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Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection Studies
Groundwater Modelling
Groundwater Mapping

Our File: 9506

December 9, 2014

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

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

Dear Mr. Hopkins:

Re: Hidden Quarry
Burnside Letter of October 6, 2014
Burnside Project No.: 300032475.0000

Thank you for your October 6, 2014 letter responding to the Harden Environmental Services Ltd. (Harden) letter dated June 10, 2014 regarding the proposed Hidden Quarry Site.

We offer the following supporting comments and analysis by section heading for issues raised by R.J. Burnside and Associates Limited (Burnside).

2.1 Groundwater Elevations Multi-Level M15

Figure 1 is a summary of the water levels obtained since May 2014. The relationship between the three deeper intervals (M15-I, II and III) remain the same throughout the summer and into the fall. The hydraulic relationship between the shallowest interval (M15-IV) and the deeper intervals changes from one of downward gradients in the spring to upward gradients in the fall. This change in relationship shows that the hydraulic seal installed effectively isolates M15-IV from the lower intervals and that on a local scale, M15-IV behaves somewhat differently than the lower intervals, although the general trend in water levels is the same. Interval M15-II has a consistently lower hydraulic head than interval M15-III above and M15-I below resulting in both upward and downward hydraulic gradients within the Gasport Aquifer. This observation confirms hydraulic isolation between these intervals.

The difference in water levels in M15-III and M15-IV, representing intervals within the proposed depth of Hidden Quarry, ranges from 0.2 to 0.5 metres. Creating a hydraulic connection between these two intervals will not result in a significant water level change.

The other significant observation is that the water levels in the intervals respond similarly to seasonal change (i.e. highest in the spring and falling until fall). This suggests that each interval is influenced in a similar manner to the seasonal increase and decrease in recharge to the aquifer. This behavior shows that the various zones within the aquifer do not behave independently of regional influences and therefore can be considered to act as a continuum.

2.2 Hydraulic Testing in Multi-Level M15

Model Results

The estimated hydraulic conductivity of M15-II is 9.1 x 10^{-5} m/s as detailed in the June 10, 2014 letter from Harden Environmental to R. J. Burnside. The groundwater model used a hydraulic conductivity of 2 x 10^{-5} m/s for the entire aquifer (Harden, 2012). This is a five-fold difference with the hydraulic conductivity used in the groundwater model being less than that measured in M15-II. Burnside has questioned how a high hydraulic conductivity zone may influence predicted water levels off site by the groundwater model.

Transmissivity used in the model is related to hydraulic conductivity in the following way;

$T = kb*86{,}400$ (1)

where,

T = transmissivity (m^2/day)

k – hydraulic conductivity (m/s)

b –aquifer thickness (m)

The average thickness of the aquifer beneath the site is 41 metres resulting in an average transmissivity of 71 m^2/day. The impact of an aquifer with higher transmissivity was detailed in the Harden Environmental response to Burnside and Associates in the June 10, 2014 letter in Section 2.2 where the hydraulic properties of the aquifer are discussed. In that letter, the effective drawdown at the nearest residential well was estimated from transmissivities ranging from 75 m^2/day to 302,000 m^2/day (a range of hydraulic conductivity between 2 x 10^{-5} m/s and 8 x 10^{-2} m/s) and calculated to be between 1.8 and 2.2 metres. This clearly shows that there is a very narrow range of possible impact even over a range in hydraulic conductivity of three orders of magnitude. Therefore, it is our conclusion that the effect of a smaller portion of the aquifer having a hydraulic conductivity of 9.1 x 10^{-5} m/s compared to an average hydraulic conductivity of 2 x 10^{-5} m/s will not be significant.

A revised groundwater model was prepared in order to address this issue of a zone of higher permeability beneath the quarry. Unlike the original model which used a constant hydraulic conductivity for the bedrock, this re-evaluation a) used a ten metre zone of higher hydraulic conductivity at a depth of three metres below the bottom of the quarry and b) used a relatively low hydraulic conductivity for the lowest layer. This re-evaluation was based on measured hydraulic conductivities at M15.

The layers used in the groundwater model are shown conceptually on Figure 2. There are four model layers representing a portion of the dolostone aquifer as follows;

Layer 1 – upper portion of the aquifer including full quarry depth

Layer 2 – portion of the upper aquifer between quarry and high conductivity layer

Layer 3 – portion of the aquifer with relatively greater hydraulic conductivity

Layer 4 – lower portion of the aquifer with relatively lower hydraulic conductivity

Two scenarios were tested as follows;

Scenario 1

The hydraulic conductivities as measured in M15 were used. The average of measured hydraulic conductivities for M15-IV and M15-II was used for the Model Layer 1 and Model Layer 2 hydraulic conductivity value. The average of hydraulic conductivities measured in M15-II and M15-I was used for Model Layer 3 hydraulic conductivity. A relatively low hydraulic conductivity value was used for Layer 4. A summary of values used is shown in Table 1.

Scenario 2

A significantly higher hydraulic conductivity was estimated for Layer 3 in order to assess the impact of such a zone on nearby wells.

Table 1: Summary of Model Results

Parameter	Layer 1 / Layer 2	Layer 3	Layer 4
Scenario 1			
Hydraulic Conductivity (m/s)	3.5×10^{-5}	8.6×10^{-5}	2.0×10^{-6}
Recharge (mm/year)	352		
Maximum Drawdown at North End of Quarry (m)	2.5		
Maximum Water Level Increase at South end of Quarry (m)	2.6		
Influence at W3 (m)	1.2	1.2	
RMS Calibration Statistic	5.54		
Scenario 2			
Hydraulic Conductivity (m/s)	1.2×10^{-5}	2.3×10^{-4}	2.0×10^{-6}
Recharge (mm/year)	352		
Maximum Drawdown at North End of Quarry (m)	3.0		
Maximum Water Level Increase at South end of Quarry (m)	2.0		
Influence at W3 (m)	0.7	0.7	
RMS Calibration Statistic	4.94		

The water level change in private well W3 was predicted for each model scenario and it was found that;

a) for conditions presented in Scenario 1, the potential impact to private well W3 was less than predicted in the original model (Harden, 2012) and

b) where a zone of high hydraulic conductivity exists (Scenario 2), the impact to local wells will be less than originally predicted and less than estimated from Scenario 1.

The model results predict 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 predictions of water level change on nearby wells is conservatively high in the Harden 2012 report submitted with the quarry application.

Connectivity between M15-III and M15-IV

The water levels shown on Figure 1 confirm that the relationship changes seasonally and confirms that there is hydraulic separation between these intervals and that the integrity of the bentonite seals is intact.

The integrity of the bentonite seals was further investigated by manually pumping each interval (using a Waterra system) for ten minutes and observing water levels in the other intervals. This is far more stress to the system than monitoring other intervals during the slug-testing procedure as suggested by Burnside and Associates. The observations are as follows;

Table 2: Summary of Observations during Interval Pumping

Pumping Interval	Response Measured in Observed Interval (m)			
	M15-I	M15-II	M15-III	M15-IV
M15-II	0.00		0.00	0.00
M15-III	0.00	0.00		0.00
M15-IV	0.00	0.00	0.00	

There was no observed change in the water level of any other interval during or following the ten minute pumping period. These observations and those of the water level differences confirm seal integrity.

2.4 Water Quality in M15

See Section 4.1 of this letter report.

3.1 Guelph Limestone Quarry Water Quality Sampling

a) The active dewatering at the Guelph Limestone Quarry is necessary because the quarry floor is below the level of the Speed River and water from the overburden, the unconfined Guelph Formation, storm water runoff and groundwater from the underlying Gasport Aquifer flow into the quarry. The background water quality in the quarry ponds represents an averaged concentration from each of these sources as well as dry deposition from nearby highways, residential areas and industrial areas. Burnside noted correctly that the background nitrate value in the pond on the day of sampling is approximately 0.5 mg/L. The only nitrogen compound that increased in concentration following the blast was organic nitrogen. This is attributed to the increased turbidity in the water following the blast since explosives do not contain organic nitrogen. There was no increase in the concentration of ammonia, nitrate or nitrite in the pond water.

The first sample was obtained within minutes of the blast and therefore there is limited influence on water chemistry by dilution from other inputs to the quarry pond. There could be dilution from water in the quarry pond. However, there was no measured increase in concentration of nitrate, ammonia or nitrite. Therefore, there was no measurable loss of nitrogen from the explosives to the pond water.

b) The mass of nitrogen in a typical blast at the Hidden Quarry will be greater than a typical blast at the Guelph Limestone Quarry and this calculation was provided to Burnside in our letter of January 14, 2014. The volume of water at the Hidden Quarry will be significantly greater than at the Guelph Limestone Quarry considering that the depth of the Guelph Limestone Quarry is approximately four metres compared with the proposed twenty-three metre depth at the Hidden Quarry. The present volume of water in the Guelph Limestone Quarry is approximately 206,000 m^3 compared to the future 4.4 million cubic metres in the Hidden Quarry ponds (west side only). By the time the Hidden Quarry pond is 0.9 hectares in area, there will be more water in the Hidden Quarry pond than in the Guelph Limestone quarry pond. Therefore, there will be significantly more dilution available at the Hidden Quarry. Nonetheless, based on the measured concentrations of nitrogen compounds in the effluent from the Dufferin Milton Quarry, the James Dick Gamebridge Quarry and the Guelph Limestone Quarry there is no indication that nitrogen compounds in quarry pond water is an environmental or health concern.

3.2 Nitrogen Compounds in Groundwater and Surface Water

Table 7 (Harden, June 10, 2014) shows that the mass of nitrogen to be input to the future quarry pond on an annual basis is 1360 kg. The annual volume of water flowing into the future quarry pond and infiltrating is 370,146 m^3. The resulting nitrate concentration in water will be 3.67 mg/L.

3.3 Revised Nitrate Prediction

A detailed assessment of nitrate from explosives was presented in our January 14, 2014 letter to Burnside including the chemical formula for the combustion of an explosive. Based on our research into explosive use at quarries we concluded that nitrogen is not a chemical of concern, however, we provided some conservatively high estimates of the potential increase in nitrogen compounds arising from the use of explosives. The recent testing of water at Guelph Limestone refutes our findings and shows that our conservative prediction of nitrogen input to water from explosives far exceeded the measured. Our conclusion is that the method of explosive use at the Guelph Limestone quarry results in a very efficient explosion with the nitrogen in the explosives converting to nitrogen gas during the combustion event as should occur. Similar explosive handling procedures are proposed for the Hidden Quarry.

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

Two baseline samples of water quality will be obtained as indicted in the proposed monitoring program. The samples will be obtained post approval of the quarry. The samples will be obtained during a period of relatively high water table and relatively low water table. The analysis included in the sampling event will be general chemistry, anions, metals, nutrients, coliform bacteria and e. coli.

As agreed in the meeting of October 21 2014, fifteen select private wells, nine on-site monitoring wells and five surface water samples were obtained in the weeks of November 3rd to November 11th (Figure 3). Private well W7 at [redacted] was not sampled because the well is inaccessible. Private well W20 at [redacted] was not sampled because a new well was drilled a few days prior to the sampling event, at the time of sampling, this well was not connected to the house.

The results of private well sampling are provided in Table 3. Well Records (if available) for these wells are provided in Appendix A. 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. The results of surface water sampling are summarized in Table 4. On-site monitoring well sampling is summarized in Table 5.

4.1.1 Private Well Sampling

The following general observations are made from the water sampling program;

1) Four of the fourteen wells (29%) have significant coliform bacteria concentrations. Letters were immediately emailed or hand delivered to those residents with recommendations to shock chlorinate their wells. The bacteria was present in both drilled wells with above-ground-casings as well as those in well-pits.

2) Every well exceeded aesthetic guidelines for hardness. This is expected in the dolostone aquifer. Six of the fourteen wells (43%) have water softeners to address the hardness issue.

3) The nitrate concentration in the private wells ranged from 6.74 mg/L to not-detected (ND).

4) The chloride concentration in two wells exceeded the aesthetic objective of 250 mg/L. This is attributed to road salting activities and highest concentrations occurred in wells obtaining water from the uppermost portion of the aquifer.

5) The iron concentration in three wells exceeded the aesthetic objective of 0.3 mg/L.

6) The sodium concentration in two wells exceeded the aesthetic objective of 200 mg/L and four wells exceed the 20 mg/L criteria for the medical officer of health notification.

7) Four of the fourteen residences have either a UV light or chlorination system installed.

8) Six wells exceed the 500 mg/L aesthetic objective for total dissolved solids (TDS). The elevated concentrations of TDS are caused by either iron, sulphate or chloride ions.

Individual letters were sent to the homeowners explaining their results. These results will be kept on file and upon approval of the quarry, another sample will be obtained from these wells during a high water level period (springtime) as well as two samples (springtime and fall) obtained from all remaining wells within 500 metres of the quarry.

Details of the water supply well are also summarized in Table 3.

4.1.2 Surface Water Quality

Water samples were obtained from surface water stations RS1 (Tributary .A), SW4, SW7, SW11 (Tributary C) and Brydson Spring. The results are summarized in Table 4. The following observations are made from the data;

1) The highest concentrations of coliform bacteria were found in Tributary B with 20,000 CFU/100ml found at SW4 and 50,000 CFU/100 ml found at SW7.

2) E.coli is present in all of the surface waters with highest concentrations found in Tributary B with 40 cfu/100ml found at SW4 and 20 cfu/100ml found at SW7.

3) The Provincial Water Quality Objective of 0.03 mg/L for zinc was exceeded at stations SW7 and Brydson Spring.

4) The Provincial Water Quality Objective of 0.01 mg/L for total phosphorous was exceeded at station SW11 (Trib.C).

5) The nitrate concentration in surface waters range from 6.02 mg/L to not-detected (ND).

6) The highest sodium and chloride concentrations are found in the Brydson Spring sample. This is a result of road salting of Highway 7.

4.1.3 On-site Monitoring Wells Groundwater Quality

Groundwater samples were obtained from M1D, M2, M3, M4, M13D, M15-I, M15-II, M15-III and M15-IV. Three well volumes were removed from each well prior to sampling. The wells were chlorinated approximately ten days prior to sampling and free-chlorine was not present in the monitoring well water when sampled.

The following observations are made from 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 the test sections.

4.2 Recent Research and Susceptibility of Local Wells to Contamination

Two baseline samples of water quality will be obtained as indicted in the proposed monitoring program. The samples (other than the fifteen already obtained) will be obtained post approval of the quarry. The samples will be obtained during a period of relatively high water table and relatively low water table. The analysis included in the sampling event will be general chemistry, anions, metals, nutrients, coliform bacteria and e. coli.

4.3 Waterfowl Use of Hidden Quarry Pond

As requested previously by R. J. Burnside, bacteria, cryptosporidium and giardia are included in the sampling program. Appendix D of our June 10, 2014 submission addresses the potential for waterfowl from using the quarry pond. It is clearly stated that as designed, the quarry will not be favourable for heavy waterfowl use.

4.4 Water Quality Early Warning and Mitigation

James Dick Construction has agreed to a detailed well survey including;

- Surface condition of the well
- Depth of pump
- potential to deepen the well to an elevation below 327 m AMSL will be evaluated
- identification of repairs needed for the well
- Brief pumping test and
- Collection of water samples

James Dick Construction Ltd. has also agreed to install M16 and M17 upon approval of the quarry. These are shown on Figure 2, Figure 9 and Figure C1 in the June 10, 2014 letter from Harden Environmental to R.J. Burnside.

5.0 Local Well Survey

JDCL has agreed to update the local well survey. Water levels and water quality samples will be obtained from wells downgradient of the quarry. Retrofits of the well head(s) will be undertaken as suggested by R.J. Burnside and Associates.

7.0 Brydson Spring and Blue Springs Creek

JDCL has agreed to include the Brydson Spring in the background study and will include flow measurements and water quality testing.

Two flow measurements of the Brydson Spring were obtained on October 16th 2014. The average of the two flow measurements was 22.4 L/s (approximately 300 imperial gallons per minute). Flow in Tributary B was not occurring beneath Hwy 7 at the time of these measurements.

8.0 Rock Extraction Water Level Change Monitoring

JDCL has agreed to install M17 as shown on Figure 2 of the June 10, 2014 letter from Harden Environmental to R.J. Burnside.

A trigger level for M17 will be established prior to commencement of quarry activities. Trigger levels have also been established for groundwater monitors M1D, M2, M13D, M14D, M15 and M16.

8.1 Historic Low Water Level

In addition to the well survey a well construction drawing will be prepared for each well. A safety factor type rating will be developed and contingency plans for each well will be prepared.

8.2 Monitoring Plan Revisions

a) In their response Section 8.0, Burnside concurs with the use of M17 as a full quarry depth hole. M17 will be situated between the sinking cut and the nearest residences making it a useful and effective monitoring well for future water level changes. A trigger level for M17 will be established before quarrying activities commence.

   In response to comments from Halton Hills, two additional multi-level monitoring wells along Hwy 7 have been agreed to by JDCL. These are named M18 and M19 and are shown on Figure 4.

b) Water level monitoring of private wells will be conducted as part of the baseline data gathering prior to commencement of extractive activities. There are, or will be, dedicated groundwater monitors situated between the quarry and the nearest domestic wells upgradient and downgradient of the quarry. The dedicated monitors provide a superior opportunity to determine water level changes between the quarry and the domestic wells as they are not influenced by daily water taking by the homeowner. Also, every time a well is accessed there is the chance of introducing bacteria to the well or damaging the well. James Dick Construction Ltd. is agreeing to a trigger level in the quarry pond that is higher than any water level downgradient. Therefore, no water level downgradient can ever be impacted by the quarry. Water quality can be taken from the existing household system, however, we agree that retrofits of the nearest wells should occur to reduce the opportunity for surface-contamination of the well. The nature of these retrofits will be determined during the detailed domestic well survey.

Table 1 of the monitoring program (Appendix B) has been updated to include monitoring of upgradient wells (quantity) and downgradient wells (quality).

We concur that M16 through M19 will be constructed as soon as possible following quarry approval. There will be a minimum of two years data obtained prior to below-water-table extraction occurring.

c) We disagree that a rigorous domestic well monitoring program is necessary. The degree of water level change that can occur is small relative to the water available in each domestic well and it is unlikely that any well will be impacted by water level changes. Trigger levels have been established for the quarry pond and monitors along the northern edge of the quarry where water level changes are most likely to occur. Other than the temporary disturbance in the water table created by the sinking cut, water level changes will not occur until the southern half of the west pond is excavated. A well complaint system has been established and a detailed baseline survey will assess the likelihood of any issue related to the quarrying activities.

This said, the residents listed in Table 6 will be contacted for the opportunity to have water level monitoring conducted post approval;

Table 6: Post Approval Water Level Monitoring

Well Identifier	Owner Name	Address
W4	[redacted]	[redacted]
W5	[redacted]	[redacted]
W8	[redacted]	[redacted]
W9	[redacted]	[redacted]

JDCL is also in agreement with post approval water quality monitoring (quarterly bacteriological sampling and annual nitrate sampling) of the residents listed in Table 7;

Table 7: Post Approval Quarterly Bacteriological and Annual Nitrate Sampling

Well Identifier	Owner Name	Address
W10	[redacted]	[redacted]
W11	[redacted]	[redacted]
W16	[redacted]	[redacted]
W17	[redacted]	[redacted]
W18	[redacted]	[redacted]
W19	[redacted]	[redacted]
W20	[redacted]	[redacted]
W21	[redacted]	[redacted]
W22	[redacted]	[redacted]
W23	[redacted]	[redacted]
W24	[redacted]	[redacted]

2.3 Trigger Levels for Sinking Cut

We recommend that the agreed to monitoring network be used to establish the level of disturbance to the water levels between the sinking cut and domestic wells. The proposed ball and tether system is designed to inform on-site workers that trigger levels may be breached if the water level falls below the established datum. The Township of Guelph Eramosa will be informed on a regular basis of water levels with comparison to the agreed upon trigger levels. There are established protocols should a trigger level be breached. The established trigger levels are very conservative in that an environmental impact or significant influence to a domestic well will not occur even if the trigger level is breached temporarily. However, the consequences of breaching a trigger level are serious for JDCL and therefore all efforts to avoid breaching trigger levels will be taken by the company.

3.0 Contingency Measures

a) Wording has been changed to "complete" from "conduct".

b) If a trigger level is breached, James Dick Construction Ltd. agrees to limit below water table extraction or cease below water table extraction while contingency plans are enacted. Normal extractive activities can commence when the water level has risen above the trigger level. This change is made on the attached monitoring plan (Appendix B).

3.2 Water Quality

We agree that the wording is unclear however, there are many existing anthropogenic influences to water quality downstream from the quarry including Highway 7, Tributaries A, B and C, industrial development along Highway 7 including horse training facilities, farm fields etc.. The quarry will be one additional potential influence on the water quality for the five wells down gradient of the quarry. The on-site monitoring locations including M13D, M2, M17 (upgradient) M15 and M1 (cross gradient) and M18, M4, M19 and M16 (downgradient), SW4 upgradient and SW7 downgradient will effectively determine water quality changes occurring as a result of the quarry operations and provide adequate opportunity to address these changes should they pose any threat to human health.

We have reviewed the water quality data obtained for the Rockwood pumping wells, on-site monitors and the on-site rental well. It is our conclusion that the water quality can naturally or with existing anthropogenic inputs exceed on Ontario Drinking Water Quality Standards, Aesthetic Objectives or Operational Guidelines for the following parameters; iron, sodium, manganese, hardness, total dissolved solids, nitrate, organic nitrogen. There are other parameters such as sulphate, fluoride and alkalinity that approach or exceed 50% of the standard, operational objective or aesthetic objective. We therefore agree that baseline water quality testing should be conducted and that a minimum of two samples representing spring conditions and fall conditions be obtained. This sampling will become the baseline against which future water quality can be compared.

5.0 Annual Reporting and Interpretation

Agreed.

9.0 Additional Work

a) A detailed well survey will be conducted.

b) New wells M16, M17, M18 and M19 will be drilled on approval of the quarry and instrumented as necessary. The intended purpose of each of the wells is to be a surrogate water well for either water quality or water level testing. Therefore, completion in the same manner as M15 is not warranted. It has been agreed to install M18 and M19 as multi-level monitors.

c) The flow in Brydson Spring has been tested and reported herein and will be included in on-going monitoring.

d) Water quality samples will be obtained from on-site monitoring wells, Tributaries A, B and C, Brydson Spring and domestic wells during the baseline study required for domestic wells.

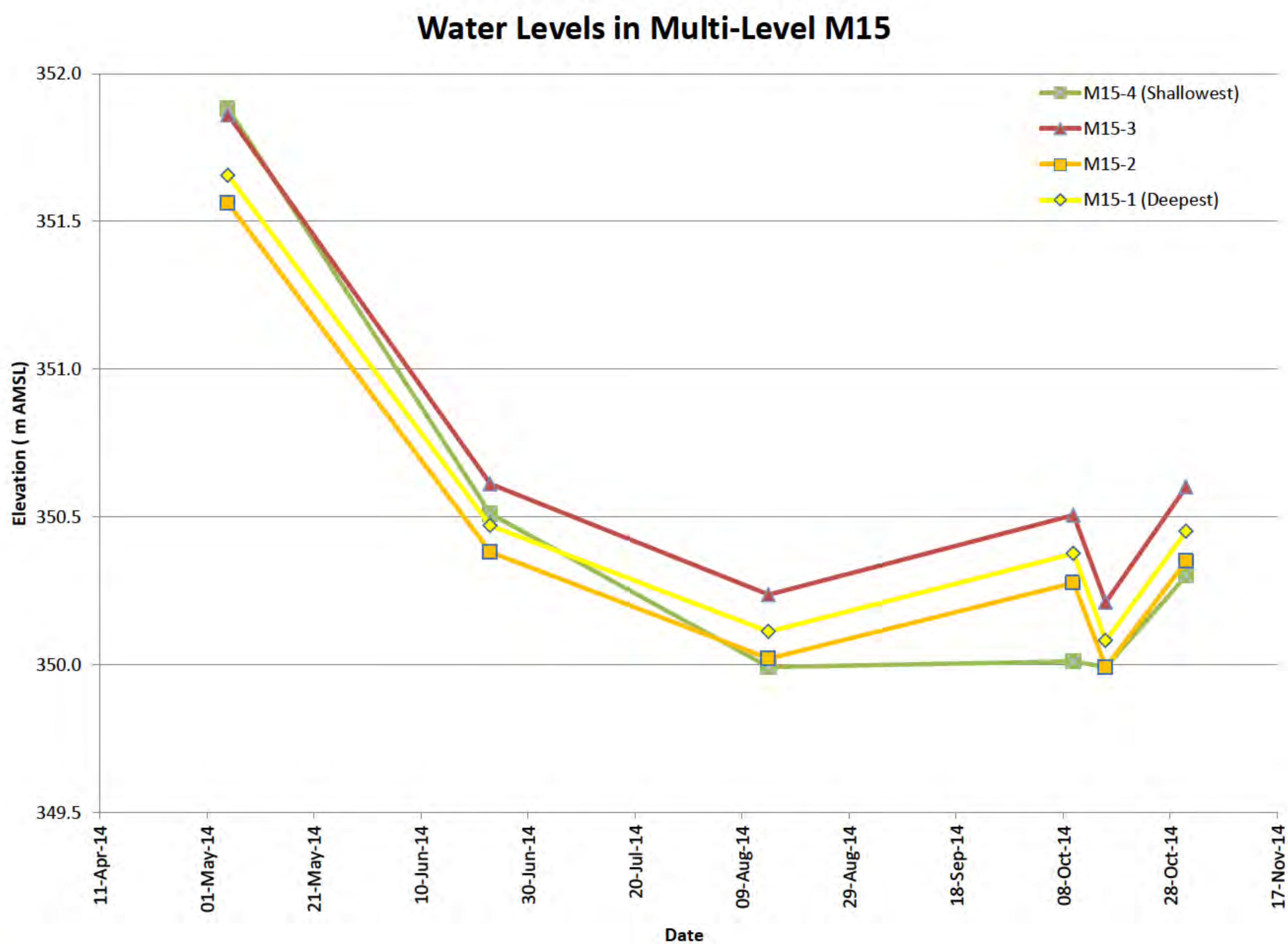
Respectfully submitted,
Harden Environmental Services Ltd.

LICENSED PROFESSIONAL ENGINEER
S. E. DENHOED
Dec 9/14
PROVINCE OF ONTARIO

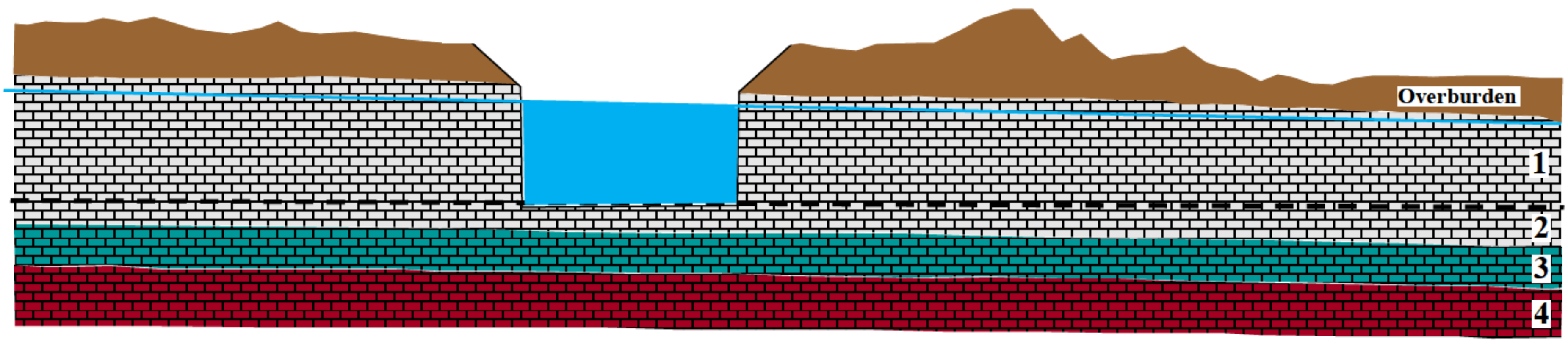
Stan Denhoed, M.Sc., P.Eng.
Senior Hydrogeologist

cc: Greg Sweetnam, James Dick Construction Limited

Figures



Harden Environmental Services Ltd.	Project No: 9506	Hidden Quarry Proposed Aggregate Extraction Response to Burnside Letter of October 6, 2014	**Figure 1: Water Levels in Multi-Level M15**
	Date: Nov 2014	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		



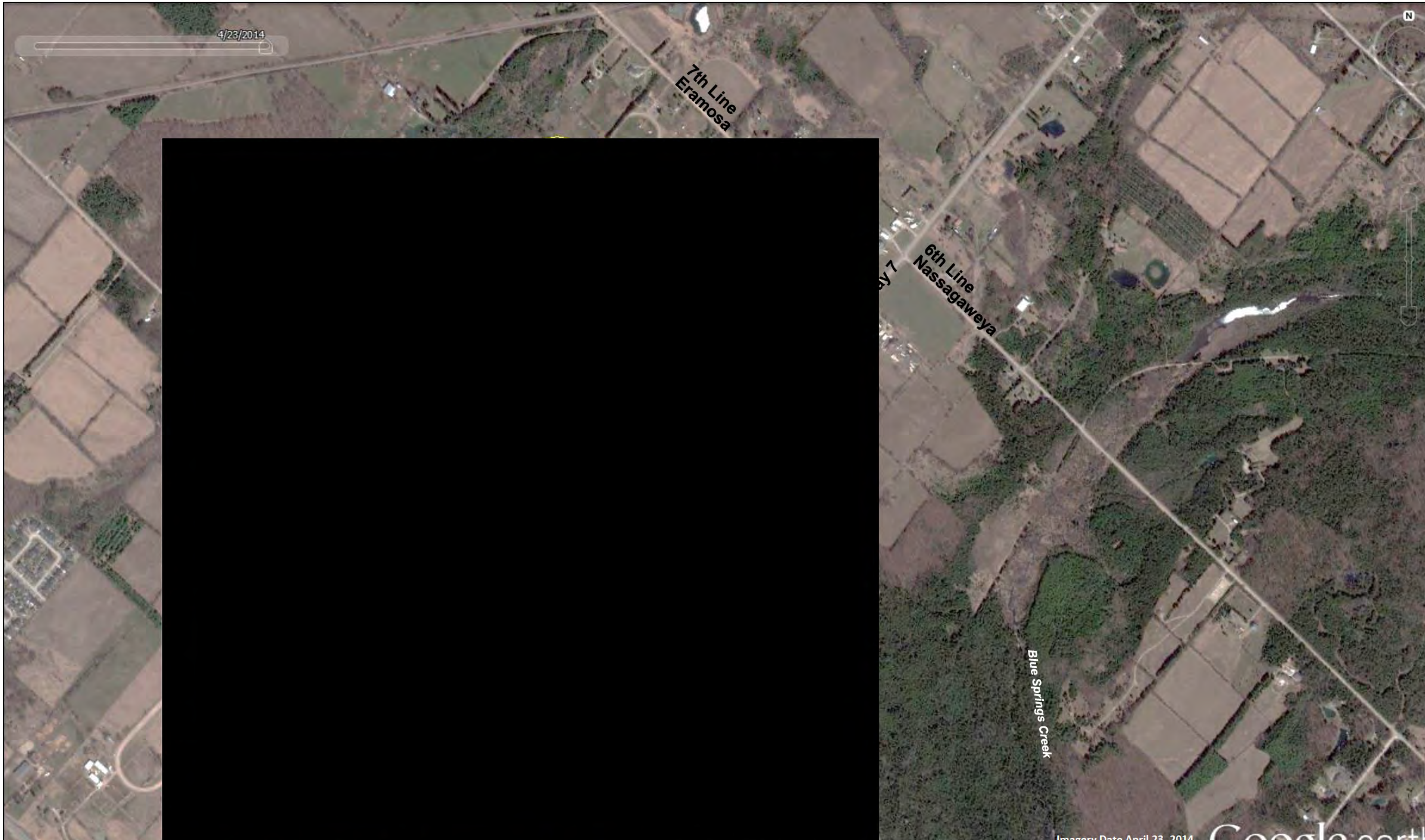
Layer 1 – upper portion of the aquifer to be removed during aggregate extraction

Layer 2 – portion of the upper aquifer to remain following aggregate extraction

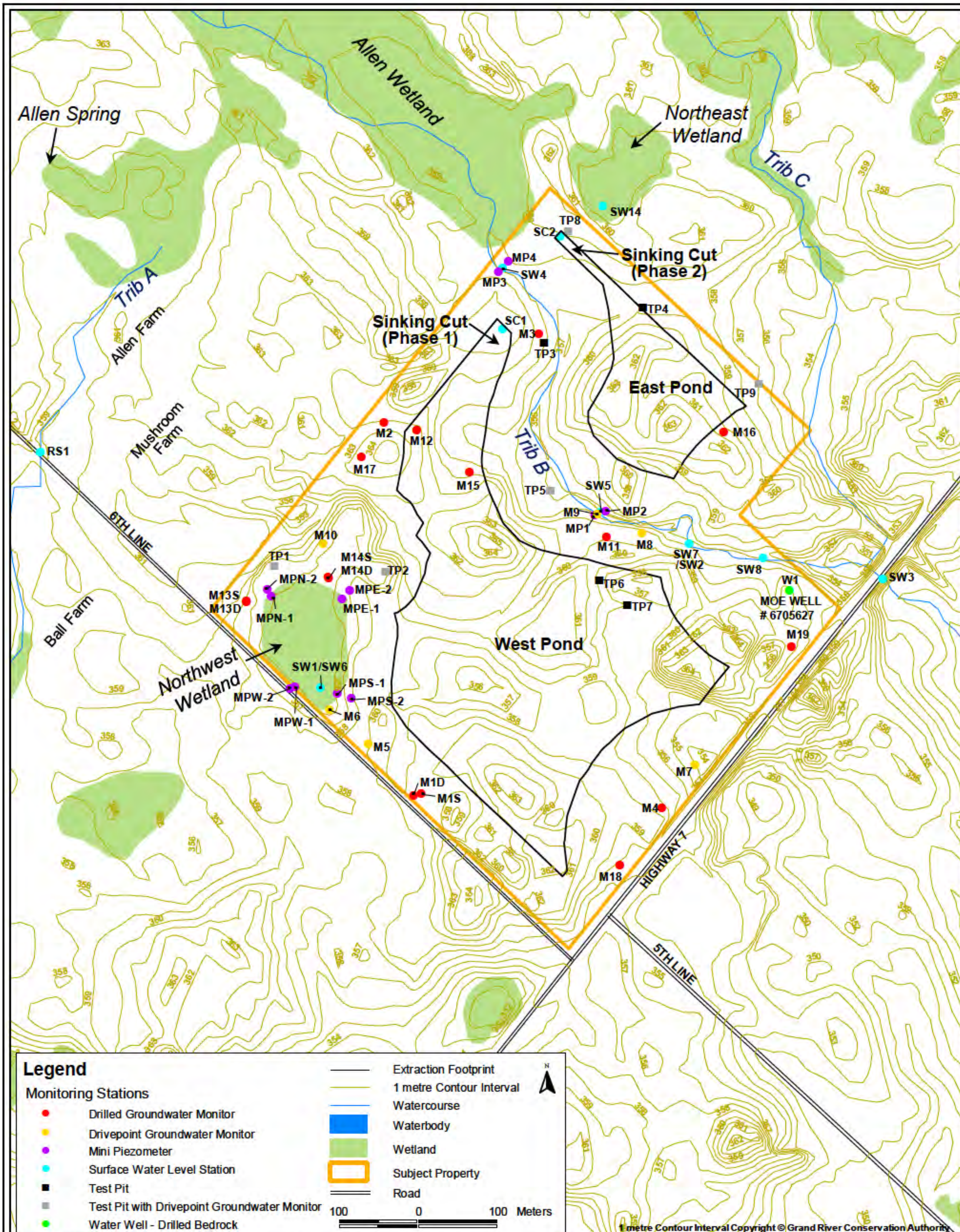
Layer 3 – portion of the aquifer with relatively greater hydraulic conductivity

Layer 4 – lower portion of the aquifer with relatively lower hydraulic conductivity

Harden Environmental Services Ltd.	**Project No:** 9506	Hidden Quarry Proposed Aggregate Extraction Response to Burnside Letter of October 6, 2014	**Figure 2: Groundwater Model Layers**
	Date: Nov 2014	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		



Harden Environmental Services Ltd.	Project No: 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	Figure 3:
	Date: Nov 2014	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	**Sampling Locations**
	Drawn By: AR		



Harden Environmental Services Ltd.	Project No: 9506	Hidden Quarry Proposed Aggregate Extraction Response to Burnside Letter of October 6, 2014	Figure 4:
	Date: Nov 2014	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	Monitoring Locations
	Drawn By: AR		

Tables

Table 3: Private Well Water Quality

RESULTS OF PRIVATE WELL SURVEY

Sample No.	Units	ODWS	IMC	A/O	125	Duplicate (125)	177	244	297	315	476	498
Sampling Date					2014/11/03 14:30	2014/11/03 14:30	2014/11/03 17:30	2014/11/04 12:15	2014/11/04 11:35	2014/11/04 17:30	2014/11/03 13:40	2014/11/03 12:30
Wellhead Condition					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Observations					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pump Type					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Well Depth (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Recommended Pump Setting (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Measured Static Water Level (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Measured Static Water Level Date					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Static Water Level from Well Record (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Available Drawdown to Well Bottom (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Available Drawdown to Recommended Pump Setting (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Ground Elevation (m AMSL)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
RESULTS OF FIELD MEASUREMENTS												
Field pH					7.25	7.25	7.04	7.1	7.01	7.09	7.05	7.12
Field Conductivity (µS/cm)					846	846	721	609	620	752	970	696
Field Temperature (°C)					10.1	10.1	10.7	13.4	10	10.2	9	11.1
Field TDS (mg/L)					422	422	360	301	311	377	486	
RESULTS OF BACTERIOLOGICAL ANALYSIS												
Total Coliform cfu/100 mL					30	30	0	0	0	0	3	0
E. coli cfu/100 mL					0	0	0	0	0	0	0	0
RESULTS OF ANALYSES OF WATER												
Maxxam ID					YI6863	YI6861	YI6847	YI6841	YI6756	YI6795	YI6796	YI6563
Sample No.	**Units**	**ODWS**	**IMC**	**A/O**	**125**	**Duplicate (125)**	**177**	**244**	**297**	**315**	**476**	**498**
Calculated Parameters												
Anion Sum	me/L	-		-	10.2	10.1	8.15	6.97	7.32	8.45	10.1	8.07
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-		-	220	220	270	270	290	280	320	260
Calculated TDS	mg/L	-		500	600	600	450	370	390	460	540	440
Carb. Alkalinity (calc. as CaCO3)	mg/L	-		-	1.5	1.5	1.8	1.8	1.6	1.8	2.0	1.8
Cation Sum	me/L	-		-	10.5	10.4	8.39	7.16	7.51	8.73	10.5	8.35
Hardness (CaCO3)	mg/L	-		80:100	510	500	380	340	350	400	380	390
Ion Balance (% Difference)	%	-		-	1.46	1.06	1.41	1.30	1.28	1.62	1.99	1.72
Langelier Index (@ 20C)	N/A	-		-	0.891	0.890	0.838	0.814	0.779	0.877	0.874	0.855
Langelier Index (@ 4C)	N/A	-		-	0.644	0.643	0.590	0.565	0.531	0.629	0.627	0.607
Saturation pH (@ 20C)	N/A	-		-	6.96	6.97	7.02	7.04	7.00	6.96	6.94	7.00
Saturation pH (@ 4C)	N/A	-		-	7.21	7.21	7.27	7.29	7.25	7.20	7.19	7.25

ODWS = Ontario Drinking Water Standard | A/O = Aesthetic Objective/Operational Guideline | IMC = Interim Maximum Acceptable Concentration | ND = Not detected

Table 3: Private Well Water Quality

RESULTS OF PRIVATE WELL SURVEY

Sample No.	Units	ODWS	IMC	A/O	125	Duplicate (125)	177	244	297	315	476	498
Sampling Date					2014/11/03 14:30	2014/11/03 14:30	2014/11/03 17:30	2014/11/04 12:15	2014/11/04 11:35	2014/11/04 17:30	2014/11/03 13:40	2014/11/03 12:30
Inorganics												
Total Ammonia-N	mg/L	-		-	ND	ND	ND	ND	ND	ND	ND	ND
Conductivity	umho/cm	-		-	890	930	790	660	690	800	1000	740
Total Kjeldahl Nitrogen (TKN)	mg/L	-		-	ND	ND	ND	ND	0.15	ND	0.12	ND
Dissolved Organic Carbon	mg/L	-		5	0.61	0.61	0.75	0.87	0.94	0.60	1.4	1.0
Orthophosphate (P)	mg/L	-		-	ND	ND	ND	ND	ND	ND	0.011	ND
pH	pH	-		6.5:8.5	7.85	7.86	7.85	7.85	7.78	7.83	7.82	7.85
Total Suspended Solids	mg/L	-		-	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Sulphate (SO4)	mg/L	-		500	260	260	82	28	28	69	23	99
Alkalinity (Total as CaCO3)	mg/L	-		30:500	230	230	270	270	290	290	320	270
Dissolved Chloride (Cl)	mg/L	-		250	7	7	34	20	23	44	110	21
Nitrite (N)	mg/L	**1**		-	ND	ND	ND	ND	ND	ND	ND	ND
Nitrate (N)	mg/L	**10**		-	ND	ND	1.89	6.74	4.38	1.12	1.44	1.67
Nitrate + Nitrite	mg/L	**10**		-	ND	ND	1.89				1.44	1.67
Metals												
. Aluminum (Al)	mg/L	-	-	0.1	ND	ND	ND	ND	0.012	ND	ND	ND
. Antimony (Sb)	mg/L	-	0.006	-	ND	ND	ND	ND	ND	ND	ND	ND
. Arsenic (As)	mg/L	-	0.025	-	0.0034	0.0033	ND	ND	ND	ND	ND	ND
. Barium (Ba)	mg/L	**1**	-	-	0.030	0.029	0.068	0.039	0.042	0.052	0.042	0.071
. Beryllium (Be)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND
. Boron (B)	mg/L	-	5	-	0.014	0.017	ND	ND	0.012	0.014	0.013	ND
. Cadmium (Cd)	mg/L	**0.005**	-	-	ND	ND	ND	ND	0.00010	ND	ND	ND
. Calcium (Ca)	mg/L	-	-	-	150	150	100	94	95	110	110	110
. Chromium (Cr)	mg/L	**0.05**	-	-	ND	ND	ND	ND	ND	ND	ND	ND
. Cobalt (Co)	mg/L	-	-	-	ND	ND	ND	ND	ND	0.00050	ND	ND
. Copper (Cu)	mg/L	-	-	1	0.0061	0.0066	0.0066	0.0083	0.0046	0.0033	0.0088	0.020
. Iron (Fe)	mg/L	-	-	0.3	0.99	1.2	ND	ND	ND	ND	ND	ND
. Lead (Pb)	mg/L	**0.01**	-	-	0.00067	0.00080	ND	0.00072	ND	ND	ND	ND
. Magnesium (Mg)	mg/L	-	-	-	34	33	29	25	27	28	27	30
. Manganese (Mn)	mg/L	-	-	0.05	0.033	0.033	ND	ND	ND	0.0043	ND	ND
. Molybdenum (Mo)	mg/L	-	-	-	0.0017	0.0026	0.0013	0.0014	0.0017	0.0029	ND	0.0016
. Nickel (Ni)	mg/L	-	-	-	ND	ND	0.0011	0.0011	0.0012	0.0066	ND	0.0033
. Phosphorus (P)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND
. Potassium (K)	mg/L	-	-	-	0.90	0.88	2.5	1.8	2.5	0.99	1.6	3.0
. Selenium (Se)	mg/L	**0.01**	-	-	ND	ND	ND	ND	ND	ND	ND	ND
. Silicon (Si)	mg/L	-	-	-	4.3	4.4	3.5	3.5	3.8	4.5	4.0	3.5
. Silver (Ag)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND
. Sodium (Na)	mg/L	**20**	-	200	5.3	5.2	18	7.0	10	19	**67**	9.2
. Strontium (Sr)	mg/L	-	-	-	3.5	3.5	0.58	0.15	0.20	0.49	0.17	0.68
. Thallium (Tl)	mg/L	-	-	-	ND	ND	ND	ND	ND	0.000052	ND	ND
. Titanium (Ti)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND
. Uranium (U)	mg/L	**0.02**	-	-	0.00013	0.00016	0.00032	0.00024	0.00034	0.00047	0.00046	0.00039
. Vanadium (V)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND
. Zinc (Zn)	mg/L	-	-	5	0.018	0.020	0.067	0.28	0.078	0.076	0.034	0.056

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Table 3: Private Well Water Quality

RESULTS OF PRIVATE WELL SURVEY

Sample No.	Units	ODWS	IMC	A/O	501	516	532	688	812	858	991
Sampling Date					2014/11/04 11:05	2014/11/05 19:30	2014/11/04 17:05	2014/11/03 13:15	2014/11/05 10:55	2014/11/03 16:10	2014/11/03 14:10
Wellhead Condition					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Observations					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pump Type					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Well Depth (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Recommended Pump Setting (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Measured Static Water Level (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Measured Static Water Level Date					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Static Water Level from Well Record (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Available Drawdown to Well Bottom (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Available Drawdown to Recommended Pump Setting (metres)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Ground Elevation (m AMSL)					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
RESULTS OF FIELD MEASUREMENTS											
Field pH					6.86	7.05	7.08	7.31	7.36	7.13	7.36
Field Conductivity (µS/cm)					620	1987	632	670	612	1649	945
Field Temperature (°C)					12.5	11	10	10.2	9.8	10.5	9.7
Field TDS (mg/L)					290	985	317		305		469
RESULTS OF BACTERIOLOGICAL ANALYSIS											
Total Coliform cfu/100 mL					14 / overgrown	0	0	18	0	0	4
E. coli cfu/100 mL					0 /overgrown	0	0	0	0	0	0
RESULTS OF ANALYSES OF WATER											
Maxxam ID					YI6845	YI6901	YI6856	YI6808	YI6805	YI6840	YI6886
Sample No.	**Units**	**ODWS**	**IMC**	**A/O**	**501**	**516**	**532**	**688**	**812**	**858**	**991**
Calculated Parameters											
Anion Sum	me/L	-		-	7.26	19.9	7.33	7.70	7.05	16.1	11.4
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-		-	300	390	270	270	270	310	220
Calculated TDS	mg/L	-		500	380	1100	390	420	380	920	690
Carb. Alkalinity (calc. as CaCO3)	mg/L	-		-	1.5	2.4	2.3	2.4	1.8	1.9	1.6
Cation Sum	me/L	-		-	7.38	21.1	7.59	8.08	7.34	17.7	11.7
Hardness (CaCO3)	mg/L	-		80:100	340	460	360	380	340	410	570
Ion Balance (% Difference)	%	-		-	0.850	2.88	1.73	2.41	1.99	4.63	1.30
Langelier Index (@ 20C)	N/A	-		-	0.728	0.963	0.933	0.978	0.821	0.847	0.946
Langelier Index (@ 4C)	N/A	-		-	0.479	0.718	0.685	0.729	0.572	0.601	0.699
Saturation pH (@ 20C)	N/A	-		-	6.98	6.85	7.02	7.00	7.04	6.96	6.93
Saturation pH (@ 4C)	N/A	-		-	7.23	7.09	7.27	7.25	7.29	7.20	7.18

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Table 3: Private Well Water Quality

RESULTS OF PRIVATE WELL SURVEY

Sample No.	Units	ODWS	IMC	A/O	501	516	532	688	812	858	991
Sampling Date					2014/11/04 11:05	2014/11/05 19:30	2014/11/04 17:05	2014/11/03 13:15	2014/11/05 10:55	2014/11/03 16:10	2014/11/03 14:10
Inorganics											
Total Ammonia-N	mg/L	-		-	ND	ND	ND	ND	ND	ND	ND
Conductivity	umho/cm	-		-	680	2000	690	730	670	1800	980
Total Kjeldahl Nitrogen (TKN)	mg/L	-		-	0.20	0.12	ND	ND	0.11	0.11	ND
Dissolved Organic Carbon	mg/L	-		5	1.4	1.1	0.85	0.72	0.85	1.1	0.59
Orthophosphate (P)	mg/L	-		-	0.019	ND	ND	ND	ND	0.011	ND
pH	pH	-		6.5:8.5	7.71	7.81	7.95	7.98	7.86	7.80	7.88
Total Suspended Solids	mg/L	-		-	ND	ND	ND	ND	ND	ND	ND
Dissolved Sulphate (SO4)	mg/L	-		500	14	36	49	76	35	18	330
Alkalinity (Total as CaCO3)	mg/L	-		30:500	310	390	270	270	270	310	220
Dissolved Chloride (Cl)	mg/L	-		250	21	400	21	21	22	330	7
Nitrite (N)	mg/L	**1**		-	ND	ND	ND	ND	ND	ND	ND
Nitrate (N)	mg/L	**10**		-	3.63	1.64	2.90	1.98	4.66	2.40	ND
Nitrate + Nitrite	mg/L	**10**		-	3.63	1.64	2.90	1.98		2.40	ND
Metals											
. Aluminum (Al)	mg/L	-	-	0.1	ND	ND	ND	0.020	ND	ND	ND
. Antimony (Sb)	mg/L	-	0.006	-	ND	ND	0.00096	ND	ND	ND	ND
. Arsenic (As)	mg/L	-	0.025	-	ND	ND	ND	ND	ND	ND	0.0016
. Barium (Ba)	mg/L	**1**	-	-	0.032	0.11	0.042	0.069	0.043	0.060	0.016
. Beryllium (Be)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND
. Boron (B)	mg/L	-	5	-	0.012	0.014	ND	ND	0.010	ND	0.017
. Cadmium (Cd)	mg/L	**0.005**	-	-	ND	0.00016	ND	ND	ND	0.00017	ND
. Calcium (Ca)	mg/L	-	-	-	94	130	97	110	94	120	170
. Chromium (Cr)	mg/L	**0.05**	-	-	ND	ND	ND	ND	ND	ND	ND
. Cobalt (Co)	mg/L	-	-	-	0.00079	ND	ND	ND	ND	ND	ND
. Copper (Cu)	mg/L	-	-	1	0.084	0.020	ND	0.0042	0.0093	0.015	ND
. Iron (Fe)	mg/L	-	-	0.3	0.48	ND	ND	ND	ND	ND	0.45
. Lead (Pb)	mg/L	**0.01**	-	-	0.0017	0.0016	ND	ND	ND	ND	ND
. Magnesium (Mg)	mg/L	-	-	-	27	30	28	28	27	25	36
. Manganese (Mn)	mg/L	-	-	0.05	0.037	ND	0.0064	ND	ND	ND	0.014
. Molybdenum (Mo)	mg/L	-	-	-	0.00072	0.00058	0.025	0.00083	0.0020	0.00072	0.0022
. Nickel (Ni)	mg/L	-	-	-	0.0017	0.0021	0.0083	ND	0.0012	ND	ND
. Phosphorus (P)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND
. Potassium (K)	mg/L	-	-	-	2.9	1.7	1.9	2.5	2.2	1.3	0.93
. Selenium (Se)	mg/L	**0.01**	-	-	ND	ND	ND	ND	ND	ND	ND
. Silicon (Si)	mg/L	-	-	-	4.0	4.1	3.5	3.6	3.6	3.5	4.3
. Silver (Ag)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND
. Sodium (Na)	mg/L	**20**	-	200	9.4	270	8.8	9.6	9.1	220	6.1
. Strontium (Sr)	mg/L	-	-	-	0.13	0.26	0.14	0.51	0.22	0.17	4.4
. Thallium (Tl)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND
. Titanium (Ti)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND
. Uranium (U)	mg/L	**0.02**	-	-	0.00034	0.00025	0.0017	0.00027	0.00036	0.00020	ND
. Vanadium (V)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND
. Zinc (Zn)	mg/L	-	-	5	0.057	0.11	0.12	0.051	0.075	0.082	0.019

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Table 4: Surface Water Quality

RESULTS OF ANALYSES OF WATER

Maxxam ID			YI6748	YI6749	YI6750	YI6751	YB2354
Sampling Date			5-Nov-14	5-Nov-14	5-Nov-14	5-Nov-14	16-Oct-14
Sampling Time			11:40	13:31	14:05	15:12	14:25
	Units	**PWQO**	**RS1/TRIB.A**	**SW4**	**SW7**	**SW11/TRIB.C**	**B SPRING**
Field pH			8.07	8.05	7.93	8.00	7.31 (Nov 5)
Field Conductivity (µS/cm)			601	574	576	588	699 (Nov 5)
Field Temperature (°C)			7.1	6.5	6.7	7.0	8.8 (Nov 5)
Field TDS (mg/L)			300	286	282	294	350 (Nov 5)
Bacteriological Analysis							
Total Coliform cfu/100 mL			3000	20000	50000	4500	500 (Nov 5)
E. coli cfu/100 mL			10	40	20	10	1 (Nov 5)
Calculated Parameters							
Anion Sum	me/L	-	6.97	6.69	6.56	6.84	7.94
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-	270	290	280	310	290
Calculated TDS	mg/L	-	380	350	340	360	420
Carb. Alkalinity (calc. as CaCO3)	mg/L	-	5.3	4.1	3.8	4.2	3.2
Cation Sum	me/L	-	7.58	7.27	6.88	7.74	8.25
Hardness (CaCO3)	mg/L	-	350	340	320	370	350
Ion Balance (% Difference)	%	-	4.19	4.21	2.39	6.18	1.96
Langelier Index (@ 20C)	N/A	-	1.31	1.19	1.12	1.24	1.08
Langelier Index (@ 4C)	N/A	-	1.06	0.942	0.875	0.993	0.828
Saturation pH (@ 20C)	N/A	-	7.00	7.00	7.03	6.92	6.99
Saturation pH (@ 4C)	N/A	-	7.25	7.25	7.28	7.17	7.23
Inorganics							
Total Ammonia-N	mg/L	-	0.058	ND	ND	ND	0.064
Conductivity	umho/cm	-	640	610	600	630	760
Total Kjeldahl Nitrogen (TKN)	mg/L	-	0.17	0.47	0.51	0.56	0.27
Total Organic Carbon (TOC)	mg/L	-	2.2	6.5	6.9	9.2	1.3
Orthophosphate (P)	mg/L	-	ND	ND	ND	0.018	ND
pH	pH	**6.5:8.5**	8.31	8.19	8.16	8.16	8.06
Total Phosphorus	mg/L	**0.01**	0.006	0.008	0.008	**0.026**	0.004
Dissolved Sulphate (SO4)	mg/L	**-**	16	8	9	ND	26
Turbidity	NTU	**-**	ND	ND	0.2	0.4	ND
Alkalinity (Total as CaCO3)	mg/L	**-**	280	290	280	310	300
Dissolved Chloride (Cl)	mg/L	**-**	21	22	23	22	46
Nitrite (N)	mg/L	**-**	0.017	ND	ND	ND	ND
Nitrate (N)	mg/L	**-**	6.02	1.05	0.80	ND	2.39
Metals							
Dissolved Calcium (Ca)	mg/L	-	98.2	94.0	88.1	105	98.6
Dissolved Magnesium (Mg)	mg/L	-	26.2	25.9	24.7	25.6	25.4
Dissolved Potassium (K)	mg/L	-	3	3	4	4	2
Dissolved Sodium (Na)	mg/L	-	10.1	8.5	8.3	7.0	27.3
Total Aluminum (Al)	mg/L	-	0.0074	0.0080	0.0096	0.022	0.016
Total Antimony (Sb)	mg/L	**0.02**	ND	ND	ND	ND	ND
Total Arsenic (As)	mg/L	**0.1**	ND	ND	ND	ND	ND
Total Barium (Ba)	mg/L	-	0.026	0.025	0.026	0.022	0.036
Total Beryllium (Be)	mg/L	**0.011**	ND	ND	ND	ND	ND

Table 4: Surface Water Quality

RESULTS OF ANALYSES OF WATER

Maxxam ID			YI6748	YI6749	YI6750	YI6751	YB2354
Sampling Date			5-Nov-14	5-Nov-14	5-Nov-14	5-Nov-14	16-Oct-14
Sampling Time			11:40	13:31	14:05	15:12	14:25
	Units	**PWQO**	**RS1/TRIB.A**	**SW4**	**SW7**	**SW11/TRIB.C**	**B SPRING**
Total Boron (B)	mg/L	**0.2**	0.017	0.014	0.012	0.011	ND
Total Cadmium (Cd)	mg/L	**0.0002**	ND	0.00018	ND	ND	ND
Total Calcium (Ca)	mg/L	-	92	90	86	96	110
Total Chromium (Cr)	mg/L	-	ND	ND	ND	ND	ND
Total Cobalt (Co)	mg/L	**0.0009**	ND	ND	ND	ND	ND
Total Copper (Cu)	mg/L	**0.005**	ND	ND	ND	ND	ND
Total Iron (Fe)	mg/L	**0.3**	ND	ND	ND	ND	ND
Total Lead (Pb)	mg/L	**0.005**	ND	ND	ND	ND	ND
Total Magnesium (Mg)	mg/L	-	26	26	25	24	31
Total Manganese (Mn)	mg/L	-	ND	0.0041	0.0059	0.0080	0.0033
Total Molybdenum (Mo)	mg/L	**0.04**	ND	ND	ND	0.00074	0.00052
Total Nickel (Ni)	mg/L	**0.025**	ND	ND	ND	ND	ND
Total Potassium (K)	mg/L	-	2.5	2.8	3.3	3.1	2.5
Total Silicon (Si)	mg/L	-	3.4	4.6	4.4	5.5	4.4
Total Selenium (Se)	mg/L	**0.1**	ND	ND	ND	ND	ND
Total Silver (Ag)	mg/L	**0.0001**	ND	ND	ND	ND	ND
Total Sodium (Na)	mg/L	-	9.7	8.3	7.9	6.1	35
Total Strontium (Sr)	mg/L	-	0.13	0.12	0.12	0.12	0.23
Total Thallium (Tl)	mg/L	**0.0003**	ND	ND	ND	ND	ND
Total Titanium (Ti)	mg/L	-	ND	ND	ND	ND	ND
Total Uranium (U)	mg/L	**0.005**	0.00045	0.00034	0.00035	0.00067	0.00038
Total Vanadium (V)	mg/L	**0.006**	ND	ND	ND	ND	ND
Total Zinc (Zn)	mg/L	**0.03**	0.028	0.022	**0.046**	0.018	**0.035**

PWQO = Provincial Water Quality Objective | ND = Not detected

Table 5: Groundwater Quality - Monitoring Wells

RESULTS OF ANALYSES OF WATER

Maxxam ID					YK4274	YK4275	YK4276	YK4277	YK4278	YK4279	YK4280	YK4281	YK4282	YK4283	
Sampling Date					11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	
Sampling Time					11:00	12:20	13:00	12:00	11:15	13:25	13:40	13:55	14:12	14:26	
	Units	**ODWS**	**IMC**	**A/O**	**M1D**	**M2**	**M3**	**M4**	**M13D**	**M15-I**	**M15-II**	**M15-III**	**M15-IV**	**Duplicate (M15-III)**	**RDL**
Well Depth (metres)					12.80	55.47	11.13	18.59	10.06	42.49	36 37	26.84	16.83	26 84	
Field pH					6.98	7.50	7.28	7.21	7.25	7.16	7.29	7.19	7.29	7.19	
Field Conductivity (µS/cm)					1074	752	680	790	740	823	782	708	762	708	
Field Temperature (°C)					10.0	8.6	8 2	8.9	10.8	8.5	8.2	8.3	8.2	8 3	
Field TDS (mg/L)					532	342	335	390	365	409	391	353	380	353	
Bacteriological Analysis															
Total Coliform cfu/100 mL					< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	14	< 1	
E. coli cfu/100 mL					< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
Calculated Parameters															
Anion Sum	me/L	-		-	11.3	7.43	7.03	8.17	7.60	8.52	8.11	7.53	8.00	7.37	N/A
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-		-	270	280	300	270	280	260	270	260	280	260	1.0
Calculated TDS	mg/L	-		500	610	400	360	450	400	470	450	410	430	400	1.0
Carb. Alkalinity (calc. as CaCO3)	mg/L	-		-	1.0	1.8	2.3	1.8	1.9	1.7	1.7	1.7	1.8	1.9	1.0
Cation Sum	me/L	-		-	11.3	7.58	7.20	8.33	7.68	8.66	8.35	7.48	8.19	7.51	N/A
Hardness (CaCO3)	mg/L	-		80:100	510	350	340	390	350	410	390	360	390	360	1.0
Ion Balance (% Difference)	%	-		-	0.0200	1.01	1.18	0 960	0.480	0.840	1.49	0 350	1.18	0.930	N/A
Langelier Index (@ 20C)	N/A	-		-	0.692	0.817	0.913	0 861	0.830	0.835	0.835	0 814	0.833	0.847	
Langelier Index (@ 4C)	N/A	-		-	0.445	0.568	0.665	0 613	0.581	0.587	0.587	0.565	0.585	0.599	
Saturation pH (@ 20C)	N/A	-		-	6.92	7.02	6.99	7.00	7.04	6.99	7.00	7.03	6.99	7.03	
Saturation pH (@ 4C)	N/A	-		-	7.16	7.27	7.23	7.24	7.28	7.24	7.25	7.28	7.24	7.28	
Inorganics															
Total Ammonia-N	mg/L	-		-	0.064	0.079	0.16	ND	0.082	ND	ND	ND	ND	ND	0.050
Conductivity	umho/cm	-		-	1100	690	660	740	720	790	760	690	740	680	1.0
Total Kjeldahl Nitrogen (TKN)	mg/L	-		-	0.37	0.26	0.26	0.18	ND	0.15	0.24	0.25	0.14	0.14	0.10
Dissolved Organic Carbon	mg/L	-		5	2.9	1.4	1.3	0.98	1.2	1.1	1.2	1.1	1.2	1.0	0.20
Orthophosphate (P)	mg/L	-		-	ND	ND	ND	ND	ND	ND	0.016	ND	ND	ND	0.010
pH	pH	-		6.5:8.5	7.61	7.83	7.90	7.86	7.86	7.83	7.84	7.85	7.83	7.88	N/A
Total Suspended Solids	mg/L	-		-	24	260	19	140	120	68	43	290	220	370	10
Dissolved Sulphate (SO4)	mg/L	-		500	100	49	10	97	44	120	98	81	82	75	1
Alkalinity (Total as CaCO3)	mg/L	-		30:500	270	280	310	270	280	260	270	260	280	260	1.0
Dissolved Chloride (Cl)	mg/L	-		250	140	19	22	20	30	20	20	16	20	16	1
Nitrite (N)	mg/L	**1**		-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.010
Nitrate (N)	mg/L	**10**		-	ND	3.99	1.12	2.48	3.55	2.01	1.99	2.33	2.25	2.32	0.10

Table 5: Groundwater Quality - Monitoring Wells

RESULTS OF ANALYSES OF WATER

Maxxam ID					YK4274	YK4275	YK4276	YK4277	YK4278	YK4279	YK4280	YK4281	YK4282	YK4283	
Sampling Date					11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	11-Nov-14	
Sampling Time					11:00	12:20	13:00	12:00	11:15	13:25	13:40	13:55	14:12	14:26	
	Units	**ODWS**	**IMC**	**A/O**	**M1D**	**M2**	**M3**	**M4**	**M13D**	**M15-I**	**M15-II**	**M15-III**	**M15-IV**	**Duplicate (M15-III)**	**RDL**
Metals															
Dissolved Aluminum (Al)	mg/L	-	-	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0050
Dissolved Antimony (Sb)	mg/L	-	0.006	-	0.0013	ND	ND	ND	0.0011	0.0022	0.0025	ND	ND	ND	0.00050
Dissolved Arsenic (As)	mg/L	-	0.025	-	0.0014	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0010
Dissolved Barium (Ba)	mg/L	**1**	-	-	0.098	0.051	0.028	0.081	0.075	0.098	0.079	0.058	0.095	0.059	0.0020
Dissolved Beryllium (Be)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00050
Dissolved Boron (B)	mg/L	-	5	-	ND	0.013	0.021	0.013	0.012	0.014	0.013	0.012	0.012	0.012	0.010
Dissolved Cadmium (Cd)	mg/L	**0.005**	-	-	0.00023	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00010
Dissolved Calcium (Ca)	mg/L	-	-	-	140	96	92	110	92	110	110	99	100	99	0.20
Dissolved Chromium (Cr)	mg/L	**0.05**	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0050
Dissolved Cobalt (Co)	mg/L	-	-	-	0.0026	0.0016	ND	ND	ND	ND	ND	ND	ND	ND	0.00050
Dissolved Copper (Cu)	mg/L	-	-	1	0.0056	ND	ND	ND	0.0012	ND	ND	ND	ND	ND	0.0010
Dissolved Iron (Fe)	mg/L	-	-	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10
Dissolved Lead (Pb)	mg/L	**0.01**	-	-	0.00051	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00050
Dissolved Magnesium (Mg)	mg/L	-	-	-	39	28	26	31	29	31	30	27	32	27	0.050
Dissolved Manganese (Mn)	mg/L	-	-	0.05	0.058	ND	ND	ND	ND	ND	0.0045	ND	ND	ND	0.0020
Dissolved Molybdenum (Mo)	mg/L	-	-	-	0.0088	0.0022	ND	0.0013	0.0075	0.0024	0.0035	0.0024	0.0016	0.0025	0.00050
Dissolved Nickel (Ni)	mg/L	-	-	-	0.011	ND	ND	0.0012	0.0026	0.0025	0.0055	0.0038	0.0018	ND	0.0010
Dissolved Phosphorus (P)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10
Dissolved Potassium (K)	mg/L	-	-	-	1.8	7.5	2.4	3.2	1.8	6.0	5.8	3.4	3.6	3.4	0.20
Dissolved Selenium (Se)	mg/L	**0.01**	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0020
Dissolved Silicon (Si)	mg/L	-	-	-	4.4	3.5	3.7	3.5	4.2	3.6	3.5	3.5	3.6	3.5	0.050
Dissolved Silver (Ag)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00010
Dissolved Sodium (Na)	mg/L	**20**	-	200	**24**	7.1	8.5	8.3	14	8.8	8.9	5.3	7.7	5.4	0.10
Dissolved Strontium (Sr)	mg/L	-	-	-	0.15	0.22	0.12	0.64	0.13	1.0	0.80	0.43	0.38	0.43	0.0010
Dissolved Thallium (Tl)	mg/L	-	-	-	ND	ND	ND	ND	ND	0.000088	0.000054	ND	0.000069	ND	0.000050
Dissolved Titanium (Ti)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0050
Dissolved Uranium (U)	mg/L	**0.02**	-	-	0.0022	0.00037	0.00042	0.00038	0.00085	0.00090	0.0012	0.00047	0.00053	0.00050	0.00010
Dissolved Vanadium (V)	mg/L	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00050
Dissolved Zinc (Zn)	mg/L	-	-	5	0.65	0.043	0.038	0.048	0.098	0.043	0.047	0.036	0.059	0.036	0.0050

ODWS = Ontario Drinking Water Standard | A/O = Aesthetic Objective/Operational Guideline | IMC = Interim Maximum Acceptable Concentration | RDL = Reportable Detection Limit | ND = Not detected

Appendix A

Well Records for Wells Sampled November 2014

Appendix A redacted by the Township

Appendix B

Monitoring Program and Contingency Measures

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

HIDDEN QUARRY

REVISED MONITORING PROGRAM AND CONTINGENCY MEASURES (DECEMBER 2014)

Colour Coding Scheme for Requested Agency Modifications to Monitoring Plan

Green – Ministry of the Environment

Orange – Grand River Conservation Authority

Magenta – Township of Guelph – Eramosa

Blue – Halton Region

1.0 ON-SITE MONITORING PROGRAM

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

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

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

We recommend the following monitoring program.

Table 1: Monitoring Program

Parameter	Monitoring Locations	Frequency
Groundwater Levels	M1S/D, M2, M3, M4, M6, M13S/D, M14S/D, MPN1, MPN2, MPS1, MPS2, MPE1, MPE2, MPW1, MPW2, TP1, TP8, TP9 MP1, MP2, MP3, MP4, M15, M16, M17, M18, M19	Manually Monthly Automatic Daily Measurement in M1D, M2, M3, M4, M15, M16 for year prior to and year following bedrock extraction with re-evaluation of monitoring frequency after 1st year of bedrock extraction.
Groundwater Levels	M2, M3, TP1, M13S/D, M14S/D, M15, M16, M17	5 minute interval during first 3 months of extraction
Surface Water Level	Sinking Cut	Automatic Daily after safe quarry face is established.
Surface Water Level	SW14, SW5, SW7	Manually Monthly Coincident with groundwater monitoring
Surface Water Levels	SW6, SW4, SW8	Automated Water Level Readings (4 hour interval)
Surface Water Flow	SW4, SW8, SW3	Manually Monthly *coincident with groundwater monitoring
Groundwater Quality	W1, M2, M4, M15, M16, M18, M19	Semi-Annually
Surface Water Quality	West Pond, East Pond, Northwest Wetland, Tributary B (SW4, SW3)	Semi –Annually (Spring and Fall)

Parameter	Monitoring Locations	Frequency
Climate	On-Site Weather Station at Scale House to include precipitation and temperature	Daily
Domestic Wells Water Level	W4, W5, W8,W9 (W7 removed at request of landowner)	Data Loggers
Domestic Well Water Quality	W10, W11, W16, W17, W18, W19, W20, W21, W22, W23, W24	Quarterly bacteria and annual nitrate.

Monitoring locations are shown on Figures C1 and C8.

2.0 TRIGGER LEVELS

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

The trigger levels are used to initiate contingency and mitigation responses outlined in Section 3. Once water levels recover above the trigger level, normal operations will commence at the site.

2.1 Trigger Levels for the Bedrock Aquifer

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

Table 2: Trigger Levels for the Bedrock Aquifer

Monitor	Historical Low	Predicted Change	Warning Level	Trigger Level
M1D	350.58	0.8	349.98	349.78
M2	349.81	2.0	348.31	347.81
M13D	352.68	1.4	351.63	351.28
M14D	353.48	1.5	352.36	351.98
M15	TBD			
M16	TBD			
M17	TBD			

TBD – to be determined

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

2.2 Trigger Level for Northwest Wetland and Allen Wetland

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

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

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

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

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

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

Table 3: Trigger Levels for the Surface Water Features

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

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

2.3 Trigger Level for Sinking Cut

James Dick Construction Ltd. has agreed to a maximum water level change of 2.54 metres in the sinking cut. The nearest groundwater monitor to the sinking cut is M3. The hydrograph of M3 is found attached as Figure C7. The low water level in M3 is 349.37 m AMSL. We propose to use this as the reference elevation resulting in a minimum water elevation in the sinking cut of 349.37 – 2.54 = 346.83 m 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 m AMSL. The buoy will be a visual indicator of the minimum allowable water level to the operator. Alternative methods such as a sonic water level reader may be employed.

Extraction will cease if the water level falls below 346.83 m AMSL and can only recommence with a water level above 346.83 m AMSL in the sinking cut.

3.0 CONTINGENCY MEASURES

3.1 Groundwater Levels and Northwest Wetland

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

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

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

3) If quarry activities are found to be responsible, James Dick Construction Ltd. will limit or cease below water table extraction and the following actions will be considered and a response presented to the GRCA and the Township of Guelph-Eramosa.

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

3.2 Water Quality

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

Groundwater Monitors and the East and West Pond

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

In the event that there is an increasing trend in the concentration of one or more elements or compounds, listed on the Ontario Drinking Water Quality Standards list, occurs over three sampling events, a study will be conducted to determine the source of the water quality change. If the quarry is found to be responsible and if there is a potential for an element or compound listed on the Ontario Drinking Water Quality Standard list to exceed the Ontario Drinking Water Quality Standard at a downgradient well, James Dick Construction Ltd. will commence with the following actions;

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

2) In the event that the quarry is determined to be responsible for water quality at a private well to become unpotable, JDCL will offer to return the water quality to within ODWQ Standards by providing appropriate treatment in the home, drilling a new well or isolating the water supply to the deeper aquifer.

Northwest Wetland

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

Domestic Wells

Private domestic wells W10, W11, W16, W17, W18, W19, W20, W21, W22, W23 and W24 will be sampled four times a year for bacteria and once a year for nitrate.

4.0 PRE-BEDROCK EXTRACTION WATER WELL SURVEY

We recommend that a detailed water well survey be completed prior to the commencement of the extraction of bedrock resources. This survey will as a minimum include all wells in the shaded area shown on Figure C8. The well survey will include the following;

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

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

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

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

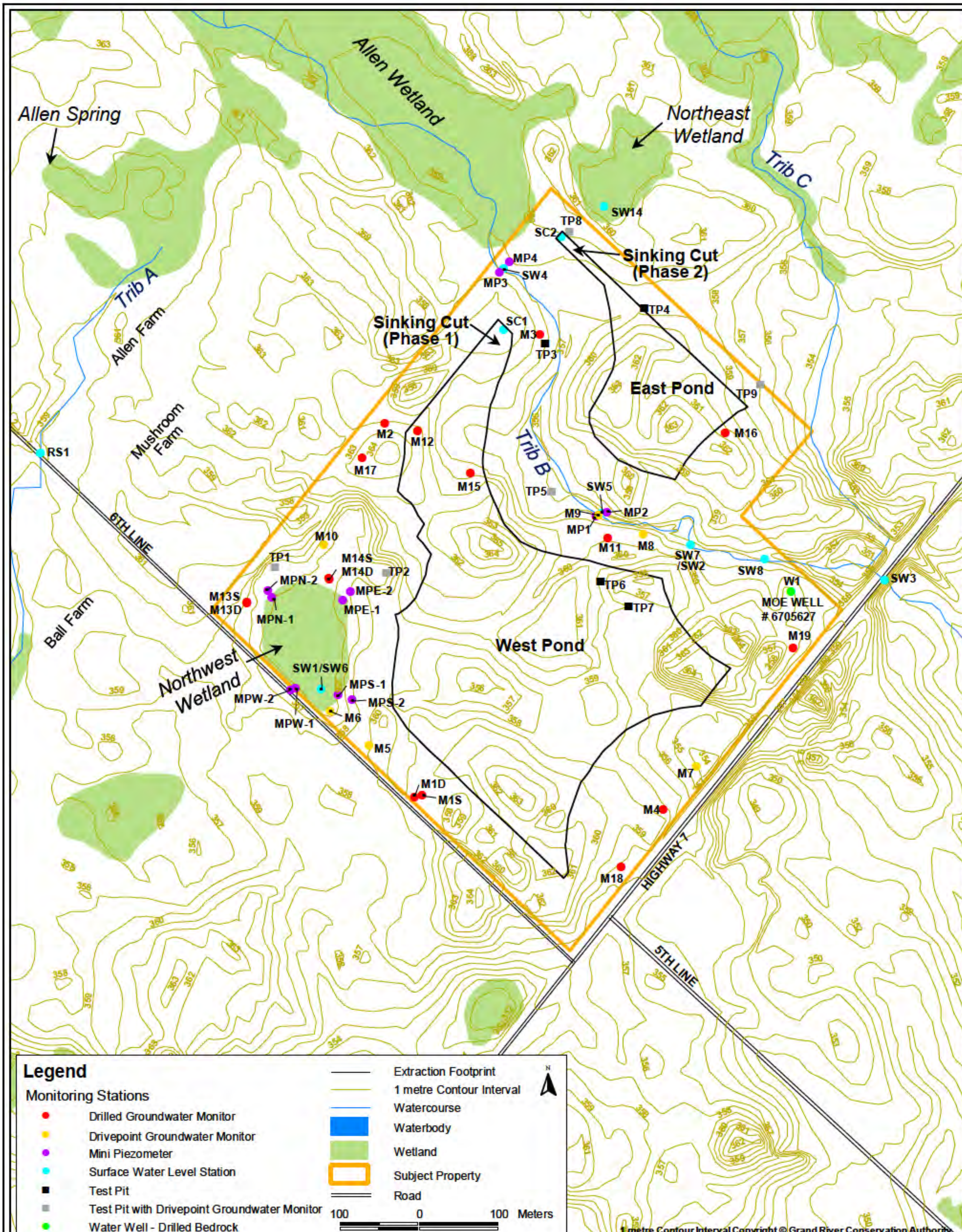
5.0 ANNUAL MONITORING REPORT AND INTERPRETATION

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

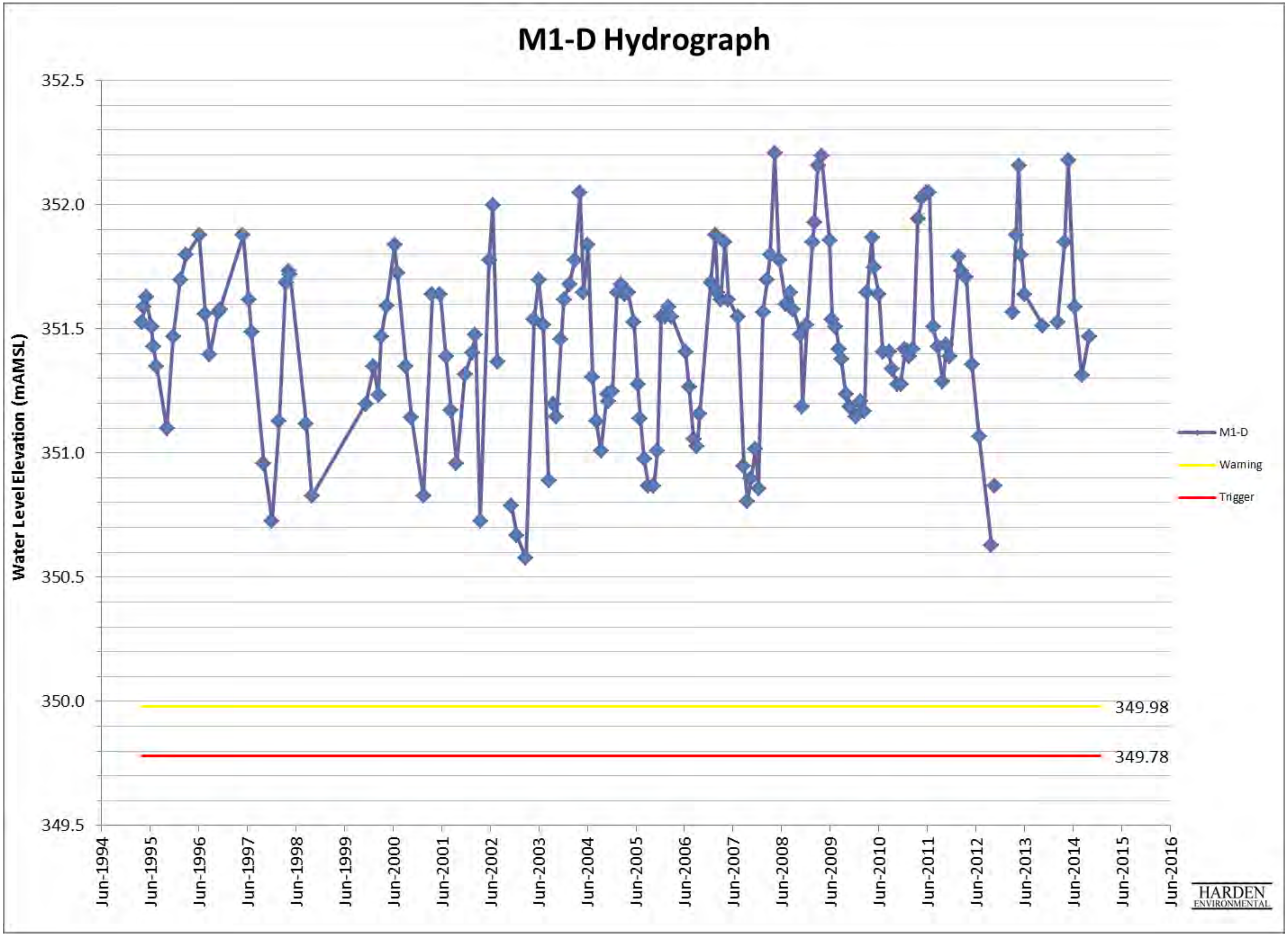
The monitoring report will include all historical monitoring data and an interpretation of the results with respect to potential impact to the quality and quantity of bedrock groundwater, hydro-period of the northwest wetland and streamflow loss from Tributary B.

6.0 Water Well Complaints

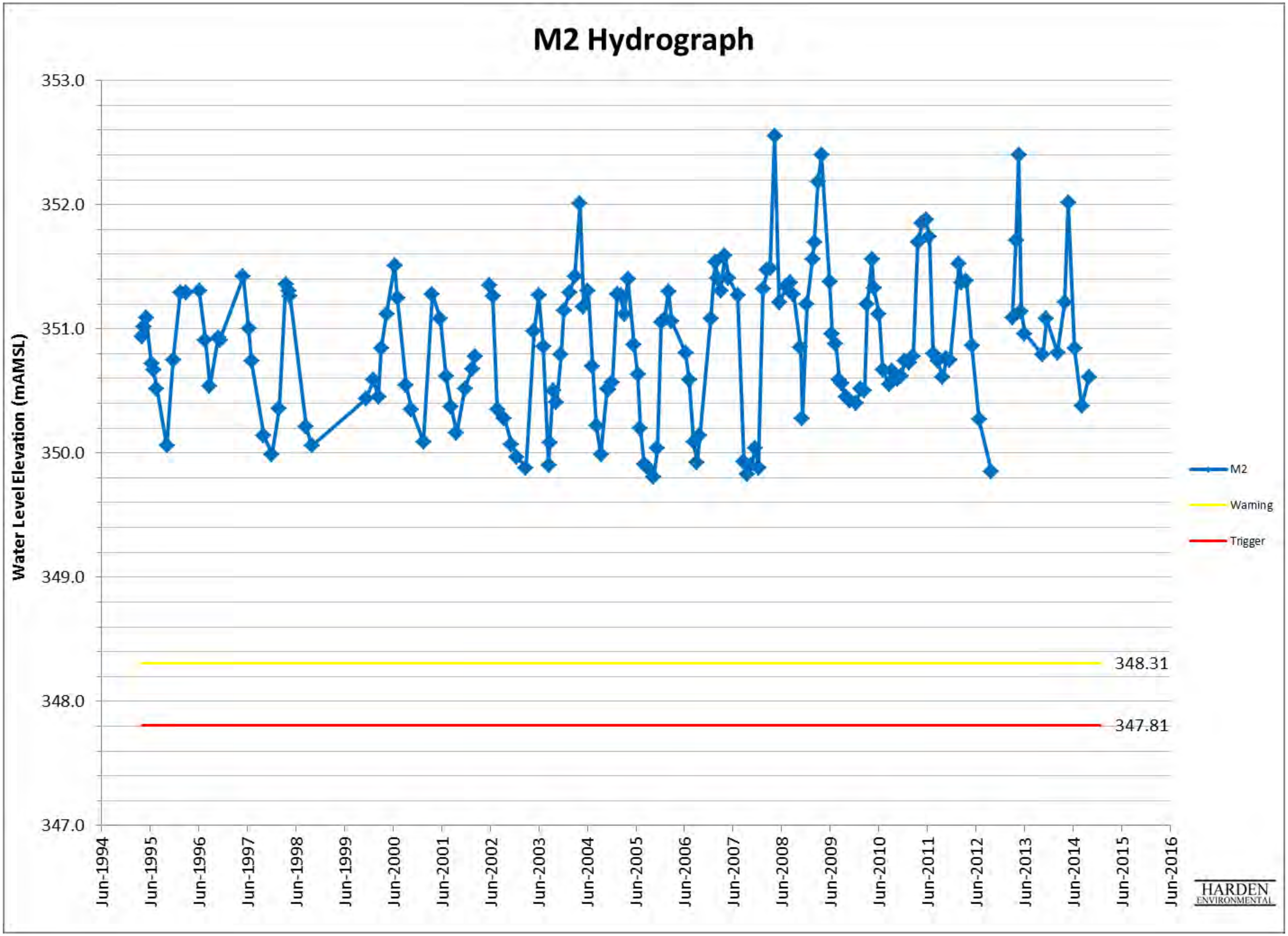
James Dick Construction Ltd. agrees to inform the Township of Guelph Eramosa and the Ministry of the Environment upon the receipt of a water well complaint and the results of any related investigation. A detailed well complaint protocol is attached as Appendix A.



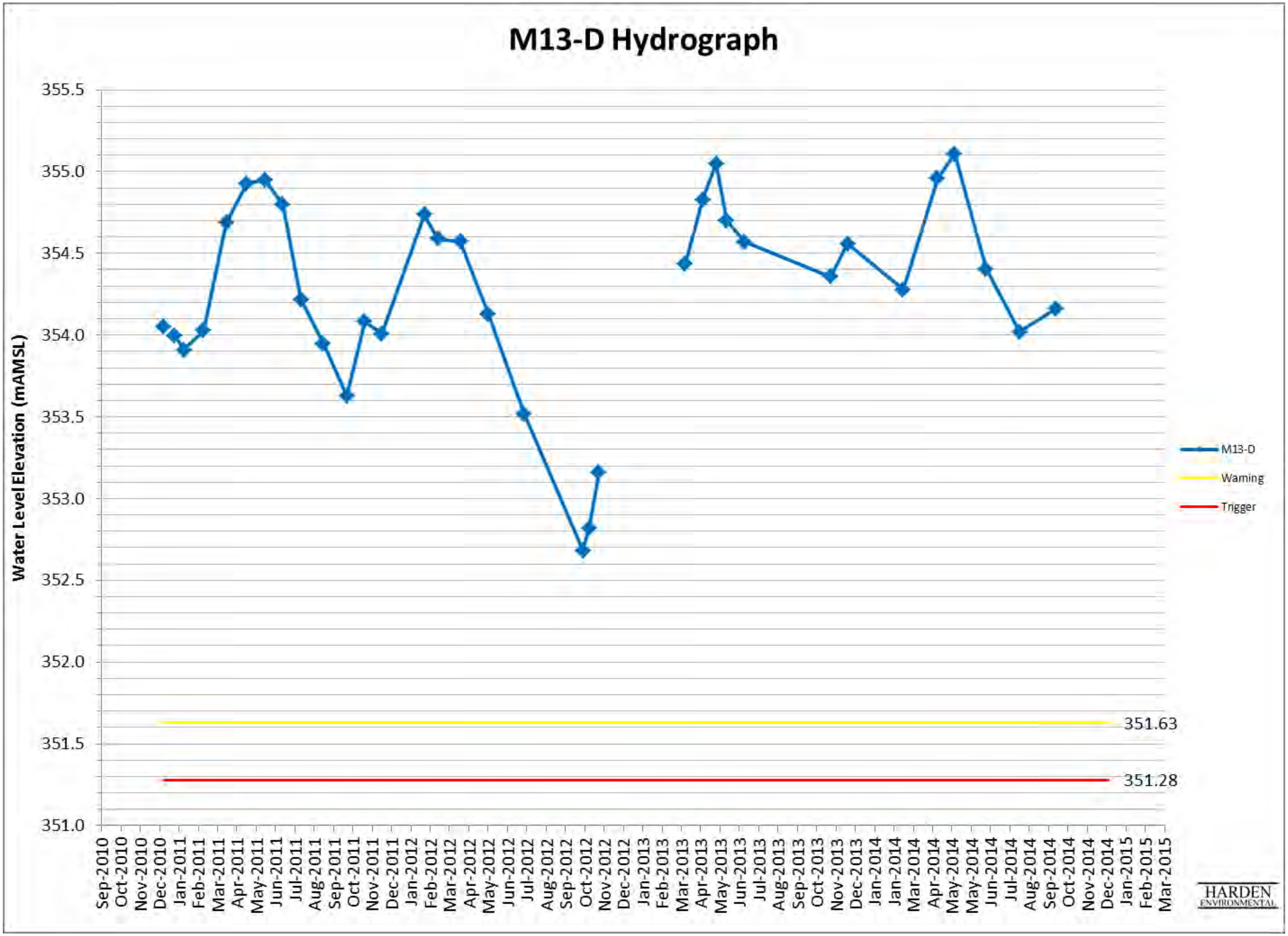
Harden Environmental Services Ltd.	Project No: 9506	Hidden Quarry Proposed Aggregate Extraction Response to Burnside Letter of October 6, 2014	Figure C1: Monitoring Locations
	Date: Nov 2014	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		



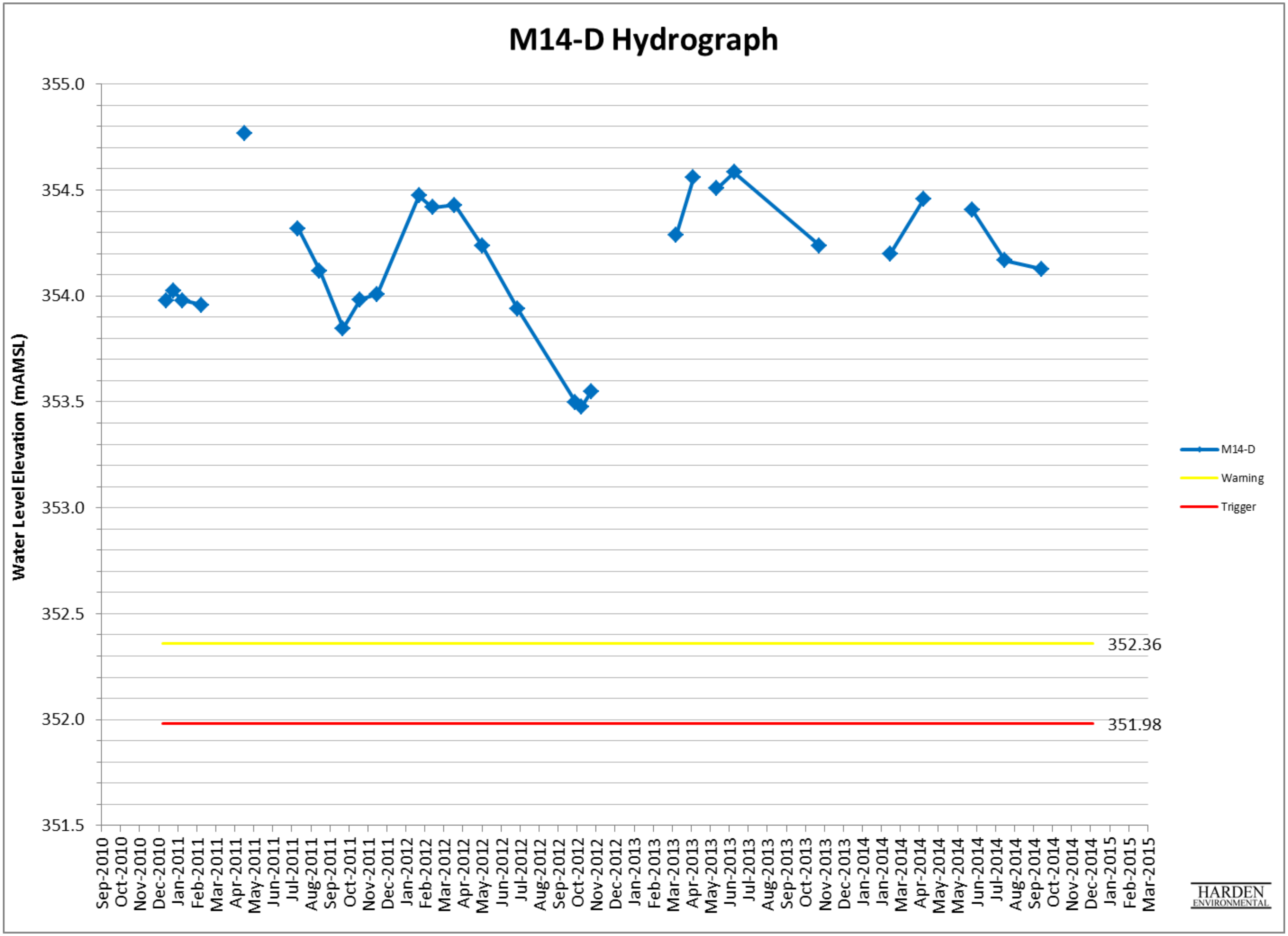
Harden Environmental Services Ltd.	**Project No:** 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	**Figure C2: M1D Trigger Level**
	Date: Nov 2014	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		



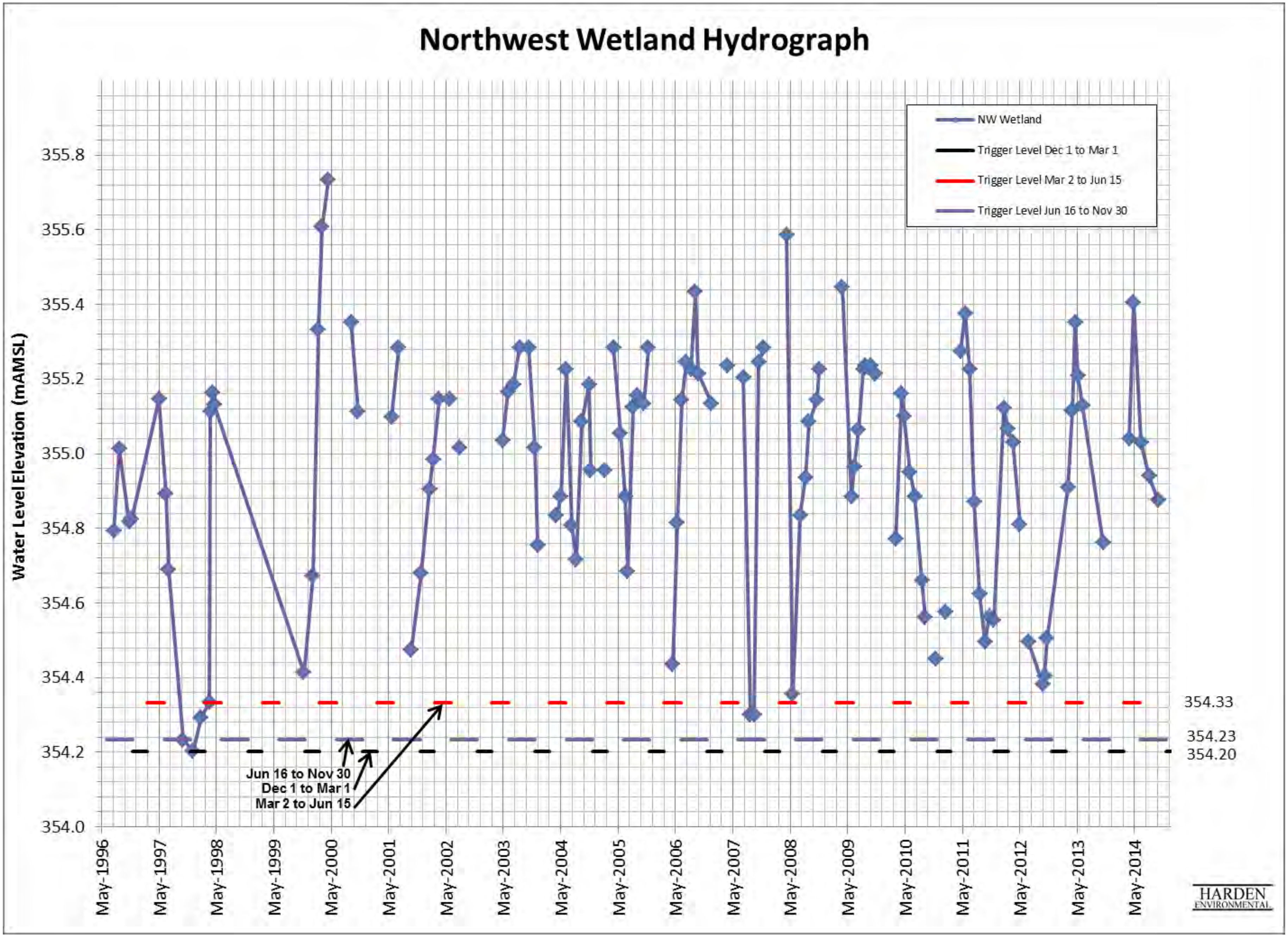
Harden Environmental Services Ltd.	**Project No:** 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	**Figure C3: M2 Trigger Level**
	Date: Nov 2014	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		



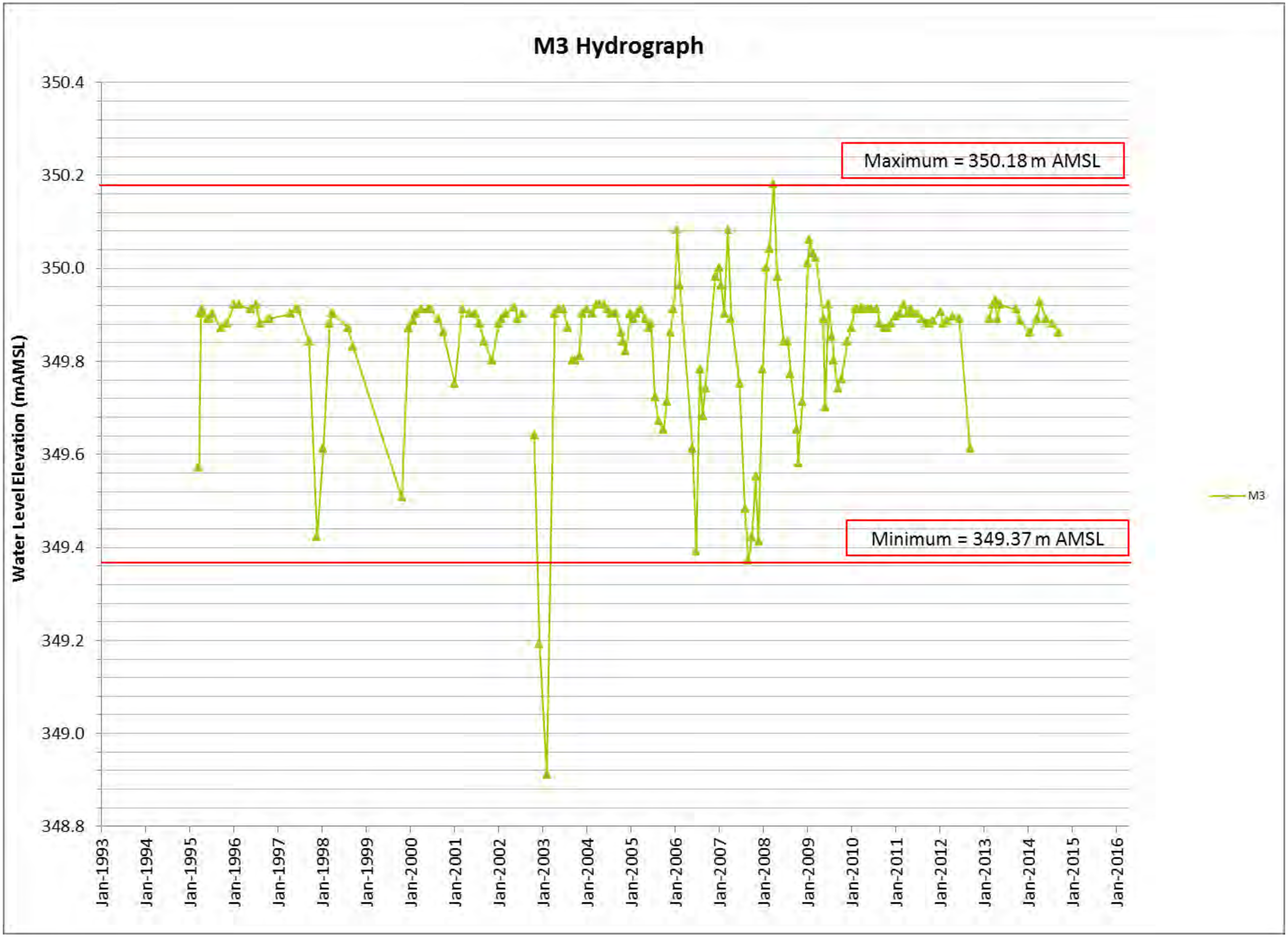
Harden Environmental Services Ltd.	**Project No:** 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	**Figure C4: M13D Trigger Level**
	Date: Nov 2014	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		



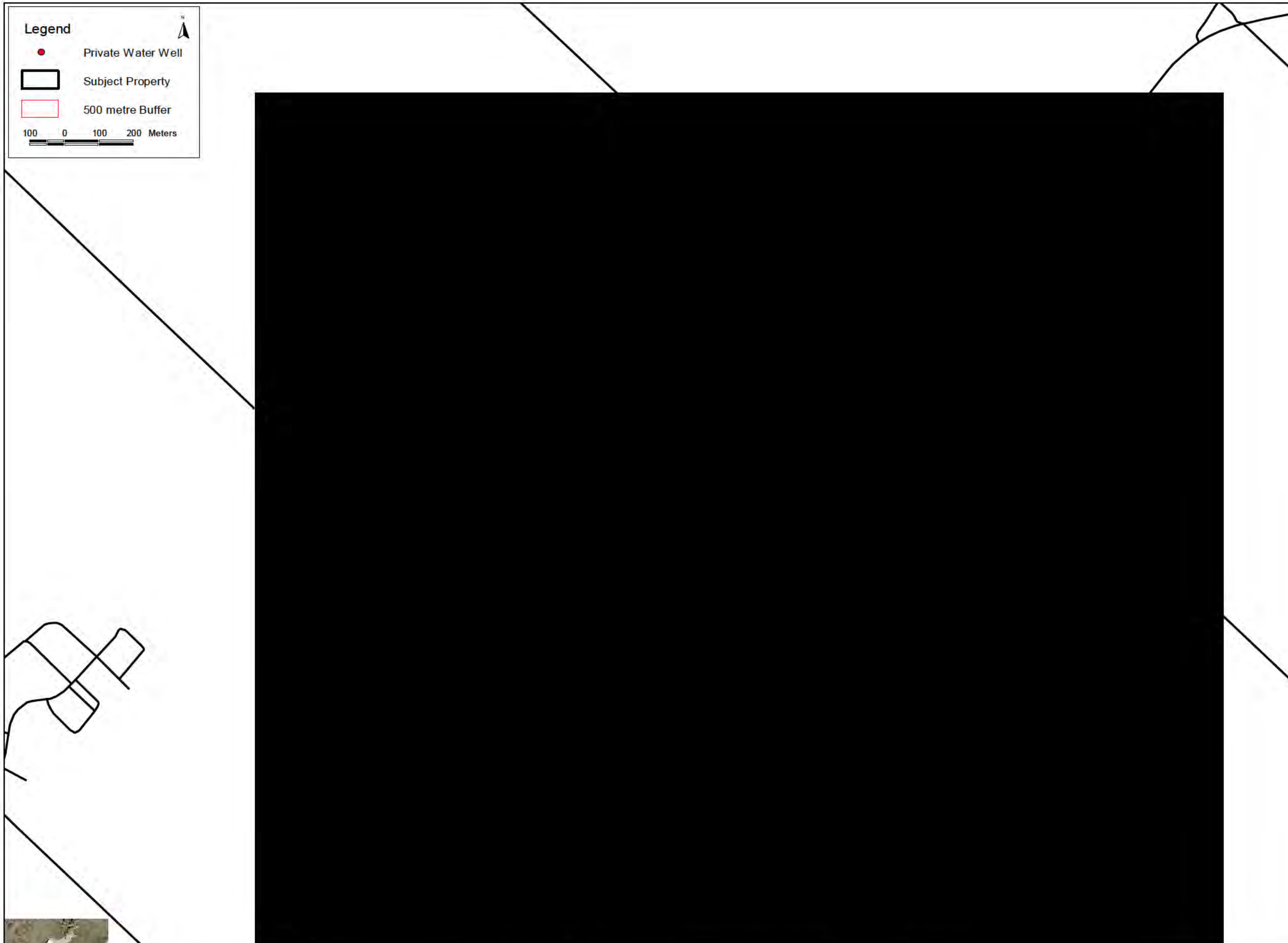
Harden Environmental Services Ltd.	**Project No:** 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	**Figure C5: M14D Trigger Level**
	Date: Nov 2014	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		



Harden Environmental Services Ltd.	**Project No:** 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	**Figure C6: Northwest Wetland Trigger Levels**
	Date: Nov 2014	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	
	Drawn By: AR		



Harden Environmental Services Ltd.	**Project No:** 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	**Figure C7: M3 Hydrograph**
	Date: Nov 2014		
	Drawn By: AR	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	



[redacted]

Harden Environmental Services Ltd.	Project No: 9506	Hydrogeologic Impact Assessment Proposed Aggregate Extraction	Figure C8:
	Date: Dec 2014	Part of Lot 1, Concession 6 Township of Guelph/Eramosa, County of Wellington	**Proposed Pre Quarry Well Survey Locations**
	Drawn By: SD		

Appendix A

Water Well Complaint Protocol

Hidden Quarry

James Dick Construction Ltd. has committed to remedying any and all issues arising as a result of quarry activities. The following complaint protocol will be followed;

Complaints about water well issues will be received any time at ___ ______. Text messages can be sent to ___ ___ ____ or email to ____@____.

James Dick Construction Ltd. has a water well contractor on stand-by to address any water quantity or quality issue that arises.

In the event of a water shortage a supply of bottled water for drinking/cooking will be delivered within 12 hours of the complaint and an alternative water supply will be delivered within 24 hours of the complaint being received.

Within 48 hours, JDCL will initiate a hydrogeological investigation conducted by an independent hydrogeologist to determine the cause of the water issue. The investigation will include but not be limited to the following actions;

- Confirmation of water levels in on-site groundwater monitoring wells
- Review of historical trends in groundwater levels and groundwater quality obtained in on-site groundwater monitoring wells.
- Review of historical measured precipitation rates
- Interview with resident regarding well complaint
- Investigation of subject well including flow testing, water level measurements and water quality testing if necessary
- Written report summarizing the findings.

In the event that quarry activities are likely to be the cause of the complaint, James Dick Construction will undertake appropriate mitigative measures such as;

- Lowering the level of the pump within the well
- Extending the cased portion of the well
- Deepening the well
- Well replacement
- Water Treatment
- Modification of quarry activities.