well survey to be completed by JDCL will provide additional clarification.

Should you have any questions, please contact the undersigned.

Yours truly,

R.J. Burnside & Associates Limited

Dave Hopkins, P.Geol.
Senior Hydrogeologist
DH:sd

cc: Ms. Liz Howson, Macaulay Shiomi Howson Ltd. (Via: Email)

141006_Response to CRC 140805 Letter
16/01/2015 12:01 PM

Hidden Quarry Hydrogeological Meeting Notes

October 21, 2014

Kim Wingrove GET,
Don McNalty, Dave Hopkins - RJ Burnside
Stan Denhoed – Harden Environmental
Greg Sweetnam, Leigh Mugford – JDCL

The meeting took place at the RJ Burnside Guelph office, October 21, 2014 at 10am.

The purpose of the meeting was to clarify and agree on what the asks were to resolve outstanding additional work items in the October 6, 2014 letter from RJ Burnside.

In general it is felt by JDCL that at the conclusion of the meeting there was sufficient clarity and agreement on the items discussed that once JDCL has put forth the agreed upon follow up documentation, RJ Burnside would be able to make a positive recommendation to GET council on the area of hydrogeology.

JDCL will be providing a detailed technical response to the October 6, 2014 letter once the agreed upon well water, groundwater monitoring and surface water monitoring has been completed.

Specific Items reviewed: (numbered as per the RJ Burnside October 6, 2014 letter)

9.0 Additional Work

- An agreement on a pre-approval and post approval voluntary residential and on site water quality/quantity well survey was reached. A map of local wells was used in the meeting as a figure to assist in the planning and a photo of the map is attached.

Pre-Approval One Time Water Quality Survey – will include general water chemistry including Nitrate and associated compounds, bacteriological test (coliform, e. coli)

- W4 W5 W7 W8 W9 to the north of the site
- W1, W10, W11, W16-W24 to the south of the site
- On site wells

Post Approval Voluntary Baseline Well Survey and Water Quality -will include general water chemistry including Nitrate and associated compounds, bacteriological test (coliform, e. coli) and residential well construction detail survey including water level (spring and fall), capacity and construction details.

- Wells indicated on Figure 6.1 in the shaded blue areas
- Wells W17-21 are considered down gradient and will be offered upgrading as required to meet current well construction specifications.
- Wells W4-W9 north of the site are considered upgradient and if long term monitoring is allowed by home owner, then upgrades to the well will be made to allow for well logger installation and access.
- Wells on site will also be included for Water Quality for ongoing monitoring and comparisons at the same time as residential wells.

One sample representing high water table conditions and one sample representing low water table conditions will be taken in all wells in the survey area.

Post Approval long term voluntary water quality monitoring program –will include quarterly bacteriological (coliform, e. coli), annual nitrate testing.

- W1, W10, W11, W16-W24 to the south of the site (nitrate and bacteriological testing)

Post Approval long term voluntary water quantity monitoring program

- W4 W5 W7 W8 W9 to the north of the site (offer to install water level loggers that would reported on annually)
- New wells M16 and M17 were discussed. The purpose of these wells was a key point in the decision on the timing of their installation. It was agreed that they are for monitoring the water table during extraction and they are not required to confirm Harden’s findings on the state of the local hydrogeology and the predicted quarry impacts. They can be monitored to add to the base line study prior to extraction as there would be a number of years post approval to obtain this information. As such these wells can be installed post-approval and pre-extraction (agreed upon at this meeting). These two wells can be flow profiled but are intended to be open holes and not multilevel monitors. JDCL discussed two additional monitoring wells M18 M19 (suggested by Region of Halton) that will be placed along the south side of the property boundary to act as monitors between the quarry operation and the residents south of Hwy 7. M18 and M19 are also to be installed post-approval. JDCL will send the matrix of Halton comments and responses to Burnside.
- As requested the Brydson Spring has been accessed by Harden for flow and water quality.
- It was agreed that sampling from on-site monitors will take place as part of the pre-approval residential sampling program to provide data from on site and off site at a relatively same point in time.

There is no additional response required for items 1.0-2.1, 2.3-2.4.

2.2 Hydraulic Testing in Multi-Level M15

- Stan indicated that he has done a significant amount of work on the different well levels. He can present an additional table to provide Burnside with additional information (that was agreed to).

3.0 Nitrate

- It was agreed that the study of nitrate has been satisfactory and that no further information is required beyond including the testing for nitrate will be included in the ongoing water quality monitoring on and off site.

There is no additional response required for items 4.0-4.3.

4.4 Water Quality Early Warning and Mitigation

- Water treatment systems were discussed. JDCL may reconsider offering a system to specific nearby residents who don't currently have one. It was agreed that many rural wells should have some sort of system, but they require routine maintenance like any mechanical system. Any offers to the public should be accompanied by a clear agreement with the person receiving the system so there aren't assumptions made regarding the ongoing maintenance and expectations regarding water quality.
- A pre-approval water survey was agreed to as discussed in Section 9.0 above.
- M16 was previously discussed also as above.

5.0 Local Well Survey – discussed in Section 9.0 above.

6.0 Quarry Depth – no additional response required.

7.0 Brydson Spring – discussed in section 9.0 above.

8.0 Rock Extraction Water Level Change Monitoring

- It was agreed that M17 will be constructed for monitoring post extraction rather than using M3.

8.1 Historic Low Water Level

- Harden agreed to provide an updated table of residential well information with a specific contingency plan for each, based on the previous visits to residences in the area. Some wells that are buried will not have complete information, however, this information will be obtained post approval during the Baseline Well Survey.

The purpose of this information is to provide Burnside with sufficient information to be able to respond to specific questions from the public regarding impacts to their wells. The Well Complaint Protocol will also be provided to Burnside and Associates.

8.2 Monitoring Plan Revisions

- As discussed above M17 will be used and M3 will not be altered. Select residential wells as identified in Section 9.0 above will be offered to have monitors placed in their wells on a non-mandatory voluntary basis.
- Monitoring M15 is ongoing. M16 is discussed above.
- Residential wells will be included in monitoring on a voluntary non-mandatory basis as discussed in Section 9.0 above. A Well Contingency Plan for residential wells is to be formulated by Harden.

2.3 Trigger Levels for Sinking Cut

- It was clarified and agreed upon that results from monitoring the sinking cut will be provided to interested parties such as the township in an electronic fashion. It is not intended that a live internet based system be implemented.

3.0 Contingency Measures

- Harden will provide notification timeline and will make the recommended change to “within 7 days to complete an evaluation” as well as wording relating to decreasing the rate of extraction while options are investigated.

3.2 Water Quality

- Harden will provide clarification of the term. The water monitoring program is discussed in Section 9.0 above.

4.0 Pre-Bedrock Extraction Water Well Survey

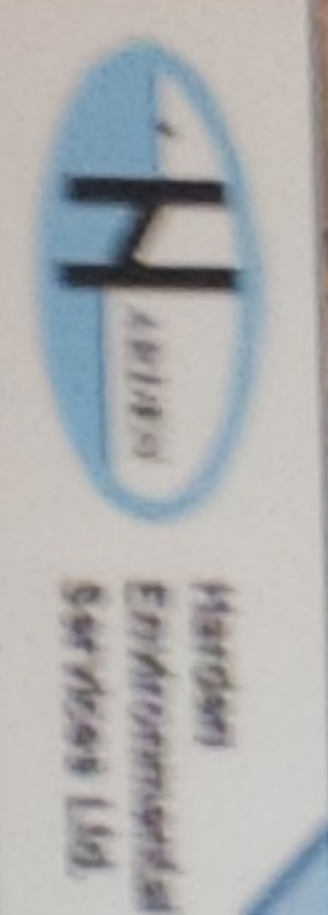
- These items (drainage around the well, casing and lid condition) will be included in well condition documentation.

5.0 Annual Monitoring Report and Interpretation

- GET will receive a copy of the annual report.

Legend

- Project Well Survey Location
- Subject Property
- 500 metre Buffer
- 100 0 100 Metres



Harden Environmental Services Ltd.
 Project No: 9996
 Date: Jul 2012
 Drawn By: SD

Hydrogeologic Impact Assessment
 Proposed Aggregate Extraction
 Part of Lot 1, Concession 6
 Township of Grange/Eramosa, County of Wellington

Figure 6.1:
 Proposed Pre Quarry Well Survey Locations

Leigh Mugford

From: Greg Sweetnam
Sent: Monday, November 10, 2014 3:28 PM
To: 'Don McNalty'; Dave.Hopkins@rjburnside.com
Cc: Leigh Mugford; Kimberly Wingrove (kwingrove@get.on.ca)
Subject: Halton August 1st Response Matrix- Hidden Quarry
Attachments: Halton Matrix Sept 23, 2014.pdf

Hi Guys,

As promised at our meeting of October 21, 2014, please find attached a copy of the Response Matrix provided for Halton Region Comments on September 23, 2014.

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



#	Contact	Date	Question	Response	Action Item	Who
1	Region Halton	28-Jul-14	<p>Surface Water Features:</p> <ul style="list-style-type: none"> Based on the GRCA's correspondence of April 23, 2014, Brydson Creek (i.e. an extension of Tributaries B+C south of Hwy 7) is classified as cold-water fish habitat. Except for SW3 at Hwy 7 crossing, there does not appear to be any surface water monitoring proposed at the Brydson Creek south of Hwy 7. Is SW3 representative of cold-water fish habitat at Brydson Creek? Are any fish habitat/ecological monitoring proposed along some specific section(s) of the creek? There is no evidence of such monitoring in any of the reviewed documents. 	<p>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. The hydraulic potential at the southern edge of the quarry will increase, thereby increasing the hydraulic gradient between the quarry and the spring. If the hydraulic gradient is maintained at current or higher levels 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 recommended. 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.</p>	<p>Attach April 7, 2014 letter from Burnside & Associates to GET and July 29, 2014 GRCA Signoff letter.</p>	JDCL
2	Region Halton	28-Jul-14	<ul style="list-style-type: none"> Brydson Farm Spring is located south of Hwy 7 and within Halton Region. There does not appear to be any monitoring proposed in regards to groundwater spring which is apparently attributed to re-emergence of Tributary B about 400m south of the proposed quarry site (i.e. at the Brydson's Farm in Milton). Harden Environmental asserts that water levels at Brydson Spring will increase, if anything, as a result of the quarry and that 600 m travel-distance from the extraction edge to the Brydson Spring would be more than sufficient to attenuate thermal changes in the groundwater. A permanent monitoring station should be established (subject to property owners' permission) at spring re-emergence to monitor for flow, temperature, water quality and any groundwater-uses and groundwater-dependant habitats in this area. 	<p>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 Brydson Spring to establish baseline conditions, including temperature. This baseline data will be helpful should any issues arise in future concerning flow conditions at the Brydson Spring. Groundwater levels and groundwater quality including temperature will be measured at several groundwater monitors downgradient of the quarry (M15, M16, M4). This monitoring will allow JDCL to measure changes in the groundwater flow system several hundreds of metres from Brydson Spring. The additional monitoring at the Brydson Spring is redundant and unnecessary.</p>	<p>Attach June 10, 2014 Harden letter.</p>	JDCL

3	Region Halton	28-Jul-14	<p>Groundwater Levels:</p> <ul style="list-style-type: none"> In their November 12, 2013 correspondence, Burnside indicated that there is significant potential for impacts from the proposed quarry activities on the groundwater resources in the surrounding area. This correspondence recommended, among other things, that all domestic wells within 500m of the quarry site be inspected and tested to evaluate how susceptible they are to water level variations, and that the proposed monitoring program should be expanded to include representative domestic wells. The groundwater levels and temperature monitoring at the south side of the subject lands should be expanded beyond M4, to all accessible domestic wells south of Hwy 7, as noted below. 	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.	Attach June 10, 2014 Letter and Figures. Attach modified Figure 6.1 Well Survey Locations Figure.	JDCL
4	Region Halton	28-Jul-14	<p>Domestic Wells:</p> <ul style="list-style-type: none"> Little is known of the current status of private wells in Halton Region south of Hwy 7 as the last well survey was conducted in mid-1990s. Both a survey and well assessment should be carried on all wells in Halton Region potentially under the influence of the flow from the quarry site. At a minimum, all properties that lie within the 500m zone should be subject to a well survey, including wells at these properties that might be located somewhat outside of the 500m zone. 	Agreed. Please see Response #3 above. Also please find attached a figure entitled "Down Gradient Wells" that illustrates the four wells in Halton Region that are down gradient from the quarry. All of these wells have been included in the Voluntary Well Survey. Please also know that with the reduction in quarry depth, there remains considerable rock left in situ beneath the quarry to allow for groundwater to continue to underflow the Quarry in undisturbed fracture sets. This allows the opportunity to retrofit downgradient wells to access this lower area of the dolostone aquifer. In the Harden June 10, 2014 correspondence to Burnside, James Dick Construction Limited agreed to the following proactive approach, subject to the request of the landowner. Pro-active modifications or retrofitting of these down gradient wells such that they are only taking water from the deeper fracture sets will be undertaken at the request of the landowner. Out of an abundance of caution we have also recommended that at-source domestic UV treatment systems be installed at the downgradient wells. UV systems should be in place in this fractured bedrock environment area in any event even without a quarry. All modifications will be done at no cost to the landowners. With these measures in place it is Harden's opinion that there will remain access to abundant high quality domestic water supplies at all receptors.	Attach June 10, 2014 Letter and Figures. Also attach Figure 4 Dec 2013 "Down Gradient Wells".	JDCL
5	Region Halton	28-Jul-14	<ul style="list-style-type: none"> Burnside stated that the monitoring program should reference the pre-extraction well survey that would include water quality/quantity testing and indicate which wells will be potentially involved in the monitoring program. Should access be limited to private wells within the Region for the purpose of long-term monitoring and testing, then additional (multi-level) monitoring installations should be established along the southerly boundary of the subject lands for monitoring and "early warning" purposes (i.e. west and east of the existing monitoring well M4). 	James Dick Construction Ltd. agrees 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.	Amend Figures to include two additional multi level monitors as indicated.	Harden
6	Region Halton	28-Jul-14	<p>Well Complaint Protocol:</p> <ul style="list-style-type: none"> JDCL proposed to involve Water Well Drilling Company and have Harden on stand-by to address any water quantity or quality issues that arise. We assume that the "well complaint protocol" would encompass Halton residences downgradient of the site. Confirmation of this understanding is required from both JDCL and Burnside. 	James Dick Construction Limited confirms that the "well complaint protocol" would encompass Halton residents.	None required.	

7	Region Halton	28-Jul-14	<p>Water Quality: Burnside expressed concerns that quarrying activities could impact current concentrations of nitrate, iron and also introduce surface water pathogens into the nearby groundwater system. We agree with Burnside's comments and recommendations on the protection, monitoring and mitigation of water quality, and recommends further improvements as summarized below:</p> <ul style="list-style-type: none"> • Burnside suggested the establishment and sampling of on-site multi-level MIS to determine nitrate concentrations with depth and that any nitrate contributed by the blasting should be quantified and included in the mass balance. We recommend installing an additional multi-level monitor at the southern site boundary and incorporating monitoring data (water level and quality) in the mass balance nitrate calculations to better understand nitrate concentrations leaving the site (pre- and during extraction). 	Please see attached response to Burnside dated June 10, 2014 that provides a detailed response to this issue. Specifically please see sections 2,3 and 4.	Attach June 10, 2014 Letter and Figures.	JDCL
8	Region Halton	28-Jul-14	<ul style="list-style-type: none"> • Burnside noted that Harden should provide commentary as to the impact of water fowl on surface water in the quarry and how this may impact downgradient wells. We agree that additional information on the matter is required. 	Please see attached response to Burnside dated June 10, 2014 that provides a detailed response to this issue. Specifically please see sections 2,3 and 4. The use of the East and West Pond by waterfowl will be limited by characteristics of the pond such as deep water, rocky shoreline and dense shoreline vegetation as discussed by GWS Ecological and Forestry Services. Waterfowl were observed in the Guelph Limestone Pond at the time of the water quality sampling for E. Coli, cryptosporidium and giardia. None of these bacteria were detected in the water. It is GWS's and Harden's conclusion that the natural introduction of nutrients and bacteria by waterfowl and wild mammals will not occur on a significant level.	Attach June 10, 2014 Letter and Figures.	JDCL
9	Region Halton	28-Jul-14	<ul style="list-style-type: none"> • Burnside noted that Harden should provide additional detail on how the existing monitoring well network would provide sufficient early warning so that the treatment system can be installed in downgradient domestic wells before unacceptable impacts to drinking water occur, and also that Harden would need to qualify if any existing wells could be deepened or whether the installation of water treatment equipment would be the preferred option. We support a pro-active approach to protection and mitigation of private wells in Halton Region. 	Please see response to Comment 4 above. Please also know that with the reduction in quarry depth, there remains considerable rock left in situ beneath the quarry to allow for groundwater to continue to underflow the Quarry in undisturbed fracture sets. This allows the opportunity to retrofit downgradient wells to access this lower area of the dolostone aquifer. Harden responded in detail to this issue in Section 4.4 of their June 10, 2014 letter to R.J. Burnside and Associates. In general, there will be several years of monitoring during Phase 1 of the quarry to observe water quality changes. In addition, at the end of Phase 1 there are only two wells downgradient of the quarry (W10 and W16). The detailed pre-quarry well survey will determine the construction details of the private wells and upon which mitigation strategies can be based, if needed. In the Harden June 10, 2014 correspondence to Burnside, James Dick Construction Limited agreed to the following pro active approach, subject to the request of the landowner. Pro-active modifications or retrofitting of these down gradient wells such that they are only taking water from the deeper fracture sets will be undertaken at the request of the landowner. Out of an abundance of caution we have also recommended that at-source domestic UV treatment systems be installed at the downgradient wells. UV systems should be in place in this fractured bedrock environment area in any event even without a quarry. All modifications will be done at no cost to the landowners. With these measures in place it is Harden's opinion that there will remain access to abundant high quality domestic water supplies at all receptors.	See Attachments in Response to Comment 4.	JDCL

10	Region Halton	28-Jul-14	<p>Review of Monitoring Adjacent to Halton Region Lands:</p> <p>It appears that JDCL intends to utilize two established monitoring locations at the southern boundary of the proposed Hidden Quarry and immediately north of Hwy 7: (i) M4 - a 18.6m deep bedrock monitoring well south of the Phase 3 area and (ii) SW3 -surface water flow station at the Tributary B crossing Hwy 7. It appears that drive-point(s) M7/M7R (i.e. 2.8m/3.1 m deep overburden piezometers just east of M4) are not proposed for monitoring (we assume they are mostly dry). Our comments regarding the proposed monitoring program are as follows:Groundwater monitoring program:</p> <p>The extraction depth of the proposed quarry is approximately 30 metres below the water table using subaqueous methods without dewatering. It is noted that fully-penetrating bedrock wells are not proposed along the southern property line adjacent to the Phase 3 lands. Therefore, the full influence on water resources south of the quarry would not be known unless adequate instrumentation is added downgradient of the Phase 3 lands.</p> <p>As M4 (18.6m deep) is the only observation well proposed for monitoring in this area, we recommend 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 should be multi-level to adequately represent groundwater levels and quality throughout the bedrock profile and to protect private wells and properties located downgradient of the site in Halton Region. The new wells should be established sufficiently ahead of the extraction in Phase 2 and 3 in order to collect representative baseline data (both water levels and water quality). The monitoring should provide information on changing groundwater regime and serve as "early warning" for downgradient private wells in Halton Region.</p>	<p>In response to comments by Burnside, James Dick Construction Ltd. has agreed to limit the depth of the quarry to a minimum elevation of 327 masl (a 7m reduction from the original proposal). Please see response to Comment 5 above where JDCL agrees 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. Please also see the response to Comment 4 above.</p>	<p>Amend Figures to include two additional multi level monitors as indicated.</p>	Harden
11	Region Halton	28-Jul-14	<p>Surface water monitoring program:</p> <p>Based on the GRCA's correspondence of April 15/13, Brydson Creek is classified as cold-water fish habitat south of Hwy 7. There does not appear to be any surface water monitoring proposed at the Brydson Creek south of Hwy 7. There does not appear to be any monitoring proposed in regards to the groundwater spring attributed to re-emergence of Tributary B about 400m south of the site in Halton Region (i.e. at the Brydson farm in Milton). Further Regional comments on surface water will be provided in our technical comments on the Natural Environment Technical Report (to be provided under separate cover).</p>	<p>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. The hydraulic potential at the southern edge of the quarry will increase, thereby increasing the hydraulic gradient between the quarry and the spring. If the hydraulic gradient is maintained at current or higher levels 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 recommended. 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.</p>	<p>None required. Brydson Spring has already been added to the monitoring program if the landowner grants access.</p>	

12	Region Halton	28-Jul-14	Private Well Monitoring: We note that the Harden Environmental February 5, 2014 letter indicates that a well monitoring program for water quality and an action plan to remedy any issues is proposed to protect neighbouring private wells. It is not clear to Regional Staff how this program protects or addresses private wells within the Region of Halton. Further, it is not clear to Regional Staff that all private wells in close proximity to the extraction site have been evaluated or are included in this program.	Please see attached Modified Figure 6.1 illustrating all wells located within the 500m Well Survey Zone. These wells include private wells located in the Region of Halton, specifically the Town of Milton.	Attach June 10, 2014 Letter and Figures 6.1.	JDCL
13	Region Halton	28-Jul-14	Additionally, the private well complaint protocol (Section 6.0 of the February 5, 2014 Harden letter) should be revised to include the Region of Halton and the Town of Milton as parties to be notified in the event that a water well complaint is received. Further, clarity on how the complaints will be handled should be provided.	James Dick Construction Agrees to include the Region of Halton and the Town of Milton as parties to be notified in the event that a water well complaint is received. A well complaint protocol was prepared in September 2013 and presented to R.J. Burnside. This protocol is attached.	Amend Well Complaint Protocol.	Harden
14	Region Halton	28-Jul-14	Other: • Trigger levels and contingency measures are proposed for northwest and north areas of the proposed quarry site, mainly in association with the on-site wetlands. No trigger water levels are proposed on at the south end of the extraction area. Further discussion to this point is requested.	Groundwater levels will rise at the south end of the quarry and since a) there are no water level sensitive features proximal to the south side of the quarry and b) the water level will not rise enough to cause issues in the root zone of the forest on the south side of Hwy 7; trigger levels are not necessary. Nonetheless, trigger levels set at the northern (upgradient) portion of the property are also protective of water levels at the south end of the property (the lake has a common elevation). The final water level in the quarry pond is estimated to be 348.6 m AMSL which is above the maximum high water elevation recorded at M4. These factors make trigger levels along the southern boundary, unnecessary. The trigger levels have been added on a table on Page 4 of the updated (July 14, 2014) site plans (attached) at the request of the GRCA.	Attach Updated Site Plans.	JDCL
15	Region Halton	28-Jul-14	• The apparent "benefits" of the on-site pond creation (subject to approval) on downstream wells, springs, ponds or streams, and properties should be subject to confirmation (through modeling) based on future (enhanced & multi-level) monitoring results; however, no off-site downgradient monitoring is proposed.	The water level at the south end of the property will increase with the creation of the lake and the leveling of the water table. As such basic engineering principals dictate that flow will increase to the south (Darcy's Law). No modeling is required. The groundwater model prepared for the site predicts a water level rise and the proposed detailed monitoring program will determine the actual water level rise. Additional modelling is not needed to confirm the benefits of the on-site pond, this will be achieved via the detailed groundwater and surface water monitoring program.	None.	
16	Region Halton	28-Jul-14	• The effects of blasting on private wells within Halton Region are not known and should be addressed.	No effect on the wells in Halton Region will occur due to blasting. Any impact on wells would be captured in the well complaint protocol. Explotech and the GET Peer review consultant Novus Environmental concur that blasting operations required for operations at the proposed James Dick Construction Ltd. Hidden Quarry site can be carried out safely and well within governing guidelines set by the Ministry of the Environment. In addition, quarrying will commence along the northern end of the quarry providing ample opportunity for monitoring water quality and observing the effects of blasting on on-site wells for several years before blasting near to Halton Region occurs. Please also see response to Comment 19 below for details of the Blast Monitoring.	None.	
17	Region Halton	28-Jul-14	Based on Site Plans; Stovel & Associates, June 6, 2014: As the site plan does not refer to any downgradient private well /private property monitoring.	The June 10, 2014 Harden response to Burnside details of the most-up-to-date monitoring program. The monitoring program has been updated (as of June 2014) to include monitoring of down gradient private well/private property monitoring as outlined in this response and the responses to other agencies and peer reviewers. This report is and will be referenced on the site plans. A summary table has been included on the site plans for onsite monitoring.	Update Monitoring Plan and reference Updated Plan on Site Plans	Harden, Stovel

18	Region Halton	28-Jul-14	<ul style="list-style-type: none"> Page 2 of 5: (i) "extraction footprint" on the site plan and in the latest hydrogeology reports do not align (ii) in regards to "a main processing area will be developed in the southwestern portion of the site once a sufficient area had been cleared", this area is not identified as part of any extraction stage; does the extraction include overburden only? (iii) "spills" protocol should include immediate notification to downgradient properties utilizing domestic wells as their primary drinking water supply. 	<p>(i)The extraction footprint on the site plan has been revised and is shown on the updated site plans. Some figures in the hydrogeology report are symbolic and do not align exactly with the site plans which are the legal document that will govern extraction. (ii)The extraction in the main processing area involves removal of vegetation, topsoil and overburden as well as the extraction and processing of above water table gravel. In this way the processing plant can be located at as low an elevation possible for noise and visual mitigation purposes. (iii)James Dick Construction Limited agrees to amend the Spills Contingency Plan to include the immediate notification of downstream properties utilizing domestic wells as their primary drinking water supply. The Spills Contingency Plan will be updated following the baseline private well survey and will include the names, addresses and contact telephone numbers for the five wells downgradient that could be impacted. If a spill is reportable to the MOE, the neighbours will be notified immediately.</p>	Amend Spills Contingency Plan to include Halton Region and the Town of Milton as well as downstream domestic well users as parties to be notified (upon completion of the Baseline Private Well Survey).	Harden
19	Region Halton	28-Jul-14	<ul style="list-style-type: none"> Page 3 of 5: (i) What are the anticipated "silt pond" depth/fill elevation in relation to groundwater levels to the south? The pond is proposed almost directly to the north of a sensitive receptor (private well W 19 defined as R16 on the site plan) in Halton Region. Is M4 installed to monitor potential impact from this pond? In reference to a "blasting line" on the south side of the west extraction area, what monitoring is proposed to ensure that private wells and other structures to the south (i.e. in Halton Region) are not affected by blasting activities? 	<p>The silt pond will be located above the bedrock and will be above water table (please note that the silt pond is generally located in the blasting setback where bedrock quarrying will not be taking place- Site Plan Page 3 of 5). Water in the washing system is closed loop and all water is recycled. Private well W19 is located to the south of the silt pond. Examination of bedrock ground water pre-extraction contours in this area (Figure 3.17 Bedrock Groundwater Contours of the September 2012 Harden Report) demonstrate that groundwater flow is almost due east, not towards W19. The overburden is dry in this area. Only during the later stages of extraction, with the establishment of the lake, does this well begin to draw water directly from the quarry area (please see the figure "Downgradient Private Wells" attached). Monitor M4 is located between the quarry and well W19 and would function to ensure water quality and quantity in off site wells located in a southerly direction. Washing aggregates is a clean activity and no chemicals are added to the process. Water is used to physically sort virgin, native materials of different grain sizes. Water naturally infiltrating the site today comes into intimate contact with these particles prior to recharging the bedrock aquifer. Water quality and quantity will be assessed in private wells prior to blasting operations. A well complaint protocol has been established should a resident feel that their well has been affected by blasting or other quarry activities. Furthermore, on-site monitoring will assess water levels and groundwater quality before leaving the site on a regular basis. All blasting events will be monitored to ensure compliance with MOE Blasting Guidelines. All blasts shall be monitored for both ground vibration and overpressure at the closest privately owned sensitive receptors adjacent the site, or closer, with a minimum of two (2) digital seismographs – one installed in front of the blast and one installed behind the blast. Monitoring shall be performed by an independent third party engineering firm with specialization in blasting and monitoring.</p>	Attach Figure 4 "Downgradient Private Wells" and Figure 3.17 "Bedrock Groundwater Contours"	JDCL
20	Region Halton	28-Jul-14	<p>Further to our July 5, 2013 letter, Regional Staff requested that an Adaptive Management Plan (AMP) be prepared as part of the review process for this proposed quarry. Regional Staff believe that this plan would provide for an effective tool to formalize any resolutions and commitments to monitor and mitigate water resources issues which would include Halton Region lands.</p> <p>It is noted that further technical comments with respect to other Regional interests on this proposed quarry will be forthcoming under separate cover.</p>	<p>Given the minimal potential for off site groundwater impacts in Halton Region from this site, there is no need for an Adaptive Management Plan at this site. A detailed Groundwater and Surface Water Monitoring Plan has been presented along with a Well Complaint Protocol and Spills Contingency Plan. Threshold values for water level changes and water quality changes are found within these documents including details of the required response by JDCL. These commitments made by JDCL include wells within Halton Region. Various agencies noted in response to Comment 1 have indicated that the proposed monitoring program is appropriate.</p>	None.	

21	Region Halton	28-Jul-14	Regional Staff note that the Region 's Review fee (\$18,714.19) remains outstanding. As noted in our April 2, 2013 correspondence, we kindly request that James Dick Construction Limited submits this review fee to the Region in accordance with the Region's Development Application Requirements.	Respectfully, JDCL declines to pay a review fee to Halton Region. We have recieved advice that demand for such a fee is not legal according to the Municipal Act, given that the Hidden Quarry lands are outside the municipal boundary of Halton Region. All fees have been paid to the Township of Guelph/ Eramosa in accordance with their requirements, including robust Peer Review Fees. Additional substantial fees have also been paid to the GRCA. The application is also consistant with the Wellington County Official Plan which designates this property as a Mineral Resource Area.	None.	
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The following materials have been reviewed as part of the Halton comments:

22	Halton Region	28-Jul-14	Letter from MOE's Carl Slater to James Dick Construction Ltd. (JDCL), dated July 3, 2013.	This letter has been superceded by MOE correspondence dated October 10, 2013. This letter states that the surface water and groundwater outstanding items have been addressed to MOE satisfaction.	Attach October 10, 2013 Letter from MOE	JDCL
23	Halton Region	28-Jul-14	Letter-report from Harden Environmental Services Ltd. (Harden) to JDCL, dated July 15, 2013, responding to MOE's comments of July 3, 2013.	See Response 22 above. MOE has signed off on all outstanding surface water and groundwater items.	Attach October 10, 2013 Letter from MOE	JDCL
24	Halton Region	28-Jul-14	(i) Hydrogeological Summary (letter) Report for Township of Guelph Eramosa from Harden to JDCL, dated September 5, 2013; (ii) Burnside's comments dated November 12, 2013 on Harden's Hydrogeological Summary Report, and (iii) Burnside's responses dated April 8, 2014 (C1) and April9, 2014 (C2) to Harden's letter (dated January 14, 2014) responding to Burnside's comments of November 12,2013.	Latest Response to Burnside Comments April 8th and 9th comments are the June 10th, 2014 response from Harden Environmental.	Attach June 10th, 2014 response from Harden Environmental.	JDCL
25	Halton Region	28-Jul-14	(i) Letter from Grand River Conservation Authority (GRCA) to Township of Guelph/Eramosa dated November 4, 2013), and (ii) Letter from GRCA to Township of Guelph/Eramosa dated March 28, 2014; and (iii) Letter from GRCA to Township of Guelph!Eramosa dated April 23,2014	GRCA correspondence has been superceded by sign off from GRCA sent to Guelph/Eramosa dated July 29, 2014. This letter staes that GRCA has no further comments on the Hidden Quarry application and as such has no objection to the application being brought forward.	Attach July 29th, 2014 GRCA letter.	JDCL
26	Halton Region	28-Jul-14	Letter-report from Harden to JDCL, dated February 5, 2014, concerning "timeline for changes to monitoring plan"	This document will be updated, including revisions as requested by Halton that have been agreed to by James Dick Construction Limited as confirmed in this document.	Revise Monitoring Section of Hydrogeolical Investigation Report Level 1 and 2 with reccommended changes once agency reviews are complete.	Harden
26	Halton Region	28-Jul-14	Site Plans; Stovel & Associates, June 6, 2014	These site plans have been updated at the request of GRCA. Please see Site Plans dated Aug	Attach Site Plans dated Aug 1, 2014.	JDCL

NATURAL HERITAGE SYSTEM RELATED TECHNICAL COMMENTS September 16, 2014

Response Date September 23, 2014

27	Halton Region	16-Sep-14	Field Survey on Adjacent Lands: Wildlife Survey records contained in Appendix C of the NE Report indicate whether species were observed on adjacent lands but do not indicate on which area of adjacent lands (i.e. north, south, east, west side?). The extent of Field Surveys and Species observations conducted on adjacent lands in Halton Region should be clarified and detailed.	From GWS: "In response to the September 16, 2014 comments made by staff of Halton Region regarding our wildlife observations on adjacent lands, we normally do not record off-site data by property ownership. Furthermore, in this case our observations were only made from Highway 7, which forms a significant obstruction to wildlife movements, except in the case of the Brydson Farm where we are managing their woodlands under the Management Forest Tax Incentive Program (MFTIP). In any event, only common species of birds and mammals were observed utilizing properties in Halton Region. All reported Species at Risk were found inhabiting lands in Wellington County."	None	
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28	Halton Region	16-Sep-14	<p>Significant Woodlands on Adjacent Lands: According to our mapping, candidate significant woodlands are located just south of the property, along the south side of Highway 7, within the 120m Adjacent Lands study area surrounding the proposed new extraction operation. This woodland is identified as vegetation community FODS-6 in the NE Rep011. A portion of this woodland area would likely meet criteria for designation as significant woodland in accordance with Section 277 of the 2006 Regional Official Plan (Interim Office Consolidated Official Plan). Regional Staff note that the Level II Report should have assessed the significance of this feature in accordance with Regional Significant Woodlands Criteria and demonstrated no negative impact in accordance with the Provincial Policy Statement. However, it is recognized that the potential to negatively impact this feature is low given the substantial setback from quarry operations, physical separation from the quarry site by Highway 7, and mitigation measures already proposed. Therefore no further assessment of this feature is required in regard to the present application.</p>	Agree.	None.	
29	Halton Region	16-Sep-14	<p>Surface Water/Fish Habitat Monitoring: Regional Staff recognize that JDCL has agreed in correspondence (Harden response to Burnside June 10, 2014) to conduct flow and water quality testing of the Brydson Spring to establish baseline conditions including temperature, but not to undertake ongoing monitoring of the spring. Staff note that the Brydson Spring may contribute to base flow and water temperature attenuation of sensitive ecological receptors downstream of the subject property (Blue Springs coldwater fishery, PSW) and therefore recommend that ongoing monitoring of the spring (including water flow, quality and temperature) be undertaken in addition to baseline characterization of the spring, particularly given that no direct monitoring of downstream ecological receptors is planned.</p> <p>Please note that Regional Staff do not concur with the statement (provided by JDCL correspondence dated August 1, 2014 in response to Halton Region Comments) that monitoring of this feature is redundant, because the source of the spring has not been satisfactorily identified. Staff recognizes that baseline characterization and ongoing monitoring are subject to landowner permission to access the spring.</p>	Agree. Water levels at the south end of the property are expected to rise over time as the quarry is excavated. As such, no decrease in flow is expected at the Brydson Spring. Notwithstanding the above, subject to landowner permission, JDCL agrees to include quarterly monitoring of the Brydson Spring for flow, quality and temperature, in the Monitoring Program. For clarity, if the landowner does not grant permission to access the spring, it will be deleted from the monit	Include new Surface Water Monitoring point at Brydson Spring	Harden
30	Halton Region	16-Sep-14	<p>Haul Route Study: Regional Comments of July 5, 2013, requested a Haul Route Study, prepared in accordance with Terms of Reference to be prepared in consultation with staff from Halton Region, Milton, and Halton Hills. Although this request remains outstanding, Regional Staff understands that the Terms of Reference for this study are currently being developed. It is recommended that the Terms of Reference require criteria for route selection to include impact minimization and avoidance for environmental features and functions in Halton Region and that any negative environmental impacts resulting from the chosen route should be identified and evaluated, be deemed unavoidable, and mitigated as appropriate.</p>	All Highways and Arterials that Hidden Quarry will be using have the planned function of carrying trucks and truck use is currently permitted. There are no new routes proposed that do not already carry significant volumes of truck traffic. As such there will be no "change in use" that would trigger an EA type assessment.	None.	
31	Halton Region	16-Sep-14	<p>Blue Springs Creek Tributary and Associated Wetlands: The proposed quarry operation has requested a reduced setback to a tributary of Blue Springs Creek traversing the subject lands. Typically, setbacks to watercourses are applied buffers for their protection from development related impacts and to ensure maintenance of their ecological functions. The Natural Heritage Reference Manual provides guidance to municipalities on appropriate buffer widths to achieve this objective.</p> <p>In considering this requested setback, Regional Staff understands that the GRCA and MNR have evaluated and provide comments/clearance on this reduced setback/buffer. Regional Staff encourage the proponent to maintain the greatest setback possible to this tributary in order to implement the Natural Heritage Reference Manual and the PPS to minimize impacts Blue Springs Tributary and downstream significant features.</p>	MNR and GRCA have reviewed and cleared the proposed setbacks.	None.	

32	Halton Region	16-Sep-14	Greenbelt Plan - External Connections Policies: Regional Comments of July 5, 2013, request that various supporting materials be updated to reflect the policies of the Greenbelt Plan, 2005. On further review, staff notes that lands within Halton Region immediately to the south of Highway 7 are within the Greenbelt Plan's Protected Countryside and are designated Greenbelt Natural Heritage System (NHS). As such, Key Natural Heritage Features (KNHF) and Key Hydrologic Features (KHF) within the NHS are located on adjacent lands south of Highway 7 (i.e. the tributary and woodland area referred to above), along the south side of Highway 7. The proposed quarry, however, is outside of the Greenbelt Plan Protected Countryside; therefore the only policies in the Greenbelt Plan, 2005, that may apply would be those policies pertaining to External Connections (Sec. 3.2.5). Policies within the Greenbelt Plan related to External Connections beyond the boundaries of the Greenbelt were reviewed. The external connections to which these policies apply are illustrated on Schedules 1 and 4 of the Greenbelt Plan. As no external connections are shown in the vicinity of the subject property, External Connection policies of the Greenbelt Plan would not apply in this instance.	Agree.	None.	
33	Halton Region	16-Sep-14	Missing Materials/Correspondence: Regional Staff note that the following materials were not copied to the Region or provided through the Township's website. To complete regional records to this point, the following materials are requested: i. Figures 10 and II were missing from the Natural Environment Report (the NE Report). ii. Peer Review Comments prepared by Williams & Associates Forestry Consultants Ltd., dated June 13, 2013. iii. Agency Review Comment prepared by GRCA, to GWS, dated July 15, 2013. iv. MNR Comments to JDCL, dated July 11, 2013. v. MOE Comments to MNR, dated April 15, 2013 vi. Response Letter regarding "Hidden Quarry Response to MNR Comments" to JDCL prepared by GWS. dated May 27, 2013. vii. Response Letter regarding "Burnside Review of Summary of Drilling and Testing of New Well M 15 at Hidden Quarry Site" to Burnside, prepared by Harden, dated January 14, 2014. viii. Response Letter regarding "GRCA 's Letter of July 8, 2014" , to GRCA, prepared by JDCL, dated July 10, 2014. ix. Site Visit Notes regarding "June 7, 2014, Site Visit" prepared by JDCL, dated August 22, 2013. x. Materials in response to GRCA's Letter of November 4, 2013, dated December 5, 2013. xi. Materials in response to GRCA's Letter of November 4, 2013, dated January 23, 2014. xii. Drawings submitted to GRCA on March 19, 2014.	Township of Guelph/Eramosa is providing additional documents, JDCL will assist if required.	Done	K. Lang GET JDCL

Regon of Halton General Comments July 5, 2013

Response Date September 23, 2014

34	Halton Region	05-Jul-13	Haul Route Study (terms of reference to be established based upon consultation with Regional Transportation Staff, the Town of Milton, and the Town of Halton Hills).	In general we believe that a haul route study is inappropriate given the fact that the Hidden Quarry is on a Provincial Highway with an established history of carrying inter-regional truck traffic. MTO has been circulated and has no objection to re-zoning the property to permit the establishment of a mineral aggregate operation. Notwithstanding the above, we will undertake to outline routes to various markets with a view to minimizing traffic through the central areas of Acton and Georgetown.	Identify existing truck routes to be used by Hidden Quarry traffic.	JDCL
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35	Halton Region	05-Jul-13	Revisions to the Level I and II Hydrogeological Investigation dated September 2012, and completed by Harden Environmental Services Ltd. to include: o Detailed Baseline Well Survey for the lands within 1,000 m of the proposed quarry within Halton Region; o Details on the proposed Well Monitoring and Mitigation Program, and more detailed contingencies as they relate to private wells within Halton; and o Detailed 'Well Complaint Protocol'.	See response to Comments 3 , 4 and 13 above.	None	
36	Halton Region	05-Jul-13	The requested updates shall also include a consolidated version of the Hydrogeological Investigation which reflects and details all agency comments received to date.	Once all comments have been finalized a consolidated version will be available.	Consolidate all changes made in response to various agencies and reviewers into final report.	Harden
37	Halton Region	05-Jul-13	An Adaptive Environmental Management Plan.	See response to Comment 20 above.	None.	
38	Halton Region	05-Jul-13	Given the potential of groundwater impact downstream in Milton/Hatton Region, it is the expectation of the Region that a zone of influence for the proposed quarry be established based on a sound scientific and policy analysis. Once this basis is established to the satisfaction of the affected municipal partners, the Natural Environment Technical Report and any necessary field work will need to be revised or commissioned to assess the potential for impact.	The Hydrogeological Study and the natural Environment Study have been prepared based on sound scientific principles. GRCA, MNR, MOE are satisfied with the information provided.	None	
39	Halton Region	05-Jul-13	As is permitted by the policies of the Greenbelt Plan, 2005, the Natural Environment Technical Report, Hydrogeological Investigation, and the Planning Justification Report must be updated to reflect the policies and requirements of the Plan, and the potential impact of the proposed quarry development on the adjacent Key Natural Heritage System and Key Hydrologic Features located to the south of these lands (i.e. in Halton Region).	Please see Comment 32 above.	None.	
40	Halton Region	05-Jul-13	Updated copy of the Operations Plan reflecting all agency comments received to date.	Site Plans are updated from time to time and the updated version is available on the Township of Guelph/Eramosa website. A final version will be prepared once all comments have been considered.	Prepare final version of site plans once all comments received.	Stovel

Leigh Mugford

From: Don McNalty <Don.McNalty@rjburnside.com>
Sent: November-11-14 1:33 PM
To: Leigh Mugford
Cc: Greg Sweetnam; Liz Howson; Kim Wingrove; sdenhoed@hardenv.com; Dave Hopkins
Subject: Fw: notes from Hidden Quarry Oct 21 hydrogeology meeting 300032475
Attachments: Hidden Quarry Hydrogeological Meeting Notes Oct 21 final.pdf

Leigh:

It is noted that Kim Wingrove had confirmed in an earlier email dated October 29, 2014 that your notes were consistent with the notes she had taken of the meeting. Please see attached Dave's email of November 3, 2014 which also recognized that the notes were complete but noted one minor point relative to additional information on the individual wells as discussed under item 8.1 is to be provided pre-approval.

We note that this is somewhat a redundant comment as we know the required field work/testing has been for the most part completed with the anticipation that more detailed work and investigation will occur if approved (post-approval). Obviously the documentation of the work completed still needs to be received. We also acknowledge as per your discussion with Dave Hopkins that the information will need to be presented in a manner to respect the confidentiality of the information.

Also as per your discussion with Dave Hopkins it is understood that a formal response to our latest comments will be forthcoming at some point.

The purpose of this email is really to close the loop on the notes from the meeting.

Don



Don McNalty

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----- Forwarded by Don McNalty/RJB on 11/11/2014 11:39 AM -----

From: Dave Hopkins/RJB
To: Don McNalty <Don.McNalty@riburnside.com>, Liz Howson <howson@mshplan.ca>, Kim Wingrove <kwingrove@get.on.ca>,
Date: 11/03/2014 10:15 AM
Subject: Re: notes from Hidden Quarry Oct 21 hydrogeology meeting

I have looked at the notes and they look complete to me. The only minor point would be that the information on the individual wells under item 8.1 is to be provided pre-approval.

From: Leigh Mugford <lmugford@jamesdick.com>
To: Don McNalty <Don.McNalty@riburnside.com>, "Dave Hopkins (Dave.Hopkins@riburnside.com)" <Dave.Hopkins@riburnside.com>, Liz Howson <howson@mshplan.ca>, Kim Wingrove <kwingrove@get.on.ca>,
Cc: Greg Sweetnam <gsweetnam@jamesdick.com>, "sdenhoed@hardenv.com" <sdenhoed@hardenv.com>
Date: 10/29/2014 12:45 PM
Subject: notes from Hidden Quarry Oct 21 hydrogeology meeting

Hello I have made some notes from the meeting at the Burnside office for you. Please let me know if you have any feedback as well.

Thanks,

Leigh Mugford
Resource Manager
James Dick Construction Ltd
lmugford@jamesdick.com
office 905-857-3500
cell 416-579-9426
fax 905-951-5521



November 20, 2014

Via: Email

Ms. Kim Wingrove
CAO
Township of Guelph/Eramosa
P.O. Box 700
Rockwood ON N0B 2K0

Dear Ms. Wingrove:

**Re: Region of Halton Technical Comments (Hydrogeology)
Hidden Quarry – July 28, 2014
Project No.: 300032475.0000**

Halton Region (Halton) provided comments to Guelph/Eramosa Township (GET) regarding “key hydrogeological related matters” associated with the zoning by-law amendment ZBA009112 (James Dick Construction Limited-Hidden Quarry). In addition to reviewing letters/reports prepared by the proponent’s hydrogeologist (Harden Environmental), the proponents planning consultant (Stovel & Associates), the GRCA and the MOE; Halton Region (Halton) has referenced peer review comments prepared by Burnside. We note that James Dick Construction Limited (JDCL) provided a response to the Halton comments in a matrix dated August 1, 2014.

The Burnside responses below use the same headings as the Halton letter.

Surface Water Features

- Halton is concerned that there is no fish habitat/ecological or flow monitoring for Brydson Creek or Brydson Spring.

Burnside concurs with Halton that a permanent monitoring station should be established at the re-emergence point of Brydson Spring south of Highway 7 to monitor for flow, temperature, water quality and any groundwater use/groundwater dependent habitats.

Groundwater Levels

- Halton recommends that domestic wells south of Highway 7 be included in the monitoring program.

In correspondence to James Dick Construction Limited (JDCL) Burnside has recommended that all domestic wells within 500 m of the quarry be evaluated. This would include wells south of Highway 7.

Domestic Wells

- Halton recommends a well survey and assessment be conducted on wells within 500 m (at a minimum) of the quarry.

Burnside agrees that a survey and well assessment should be conducted on all wells in Halton Region potentially under the influence of the flow from the quarry site, including wells that might be located somewhat outside the 500 m zone. JDCL has previously visited most of the wells within 500 m of the site and has agreed to provide a table summarizing the information that was obtained during previous visits. A detailed domestic well survey will be completed if the quarry is approved. JDCL has agreed to complete a pre-approval water quality survey for on-site wells and the closest up-gradient and down-gradient domestic wells.

- Halton recommends that should access “be limited” to private wells within the Region for the purpose of long-term monitoring and testing, then additional (multi-level) monitoring installations should be established along the southern boundary of the subject lands for monitoring and “early warning” purposes.

It is Burnside’s preference that existing domestic wells be set up as monitoring wells. The heterogeneous nature of the bedrock makes it possible that monitoring wells completed at the same depth as the domestic wells but in different locations may not encounter the same fractures, and as a result, water quality, water levels and responses in the monitoring wells/domestic wells to different events could be different. Collection of pre-extraction water level/water quality data is needed so that the results from monitoring wells and domestic wells can be compared. Once the degree of connection between the on-site wells and domestic wells is known, water level changes on-site can be used to predict the changes in domestic wells so that appropriate mitigation can occur. It is our opinion that a rigorous domestic well monitoring program combined with a well-specific contingency program will provide an appropriate level of protection for domestic wells.

Well Complaint Protocol

It is Burnside’s understanding that the well complaint protocol will include all domestic wells within 500 m, not just those located in GET.

Water Quality

- Halton recommends an additional multi-level monitoring well along the southern boundary to better understand nitrate concentrations leaving the site.

It is Burnside’s understanding that JDCL has agreed to install two new multi-level wells in the southern portion of the site (approximately mid-way between M7 and SW3 and west of M4).

- Halton requests additional information on the impact of water fowl on surface water in the quarry.

JDCL provided comments from a biologist on water fowl impacts in their June 10, 2014 letter to Burnside.

- Halton concurs with Burnside that Harden should provide additional detail on how the existing monitoring well network would provide sufficient early warning so that a treatment system could be installed in down-gradient domestic wells before unacceptable impacts to drinking water occur. Harden would need to qualify if any existing wells could be deepened or whether the installation of water treatment equipment would be preferred option. Halton supports a proactive approach.

Burnside has recommended that a detailed well assessment be completed in support of the application process so that an individual detailed contingency plan can be prepared for each well.

Review of Monitoring Adjacent to Halton Region Lands

Groundwater Monitoring Program

- Since there are no wells that extend to the proposed extraction depth, Halton recommends additional wells along the southern property boundary to provide information on the changing groundwater regime and serve as “early warning” for down-gradient private wells in Halton Region.

Burnside concurs that additional wells will assist in the understanding of groundwater conditions at the site, although, as indicated above they may not be necessarily be completed in the same fracture system as down-gradient domestic wells. Since no dewatering is to occur, new monitoring wells along the southern property boundary combined with a rigorous domestic well monitoring program should provide sufficient time to mitigate impacts before they adversely affect domestic wells.

Surface Water Monitoring Program

- Halton indicates that there does not appear to be any surface water monitoring proposed for Brydson Creek south of Highway 7 or at the re-emergence of Tributary B about 400 m south of the site in Halton Region. More comments are to be provided by Halton in their technical comments on the Natural Environment Technical Report.

Burnside has recommended that Brydson Spring be added to the monitoring program.

Private Well Monitoring

- Halton expresses concerns about how the proposed private well monitoring program will protect wells in Halton and Region staff are not clear if all private wells in close proximity to the site have been evaluated or are included in the monitoring program. Halton requests that both the Region of Halton and Town of Milton be notified in the event a well complaint is received, and they request clarity on how the complaints will be handled.

Burnside concurs with Halton’s comment. It has always been our intent that the monitoring program include all wells with 500 m, not just those in GET.

- Halton requests further discussion on the lack of trigger levels for the south end of the extraction area.

Burnside agrees that this should be clarified, although since water levels are predicted to rise there may be no need for trigger levels. However, there is a need to monitor water levels to confirm that the water level increases are as predicted.

- Halton indicates that the benefits of the on-site pond should be confirmed with modelling based on future results and, they express concern that no off-site down-gradient monitoring is proposed.

Burnside has recommended that off-site monitoring of domestic wells and the Brydson Spring be included in the monitoring program.

- Halton indicates that the effects of blasting on private wells in Halton Region are not known and should be addressed.

It is our understanding that the blasting report prepared on behalf of JDCL has been peer reviewed.

- Halton is concerned that the Site Plans (Stovel & Associates, June 6, 2014) do not refer to any private well/private property monitoring and ask that the following issues be clarified:
 - Page 2 of 5 (i) the “extraction footprint” on the plan is not the same as in the hydrogeology report and (ii) – Halton requests details on the “main processing area” and suggests (iii) that the “spill protocol” should include immediate notification to down-gradient properties utilizing domestic wells as their primary drinking supply.

It is anticipated that the list of down-gradient wells to be involved in the monitoring program won't be finalized until residents are visited and provide permission for their wells to be included. Burnside agrees that more information needs to be provided on the main processing area. Of particular interest is the volume and source of water that will be used to “wash” the aggregate. The need to notify residents in the event of a spill should be based on an established protocol which takes into account the volume of the spill and the material spilled. The MOE Spill Action Centre is required to be notified in the event of a spill.

- Page 3 of 5 – Halton is concerned about the “silt pond” and how it will be monitored. They also ask about the “blasting line” on the south side of the west extraction area and what monitoring is proposed to ensure private wells and structures in Halton are not affected by the blasting.

Burnside agrees that detail needs to be provided on the silt pond; in particular, the need for a liner should be discussed. Our expectation is that the peer review of the blasting report will include recommendations for monitoring to ensure that private wells and other structures to the south are not affected by blasting.

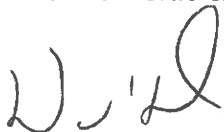
- Halton recommends that an Adaptive Management Plan (AMP) be prepared as they felt it would be an effective tool for use in formalizing resolutions and commitments to monitor and mitigate water resource issues which would include Halton Region Lands.

Burnside recommends that the domestic well survey be completed prior to finalizing the details of the monitoring program. This would be a condition of approval and would be undertaken prior to any extraction activities on-site. Once this has been completed there should be sufficient data available to create a rigorous and detailed monitoring plan for the wetland, on-site wells, on-site ponds and nearby domestic wells which includes trigger levels and contingency plans.

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

Yours truly,

R.J. Burnside & Associates Limited



Dave Hopkins, P.Geo.
Senior Hydrogeologist
DH:sd

cc: Elizabeth Howson, Macaulay Shiomi Howson Ltd. (Via: Email)
Kelsey Lang, Guelph/Eramosa Township (Via: Email)

140930_Burnside Response to Halton Tech. Comments
21/11/2014 10:20 AM

Leigh Mugford

From: Leigh Mugford
Sent: Thursday, January 29, 2015 4:20 PM
To: Garry Hunter; stephanie De Grandis
Cc: 'Kim Wingrove'; sdenhoed@hardenv.com; Greg Sweetnam; Liz Howson
Subject: RE: Hidden Quarry Re: Missing JDCL Well Testing Results
Attachments: Hunter_Request_Jan26_2015.pdf

Hello Gary and Stephanie, we have asked Stan to respond to the four points in the message we received below. Please see the attachment.

Leigh Mugford
Resource Manager
James Dick Construction Ltd
lmugford@jamesdick.com
office 905-857-3500
cell 416-579-9426
fax 905-951-5521

From: Kim Wingrove [mailto:kwingrove@get.on.ca]
Sent: January-28-15 10:09 AM
To: Garry Hunter; Greg Sweetnam; Leigh Mugford; Stan Denhoed
Cc: stephanie De Grandis; Kelsey Lang; Meaghen Reid; Don McNalty; Dave Hopkins; Liz Howson; Doug Tripp
Subject: RE: Hidden Quarry Re: Missing JDCL Well Testing Results

The purpose of this email is to share questions and requests for additional data related to water quality and quantity testing, made by the Concerned Residents Coalition and their consultant Garry Hunter, with JDCL and their consultant Harden Environmental. Please refer to the attached email and the email text below. I respectfully request that JDCL/Harden speak directly with Mr. Hunter and CRC regarding the requested information.

Thank you,

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

From: Garry Hunter [<mailto:ghunter@hunter-gis.com>]

Sent: Monday, January 26, 2015 12:28 PM

To: Kim Wingrove

Cc: stephanie De Grandis; Kelsey Lang; Meaghen Reid; Don McNalty; Dave Hopkins; Liz Howson; Doug Tripp

Subject: Re: Hidden Quarry Re: Missing JDCL Well Testing Results

Ms Wingrove,

I have now reviewed the report in detail and I am in substantive agreement with your proposed request to Mr Denhoed. I provide the following further clarifications.

1. Applicant Monitoring Data Updates

The last Applicant monitoring data I have seen is in the tables and Figures of Appendix B Water Level Monitoring Data and Appendix C Flow Monitoring Data included with the Harden Sept 2012 Hydrogeological Evaluation Report. For the most part, monitoring data after early 2012 is not included.

This data is required for comparison to the more recent M15 monitoring and to extend the monitoring record.

2. s2.2 pg 3 Revised Model Potential Impacts

No potential impact visuals are provided to review predicted drawdowns for the now 'revised' groundwater model. Example W3 used for analysis is not a critical well.

3. Laboratory Analytical Reports for the Applicants wells and surface water samples.

I also note that some of the 'private' wells are actually commercial wells. These business wells may include W3, W13, W14, W17 and W18.

Also W1 is on the Applicant property.

These well should not be redacted in the Harden Reports.

4. Brydson Spring water quality sampling and flow measurement location.

This and other of the Applicants groundwater and surface water monitoring location information may be on Fig 3 which has been deleted in its entirety rather than redacting only the private data.

I note that the surface sampling sites are colder than the Bydson Spring waters (Table 4). I request air temperature at the time of sampling if available.

Thank you for your expedient follow up.

Yours truly,

Garry T. Hunter M.A.Sc. P.Eng.
President

Hunter and Associates / Hunter GIS
2285 Dunwin Drive, Unit 18
Mississauga, ON L5L 3S3

Tel (905) 607-4120
Fax (905) 607-1132
Email ghunter@hunter-gis.com
Website <http://www.hunter-gis.com>

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On 1/22/2015 6:16 PM, Garry Hunter wrote:

Ms Wingrove,
Thank you very much for your quick and meaningful response.

I will look this over in detail tomorrow.

Yours truly,

Garry T. Hunter M.A.Sc. P.Eng.
President

Hunter and Associates / Hunter GIS
2285 Dunwin Drive, Unit 18
Mississauga, ON L5L 3S3

Tel (905) 607-4120
Fax (905) 607-1132
Email ghunter@hunter-gis.com
Website <http://www.hunter-gis.com>

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On 1/22/2015 5:54 PM, Kim Wingrove wrote:

Mr. Hunter, thank you for getting back to me so quickly with your comments. You are correct that there were some pages missing from the material that was sent to you. I believe the size of the file caused our printer some difficulty. I have attached the additional pages you should have received. The full redacted report will be posted on the website tomorrow.

The data that has been redacted is identifying information with regard to the property location and owner's name. We must honour the owner's requests for privacy. Figure 3 and Appendix A both contain personal/identifying information so they are not able to be released.

Table 6 refers to W4, 5, 8 and 9

Table 7 refers to W10, 11,16, 17, 18, 19, 20, 21,22,23 and 24.

Harden has not provided us with the correlation between sample ID and specific wells and as such neither the Township or Burnside is aware of which result goes with which well.

There are some things you are requesting that we don't have and would need to be requested from Stan Denhoed at Harden:

- Data for water level monitoring on the site.
- S2.2 pg 3 – Harden will need to address your comment.
- Laboratory analytical reports from the applicant's well.
- Brydson Spring specific measurement location information.

I hope this information is helpful to you.

Regards,

Kim

From: Garry Hunter [<mailto:ghunter@hunter-gis.com>]

Sent: Thursday, January 22, 2015 9:57 AM

To: Kim Wingrove

Cc: stephanie De Grandis; Kelsey Lang; Meaghen Reid; Don McNalty; Dave Hopkins; Liz Howson; Doug Tripp

Subject: Hiden Quarry Re: Missing JDCL Well Testing Results

Ms Wingrove,

Once again, notwithstanding your comments to Ms De Grandis below, the recent Harden documents released by the Township to the CRC are incomplete. Furthermore the Applicant's commercial data has been inappropriately omitted, deleted or redacted. No actual water well testing results are provided in the documents released.

Has the Township provided its own consultants with the private property owner and Applicant water quality data? I can assure the Township I am sensitive to private citizen water quality concerns.

Dec 9, 2014 Letter from Harden to Burnside

s2.1 pg 1

Fig 1 summary of water levels for the Applicant onsite M15 since May 2014 is missing.

I also note that I previously requested water level monitoring for all of the Applicant on site monitoring since the last release of earlier data in the Sept 2012 Hydrogeology Reports. These have not yet been forthcoming.

s2.2 pg 3

No potential impact visuals are provided to review predicted drawdowns for the now 'revised' groundwater model. Example W3 is not a critical well.

s2.2 pg 4 second last para

Again Fig 1 is missing.

s4.1 pg 7

Fig 3 is missing. Appendix A is missing. Tables 3 and 4 are also missing. Table 3 may be redacted due to private data.

However there doesn't seem to be any reason to redact the water quality data from the Applicant's nine commercial on site monitoring wells and the five surface water samples including Table 4.

I also request the laboratory analytical reports for the Applicant's commercial on site wells and the surface water samples.

s4.1.2 pg 8

Again Table 4 is missing. This is not private data.

s4.1.3

List of specific on site commercial monitoring wells sampled (See also s4.1 comment above).

s7.0 pg 10

Specific location of Brydson Spring flow measurement and water quality testing not provided.

s8.2 a) pg 11

Fig 4 is missing.

s8.2 c) pg 12

Table 5 and 6 are missing. Why is Table 7 redacted? Why not use the "W" well codes.

pg 13, 14 and 15

These pages are all missing. Please provide the redacted versions.

Jan 8, 2015 Memorandum from Harden to Burnside

Fig 1 and Table 1 Results of Well Survey are barely legible.

Why are commercial wells redacted?

We would very much appreciate the Township's cooperation and expedient response so we may complete our peer review work.

Yours truly,

Garry T. Hunter M.A.Sc. P.Eng.
President

Hunter and Associates / Hunter GIS
2285 Dunwin Drive, Unit 18
Mississauga, ON L5L 3S3

Tel (905) 607-4120
Fax (905) 607-1132
Email ghunter@hunter-gis.com
Website <http://www.hunter-gis.com>

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On 1/21/2015 9:53 PM, stephanie De Grandis wrote:

I had asked for Kelsey to make sure all of the figures and pages were available. This is what Kim sent.

Cheers

Stephanie

----- Forwarded message -----

From: **Kim Wingrove** <kwingrove@get.on.ca>

Date: Wed, Jan 21, 2015 at 5:09 AM

Subject: RE: JDCL Well Testing Results

To: stephanie De Grandis <biolaunch@gmail.com>

Cc: Doug Tripp <dtripp@on.aibn.com>, Meaghen Reid <mreid@get.on.ca>, Kelsey Lang <klang@get.on.ca>, Don McNalty <Don.McNalty@rjburnside.com>, Dave Hopkins <Dave.Hopkins@rjburnside.com>, Liz Howson <howson@mshplan.ca>

Hi Stephanie. The documents that were provided to you and posted on the web site have been redacted to protect the privacy of the individual property owners. The sheets that were not included are individual well reports that include mapping of the well site on the property as well as identifying information about the property owner. I believe the summary tables that were included do show all of the information regarding the results of both quantity and quality testing that you need.

Thanks,

Kim

-----Original Message-----

From: stephanie De Grandis [<mailto:biolaunch@gmail.com>]

Sent: Tue 20/01/2015 9:51 PM

To: Kim Wingrove

Cc: Doug Tripp; Meaghen Reid; Kelsey Lang; Don McNalty;

Dave Hopkins; Liz Howson

Subject: Re: JDCL Well Testing Results

Dear Kim,

There are pages missing from one document (page 13-15). There are missing

Tables and Figures. We really wanted the water quality results in detail.

Before I and Garry review these documents would you have Kelsey go through the documents and make sure all the pages and Figures are there or explain why they were removed.

Many thanks

Cheers

stephanie

On Mon, Jan 19, 2015 at 4:41 PM, Kim Wingrove <kwingrove@get.on.ca> wrote:

- > Doug and Stephanie, I am forwarding the results of the well quantity
- > and quality testing that was undertaken by Harden as requested as part of
- > the assessment of the Hidden Quarry application. The results have been
- > redacted where necessary to honour landowner requests that their
- > information remain confidential. RJ Burnside are evaluating these results
- > and will comment formally when their assessment is complete.
- >
- >
- >
- > As you may be aware, representatives from Harden Environmental Services
- > Ltd. (Harden) have visited the majority of the neighbouring properties on a
- > number of occasions since 1995 to obtain information on domestic wells and
- > have correlated the wells with water well records available from the
- > Ontario Ministry of Environment and Climate Change where possible.
- > Residents in the vicinity of the proposed Hidden Quarry rely on the bedrock
- > aquifer for their source of drinking water.
- >
- >
- >
- > Although Harden predicted that the quarry operations would not

impact

- > neighbouring wells, the Township requested additional data to demonstrate
- > that impacts to domestic wells could be mitigated by either accessing
- > fractures below the base of the quarry or installing readily available and
- > proven domestic water treatment technology. Studies completed on behalf of
- > James Dick Construction Limited (JDCL) have indicated that the water level
- > and water quality impacts due to the below water table quarrying operations
- > will be minimal and will not adversely impact nearby wells. The attached
- > table provides a summary of the information for the wells in the vicinity
- > of the proposed quarry along with the options available to remedy any water
- > quality/quantity impacts related to operations at the proposed quarry.
- >
- >
- >
- > The preferred option to address water quantity/quality impacts is to
- > deepen existing wells so that they obtain water from fractures which are
- > below the base of the quarry and therefore unaffected by extraction
- > activities. The other option to deal with quality impacts is to install a
- > treatment system which will be paid for by JDCL.
- >
- >
- >
- > Regards,
- >
- >
- >
- >
- >
- > *Kim Wingrove*
- >
- > *Chief Administrative Officer*
- >
- > Township of Guelph Eramosa
- >
- > T [\(519\)856-9596 ext 105](tel:(519)856-9596)
- >
- > C [\(519\) 835-6720](tel:(519)835-6720)

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<http://www.brainyquote.com/quotes/keywords/mother_nature.html#M9qvKBob3Ip7PHXv.99>

<http://www.brainyquote.com/quotes/keywords/mother_nature.html#M9qvKBob3Ip7PHXv.99>

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Harden Environmental Services Ltd.
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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

Memorandum

Our File: 9506

Date: January 29, 2015

To: Greg Sweetnam – James Dick Construction Ltd.

From: Stan Denhoed, M.Sc., P.Eng., Harden Environmental Services Ltd.

Re: Response to request from Hunter and Associates (Jan 26 2015 email to K. Wingrove)

Here is our response to the request by Mr. Hunter.

1. Applicant Monitoring Data Updates

The last Applicant monitoring data I have seen is in the tables and Figures of Appendix B Water Level Monitoring Data and Appendix C Flow Monitoring Data included with the Harden Sept 2012 Hydrogeological Evaluation Report. For the most part, monitoring data after early 2012 is not included.

This data is required for comparison to the more recent M15 monitoring and to extend the monitoring record.

We have attached five hydrographs representing water levels obtained from several on-site bedrock monitors for all data collected up until December 2014.

2. s2.2 pg 3 Revised Model Potential Impacts

No potential impact visuals are provided to review predicted drawdowns for the now 'revised' groundwater model. Example W3 used for analysis is not a critical well.

We have attached maps with contours showing the potential drawdown for Scenario 1 and Scenario 2 as presented in our December 9, 2014

letter to R.J.Burnside and Associates.

3. Laboratory Analytical Reports for the Applicants wells and surface water samples.

I also note that some of the 'private' wells are actually commercial wells. These business wells may include W3, W13, W14, W17 and W18.

Also W1 is on the Applicant property.

These well should not be redacted in the Harden Reports.

The majority of the residents in the water quality survey did not want their information available to the general public and we made the decision to withhold all information linking the water sample to a specific address or name. Not all of the samples listed by Mr. Hunter were included in the survey and none of them are publicly owned facilities. The water quality sample obtained from W1 has previously been reported and the recent sampling does not reveal any significantly different results. You are welcome to approach individuals for copies of their results; however, we were asked to be discrete with the findings and have presented the data with that promise in mind.

4. Brydson Spring water quality sampling and flow measurement location.

This and other of the Applicants groundwater and surface water monitoring location information may be on Fig 3 which has been deleted in its entirety rather than redacting only the private data.

I note that the surface sampling sites are colder than the Bydson Spring waters (Table 4). I request air temperature at the time of sampling if available.

The sampling locations are shown on our original report (Figure 2.4) and the ambient air temperature is shown on the attached graph.

Figure B1: M1 S/D Hydrograph

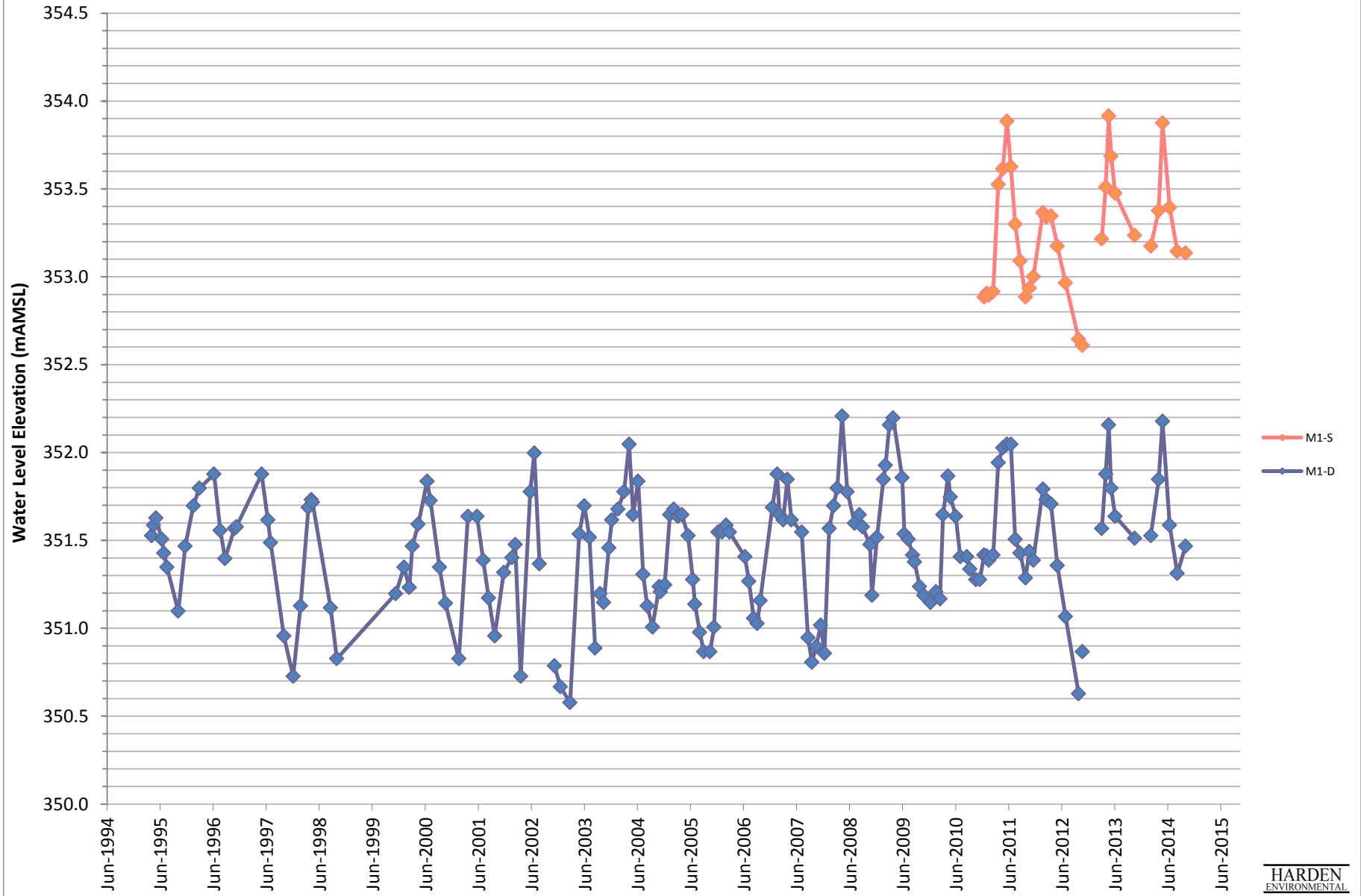


Figure B2: M2 Hydrograph

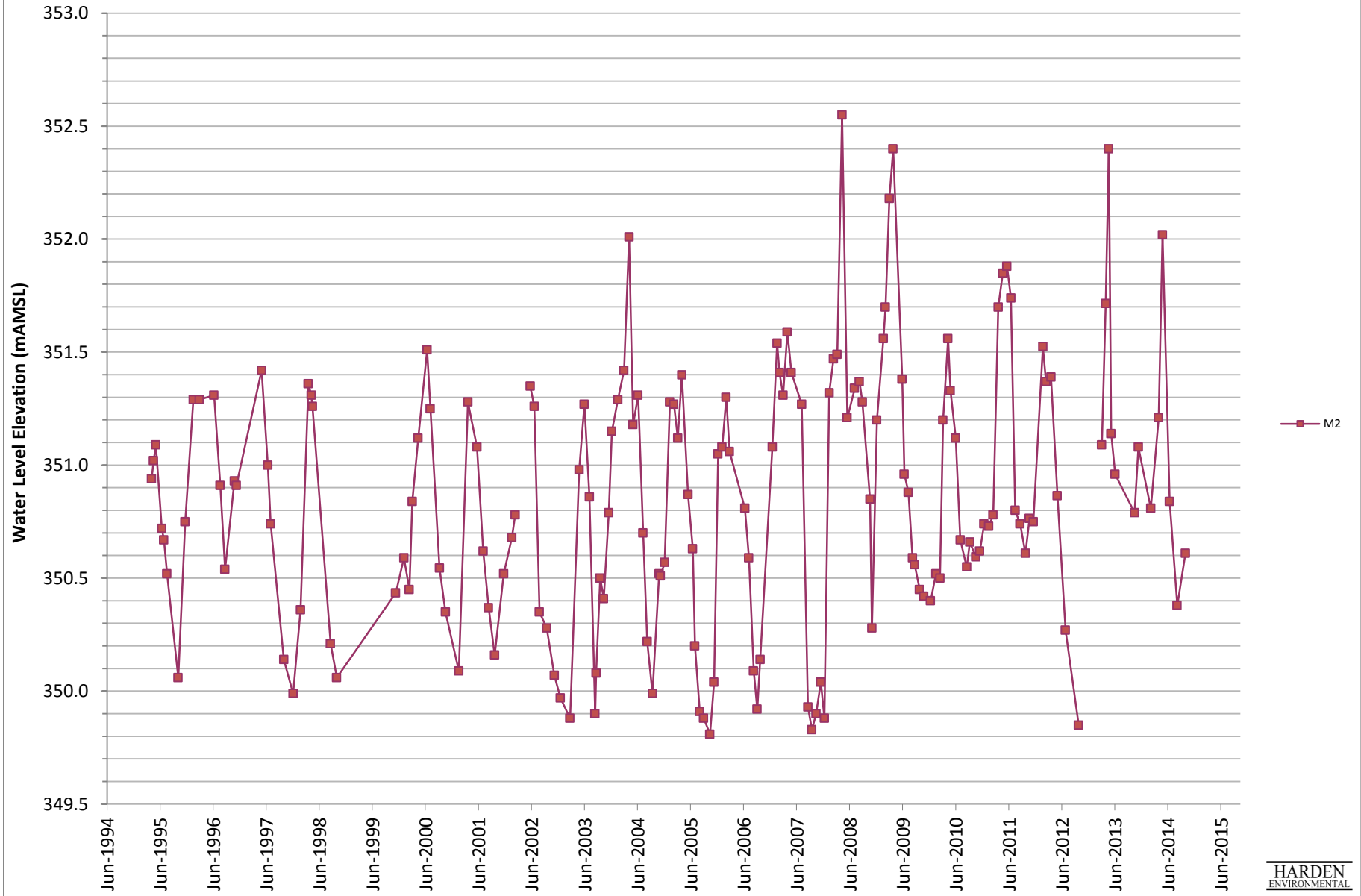


Figure B3: M3 Hydrograph

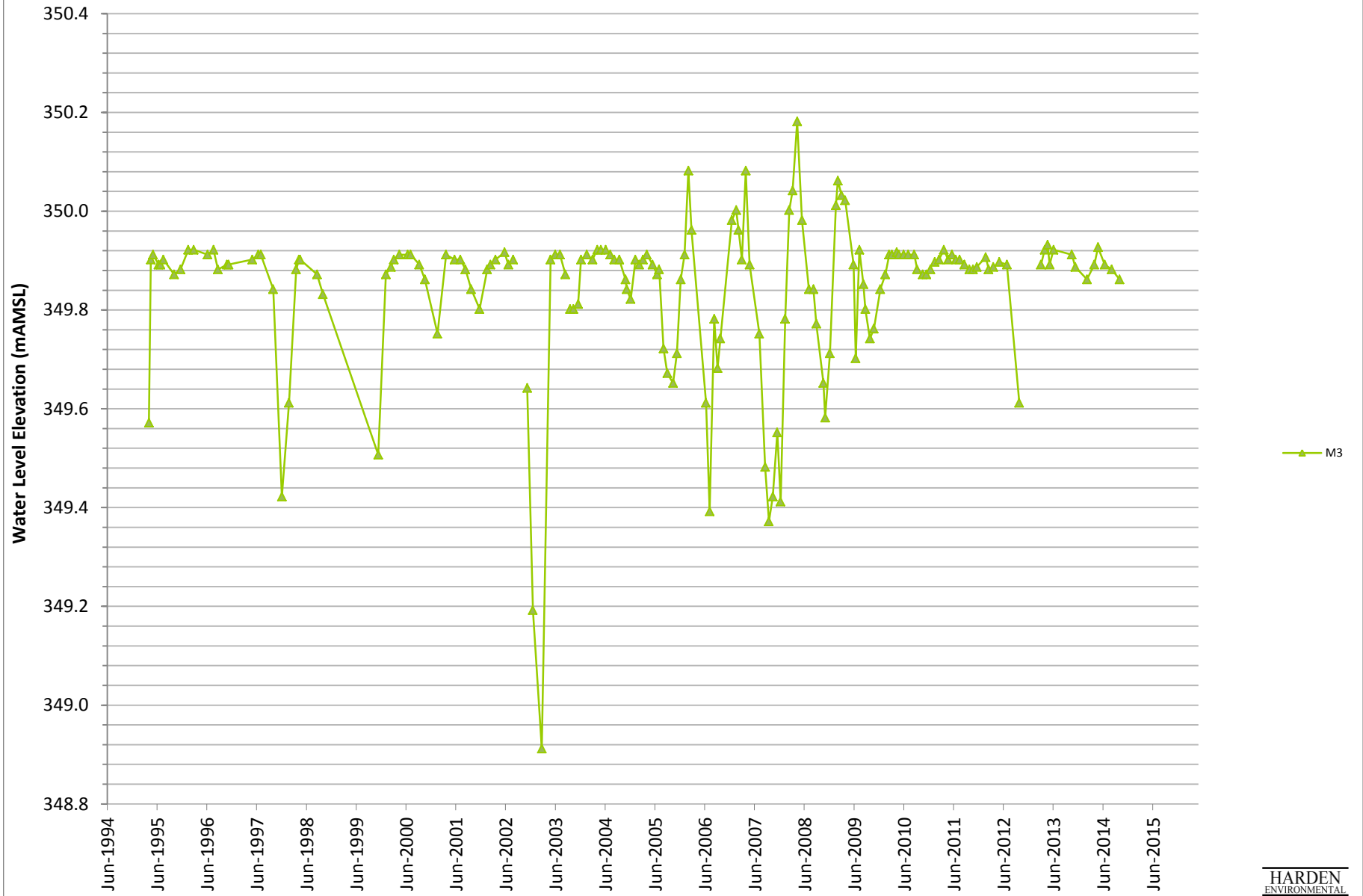
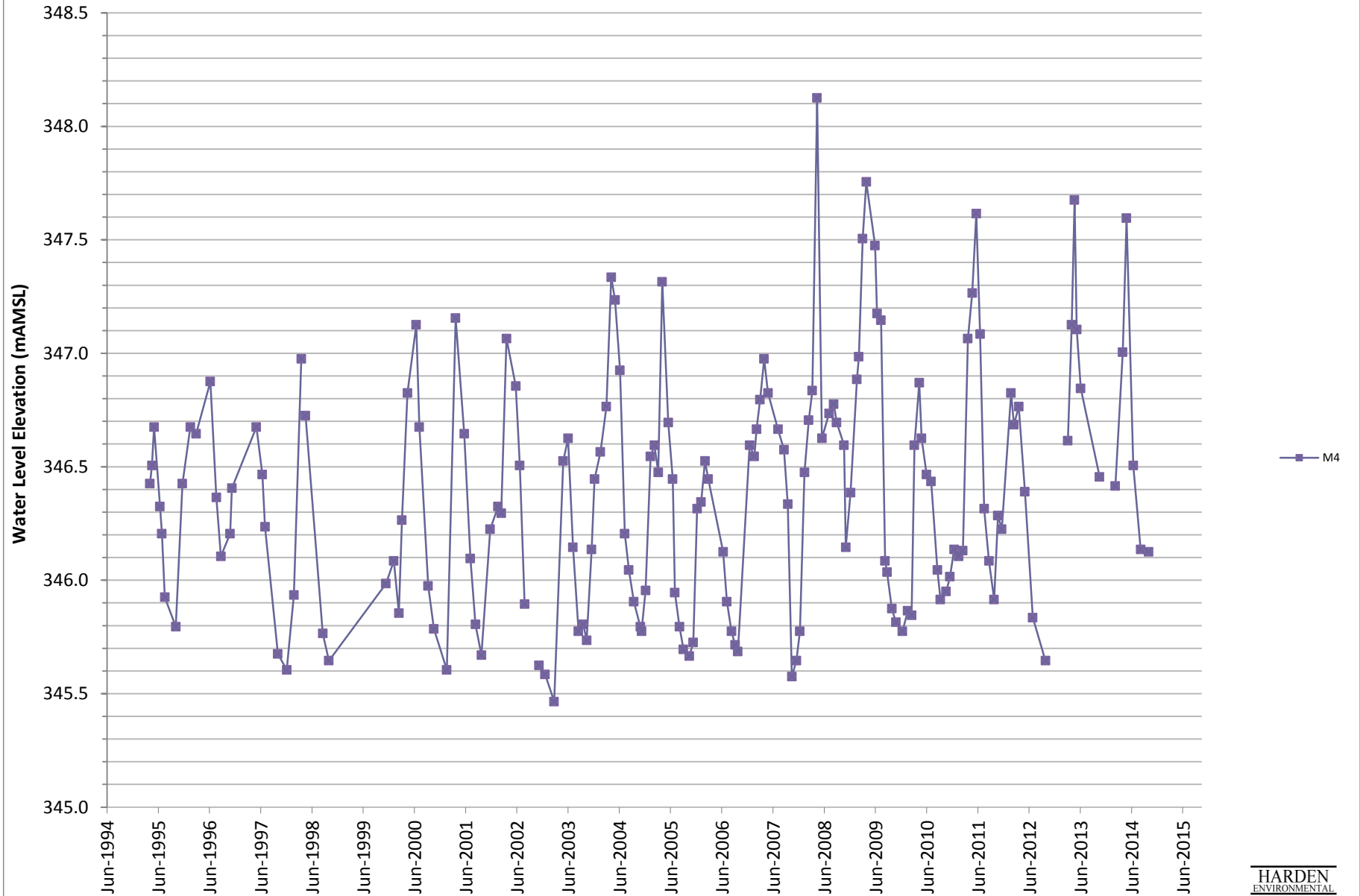
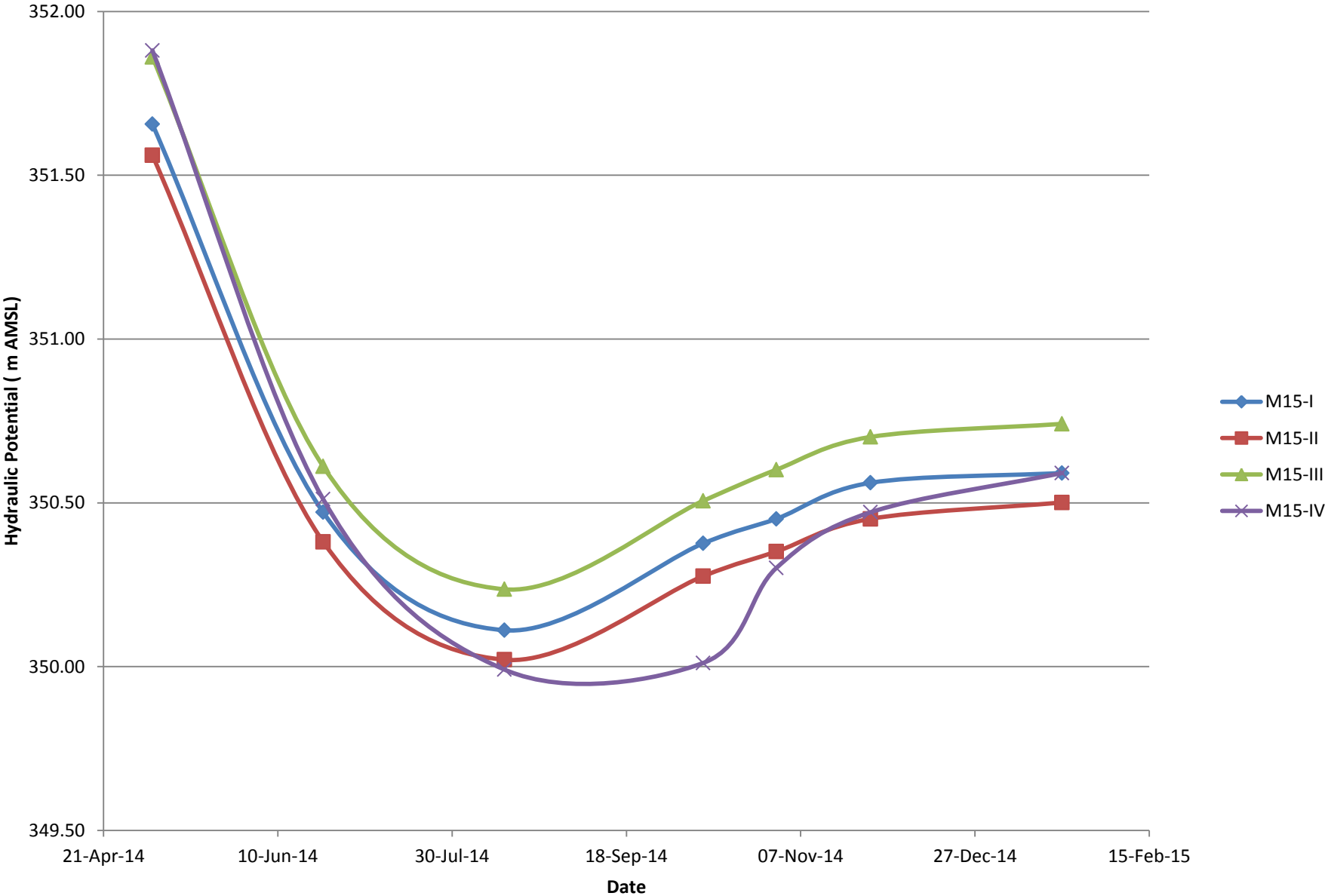
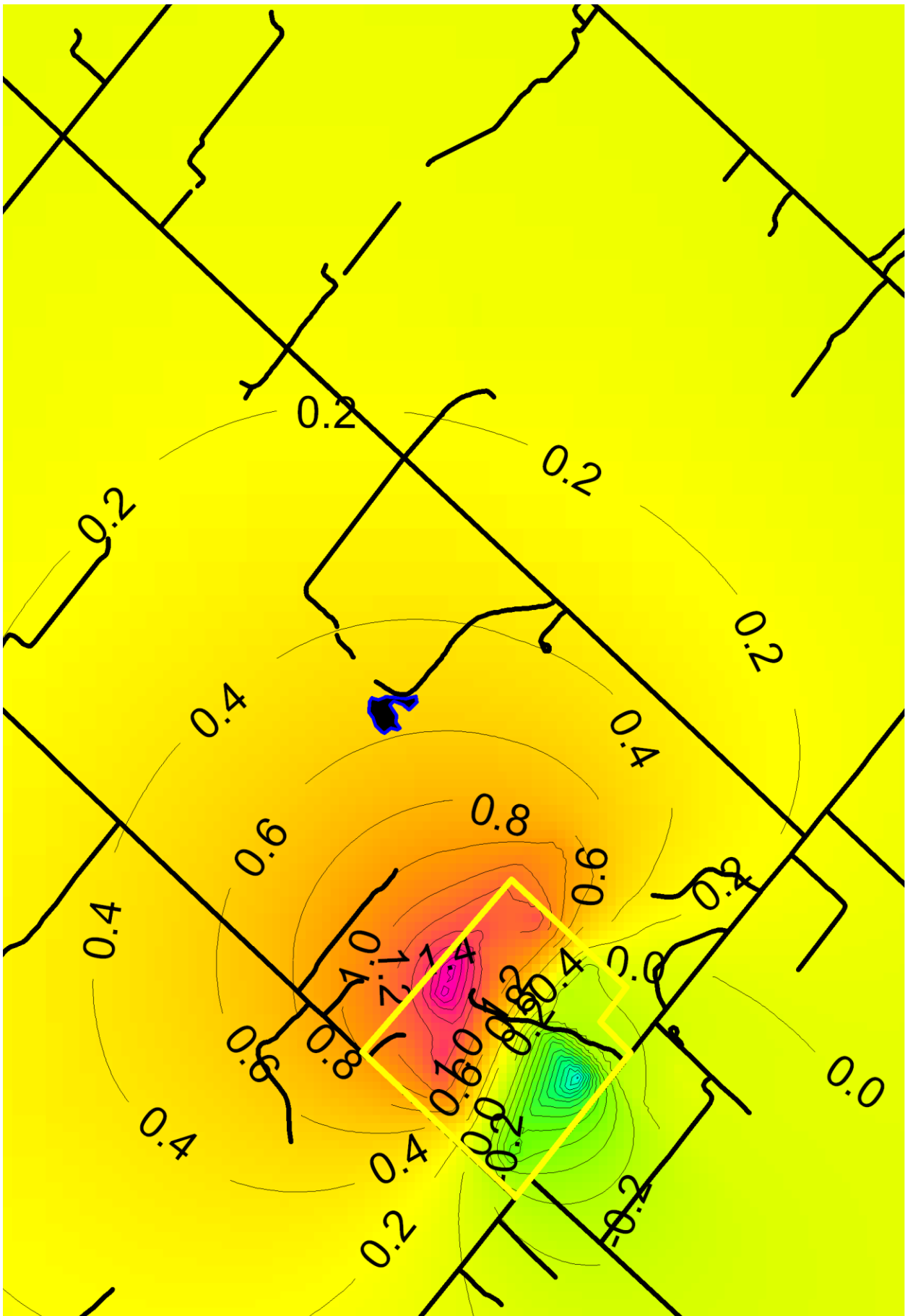


Figure B4: M4 Hydrograph

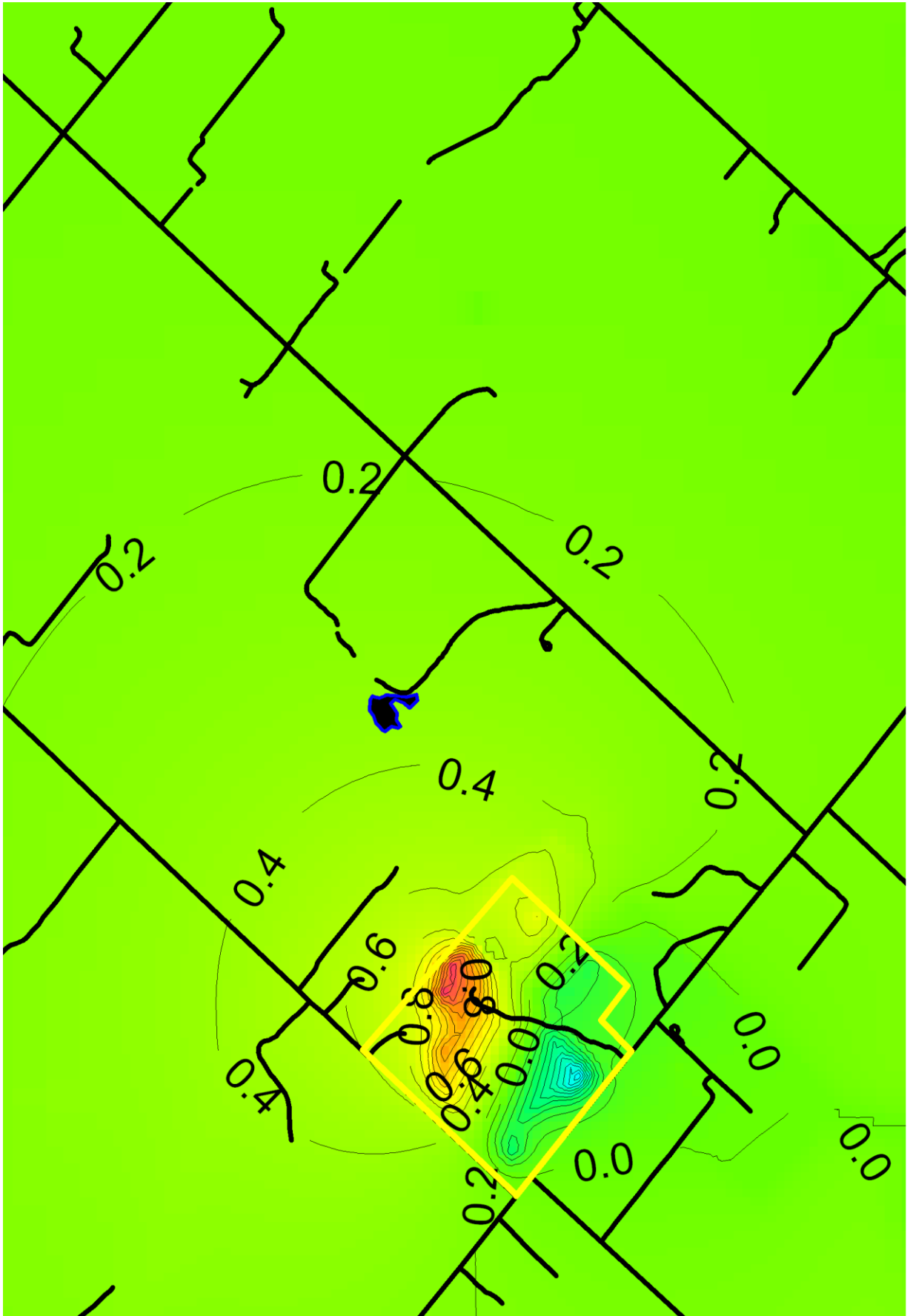


M15 Hydrograph



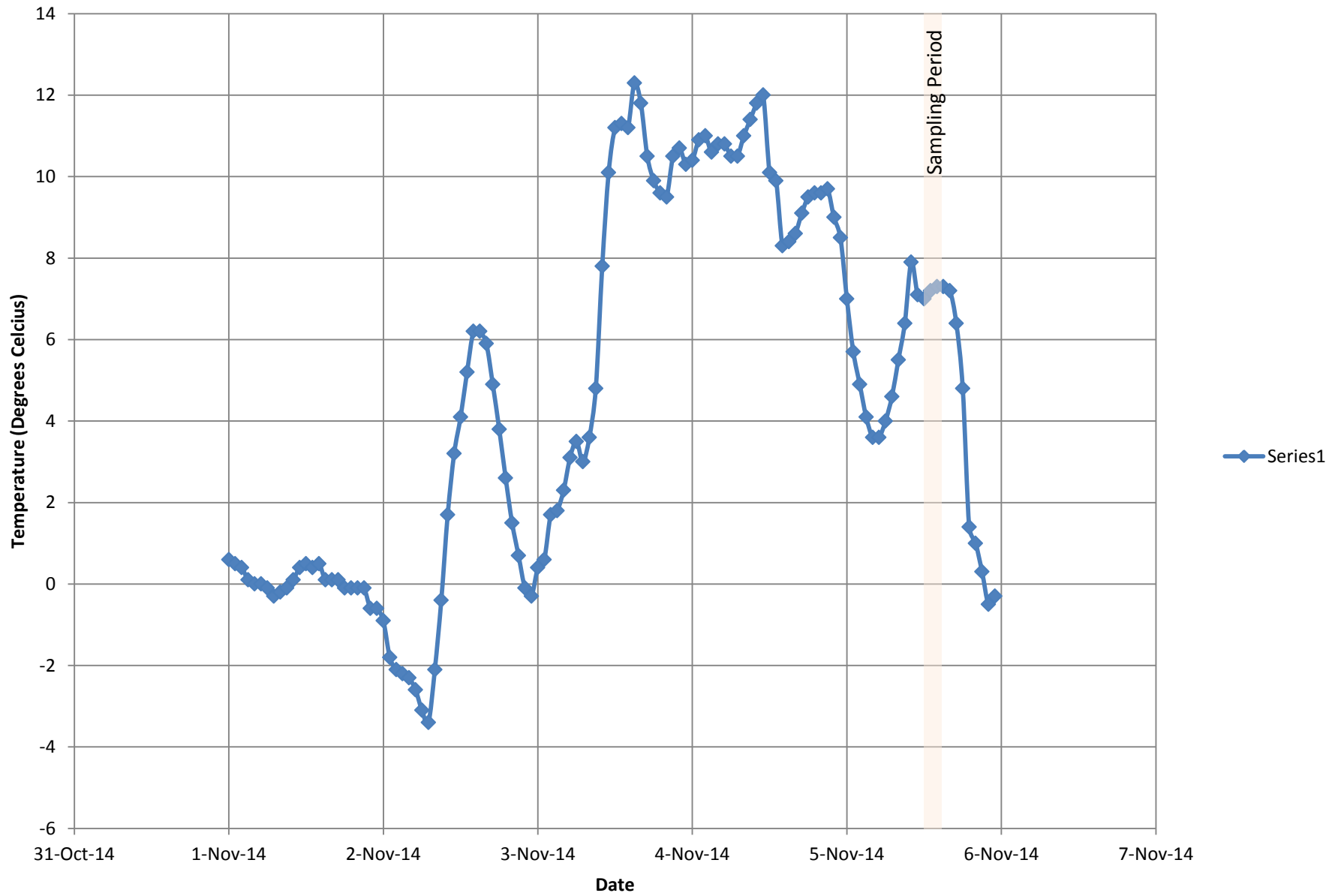


Drawdown in metres for Scenario 1



Drawdown in metres for Scenario 2

Ambient Atmospheric Temperature: Guelph Turfgrass Institute



Leigh Mugford

From: Leigh Mugford
Sent: Tuesday, February 10, 2015 12:58 PM
To: 'Garry Hunter'
Cc: stephanie De Grandis; 'Kim Wingrove'; sdenhoed@hardenv.com; Greg Sweetnam; Liz Howson
Subject: RE: Hidden Quarry Re: Missing JDCL Well Testing Results
Attachments: Guelph Quarry water discharge.pdf; HQ_DataRequest_5Feb2015.pdf

Hello Mr Hunter, I have attached information that should address #1, #4 and #5. For #3 the residence owned by JDCL is identified by # 125. For any other well data you may ask the individuals for their results but we have stated that we would not release any of their water quality information so we will not.

Thanks,

Leigh Mugford
Resource Manager
James Dick Construction Ltd
lmugford@jamesdick.com
office 905-857-3500
cell 416-579-9426
fax 905-951-5521

From: Garry Hunter [mailto:ghunter@hunter-gis.com]
Sent: February-09-15 5:17 PM
To: Leigh Mugford
Cc: stephanie De Grandis; 'Kim Wingrove'; sdenhoed@hardenv.com; Greg Sweetnam; Liz Howson
Subject: Re: Hidden Quarry Re: Missing JDCL Well Testing Results

Mr Mugford,

Will JDCL be replying to my follow up requests below?

If JDCL does not intend to reply, please advise.

I would like to wrap up my input on this file.

Thank you.

Yours truly,

Garry T. Hunter M.A.Sc. P.Eng.
President

Hunter and Associates / Hunter GIS
2285 Dunwin Drive, Unit 18
Mississauga, ON L5L 3S3

Tel (905) 607-4120
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On 1/30/2015 9:38 AM, Garry Hunter wrote:

Mr Mugford,

In reference to your Memorandum of Jan 29, 2015,

1. The response is appropriate with respect to long term groundwater monitoring. However the surface monitoring stations (static levels) have not been included.

I had previously requested the respective .xls files to permit additional data analysis.

Alternatively if you prefer, please provide us with 2014 hydrograph plots for all monitors with similar horizontal (time) scale to that of M15.

2. The response is complete.

3. I agree that none of the wells are for publicly owned facilities.

However as you must be aware I am asking for well data from commercial facilities and from the house well on the Applicant's land.

4. I assume 'original' report means the Harden Sept 2012 Hydrogeological Investigation. I am looking for more precision than the location on Fig 2.4. Please provide UTM field coordinates and / or site photo's or other reference descriptions. Are your locations 'marked' on site.

Are the Brydson sampling and flow monitoring sites near the former on stream milk cooling house, the pedestrian bridge or at one of the in stream weirs?

5. As previously requested, JDCL has not yet provided us with the routine dewatering discharge MOE compliance monitoring for the Guelph Dolime Quarry. Will this be forthcoming?

Thank you again for your efforts and prompt reply.

Yours truly,

Garry T. Hunter M.A.Sc. P.Eng.
President

Hunter and Associates / Hunter GIS
2285 Dunwin Drive, Unit 18
Mississauga, ON L5L 3S3

Tel (905) 607-4120
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On 1/29/2015 4:20 PM, Leigh Mugford wrote:

Hello Gary and Stephanie, we have asked Stan to respond to the four points in the message we received below. Please see the attachment.

Leigh Mugford
Resource Manager
James Dick Construction Ltd
lmugford@jamesdick.com
office 905-857-3500
cell 416-579-9426
fax 905-951-5521

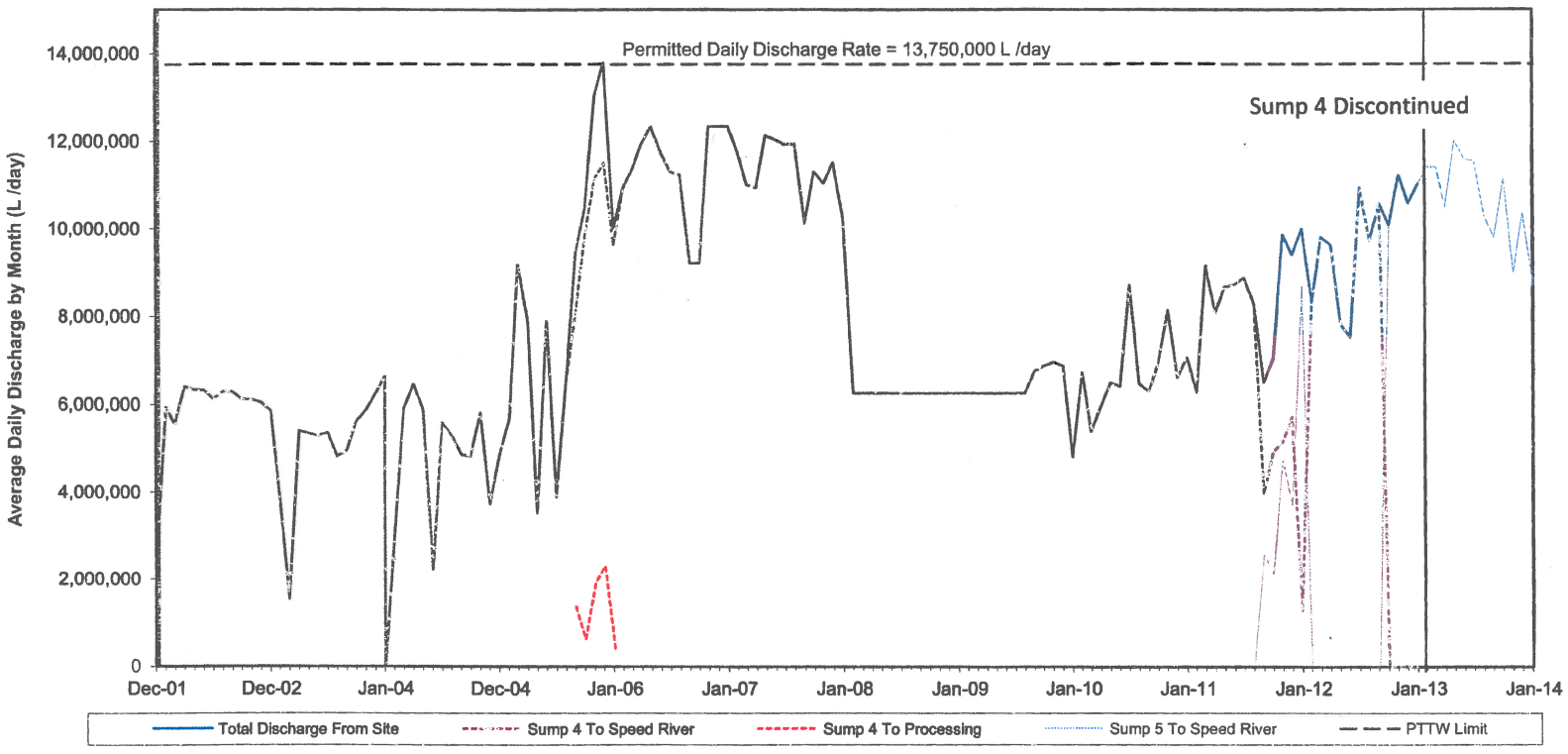
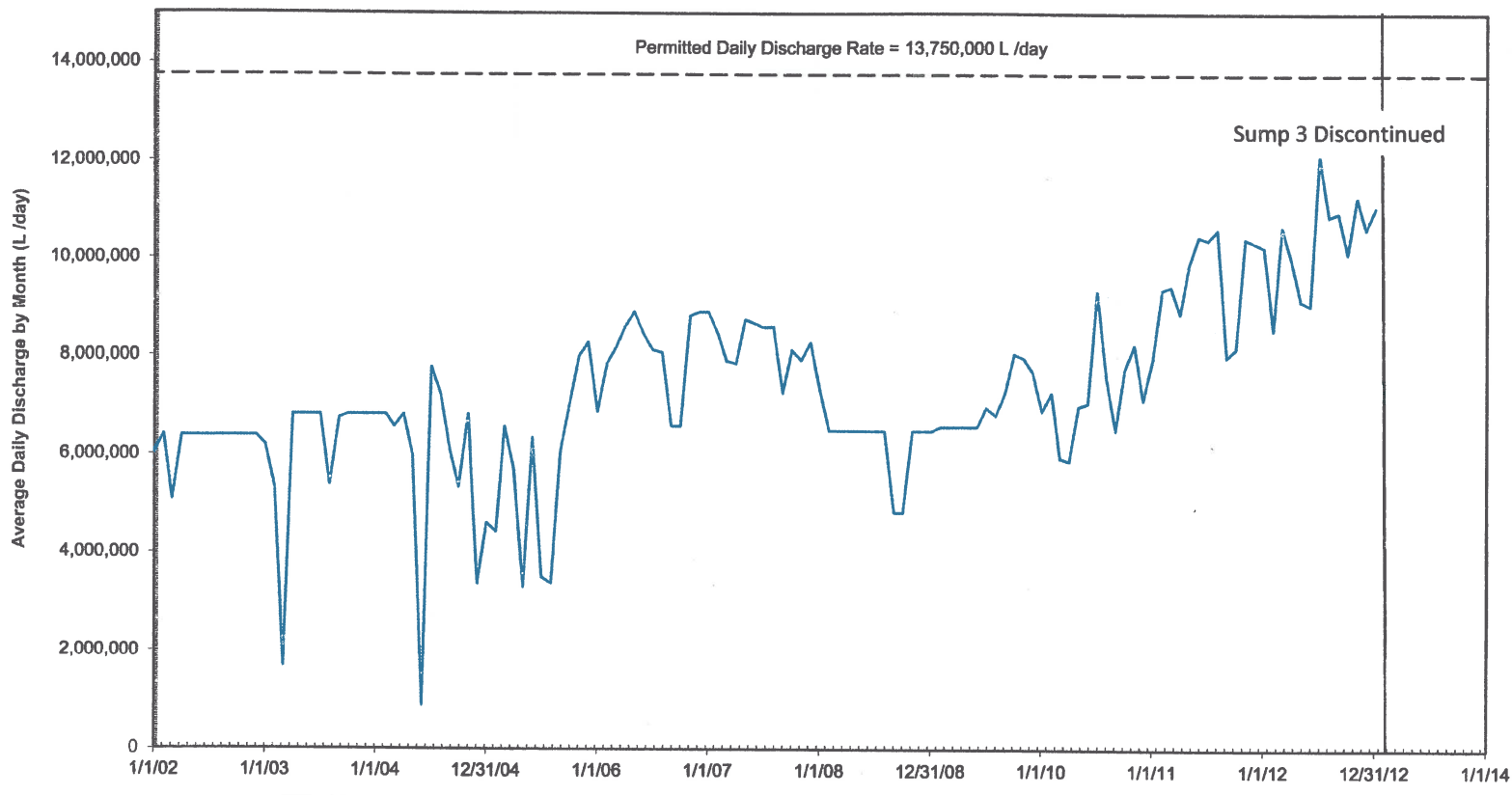
From: Kim Wingrove [<mailto:kwingrove@get.on.ca>]
Sent: January-28-15 10:09 AM
To: Garry Hunter; Greg Sweetnam; Leigh Mugford; Stan Denhoed
Cc: stephanie De Grandis; Kelsey Lang; Meaghen Reid; Don McNalty; Dave Hopkins; Liz Howson; Doug Tripp
Subject: RE: Hidden Quarry Re: Missing JDCL Well Testing Results

The purpose of this email is to share questions and requests for additional data related to water quality and quantity testing, made by the Concerned Residents Coalition and their consultant Garry Hunter, with JDCL and their consultant Harden Environmental. Please refer to the attached email and the email text below. I respectfully request that JDCL/Harden speak directly with Mr. Hunter and CRC regarding the requested information.

Thank you,

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 Quarry Water Discharge from Sump 3, 4, 5 2001-Jan 2014

Surface Water Sampling Locations

Sample	Easting	Northing
RS1/Trib A	571,385	4,829,537
SW4	571,954	4,829,773
SW7	572,280	4,829,413
SW11/Trib C	572,286	4,829,949
Brydson Spring	572,713	4,829,118

Brydson Spring Streamflow Measurement Locations

Measurement	Easting	Northing
1	572774	4829150
2	572776	4829154

* Both measurements taken Oct 16, 2014

** Measurement 2 is 5 metres downstream of measurement 1

MONITOR / LOCATION	May-05-14	June-23-14	August-14-14	October-10-14
SW3	349.177	dry		
SW4	359.194	359.024		358.984
SW5	355.295	355.035		354.88
SW6	355.406	355.031	354.94	354.875
SW7	355.226	354.761		
SW8		dry		
North Wetland Ref Point	358.512	358.272		
RS1 -U	358.582	358.552	358.547	358.562
M1-D	352.177	351.587	351.312	351.467
M2	352.019	350.839	350.379	350.609
M3	349.927	349.892	349.882	349.862
M4	347.595	346.505	346.135	346.125
M5	354.801	354.256	354.016	353.981
M6 in	355.387	354.997	354.612	354.522
M6 out	355.397	355.027		
M9	354.8	354.45	353.16	353.37
M10 in	355.361	354.671		354.396
M10 out	355.361			
TP1	355.444	355.204	354.894	354.824
TP2 in	355.138	354.368	354.138	354.108
TP2 out	355.368			
TP8	355.47	354.5		
TP9	352.27			
MPN-1 in	355.405	355.045	354.725	354.675
MPN-1 out	355.405	355.035		
MPN-2 in	355.405	355.07	354.745	354.7
MPN-2 out	355.37			
MPE-1 in	355.184	354.679	354.389	354.334
MPE-1 out	355.409	355.029		
MPE-2 in	355.218	354.698	354.433	354.378
MPE-2 out	355.408			
MPS-1 in	355.311	354.866	354.501	354.426
MPS-1 out	355.406	355.031		
MPS-2	355.199	354.669	354.349	354.299
MPW-1 in		355.109	354.709	354.674
MPW-1 out		355.229		
MPW-2 in	355.525	355.075	354.695	354.67
MPW-2 out	355.525			
MP1	354.534	354.224	353.004	353.124
MP2	355.12	354.82	353.5	353.87
MP3	356.339			

MONITOR / LOCATION	May-05-14	June-23-14	August-14-14	October-10-14
M1-S	353.875	353.395	353.145	353.135
M13-S	355.504	355.164	354.844	354.789
M13-D	355.108	354.403	354.018	354.163
M14-S in	355.106	354.531	354.261	354.226
M14-S out	355.356	354.816		
M14-D		354.408	354.168	354.128
M15-1	351.656	350.471	350.111	350.376
M15-2	351.561	350.381	350.021	350.276
M15-3	351.861	350.611	350.236	350.506
M15-4	351.881	350.511	349.991	350.011

Leigh Mugford

From: Leigh Mugford
Sent: Thursday, February 12, 2015 9:19 AM
To: 'Garry Hunter'
Cc: stephanie De Grandis; 'Kim Wingrove'; sdenhoed@hardenv.com; Greg Sweetnam; Liz Howson
Subject: RE: Hidden Quarry Re: Missing JDCL Well Testing Results

Mr Hunter I confirm there is not a requirement to perform water quality testing for the MOE at the Guelph Quarry.

Leigh

From: Garry Hunter [mailto:ghunter@hunter-gis.com]
Sent: February-12-15 9:14 AM
To: Leigh Mugford
Cc: stephanie De Grandis; 'Kim Wingrove'; sdenhoed@hardenv.com; Greg Sweetnam; Liz Howson
Subject: Re: Hidden Quarry Re: Missing JDCL Well Testing Results

Mr Mugford,

So we can move on, I accept your response to question 3.

With regard to question 5, we already have the Harden sampling data.

MOE often requires routine compliance sampling and analysis of quarry discharge water quality, in the alternative, please confirm that this is not the case at the Guelph Dolime Quarry.

Thank you,

Yours truly,

Garry T. Hunter M.A.Sc. P.Eng.
President

Hunter and Associates / Hunter GIS
2285 Dunwin Drive, Unit 18
Mississauga, ON L5L 3S3

Tel (905) 607-4120
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On 2/11/2015 3:21 PM, Leigh Mugford wrote:

Hello Mr Hunter,

For #3, we will be sticking with what we said we would do regardless.

For #5 I believe the relevant water quality data has been previously submitted to Burnside. There were a number of additional samples taken at the Guelph quarry for chemical parameters after blasting. I trust you are familiar with those reports. If you require I can advise on the Harden documents that refer to this testing.

Leigh

From: Garry Hunter [<mailto:ghunter@hunter-gis.com>]

Sent: February-11-15 10:41 AM

To: Leigh Mugford

Cc: stephanie De Grandis; 'Kim Wingrove'; sdenhoed@hardenv.com; Greg Sweetnam; Liz Howson

Subject: Re: Hidden Quarry Re: Missing JDCL Well Testing Results

MR Mugford,

Your replies to my requests 1, 2 and 4 are sufficient for my purposes.

With respect to 3, I am still of the opinion that JDCL can release the water quality data from the nearby sampled commercial wells.

With respect to Request 5, although I do appreciate receiving the dewatering discharge record for Guelph Dolime Quarry, the context of my request was for the related water quality discharge monitoring compliance data.

Thank you very much for your efforts to date and expedient response to my requests 3 and 5.

Yours truly,

Garry T. Hunter M.A.Sc. P.Eng.

President

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Yours truly,

Garry T. Hunter M.A.Sc. P.Eng.

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Leigh Mugford
Resource Manager
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office 905-857-3500
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fax 905-951-5521

From: Kim Wingrove [<mailto:kwingrove@get.on.ca>]
Sent: January-28-15 10:09 AM
To: Garry Hunter; Greg Sweetnam; Leigh Mugford; Stan Denhoed
Cc: stephanie De Grandis; Kelsey Lang; Meaghen Reid; Don McNalty; Dave Hopkins; Liz Howson; Doug Tripp
Subject: RE: Hidden Quarry Re: Missing JDCL Well Testing Results

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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





April 24, 2015

Via: Email

Mr. Stan Denhoed, M.Sc., P.Eng.
Harden Environmental Services Ltd.
4622 Nassagawaya-Puslinch Townline Road
RR 1
Moffat Ontario N0P 1J0

Dear Mr. Denhoed:

**Re: Harden Letter of December 9, 2014
And Septic Well Contingency Plan dated January 8, 2015
Project No.: 300032475.0000**

Thank you for your letter of December 5, 2014 which provides responses to the R.J. Burnside & Associates Limited (Burnside) letter of October 6, 2014. In addition to addressing the comments in the Burnside letter, proposed contingency plans for a number of wells in the vicinity of the proposed Hidden Quarry are presented in Table 1 of your Memorandum of January 8, 2015. Comments on the Memorandum are provided under separate cover.

Burnside offers the following comments in response to your December 9, 2014 letter. Our response uses the same section numbering system as the October 6, 2014 Burnside letter.

1.0 Karst

Comments only, no response from Harden required.

2.1 Groundwater Elevation Multi-Level M15

Harden collected water level data from M15 on six occasions between May 2014 and October 2014. The hydraulic gradient between the shallowest well (M15-IV) and the deeper wells changes from downwards gradients in the spring to upwards gradients in the fall. The water levels in M15-III and M15-IV (both in bedrock above the proposed quarry floor) were identical in May 2014, but differ during the remainder of the year by up to 0.5 m indicating that there is separation between the fractures and that the well seals are effective.

Although water levels in all four screened intervals show a similar pattern, the greatest decline occurs in M15-IV (the shallowest well) and as a result, the gradient in the monitored portion of the Gasport Formation changes from downwards in the spring to upwards after August 9, 2014. The water levels all follow a single trend (except M15-IV on October 8, 2014) indicating that the various zones in the bedrock are influenced by regional events.

Burnside Response

The additional data collected by Harden has improved the understanding of the bedrock system at M15. As would be expected, the shallow bedrock behaves somewhat differently than the deeper intervals. Water level differences between M15-III and M15-IV vary from 0.2 to 0.5 m suggesting that creating a hydraulic connection between these intervals will result in significant water level changes.

2.2 Hydraulic Testing in Multi-Level M15

Revised testing by Harden using a Waterra pump to remove water from each well separately did not produce any measurable drawdown in the other wells at M15. This confirms the integrity of the well seal.

Harden revised the groundwater model in order to address the presence of a zone of higher hydraulic conductivity beneath the quarry (as measured in M15-I and M15-II). Four layers were used in the model to represent a portion of the dolostone aquifer. In the first scenario the data obtained from the testing at M15 was used to assign hydraulic conductivity values to the four layers used by the revised groundwater model.

For Scenario 1, the revised model predicts a reduced water level decline at domestic well W3 than predicted by the original model.

Scenario 2 used a significantly higher hydraulic conductivity for layer 3, the same hydraulic conductivity for layer 4 as Scenario 1 and a slightly lower value for layer 1 and layer 2. Again the revised model predicts less drawdown at the nearest domestic well than predicted by the original model and also predicts less drawdown than estimated in Scenario 1.

Harden concludes that “the presence of a zone with greater permeability results in less impact to local wells than the scenario without a zone of greater permeability within the Gasport Aquifer”. Therefore the prediction of water level change on nearby wells is conservatively high in the Harden 2012 report submitted with the “quarry application.”

Harden investigated the integrity of the bentonite seals by manually pumping each screened interval for 10 minutes using a Waterra internal pump. No water level response was observed other than in the interval being pumped.

Burnside Response

The use of site specific data collected from M15 confirms that the prediction of water level changes predicted by the original Harden groundwater model as result of the proposed quarry are reasonable and conservative. The water level declines predicted by the model will need to be utilized along with data collected during detailed domestic well surveys to refine the well specific contingency plans that have been developed using historical domestic well data collected by Harden as part of their work at the proposed Hidden Quarry. Testing completed by Harden confirmed the integrity of the bentonite seals.

2.3 Combined Impact of Future Rockwood Well Number 4 and Hidden Quarry

Burnside indicated that wells on the proposed quarry site would be monitored during testing of Rockwood Well Number 4 to assess the degree of connection (if any) between the new well and the bedrock aquifer in the area of the proposed quarry.

Burnside Response

Rockwood Well 4 has been constructed and a pumping test was recently completed with monitoring of select wells at Hidden Quarry undertaken before, during and after the test. The data collected from the test reviewed by Burnside and indicates that there was no measurable response to pumping in the bedrock aquifer in wells monitored at the site of the proposed quarry.

2.4 Water Quality Testing in Multi-Level M15

This is also discussed in Section 4.1.3 of the Harden letter. Water quality samples were collected from M15 on November 11, 2014 approximately 10 days after being chlorinated. No E.coli was detected in any of the M15 screens, however total coliform was present in the sample from M15-IV. Nitrate ranged from 1.99 mg/L in M15-II to 2.33 mg/L in M15-III. This is consistent with previous testing where highest nitrate concentration was present in the sample from M15-III. The results for the two sampling events are shown in Table 1.

Table 1: Sampling Results

Well	Nitrate Concentration (mg/L)	
	May 5, 2014	November 11, 2014
M15-I	1.61	2.01
M15-II	2.19	1.99
M15-III	3.17	2.33
M15-IV	1.96	2.25

Burnside Response

The two sets of samples indicate that there is nitrate present at low concentrations throughout the entire bedrock sequence at the location of M15. This suggests that a vertical connection already exists in the bedrock and that the vertical connections created by bedrock extraction will not result in a significant change to the water quality.

3.1 Guelph Limestone Quarry Water Quality Sampling

- a) Harden indicates that the background nitrate value of 0.5 mg/L in the Guelph Limestone Quarry pond represents an average concentration of water from the overburden, the unconfined Guelph Formation, stormwater runoff, groundwater from the underlying Gasport Aquifer along with dry deposition from nearby highways, residential areas and industrial areas.
- b) Harden indicates that although the mass of nitrogen in a blast at Hidden Quarry will be greater than a typical blast at the Guelph Limestone Quarry, the volume of water at Hidden Quarry is much greater and will provide significantly more dilution. In addition, sampling

from the Dufferin Milton Quarry, the James Dick Cambridge Quarry and the Guelph Limestone Quarry has demonstrated that nitrogen compounds in quarry pond water are not an environmental or health concern.

Burnside Response

The data presented by Harden confirms that the nitrogen compounds entering the quarry pond and the groundwater will not result in any significant increase in nitrate concentrations.

3.2 Nitrogen Compounds in Groundwater and Surface Water

Harden references Table 7 (Harden, June 10, 2014) which indicates that the nitrate concentration in the quarry pond will be 3.67 mg/L. Harden also indicates in the June 10, 2014 letter that nitrogen concentrations down gradient of the quarry property will continue to be less than entering the quarry property.

Burnside Response

Harden has demonstrated through the use of mass balance calculations and examples from other quarries that the proposed Hidden Quarry will not result in an increase in nitrate concentrations down gradient of the quarry.

3.3 Revised Nitrate Prediction

Harden indicates that the mass of nitrogen introduced by the explosives (Table 3 of their January 14, 2014 letter) is conservative. This is based on recent testing at the Guelph Limestone Quarry which indicates that the predicted nitrogen input to water from explosives far exceeded the concentrations measured in surface water samples from the quarry.

Burnside Response

The data presented for Harden is based on samples taken from the Guelph Limestone Quarry which is completed in the same bedrock formation. The data indicates that the input of nitrogen compounds from explosives is minimal. However, Burnside's main concern related to nitrate was that the removal of the bedrock would result in a vertical connection of the fractures from the bedrock surface to the base of the quarry at 327 masl. It was envisioned that the shallow fracture system would have been the most impacted by anthropogenic activities and would have the highest concentration of nitrate as a result of upgradient agricultural/farming activities. The two rounds of sampling at M15 have demonstrated that low concentrations of nitrates are distributed fairly evenly throughout the bedrock, suggesting that there is already a connection between the horizontal fracture systems. The water quality data and calculations presented by Harden demonstrate that the quarry will not result in an increase in nitrate concentrations in the downgradient groundwater.

4.1 Current State of Local Water Supplies and Vulnerability of the Aquifer

At a meeting held on October 21, 2014, it was agreed that Harden would collect water quality samples from 15 select private wells, nine on-site monitoring wells and five surface water locations. Approximately 70% of the residents did not want to have their water quality results

made public; therefore a three digit random number is used to identify all individual wells. Where available, information on the pump depth, static water level and available drawdown is included in Table 3 (Private Well Survey) along with general observations about the condition of the well head.

4.1.1 Private Well Sampling

A variety of water quality issues were identified in nearby domestic wells including significant coliform bacteria concentrations in four wells, chloride and sodium above the ODWQS in two wells; nitrate ranging from not detected to 6.74 mg/L; iron above the ODWQS in three wells, hardness above the ODWQS (all wells), and total dissolved solids (TDS) above the ODWQS in six wells. Four of the 14 residents have either a UV light or chlorination system installed.

Burnside Response

The collection of water quality samples from nearby domestic wells provides baseline data that can be used to evaluate water quality impacts (if any) from the quarry (if approved). As would be expected, hardness was above the ODWQS in all samples. The information presented by Harden indicates that the quarry will not result in an increase in nitrate concentration in groundwater. However, it could be perceived by residents that the quarry could be the source of increasing nitrate concentrations in their well. As a result it will be important that the probable sources of the elevated nitrate be established prior to the onset of any quarrying activities as a condition of development.

4.1.2 Surface Water Quality

Surface water samples were collected from RS1 (Tributary A), SW4 (Tributary B), SW7 (Tributary B), SW11 (Tributary C) and Brydson Spring. The highest concentrations of coliform bacteria were found in Tributary B (SW4 and SW7). E.coli was present in all the surface water. Nitrate was not detected at SW11, and ranged in concentration from 0.80 mg/L at SW7 to 6.02 mg/L at RS1. The elevated sodium and chloride in the Brydson Spring, are attributed to road salt impacts by Harden.

Burnside Response

It is apparent that surface water has been impacted by coliform and E.coli bacteria which are likely being introduced by agricultural activities and local wildlife. The decline in coliform from 50,000 cfu/100 ml at SW7 to 500 cfu/100 ml at the Brydson Spring sample location suggests that either there is a limited connection between Tributary B and the Spring or there is a significant degree of attenuation occurring. The elevated sodium and chloride seen in the Brydson Spring sample may be due to road salt impacts.

4.1.3. On-Site Monitoring Wells Groundwater Quality

The on-site wells were chlorinated approximately 10 days prior to sample collection. Three well volumes were purged prior to sample collection and free-chlorine was not present in any of the wells when sampled. Harden provides the following comments on the data:

1. *M15-IV is the only monitoring well with coliform bacteria. The sample contained a bacterial concentration of 14 cfu/100 ml.*
2. *Water obtained from M1D had a manganese concentration of 0.058 mg/L. This exceeds the Aesthetic Objective of 0.05 mg/L.*
3. *All wells exceeded the Aesthetic Objectives for Hardness and M1D exceeded the Aesthetic Objective for Total Dissolved Solids due to the presence of sodium and chloride from road salting activities.*
4. *Nitrate concentrations in the groundwater range from not detected (ND) to 3.99 mg/L. Nitrate occurred in all wells except M1D.*
5. *The chemistry of each interval in monitoring well M15 is distinct. This corroborates the findings of the hydraulic testing that there is not leakage between test sections.*

Burnside Response

The data collected by Harden provides a good indication of groundwater quality in the area of the proposed quarry, both upgradient and downgradient of the two extraction areas.

4.2 Recent Research and Susceptibility of Local Wells to Contamination

Harden indicates that two baseline samples of water quality will be obtained post approval of the quarry during a period of relatively high water table and relatively low water table. Samples will be analyzed for general chemistry, anions, metals, nutrients, coliform bacteria and E.coli.

Burnside Response

Wells that have elevated levels of parameters such as bacteria and nitrate will require further investigation to establish the source as a condition of development. This will assist in the resolution of any future water quality interference claims. We would also recommend that an upgradient well with known nitrate impacts be used as a background well to monitor nitrate impacts from agricultural activities.

4.3 Water Fowl Use of Hidden Quarry Pond

Appendix D of the June 10, 2014 Harden letter addresses the potential for water fowl to use the quarry pond. Harden indicates that the proposed quarry will not be favourable for heavy water fowl use.

Burnside Response

The addition of giardia and cryptosporidium to the monitoring program will be useful in assessing the impacts of water fowl and other animals that may use the ponds and is recommended. Ideally the ponds will be completed in a manner to discourage their long term use by water fowl.

4.4 Water Quality Early Warning and Mitigation

Harden has agreed to complete a detailed well survey and install M16 and M17 upon approval of the quarry. The installation of M16 and M17 will provide additional information on the bedrock sequence. In particular M16 will provide information on the east side of the site where there is limited data.

Burnside Response

Since bedrock fractures are heterogeneous, it will be important that the degree of connectivity between fracture systems identified in M16/M17 and M15 be established. Similarly the water quality variation with depth must also be assessed. At a minimum the following will need to be completed at M16/17 (and at M18/19) as a condition of development:

- Detailed core logging which includes fracture identification;
- A pumping test on the open hole wells to assess connectivity with other wells on site;
- A downhole video and flow profile to identify productive fracture systems;
- Completion of a multi-level well at M16 with M17 to remain as an open hole;
- Water quality sampling from each well to allow for assessment of water quality variations with depth; and
- Hydraulic conductivity testing.

The results of the drilling should be documented in a technical memorandum.

5.0 Local Well Survey

Harden has agreed to update the local well survey for wells downgradient of the quarry. Retrofits at the well head(s) will be undertaken.

Burnside Response

The well survey should include wells upgradient of the quarry as they have the greatest potential to be negatively impacted by water level changes as a result of the proposed quarry.

6.0 Quarry Depth Limitation

No comment necessary

7.0 Brydson Spring and Blue Springs Creek

Harden has agreed to include Brydson Spring in the background study and will include flow measurements and water quality testing. Two flow measurements were obtained on October 16, 2014. Flow in Tributary B was not occurring beneath Highway 7 at the time of these measurements.

A review of water quality results from Tributary B (SW4 and SW7) and Brydson Spring indicates that there are some differences.

Burnside Response

The water quality sample from the Brydson Spring had much higher sodium and chloride than samples from SW4 and SW7 and nitrate (2.39 mg/L) was elevated in comparison to results from SW4 (1.05 mg/L) and SW7 (0.80 mg/L). Total coliform was much lower at Brydson Spring (500 cfu/100 ml) compared to SW4 (20,000 cfu/100 ml) and SW7 (50,000 cfu/100 ml). Parameter such as hardness are similar in both the surface water and bedrock samples which makes it difficult to confirm the contribution of bedrock/surface water to spring flow.

It is known that there are times when there is flow at SW4 when at the same time there is no flow at Tributary B at the point where it crosses the southern property boundary. Flow measurements on October 16, 2014 indicate an average flow in the Brydson Spring of 22.4 L/s while flow in Tributary B was not occurring beneath Highway 7. It is not known what the flow was at SW4 at the time so the contribution from Tributary B to the spring is not known. Although quarry operations are not predicted to impact flow in Tributary B, the contribution of Tributary B to flows at Brydson Spring has not been quantified. Flow in the Brydson Spring should be compared to flows in Tributary B near SW3, SW4 and SW5 under a variety of conditions. Flow measurements should begin as soon as possible to ensure that sufficient baseline data is collected under a variety of conditions. This will allow the contribution of Tributary B to Brydson Spring to be quantified. The relationship of the flow in Tributary B and the flow in Brydson Spring can then be monitored to confirm that the quarry operations are not impacting the spring. The proposed monitoring program should be revised to include flow monitoring at SW3, SW4, SW5 and Brydson Spring...

8.0 Rock Extraction Water Level Change Monitoring

JDCL has agreed to install M17 and a trigger level will be established prior to commencement of quarrying activities. Trigger levels have been established for M1D, M2, M13D, M14D, M15 and M16.

Burnside Response

Once M17 is installed, several rounds of water levels will need to be collected from all the on-site wells and the upgradient domestic wells so that the relationship between water levels can be established and reviewed. The trigger levels will need to consider how the water levels relate to those in nearby domestic wells so that the allowable water level change on site does not result in unacceptable changes in domestic wells. Harden did not respond to the Burnside recommendation to deepen M3. M3 should be deepened as a condition of development with water level data collected far enough in advance of quarrying to develop a defensible baseline that can be used to assess quarry impacts.

8.1 Historic Low Water Level

Harden has agreed to complete a well survey and a well construction drawing for each well. A safety factor type rating and contingency plans will be developed for each well.

Burnside Response

A significant amount of information has been gathered for the domestic wells in the area. The information has been summarized in Table 1 which is included as an attachment to the Harden January 8, 2015 Memorandum. Seventy percent of residents asked that details about their wells remain private and as a result, the location of the wells in the table is not shown. There are a number of wells with limited available drawdown above the pump intake or with completion depths above 327 masl which makes them more vulnerable to water level declines. These wells will require additional investigation and the development/implementation of a rigorous contingency plan as a condition of development.

8.2 Monitoring Plan Revisions

- a) Harden has agreed to install M17 between the sinking cut and the nearest domestic wells, M17 will remain as a full depth open hole and a trigger level will be established. M18 and M19 are to be installed along the southern property boundary.

Burnside Response

Burnside had recommended deepening M3 to 227 masl to provide information on the entire bedrock sequence. Harden does not respond to this recommendation. The well as constructed does not conform to O. Reg. 903 and should be deepened in order to provide more reliable water level data.

- b) Harden has agreed to water level monitoring of private wells as part of the baseline monitoring program, but suggests that the dedicated on-site monitoring provide a superior opportunity to determine water level changes between the quarry and the domestic wells. Harden has agreed to retrofit the nearest wells in order to limit the possibility of surface contamination.

Burnside Response

Burnside recommends that the long term monitoring program include both on-site well and nearby domestic wells. Domestic wells should be equipped with direct read loggers installed in conduit to minimize disturbance to the well during data collection. Sufficient baseline water level data should be collected to allow for water levels in on-site monitors to be correlated to domestic well water levels. The data can then be used to develop trigger levels in on-site wells that will be used to initiate appropriate actions in domestic wells.

- c) Harden disagrees that a rigorous domestic well monitoring program is necessary, but provides a list of residents who will be contacted for the opportunity to have water level monitoring conducted as part of approval.

Burnside Response

Burnside recommends that any resident who wishes to have water levels monitored be included in the program. To date there has been no indication of the volumes or source of wash water that will be required for material processing. If a groundwater source is required the predictions of drawdown may change, particularly if the source is located along the southern portion of the site. As a result, we continue to require a rigorous domestic well monitoring program.

2.3 Trigger levels for Sinking Cut

Harden recommends that the agreed to monitoring network be used to establish the level of disturbance to the water levels between the sinking cut and the domestic wells. A “ball and tether” system will be installed in the pond to inform on-site workers if the water level falls below the established datum. Harden indicates that the Township will be informed on a “regular basis” of water levels with comparison to the agreed upon trigger levels.

Burnside Response

The “ball and tether” system needs to be augmented by an automated water level data collection device. Requiring on-site workers to visually confirm that the ball is above the trigger level is not a rigorous method of ensuring compliance with a trigger level. The requirement to inform the Township of water levels on a regular basis is too vague. Data from the automatic water level recording device should be provided to the Township on a bi-weekly basis until the data indicates that water levels are remaining consistently above the trigger level.

3.0 Contingency Measures

Harden has made the changes to the wording recommended by Burnside.

Burnside Response

No comment required.

3.2 Water Quality

Harden has agreed to complete two sampling events which will become the baseline against which future water quality can be compared.

Burnside Response

No comment.

5.0 Annual Reporting and Interpretation

No Comment needed.

9.0 Additional Work

Harden has agreed with the Burnside recommendation with exception of the recommendation to evaluate wells M16, M17, M18 and M19 in the same manner as M15. Harden indicates that completion in the same manner as M15 is not warranted.

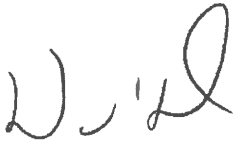
Burnside Response

Burnside agrees with Harden that the new wells do not need to be completed in the same manner as M15. However as indicated in the December 6, 2014 letter, the new wells should be

evaluated in the same manner as M15. To clarify, Burnside recommends that downhole video flow profiling be completed on M16, M17, M18 and M19 as there is limited information in the vicinity of these new wells. In addition, a short term test should be completed on the open hole to obtain a bulk hydraulic conductivity value. We agree that the wells should be completed as "open holes" to be consistent with domestic well construction.

Yours truly,

R.J. Burnside & Associates Limited



Mr. David Hopkins, P.Geo.
Senior Hydrogeologist
DH:sd

Enclosure(s)

cc: Ms. Kim Wingrove, Guelph Eramosa Township (Via: Email)
Ms. L. Howson, MCIP, RPP, MSH (Via: Email)

150209_Denhoed Letter
24/04/2015 1:54 PM



April 24, 2015

Via: Email

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

Dear Mr. Denhoed:

**Re: Hidden Quarry Specific Well Contingency Plans
Project No.: 300032475.0000**

1.0 Introduction

Thank you for your memorandum of January 8, 2015 which uses existing information from well surveys and water well records to assist in the preparation of well specific contingency plans for domestic wells in the vicinity of the proposed Hidden Quarry.

The extraction of bedrock in the quarry is predicted to result in a permanent decline in bedrock water levels to the north and a rise in water levels to the south. The quarry will also result in mixing of water quality from a variety of previously unconnected zones in the bedrock which could impact wells downgradient of the site. In addition, although the site is not considered to be favourable for water fowl use, there is the potential for bacteria to be introduced into the quarry ponds and migrate laterally downgradient in bedrock fractures. Although the work completed to date by Harden suggests that the quarry will not result in water quality/quantity impacts, Burnside requested that the available information for each well be used to come up with a well-specific contingency plan to deal with potential impacts. Information for 39 wells is included in Table 1 which is attached to the Memorandum.

2.0 Water Quantity Issues

The maximum predicted drawdown in the bedrock aquifer at the nearest off-site well is about 1.4 m immediately northwest of the proposed quarry property. There are two options that can be used to mitigate water level declines:

1. Lower the pump in the well; and
2. Deepen the well.

The groundwater model used by Harden predicted that water level declines in the bedrock will be seen in the northern half of the site with increases seen to the south. Figure 4.3 from the

original report presents the predicted drawdown and is attached for reference. The December 9, 2014 Harden letter indicates that the groundwater model was revised to consider the potential of a zone of higher hydraulic conductivity beneath the quarry. The results indicated that the original predictions were conservative. As a result, it is considered reasonable to utilize the Figure 4.3 to assist in assessing the impacts to nearby domestic wells. As can be seen, drawdown is expected to occur north of Highway 7 along the 6th Line, west of the proposed quarry and along the 7th Line, east of the quarry.

Table 1 contains a significant amount of information including the well depth, well depth elevation, static water level (both measured and from MOECC water well record), recommended pump setting and available drawdown to recommended pump setting.

Calculating the available drawdown to the bottom of the well and to the recommended pump setting is a reasonable approach to assess if there is an opportunity to lower the pump in the event that water levels are approaching the pump intake. However, the recommended pump setting may not be the actual pump setting and is difficult to verify. A more conservative approach would be to use the pumping data from the water well record and look at the available drawdown from the pumping level to the recommended pump setting and the bottom of the well.

The wells that are predicted to experience the greatest drawdown due to quarry activities are W2, W4, W5, W6, W7 and W8 which are all completed in the bedrock. W31 is a shallow dug well with limited available drawdown. The spring feeding W31 is indicated by Harden to originate in the overburden. This needs to be confirmed as predicted drawdown in the bedrock is between 0.4 and 0.6 m. The well has limited available drawdown and could be significantly impacted if the spring was fed from the bedrock.

Burnside recommends the following:

1. The status of W7 be clarified; there is no information for this well provided in Table 1.
2. Additional information be provided for W2 and W3 which are located in the mushroom farm site.
3. Short term pumping tests should be completed on wells W2, W3, W4, W5, W6, W7 and W8 to confirm the pumping water levels and the contingency options in Table 1 finalized.
4. The source of water for W31 should be confirmed.
5. Additional information be provided for wells W20, W35, W38, W42 and W43. Although they may be in areas where impacts are not expected, the information in Table 1 should be filled out for these wells as a condition of development. Burnside recommends that these wells be investigated in more detail, recognizing that provincial privacy rules and issues with owners not allowing access to their wells can make it difficult to correlate well records to specific properties

Bedrock drawdown in the order of 0.4 m is predicted northeast of the proposed quarry along 7th Line which could impact wells W25 to W34. With the exception of W26, all these wells are completed above the base of the quarry so the wells could be deepened if necessary.

3.0 Water Quality

Water quality impacts will be limited to wells located south of the proposed quarry where water levels are predicted to rise. In the majority of cases there is an option to drill the well deeper and extend the casing below the depth of the quarry to access deeper bedrock fractures. UV light protection is also recommended as a treatment option. Burnside recommends the following:

1. The well heads at W17, W18 and W21 be upgraded to comply with O. Reg. 903 to facilitate monitoring and reduce the potential for impacts from surface water infiltration which could be misconstrued as originating from the quarry. This should be completed as a condition of development.
2. Water treatment systems are not the preferred options as they will require long term maintenance by the property owner.

Yours truly,

R.J. Burnside & Associates Limited



David Hopkins, P.Geo.
Senior Hydrogeologist
DH:sd

cc: Ms. Kim Wingrove, Township of Guelph/Eramosa (enc.) (Via: email)
Ms. Liz Howson, Macaulay Shiomi Howson Ltd. (Via: email)