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REPORT ON

**HYDROGEOLOGICAL
STUDY
PROPOSED COACH HOUSE
3674 YORK'S CORNERS ROAD
OSGOODE WARD
CITY OF OTTAWA, ONTARIO**

Submitted to:

Ryan McCarlie
3674 York's Corners Road
Metcalfe, Ontario
K0A 2P0

DATE July 8, 2022

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220471



Professional Engineers
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July 8, 2022

220471

Ryan McCarlie
3674 York's Corners Road
Metcalf, Ontario
K0A 2P0

RE: HYDROGEOLOGICAL AND TERRAIN STUDY
PROPOSED COACH HOUSE
3674 YORK'S CORNERS ROAD
OSGOODE WARD
CITY OF OTTAWA, ONTARIO

Kollaard Associates Inc. was retained by Mr. Ryan McCarlie to undertake a hydrogeological and terrain study for a proposed coach house on York's Corners Road in Metcalfe, Ontario (Key Plan, Figure 1).

It is understood that it is being proposed to construct a coach house on the existing 10 hectares (~25 acres) property. It is the intention of the owner that the existing well is to be shared between the coach house and the existing dwelling. A new sewage system is to be constructed to service the coach house. It is understood that the proposed coach house is located south of the existing house with the proposed sewage system for the coach house located east of the coach house. The attached drawing (Attachment A) is a proposed Coach House Grading Plan, prepared by Kollaard Associates Inc, that shows the location of the proposed coach house, the existing dwelling, septic bed and well and the proposed sewage system location.

Kollaard Associates Inc. carried out a six hour pumping test on the existing well at the site and obtained a water sample that was tested for the subdivision list of parameters to confirm that water quantity and quality are acceptable to service the existing and proposed residential development. Information provided by the client from the sewage system design including test pit and topographic survey were used to establish soil conditions with consideration for sewage system design and the potential for sewage system impacts.

This report consists of an evaluation of the water quality and quantity of the existing well at the subject site, and an assessment of the sewage system impact, to ensure that the water quality and quantity of the existing well is acceptable using the following documents; Ministry of the Environment, Conservation and Parks (MECP) Guideline D-5-5 and the Ontario Drinking Water Standards, Objectives and Guidelines (ODWSOG). Consideration has also been given to the groundwater impact assessment guidelines under MECP D-5-4. The scope of work carried out for this assessment was prepared in consideration of the City of Ottawa document "Terms of Reference Scoped Hydrogeological Study for Coach Houses".



HYDROGEOLOGICAL STUDY

Background

A bedrock geology map for the site area indicates the bedrock at the site consists of dolostone and sandstone of the Beekmantown Group.

The surficial geology map indicates that the soil at the property consists of till on Paleozoic terrain, and fine-textured glaciomarine deposits.

Two test pits were put down as part of a proposed sewage system design to service the proposed coach house. The test pits were put down by a member of Kollaard Associates Inc. as part of the sewage design for the coach house on June 10, 2022. The test pits encountered about 0.65 metres of soil, consisting of a layer of topsoil (0.30 metres) overlying silty clay, cobbles, and gravel. Probing down to 1 meter revealed more of the same with refusal on a boulder. There was groundwater intrusion into one of the test pits at a depth of 0.50 metres.

The existing well that services the existing dwelling at the site was assessed to determine whether the well is capable of supplying the water demand for the proposed coach house and the existing dwelling. According to the well record, the well is about 18.3 metres deep with 9.1 metres of casing. The pump was installed at about 15 metres below the existing ground surface.

Area Well Records

A review of five area well records was carried out. The well records are provided (Attachment B). The depths of the wells are indicated to be between 16 and 21 metres, obtaining water from a limestone aquifer. Test pumping rates for the area wells were 37.9 to 113.6 litres per minute. Recommended pumping rates were between 18.9 and 56.8 litres per minute. Overburden was identified as clay, till, sand, and gravel between 4.9 to 16.2 metres in thickness. All area wells had between 4.9 to 16.2 metres of casing below the ground surface.

Water Quantity

A pumping test was carried out on May 31, 2022, at the existing well on the site. The well is a drilled, cased well with about 0.6 metres of casing above the ground surface.

The testing consisted of a 6 hour duration pumping test. During the pumping test, manual water level measurements were made on a regular basis to monitor the drawdown of the water level in the well in response to pumping and water levels were monitored at one minute intervals using a pressure transducer. Groundwater samples were collected from the well after six hours to characterize groundwater quality. Hourly field water quality readings were recorded for the water temperature, pH, and total dissolved solids (conductivity). Turbidity could not be monitored in the field due to equipment malfunction. However, the lab results subsequent to testing indicate that turbidity was measured to be 0.9 NTU. As such, there was no impact caused by the equipment malfunction as turbidity was less than 1 NTU at the time of sampling. After the pump was shut off, the recovery of the water level in the well was measured until 95% recovery of static water level had been achieved or for 24 hours, whichever was less.

The well was pumped for about 360 minutes at a pumping rate of about 30.0 litres per minute. Over the course of the pumping test, the water level in the well dropped some 4.85 metres. At the end of pumping, 93% recovery of the total drawdown in the static water level created during pumping was measured after about 50 minutes. The subsequent day, a final water level reading was obtained



manually after some 26 hours and 45 minutes. At that time, the water level recovery was some 96%.

The pumping test drawdown and recovery data and plots for TW1 are provided as Attachment C. The drawdown and recovery data provided were measured with reference to the top of the well casing at the test well location.

The pumping test data for the test well was analyzed using the method of Cooper and Jacob (1946). Although the assumptions on which these equations are based are not strictly met, this method provides a reasonable estimate of the aquifer transmissivity.

Transmissivity was calculated using the following relationship:

$$T = \frac{2.3Q}{4\pi ds}$$

where Q is the pump rate, m³/day
ds is the change in drawdown over one time log cycle, m
T is the transmissivity, m²/day

Based on the pumping test drawdown and recovery data, the transmissivity of the aquifer is estimated to be between about 39.5 and 22.6 m²/day, respectively.

Based on the data obtained during the six hour pumping test, it can be concluded that the well is capable of sustaining a short term yield of at least 30.0 litres per minute. During the course of the 6 hour pumping period, 40.7 percent of the available drawdown in the test well was utilized, based on a pump depth of 15 metres and the initial static water level measured at the time of the pumping test (3.09 metres).

The expected water demand for the site was calculated using the total expected residential occupancy. It is understood that the main (existing) house has four bedrooms and that the proposed coach house will contain two bedrooms. Using Guideline D-5-5, total occupancy will consist of five people in the main house and up to three people in the coach house (assuming number of bedrooms plus one for each dwelling). The peak water demand (obtained from MECP D-5-5) is taken as 3.75 litres per person per minute, equivalent to 30.0 litres per minute. This peak demand rate is assumed to occur for a period of two hours each day. The pump test rate was 30.0 litres per minute carried out for six hours. Based on the above noted information, there is sufficient water quantity available to service the peak water demands at the site.

Water Quality

To determine the water quality of the groundwater supply, groundwater samples were obtained from the well after six hours during the pumping test and prepared/preserved in the field using appropriate techniques and submitted to Eurofins Environmental Testing in Ottawa, Ontario, for the chemical, physical and bacteriological analyses listed in the Ministry of the Environment (MECP) guideline entitled Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment, August 1996. The results of the trace metals, chemical, physical and bacteriological analyses of the water samples obtained from the test well are provided in Attachment D. A summary of the water quality measured in the field are provided as Table I, Water Quality Measurements for Test Well.



The water quality as determined from the results of the analyses is favourable. The water meets all the Ontario Drinking Water Standards, Objectives and Guidelines (ODWSOG) health and aesthetic parameters tested for at the test well except for hardness and strontium. Strontium has a health related proposed MAC and treatment to reduce strontium in drinking water is highly recommended.

Hardness

The water is considered to be hard by water treatment standards. Water with hardness above 80 to 100 milligrams per litre as CaCO_3 is often softened for domestic use. The hardness at the well was 331 milligrams per litre. According to MECP D-5-5, the ODWO is 500 mg/l. Water softening by conventional sodium ion exchange may introduce relatively high concentrations of sodium into the drinking water, which may contribute a significant percentage to the daily sodium intake for a consumer on a sodium restricted diet. The sodium level of the untreated water is 7 mg/L, which is below the 20 mg/l medical advisory limit and well within the aesthetic objective of 200 mg/L. When sodium levels exceed 20 mg/l, the local Medical Officer of Health should be informed so that the information can be relayed to local physicians. It is expected that water treated using an ion exchange water softener will have sodium levels exceeding 20 mg/L.

Trace Metals

The results of the trace metals testing indicates that, where present, all trace metals are indicated to be within allowable limits, except for strontium.

Strontium

Strontium currently has a proposed Maximum Acceptable Concentration (MAC) by Health Canada of 7.0 mg/L. The level of strontium measured in the water supply at this site is 14.8 mg/L, which is above the proposed acceptable limit. The strontium level is of particular concern in the Ottawa area, due to its association as naturally occurring in some sedimentary bedrock, such as limestone and sandstone. The proposed MAC is established based on studies that indicate a potential for adverse effects of strontium for humans. Since the highest sensitivity to adverse bone effects occurs in the first year of life, infants are the most sensitive to strontium toxicity. Strontium may be reduced from water by the use of a whole home ion exchange water softener. Where the preferred treatment is using a water softener and a point of use reverse osmosis filter is not installed in the kitchen for water used for drinking and culinary purposes, it is recommended that untreated water should not be consumed. To reduce sodium from water treated by conventional ion exchange used for drinking and culinary purposes, a point of use reverse osmosis filter is recommended. Additional information regarding strontium, its occurrence and treatment considerations are provided in the attached City of Ottawa document "Strontium in Drinking Water, Questions and Answers for the Public", which is provided as Attachment D along with the laboratory testing results for the water.

Groundwater Impact Assessment

The Ministry of the Environment, Conservation and Parks (MECP) in the MOE Procedure D-5-4 provides guidelines for evaluating "the ability of the lands identified by and restricted to the development to treat sewage effluent to meet acceptable limits". The guideline requires that the representative background nitrate levels in the receiving groundwater be determined. Where background levels are greater than 10 milligrams per litre the ministry indicates development of the site should not be supported unless it can be demonstrated that existing levels of nitrates are the results of historical agricultural practices on the site. In addition, the guideline requires demonstration that the site is not obviously hydrogeologically sensitive such as karstic areas, areas of fractured bedrock exposed at the surface, areas of thin soil cover or areas of highly permeable soils.



The guideline indicates that the assessment involves a three step process.

Step 1 regards lot size considerations. Where the lot size for each private residence within the development is an average of one hectare or larger and no lot is smaller than 0.8 hectares, and provided the site is not hydrogeologically sensitive, the risk that impact limits may be exceeded by individual systems is considered acceptable.

Step 2 is in regards to septic system isolation considerations. Developments are considered low risk when it can be demonstrated that sewage effluent is hydrogeologically isolated from existing or potential supply aquifers. For this case the most probable groundwater receiver for sewage is to be defined through information obtained through a test pit or test hole program, and the most probable lower hydraulic or physical boundary of the groundwater receiving sewage effluent is to be defined. The guideline indicates hydrogeological information concerning lands up to 500 metres beyond the actual development boundary may be required. When it can be demonstrated that the sewage will not enter supply aquifers the lot density of the proposed development is determined based on the space required to install a suitable septic system at each lot in accordance with the Ontario Building Code.

Step 3 is in regards to contaminant attenuation considerations. For this case, it is required to assess the risk that the on-site sewage systems within the proposed development will cause a concentration of nitrate in groundwater above 10 milligrams per litre at the down gradient boundary of the site.

The existing residential lot occupies an area of about 25 acres (10 hectares). Test pits put down in the proposed sewage system area for the coach house encountered about 1 metre of soil overlying boulders. Surficial geology maps, combined with area wells indicate that the soil thickness is about 4.9 to 16.2 metres in thickness, and is identified as either clay, till, or sand. The City of Ottawa considers any site with less than 2.0 metres of soil cover to be potentially hydrogeologically sensitive. As such, the site is not considered to be potentially hydrogeologically sensitive, based on the test pit information and supporting information from the well record for the site along with surficial geology mapping.

Based on the lot size, which is much greater than 1 hectare, and the lack of thin soils at the site, the potential for sewage impacts are satisfied by Step 1 and no further assessment of sewage impact considerations is required.

Results and Recommendations

The water is considered to be hard by water treatment standards. Water with hardness above 80 to 100 milligrams per litre as CaCO_3 is often softened for domestic use. The hardness at the well is 331 milligrams per litre. Water softening by conventional sodium ion exchange may introduce relatively high concentrations of sodium into the drinking water, which may contribute a significant percentage to the daily sodium intake for a consumer on a sodium restricted diet. Where ion exchange water softeners are used, a separate unsoftened water supply could be used for drinking and culinary purposes. Sodium level is 7 mg/L, which is below the 20 mg/l medical advisory limit and well within the aesthetic objective of 200 mg/L. When sodium levels exceed 20 mg/l, the local Medical Officer of Health should be informed so that the information can be relayed to local physicians.

The level of strontium measured in the water supply at this site is 14.8 mg/L, which is above the proposed health related Maximum Acceptable Concentration (MAC) by Health Canada of 7.0 mg/L.



The strontium level is of particular concern in the Ottawa area, due to its association as naturally occurring in some sedimentary bedrock, such as limestone and sandstone. The proposed MAC is established based on studies that indicate a potential for adverse effects of strontium for humans, especially infants. Additional information regarding strontium, its occurrence and treatment considerations are provided in the attached City of Ottawa document "*Strontium in Drinking Water, Questions and Answers for the Public*", which is provided as Attachment D along with the laboratory testing results for the water. Strontium is effectively reduced from water treated by conventional ion exchange. Where unsoftened water is desired for drinking and culinary purposes and/or where consumption of sodium above levels of 20 mg/L cannot be allowed for those persons who must be on a sodium reduced diet for medical purposes, a point of use reverse osmosis filter is recommended in the kitchen. Where the preferred treatment is using a whole home water softener and a reverse osmosis tap is not installed, consumption of untreated water (bypass on water softener in kitchen) is not recommended to avoid intake of high levels of strontium.

Based on the above noted site conditions, Kollaard Associates Inc. considers that the groundwater impact of the proposed development is within the impact limits established by the MECP and the water supply is adequate to provide for the existing dwelling and the proposed coach house.

We trust this letter provides sufficient information for your purposes. If you have any questions concerning this letter, please do not hesitate to contact our office.

Yours truly,

Kollaard Associates Inc.



Colleen Vermeersch, P. Eng.

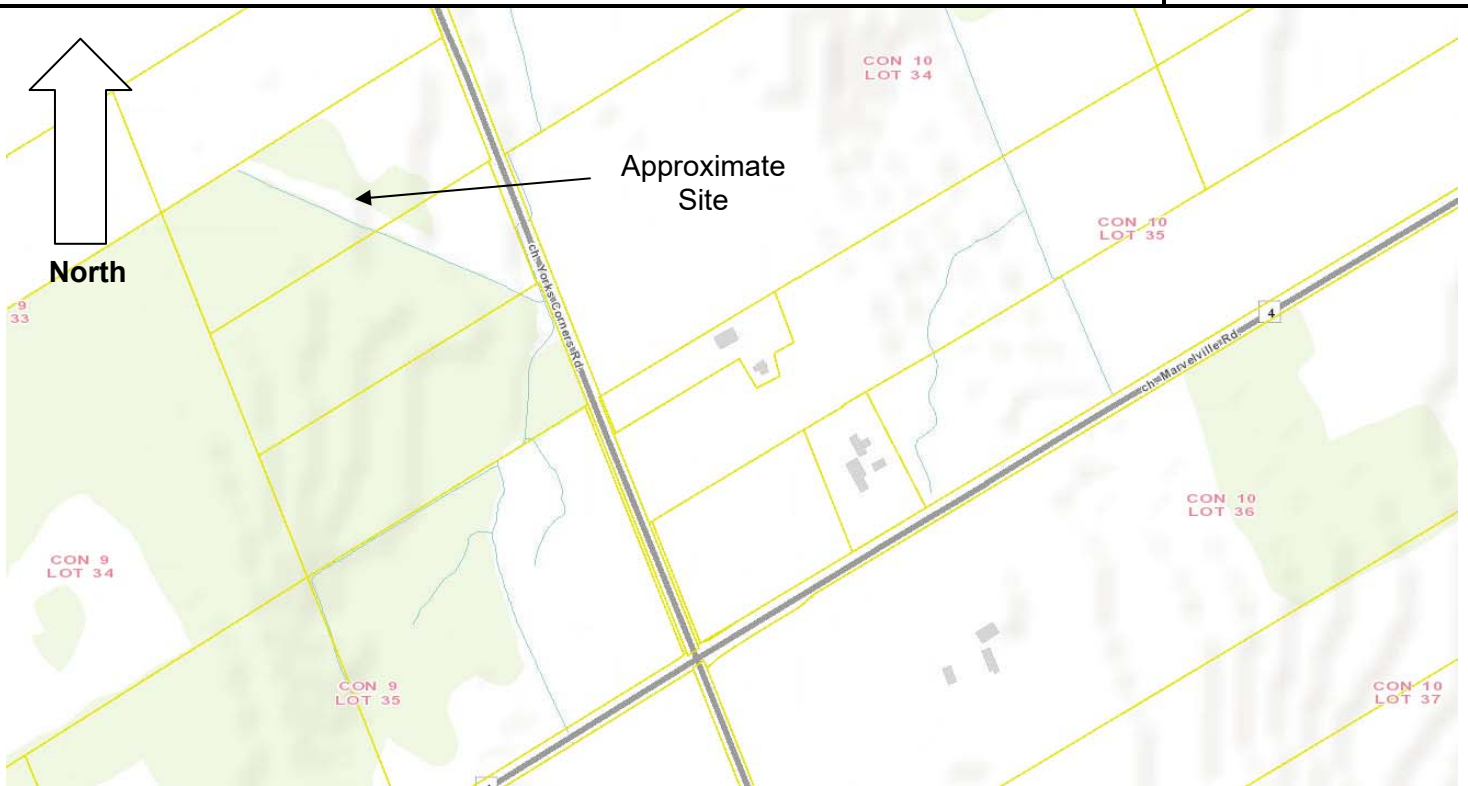
Attachments:	Table I	Summary of Hourly Field Water Quality
	Figure 1	Key Plan
	Attachment A	Proposed Sewage System
	Attachment B	TW1-Well Record for Site and Area Wells
	Attachment C	TW1-Pumping Test Data
	Attachment D	TW1-Laboratory Water Testing Results and Strontium Fact Sheet

TABLE I
FIELD WATER QUALITY MEASUREMENTS
FOR TEST WELL 1

Time Since Pumping Test Started (min)	Temperature (°C)	pH	Turbidity (NTU)	Total Dissolved Solids (ppm)	Conductivity (μS)	Free Chlorine (ppm)
60	14.0	7.71	Not read. Slightly cloudy (likely about 2-5 NTU)	336	675	Not read
120	13.6	7.59	Not read. Clear (likely less than 2 NTU)	329	652	-
180	14.0	7.62	Not read. Clear (likely less than 2 NTU)	332	657	Not read
240	14.4	7.59	Not read. Clear (likely less than 2 NTU)	323	647	-
300	13.8	7.52	Not read. Clear (likely less than 2 NTU)	326	649	-
360	12.8	7.55	Not read. Clear (likely less than 2 NTU)	332	665	Not read

KEY PLAN

FIGURE 1



NOT TO SCALE



Kollaard Associates
Engineers

Project No. 220471

Date July 2022



Ryan McCarlie
July 8, 2022

Hydrogeological and Terrain Study for Coach House
3674 York's Corners Road, Metcalfe, Ontario
220471

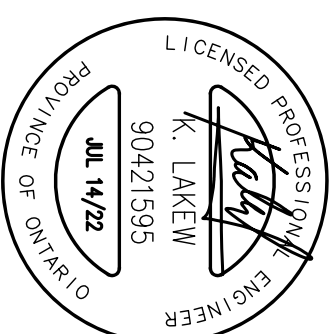
ATTACHMENT A

SEWAGE DESIGN PLAN

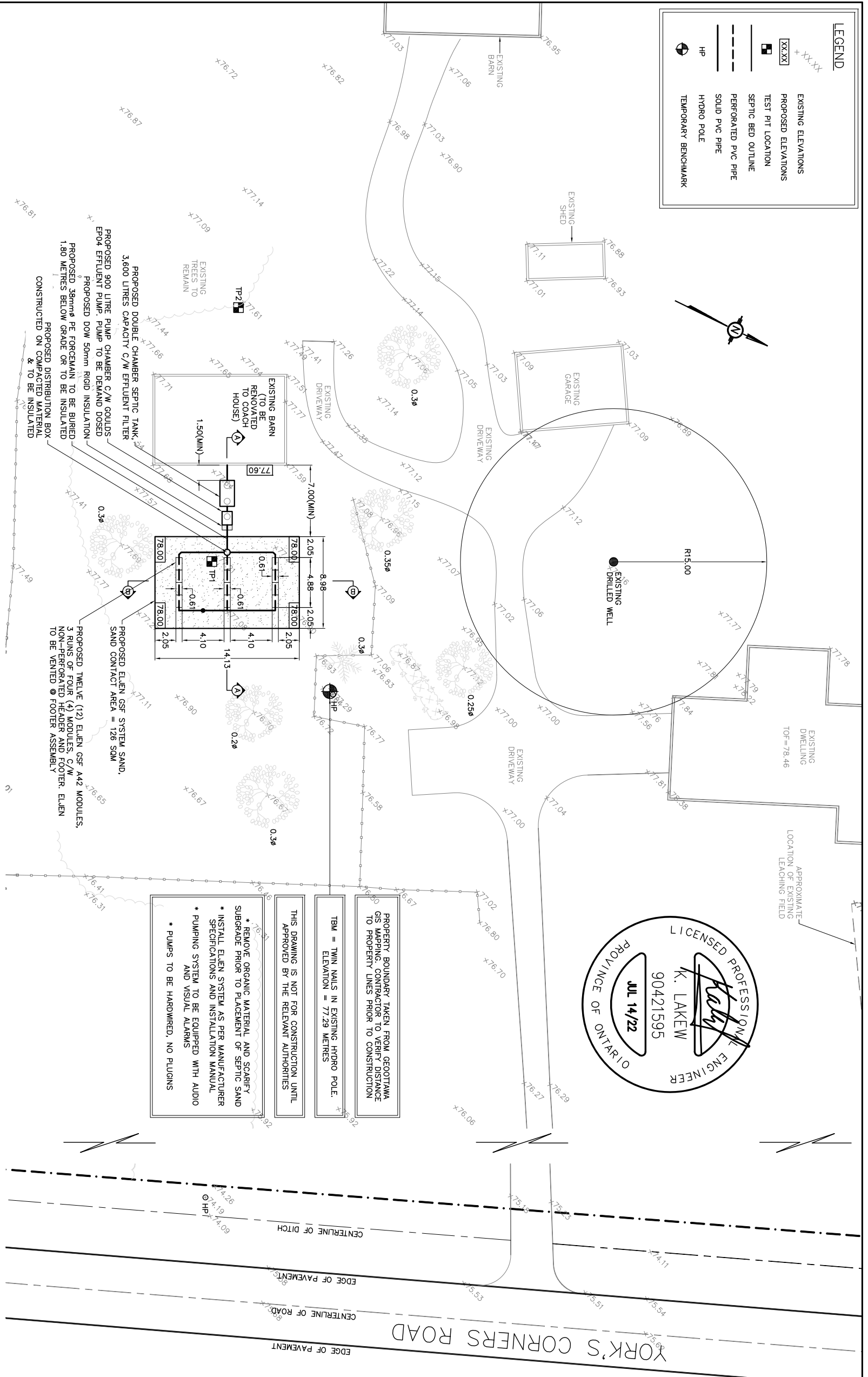
DRAWING NUMBER: 220471-SD

CONSTRUCTION NOTES:

1. All dimensions and elevations are in metres. Do not scale drawing.
2. This drawing is not a legal survey, a utility plan or a site plan and is for septic purposes only. Elevation = 3. TBM = Twin nails in existing hydro pole. Elevation = 77.29 metres.
4. This drawing cannot be accepted as acknowledging all of the utilities, and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
5. This drawing is not for construction until approved by the relevant authorities.
6. The sewage system envelope (leaching bed) as identified on the drawing must be maintained free of the deposit or disposal of any materials, structures, or equipment other than the material or equipment required for the construction of the leaching bed within the sewage system envelope.
7. Topsoil rootrot (organics) to be removed from bed area and exposed subgrade. No wheeled vehicles to be allowed in leaching bed area.
8. Percolation rate of any imported sand for bed to be 6 to 8 min/cm, with < 5% passing the #200 (0.080 mm) sieve.
9. Stone layer to be washed septic stone, free of fine material, with gradation conforming to OBC table 8.7.3.5.A.
10. The septic system leaching bed is to be graded to provide positive drainage away from the septic system and treated with 75 to 100 mm permeable topsoil and seed. Grass growth is to be established.
11. The following are not to be connected to the septic system: Water softener, swimming pool or filter system backwash, sump pump discharge.
12. The septic system to be installed in accordance with the 13. Septic tank to meet criteria described in the OBC.
14. No silty clay or clayey or silty material to be placed around or over leaching bed.
15. All changes to this design must be verified and approved by Kollaard Associates Incorporated.
16. Minimum clearance from treatment unit to:
 - * structure = 1.5m
 - * property line = 3m
 - * drilled well = 15m
17. Minimum clearance from distribution piping to:
 - * structure = 7m
 - * property line = 5m
 - * drilled well = 17m



YORK'S CORNERS ROAD



LEGEND

XXXXXX	EXISTING ELEVATIONS
PROPOSED ELEVATIONS	
TEST PIT LOCATION	
SEPTIC BED OUTLINE	
PERFORATED PVC PIPE	
SOLID PVC PIPE	
HYDRO POLE	
HP	TEMPORARY BENCHMARK

PROPERTY BOUNDARY TAKEN FROM GEOTITAMA GIS MAPPING. CONTRACTOR TO VERIFY DISTANCE TO PROPERTY LINES PRIOR TO CONSTRUCTION

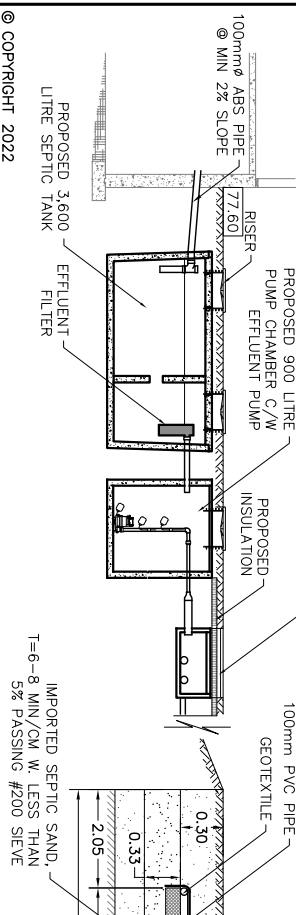
TBM = TWIN NAILS IN EXISTING HYDRO POLE. ELEVATION = 77.29 METRES

THIS DRAWING IS NOT FOR CONSTRUCTION UNTIL APPROVED BY THE RELEVANT AUTHORITIES

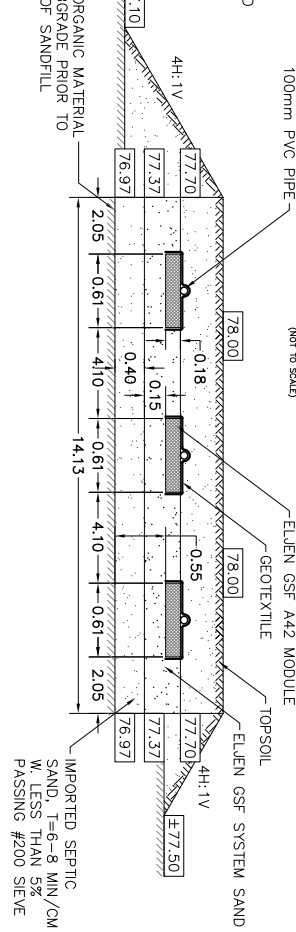
- * REMOVE ORGANIC MATERIAL AND SCARIFY SUBGRADE PRIOR TO PLACEMENT OF SEPTIC SAND
- * INSTALL ELJEN SYSTEM AS PER MANUFACTURER SPECIFICATIONS AND INSTALLATION MANUAL
- * PUMPING SYSTEM TO BE EQUIPPED WITH AUDIO AND VISUAL ALARMS
- * PUMPS TO BE HARDWIRED, NO PLUGS

- PROPOSED DOUBLE CHAMBER SEPTIC TANK, 3,600 LITRES CAPACITY C/W EFFLUENT FILTER
- PROPOSED 900 LITRE PUMP CHAMBER C/W GULLERS EP04 EFFLUENT PUMP. PUMP TO BE DEMAND DOSED
- PROPOSED DOW 50mm RIGID INSULATION
- PROPOSED 38mm PE FORCMAIN TO BE BURIED 1.80 METRES BELOW GRADE OR TO BE INSULATED
- PROPOSED DISTRIBUTION BOX & TO BE INSULATED
- PROPOSED ELJEN GSF SYSTEM SAND, SAND CONTACT AREA = 128 SQM
- PROPOSED TWELVE (12) ELJEN GSF A42 MODULES, 3 RUNS OF FOUR (4) MODULES C/W NON-PERFORATED HEADER AND FOOTER. ELJEN TO BE VENTED @ FOOTER ASSEMBLY

SECTION A-A (NOT TO SCALE)



SECTION B-B (NOT TO SCALE)



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<p>CLIENT: RYAN MCCARLIE</p> <p>PROJECT: COACH HOUSE</p> <p>DRAWING: PROPOSED SEPTIC DESIGN PLAN</p> <p>LOCATION: 3674 YORK'S CORNERS ROAD LOT 33, CONC. 9, OSGOODE, CITY OF OTTAWA, ONTARIO</p> <p>DESIGNED BY: AKM</p> <p>DATE: JUL 14, 2022</p> <p>DRAWN BY: AKM</p> <p>SCALE: 1:400</p> <p>KOLLAARD FILE NUMBER: 220471</p>	<p>210 PRESCOTT STREET PO BOX 189 KEMPVILLE ONTARIO K0G 1J0</p> <p>(613) 860-0923 FAX (613) 258-0475 www.kollaard.ca info@kollaard.ca</p> <p>Kollaard Associates Engineers</p>
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Ryan McCarlie
July 8, 2022

Hydrogeological and Terrain Study for Coach House
3674 York's Corners Road, Metcalfe, Ontario
220471

ATTACHMENT B

MECP WELL RECORD
FOR TEST WELL AND
AREA WELL RECORDS

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11
1 2

1530211

Municipality 15009 Con. CON 09
10 14 15 22 23 24

County or District Ottawa-Carleton	Township/Borough/City/Town/Village Osgoode Township	Con block tract survey, etc. Con. 09	Lot 25-27 33
Address Yorks Corner Rd.		Date completed 10 09 98 day month year	

21
1 2
M 10 12 17 18 24 25 26 30 31 47
Northing RC Elevation RC Basin Code ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)					
General colour	Most common material	Other materials	General description	Depth - feet	
				From	To
Brown	Hardpan	Stones & handpack soils		0'	28'
Grey	Limestone	Fracture		28'	30'
Grey	Limestone	Med.		30'	60'

31
32
10 14 15 21 32 43 54 65 75 80

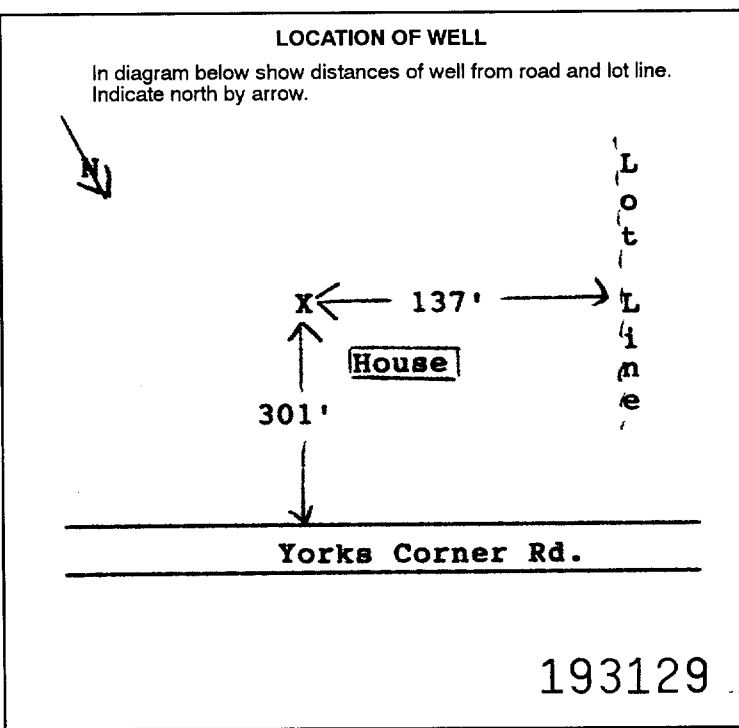
WATER RECORD	
Water found at - feet	Kind of water
42'	UNTESTED 1 <input type="checkbox"/> Fresh 3 <input type="checkbox"/> Sulphur 2 <input type="checkbox"/> Salty 4 <input type="checkbox"/> Minerals
54'	UNTESTED 1 <input type="checkbox"/> Fresh 3 <input type="checkbox"/> Sulphur 2 <input type="checkbox"/> Salty 4 <input type="checkbox"/> Minerals
	1 <input type="checkbox"/> Fresh 3 <input type="checkbox"/> Sulphur 2 <input type="checkbox"/> Salty 4 <input type="checkbox"/> Minerals 6 <input type="checkbox"/> Gas
	1 <input type="checkbox"/> Fresh 3 <input type="checkbox"/> Sulphur 2 <input type="checkbox"/> Salty 4 <input type="checkbox"/> Minerals 6 <input type="checkbox"/> Gas
	1 <input type="checkbox"/> Fresh 3 <input type="checkbox"/> Sulphur 2 <input type="checkbox"/> Salty 4 <input type="checkbox"/> Minerals 6 <input type="checkbox"/> Gas

CASING & OPEN HOLE RECORD				
Inside diam inches	Material	Wall thickness inches	Depth - feet	
			From	To
10"	1 <input type="checkbox"/> Steel 2 <input type="checkbox"/> Galvanized 3 <input type="checkbox"/> Concrete 4 <input checked="" type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic		0'	30'
6"	1 <input checked="" type="checkbox"/> Steel 2 <input type="checkbox"/> Galvanized 3 <input type="checkbox"/> Concrete 4 <input type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic	.188	+2'	30'
6"	1 <input type="checkbox"/> Steel 2 <input type="checkbox"/> Galvanized 3 <input type="checkbox"/> Concrete 4 <input type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic		30'	60'

SCREEN	Sizes of opening (Slot No.)	Diameter inches	Length feet
		Material and type	

PLUGGING & SEALING RECORD	
<input type="checkbox"/> Annular space <input type="checkbox"/> Abandonment	
Depth set at - feet	
From	To
30'	0'
Material and type (Cement grout, bentonite, etc.)	
Cement Grout	
12 sacks of High	
Early Cement	

PUMPING TEST	
71 Pumping test method 1 <input checked="" type="checkbox"/> Pump 2 <input type="checkbox"/> Bailer	Pumping rate 10 GPM Duration of pumping 1 Hours 0 Mins
Static level 8.7' feet	Water level end of pumping 23' feet
Water levels during 1 <input type="checkbox"/> Pumping 2 <input type="checkbox"/> Recovery	
15 minutes 14' feet	30 minutes 17.3' feet
45 minutes 19' feet	60 minutes 23' feet
If flowing give rate GPM	Pump intake set at feet
Recommended pump type <input type="checkbox"/> Shallow <input type="checkbox"/> Deep	Recommended pump setting feet
	Water at end of test <input type="checkbox"/> Clear <input type="checkbox"/> Cloudy
	Recommended pump rate GPM



FINAL STATUS OF WELL	
1 <input checked="" type="checkbox"/> Water supply	5 <input type="checkbox"/> Abandoned, insufficient supply
2 <input type="checkbox"/> Observation well	6 <input type="checkbox"/> Abandoned, poor quality
3 <input type="checkbox"/> Test hole	7 <input type="checkbox"/> Abandoned (Other)
4 <input type="checkbox"/> Recharge well	8 <input type="checkbox"/> Dewatering
9 <input type="checkbox"/> Unfinished 10 <input type="checkbox"/> Replacement well	

WATER USE	
1 <input checked="" type="checkbox"/> Domestic	5 <input type="checkbox"/> Commercial
2 <input type="checkbox"/> Stock	6 <input type="checkbox"/> Municipal
3 <input type="checkbox"/> Irrigation	7 <input type="checkbox"/> Public supply
4 <input type="checkbox"/> Industrial	8 <input type="checkbox"/> Cooling & air conditioning
9 <input type="checkbox"/> Not used 10 <input type="checkbox"/> Other	

METHOD OF CONSTRUCTION	
1 <input type="checkbox"/> Cable tool	5 <input type="checkbox"/> Air percussion
2 <input type="checkbox"/> Rotary (conventional)	6 <input type="checkbox"/> Boring
3 <input type="checkbox"/> Rotary (reverse)	7 <input type="checkbox"/> Diamond
4 <input checked="" type="checkbox"/> Rotary (air)	8 <input type="checkbox"/> Jetting
9 <input type="checkbox"/> Driving 10 <input type="checkbox"/> Digging 11 <input type="checkbox"/> Other	

Name of Well Contractor Olympic Drilling Co.Ltd.	Well Contractor's Licence No. 4006
Address Box 9180 Ottawa, Ont. K1G 3T9	
Name of Well Technician Wayne Renwick	Well Technician's Licence No. TO-327
Signature of Technician/Contractor <i>Wayne Renwick</i>	Submission date day 22 mo 09 yr 98

MINISTRY USE ONLY	Data source 58 4006	Contractor 59-62 CON	Date received 63-68 OCT 02 1998
	Date of inspection	Inspector	
	Remarks CSS. ES9		



Ontario

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

316/3e
15009
15 14 260
15 09

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT: Pelee TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Pelee CON., BLOCK, TRACT, SURVEY, ETC.: 9 LOT: 25-27

DATE COMPLETED: DAY 09 MONTH 07 YEAR 74

RC: 06728 ELEVATION: 4 BASIN CODE: 0250 RC: 4 BASIN CODE: 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	<u>Hard Pan</u>			<u>0</u>	<u>31</u>
	<u>Time stone</u>			<u>31</u>	<u>55</u>

31 0031 14 0055 15

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER			
10-13	<input checked="" type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
15-18	<input checked="" type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
20-23	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
25-28	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
30-33	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
<u>8</u>	<input checked="" type="checkbox"/> STEEL	<u>186</u>	<u>0</u>	<u>31</u>
<u>05</u>	<input checked="" type="checkbox"/> OPEN HOLE		<u>31</u>	<u>0031</u>
<u>05</u>	<input checked="" type="checkbox"/> OPEN HOLE			<u>0055</u>

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE: _____ DEPTH TO TOP OF SCREEN: _____

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	(CEMENT GROUT, LEAD PACKER, ETC.)
10-13		
14-17		
18-21		
22-25		
26-29		
30-33		

71 PUMPING TEST

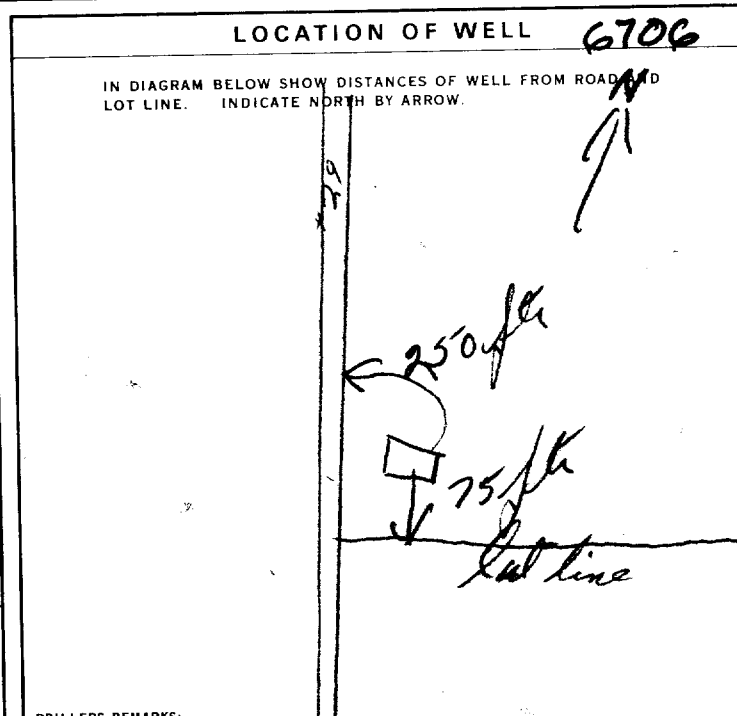
PUMPING TEST METHOD	PUMPING RATE GPM	DURATION OF PUMPING HOURS
<input type="checkbox"/> PUMP <input checked="" type="checkbox"/> BAILER	<u>0020</u>	<u>02</u> <u>00</u>

STATIC LEVEL FEET	WATER LEVEL END OF PUMPING FEET	WATER LEVELS DURING PUMPING					
<u>018</u>	<u>040</u>	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES		
		<u>040</u>	<u>040</u>	<u>040</u>	<u>040</u>		

IF FLOWING, GIVE RATE: _____ PUMP INTAKE SET AT: 5 FEET WATER AT END OF TEST: _____

RECOMMENDED PUMP TYPE: DEEP SHALLOW RECOMMENDED PUMP SETTING: 045 FEET RECOMMENDED PUMPING RATE: 0005 GPM

50-53 000.9 GPM./FT. SPECIFIC CAPACITY



FINAL STATUS OF WELL

1 WATER SUPPLY 5 ABANDONED, INSUFFICIENT SUPPLY
 2 OBSERVATION WELL 6 ABANDONED POOR QUALITY
 3 TEST HOLE 7 UNFINISHED
 4 RECHARGE WELL

WATER USE

1 DOMESTIC 5 COMMERCIAL
 2 STOCK 6 MUNICIPAL
 3 IRRIGATION 7 PUBLIC SUPPLY
 4 INDUSTRIAL 8 COOLING OR AIR CONDITIONING
 OTHER 9 NOT USED

METHOD OF DRILLING

1 CABLE TOOL 6 BORING
 2 ROTARY (CONVENTIONAL) 7 DIAMOND
 3 ROTARY (REVERSE) 8 JETTING
 4 ROTARY (AIR) 9 DRIVING
 5 AIR PERCUSSION

CONTRACTOR

NAME OF WELL CONTRACTOR: Armed & Arthur LICENCE NUMBER: 2308
 ADDRESS: Pelee
 NAME OF DRILLER OR BORER: _____ LICENCE NUMBER: _____
 SIGNATURE OF CONTRACTOR: Armed & Arthur SUBMISSION DATE: 9 July 74

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 2308 DATE RECEIVED: 230874
 DATE OF INSPECTION: _____ INSPECTOR: K
 REMARKS: _____
 P
 WI



Ministry of the Environment

Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

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1519805

MUNICIPALITY 15009

CON

609

COUNTY OR DISTRICT: *Carleton Place* TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: *Carleton Place* CON - BLOCK, TRACT, SURVEY ETC: *9* LOT: *37*

DATE COMPLETED: *23* MO: *Jan* YR: *85*

NG: _____ RC: _____ ELEVATION: _____ RC: _____ BASIN CODE: _____ II: _____ III: _____ IV: _____

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
<i>grey</i>	<i>hard pan</i>	<i>stone</i>		<i>0</i>	<i>43</i>
<i>grey</i>	<i>sand gravel</i>	<i>stone</i>		<i>43</i>	<i>53</i>
<i>grey</i>	<i>limestone</i>	<i>rock</i>		<i>53</i>	<i>63</i>

31 _____ 32 _____

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER			
10-13 <i>61</i>	<input checked="" type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
15-18	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
20-23	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
25-28	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
30-33	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
10-11 <i>6 1/4</i>	<input checked="" type="checkbox"/> STEEL	<i>188</i>	<i>0</i>	<i>53</i>
17-18	<input type="checkbox"/> GALVANIZED			
24-25	<input type="checkbox"/> CONCRETE			
	<input type="checkbox"/> OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE: _____ DEPTH TO TOP OF SCREEN: _____ FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	
18-21	
26-29	

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
<input type="checkbox"/> PUMP <input checked="" type="checkbox"/> BAILER	<i>10</i> GPM	<i>1</i> HOURS
STATIC LEVEL	WATER LEVELS DURING	
19-21 <i>22</i> FEET	15 MINUTES 26-28 <i>28</i> FEET	30 MINUTES 29-31 <i>30</i> FEET
	45 MINUTES 32-34 <i>32</i> FEET	60 MINUTES 35-37 <i>32</i> FEET
IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
	<i>63</i> GPM	
RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
<input type="checkbox"/> SHALLOW <input checked="" type="checkbox"/> DEEP	<i>45</i> FEET	<i>8</i> GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE INDICATE NORTH BY ARROW.

KN

Kenmore Valley 1 km

Con 9

DRILLERS REMARKS: _____

FINAL STATUS OF WELL

1 WATER SUPPLY 5 ABANDONED, INSUFFICIENT SUPPLY
2 OBSERVATION WELL 6 ABANDONED POOR QUALITY
3 TEST HOLE 7 UNFINISHED
4 RECHARGE WELL

WATER USE

1 DOMESTIC 5 COMMERCIAL
2 STOCK 6 MUNICIPAL
3 IRRIGATION 7 PUBLIC SUPPLY
4 INDUSTRIAL 8 COOLING OR AIR CONDITIONING
 OTHER 9 NOT USED

METHOD OF DRILLING

1 CABLE TOOL 6 BORING
2 ROTARY (CONVENTIONAL) 7 DIAMOND
3 ROTARY (REVERSE) 8 JETTING
4 ROTARY (AIR) 9 DRIVING
5 AIR PERCUSSION

CONTRACTOR

NAME OF WELL CONTRACTOR: *Maurice Payer Ltd.* LICENCE NUMBER: *1517*

ADDRESS: *Carleton Ont.*

NAME OF DRILLER OR BORER: _____ LICENCE NUMBER: _____

SIGNATURE OF CONTRACTOR: *Maurice Payer* SUBMISSION DATE: _____

OFFICE USE ONLY

DATE OF INSPECTION: _____ INSPECTOR: _____

REMARKS: _____

WDE

1525818

MUNICIPALITY: 15009 CON. NO.: 09

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT: **Ottawa Carleton** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Osgoode** CON. BLOCK, TRACT, SURVEY ETC: **9** LOT: **25-27**
OWNER (SURNAME FIRST): **[REDACTED]** ADDRESS: **c/o Chris Vriand Construction Osgoode, Ontario** DATE COMPLETED: **17 MO 08 YR 91**

ZONE: **21** EASTING: **10-17** NORTHING: **18-25** RC: **25** ELEVATION: **26** KOA: **ZWO**

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
Brown	Clay	Boulders	Packed	0	10
Gray	Hardpan	Boulders	Packed	10	16
Gray	Limestone	Black Layers	Medium Hard	16	70

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41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER			
10-13	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERALS
17	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERALS
15-18	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERALS
20-23	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERALS
25-28	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERALS
30-33	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERALS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
6 1/4	STEEL	.188	0	16
6 1/8	STEEL		16	70

SCREEN

SIZE(S) OF OPENING (SLOT NO)	DIAMETER	LENGTH
	INCHES	FEET

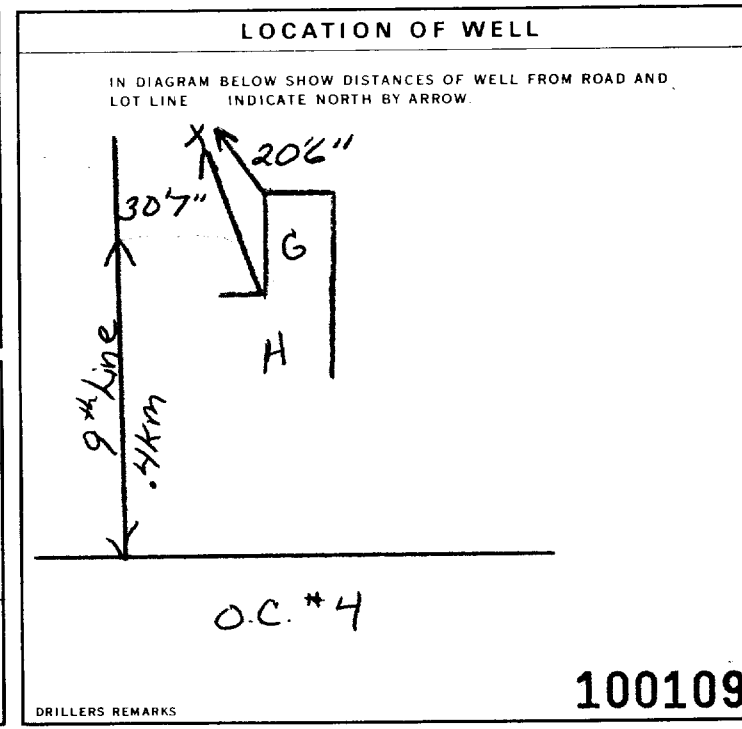
61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE
10-13	Cement (1)
18-21	High Early (2)

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
<input checked="" type="checkbox"/> PUMP	30 GPM	1 HOURS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING			
8 FEET	18 FEET	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
		18 FEET	18 FEET	18 FEET	18 FEET



FINAL STATUS OF WELL

WATER SUPPLY

WATER USE

DOMESTIC

METHOD OF CONSTRUCTION

CABLE TOOL

CONTRACTOR

NAME OF WELL CONTRACTOR: **Capital water Supply Ltd.** WELL CONTRACTOR'S LICENCE NUMBER: **1558**

Box 490 Stittsville, Ontario K2S 1A6

NAME OF WELL TECHNICIAN: **J. Moore** WELL TECHNICIAN'S LICENCE NUMBER: **T0096**

SUBMISSION DATE: **DAY 21 MO 8 YR 91**

OFFICE USE ONLY

DATE RECEIVED: **NOV 22 1991**

CONTRACTOR: **1558**

REMARKS: **CSS. 628**

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11

1530554

Municipality 15009 Con. CON 09

County or District *Ontario* Township/Borough/City/Town/Village *Osgood* Con block tract survey, etc. *9* Lot *34*
Address *Yorks Corner Rd Metcalfe* Date completed *3 June 99*
Northing RC Elevation RC Basin Code ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)					
General colour	Most common material	Other materials	General description	Depth - feet	
				From	To
<i>Brown</i>	<i>clay</i>	<i>hard pan, stone</i>		<i>0</i>	<i>26</i>
<i>grey</i>	<i>limestone</i>	<i>rock</i>		<i>26</i>	<i>52</i>

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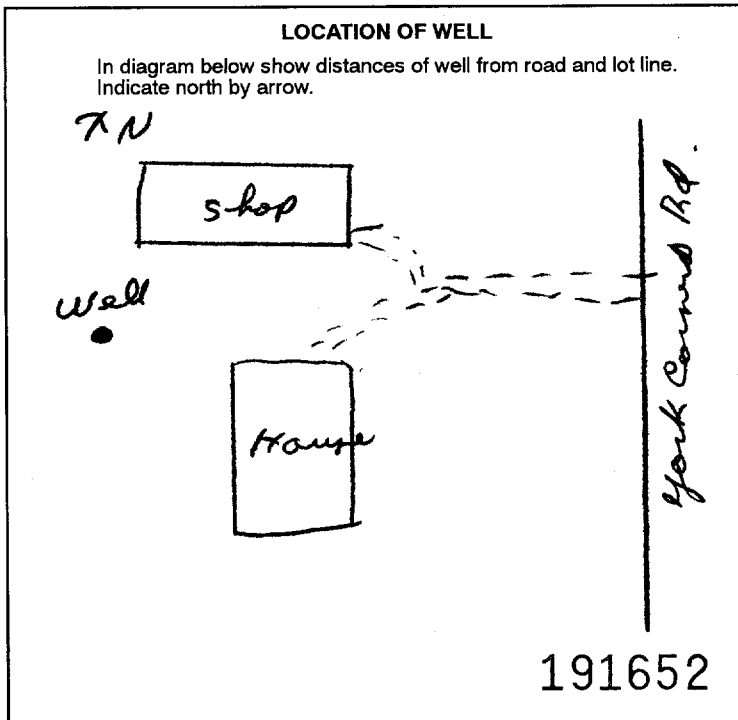
41 WATER RECORD			
Water found at - feet	Kind of water		
<i>51</i>	<input checked="" type="checkbox"/> Fresh <input type="checkbox"/> Salty	<input type="checkbox"/> Sulphur <input type="checkbox"/> Minerals <input type="checkbox"/> Gas	<input type="checkbox"/> 14
	<input type="checkbox"/> Fresh <input type="checkbox"/> Salty	<input type="checkbox"/> Sulphur <input type="checkbox"/> Minerals <input type="checkbox"/> Gas	<input type="checkbox"/> 19
	<input type="checkbox"/> Fresh <input type="checkbox"/> Salty	<input type="checkbox"/> Sulphur <input type="checkbox"/> Minerals <input type="checkbox"/> Gas	<input type="checkbox"/> 24
	<input type="checkbox"/> Fresh <input type="checkbox"/> Salty	<input type="checkbox"/> Sulphur <input type="checkbox"/> Minerals <input type="checkbox"/> Gas	<input type="checkbox"/> 29
	<input type="checkbox"/> Fresh <input type="checkbox"/> Salty	<input type="checkbox"/> Sulphur <input type="checkbox"/> Minerals <input type="checkbox"/> Gas	<input type="checkbox"/> 34

51 CASING & OPEN HOLE RECORD				
Inside diam inches	Material	Wall thickness inches	Depth - feet	
			From	To
<i>6 1/4</i>	<input checked="" type="checkbox"/> Steel <input type="checkbox"/> Galvanized <input type="checkbox"/> Concrete <input type="checkbox"/> Open hole <input type="checkbox"/> Plastic	<i>188</i>	<i>0</i>	<i>28</i>
	<input type="checkbox"/> Steel <input type="checkbox"/> Galvanized <input type="checkbox"/> Concrete <input type="checkbox"/> Open hole <input type="checkbox"/> Plastic			
	<input type="checkbox"/> Steel <input type="checkbox"/> Galvanized <input type="checkbox"/> Concrete <input type="checkbox"/> Open hole <input type="checkbox"/> Plastic			

SCREEN	Sizes of opening (Slot No.)	Diameter	Length
		inches	feet

61 PLUGGING & SEALING RECORD		
<input type="checkbox"/> Annular space <input type="checkbox"/> Abandonment		
Depth set at - feet	Material and type (Cement grout, bentonite, etc.)	
From	To	
<i>0</i>	<i>28</i>	<i>grout</i>

71 PUMPING TEST	Pumping test method	Pumping rate	Duration of pumping
	<input type="checkbox"/> Pump <input checked="" type="checkbox"/> Bailer	<i>20</i> GPM	<i>1</i> Hours <i>17</i> Mins
	Static level	Water level end of pumping	Water levels during
	<i>10</i> feet	<i>20</i> feet	<i>18</i> feet <i>20</i> feet <i>20</i> feet <i>20</i> feet
If flowing give rate	Pump intake set at	Water at end of test	
	<i>52</i> feet	<input type="checkbox"/> Clear <input checked="" type="checkbox"/> Cloudy	
Recommended pump type	Recommended pump setting	Recommended pump rate	
<input type="checkbox"/> Shallow <input checked="" type="checkbox"/> Deep	<i>30</i> feet	<i>15</i> GPM	



FINAL STATUS OF WELL

1 Water supply
2 Observation well
3 Test hole
4 Recharge well

5 Abandoned, insufficient supply
6 Abandoned, poor quality
7 Abandoned (Other)
8 Dewatering

9 Unfinished
10 Replacement well

WATER USE

1 Domestic
2 Stock
3 Irrigation
4 Industrial

5 Commercial
6 Municipal
7 Public supply
8 Cooling & air conditioning

9 Not used
10 Other

METHOD OF CONSTRUCTION

1 Cable tool
2 Rotary (conventional)
3 Rotary (reverse)
4 Rotary (air)

5 Air percussion
6 Boring
7 Diamond
8 Jetting

9 Driving
10 Digging
11 Other

Name of Well Contractor *Maurice Cayer LTD* Well Contractor's Licence No. *1517*
Address *Casselman ont.*
Name of Well Technician _____ Well Technician's Licence No. _____
Signature of Technician/Contractor *Maurice Cayer* Submission date *31 May 99*

MINISTRY USE ONLY

Data source _____ Contractor *1517* Date received *JUN 30 1999*
Date of inspection _____ Inspector _____
Remarks _____
CSS.ES9

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11

1530555

Municipality 15009 Con. CON 09

RP 4R-12661 part 5 & 6

County or District: Ottawa Carleton
Township/Borough/City/Town/Village: Orswoods
Con block tract survey, etc.: 9 East
Lot: 34
Address: 3760 RRI Metcalf Ont
Date completed: 21 May 99
York Corners RC Elevation RC Basin Code ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)					
General colour	Most common material	Other materials	General description	Depth - feet	
				From	To
grey	clay			0	29
grey	gravel	sand.		29	30
grey	limestone	rock		30	55
Brown					

31
32

41 WATER RECORD			
Water found at - feet	Kind of water		
53	<input checked="" type="checkbox"/> Fresh	<input type="checkbox"/> Sulphur	<input type="checkbox"/> Minerals
	<input type="checkbox"/> Salty	<input type="checkbox"/> Gas	

51 CASING & OPEN HOLE RECORD				
Inside diam inches	Material	Wall thickness inches	Depth - feet	
			From	To
6 1/4	Steel	188	0	32

SCREEN	Sizes of opening (Slot No.)	Diameter inches	Length feet

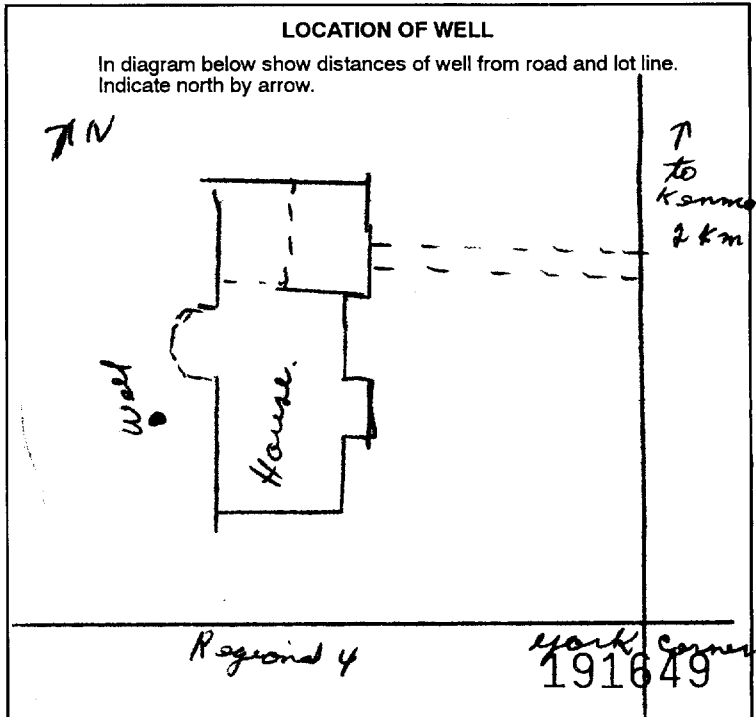
61 PLUGGING & SEALING RECORD			
Depth set at - feet		Material and type (Cement grout, bentonite, etc.)	
From	To		
0	32	grout.	

71 Pumping test method		Pumping rate	Duration of pumping
<input type="checkbox"/> Pump	<input checked="" type="checkbox"/> Bailer	30 GPM	1 Hours

PUMPING TEST	Static level	Water level end of pumping	Water levels during			
	19-21	22-24	15 minutes	30 minutes	45 minutes	60 minutes
	5 feet	15 feet	10 feet	12 feet	15 feet	15 feet

If flowing give rate		Pump intake set at	Water at end of test
GPM		55 feet	<input type="checkbox"/> Clear <input checked="" type="checkbox"/> Cloudy

Recommended pump type		Recommended pump setting	Recommended pump rate
<input type="checkbox"/> Shallow <input checked="" type="checkbox"/> Deep		25 feet	15 GPM



FINAL STATUS OF WELL

Water supply Abandoned, insufficient supply Unfinished

Observation well Abandoned, poor quality Replacement well

Test hole Abandoned (Other)

Recharge well Dewatering

WATER USE

Domestic Commercial Not used

Stock Municipal Other

Irrigation Public supply

Industrial Cooling & air conditioning

METHOD OF CONSTRUCTION

Cable tool Air percussion Driving

Rotary (conventional) Boring Digging

Rotary (reverse) Diamond Other

Rotary (air) Jetting

Name of Well Contractor: Maurice Cayer Ltd
Address: Casselman Ont.
Name of Well Technician: [Signature]
Signature of Technician/Contractor: Maurice Cayer
Well Contractor's Licence No.: 1517
Well Technician's Licence No.: [Blank]
Submission date: 20 May 99

MINISTRY USE ONLY

Data source: 1517
Contractor: 1517
Date received: JUN 30 1999
Date of inspection: [Blank]
Inspector: [Blank]
Remarks: [Blank]
CSS.ES9

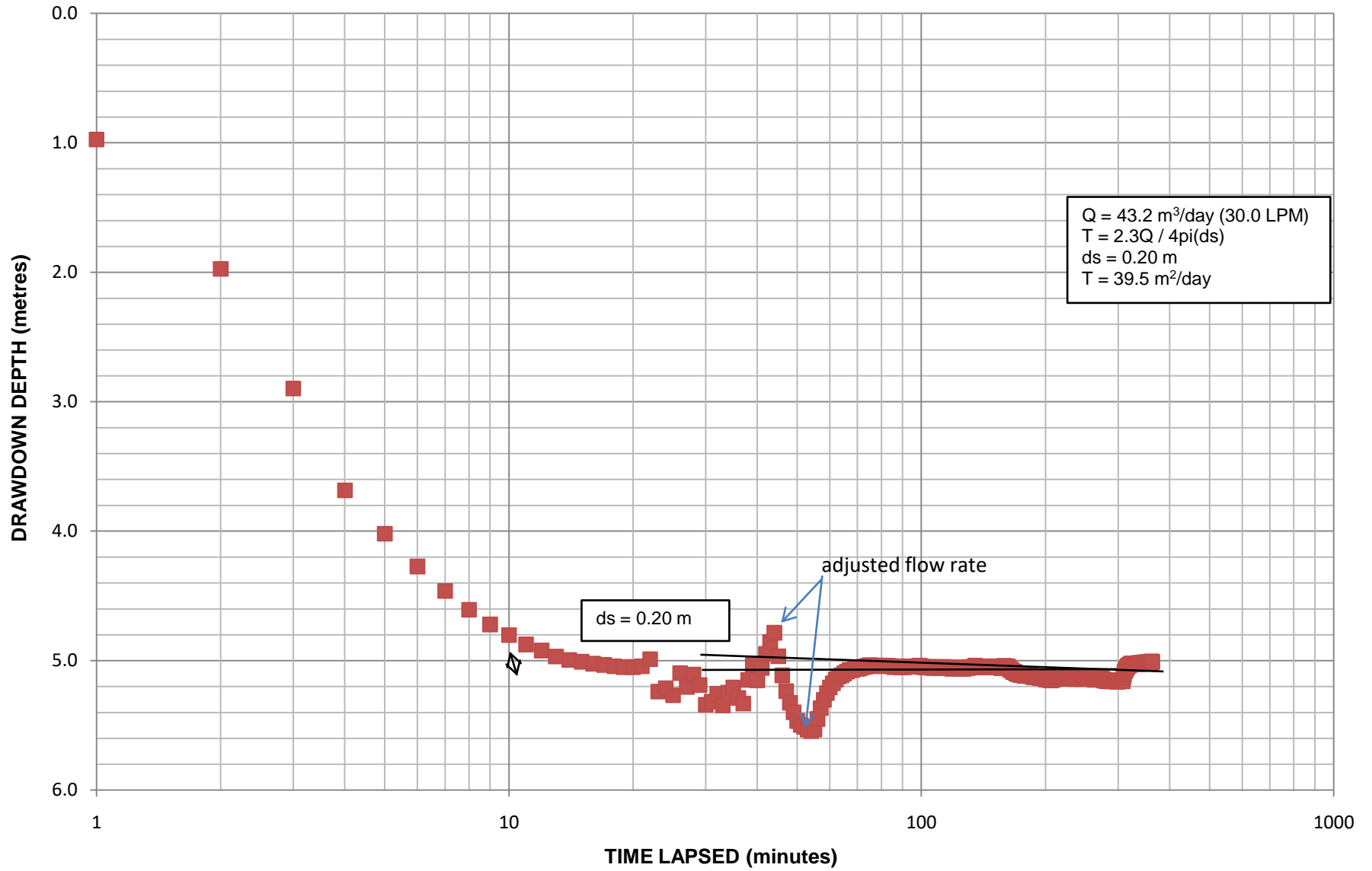


Ryan McCarlie
July 8, 2022

Hydrogeological and Terrain Study for Coach House
3674 York's Corners Road, Metcalfe, Ontario
220471

ATTACHMENT C
PUMPING TEST DATA

TW1-WELL DRAWDOWN VS. TIME-KOLLAARD FILE 220471



DRAWDOWN DATA TW1

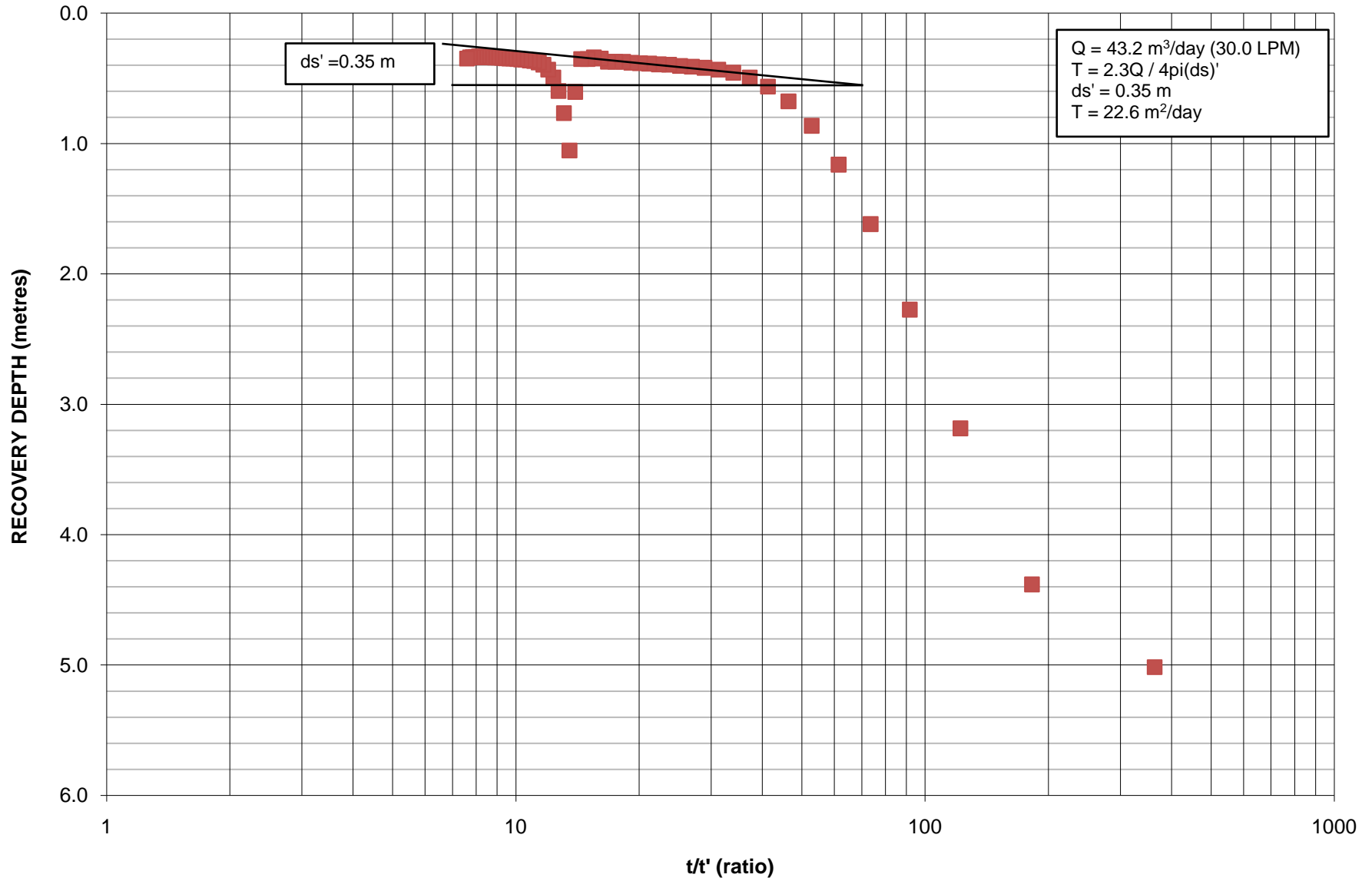
Time Lapsed (minutes)	Abs Pres (kPa)	Temp (°C)	Water Level (m)	Drawdown (m)
0	251.222	9.472	-3.09	0.00
1	241.671	9.472	-4.064	0.97
2	231.874	9.472	-5.063	1.97
3	222.801	9.373	-5.988	2.90
4	215.086	9.373	-6.775	3.69
5	211.802	9.373	-7.11	4.02
6	209.319	9.373	-7.363	4.27
7	207.464	9.373	-7.552	4.46
8	206.038	9.373	-7.697	4.61
9	204.925	9.373	-7.811	4.72
10	204.127	9.373	-7.892	4.80
11	203.414	9.373	-7.965	4.88
12	202.957	9.373	-8.012	4.92
13	202.501	9.373	-8.058	4.97
14	202.245	9.373	-8.084	4.99
15	202.098	9.275	-8.099	5.01
16	201.956	9.275	-8.114	5.02
17	201.87	9.275	-8.123	5.03
18	201.756	9.275	-8.134	5.04
19	201.699	9.275	-8.14	5.05
20	201.699	9.275	-8.14	5.05
21	201.756	9.275	-8.134	5.04
22	202.298	9.275	-8.079	4.99
23	199.846	9.275	-8.329	5.24
24	200.103	9.275	-8.303	5.21
25	199.561	9.275	-8.358	5.27
26	201.243	9.275	-8.186	5.10
27	200.188	9.275	-8.294	5.20
28	201.129	9.275	-8.198	5.11
29	200.331	9.275	-8.279	5.19
30	198.849	9.275	-8.431	5.34
31	199.077	9.275	-8.407	5.32
32	199.675	9.275	-8.346	5.26
33	198.792	9.275	-8.436	5.35
34	199.761	9.275	-8.338	5.25
35	200.16	9.275	-8.297	5.21
36	199.362	9.275	-8.378	5.29
37	198.934	9.275	-8.422	5.33
38	200.73	9.275	-8.239	5.15
39	201.87	9.275	-8.123	5.03
40	200.701	9.275	-8.242	5.15
41	201.642	9.275	-8.146	5.06
42	202.697	9.275	-8.038	4.95
43	203.609	9.275	-7.945	4.86
44	204.294	9.275	-7.875	4.79
45	202.526	9.275	-8.056	4.97
46	201.072	9.275	-8.204	5.11
47	199.875	9.275	-8.326	5.24
48	198.991	9.275	-8.416	5.33
49	198.279	9.275	-8.489	5.40
50	197.623	9.275	-8.556	5.47
51	197.31	9.275	-8.587	5.50
52	197.168	9.275	-8.602	5.51
53	196.968	9.275	-8.622	5.53
54	196.854	9.275	-8.634	5.54
55	196.968	9.275	-8.622	5.53
56	197.766	9.275	-8.541	5.45
57	198.592	9.275	-8.457	5.37
58	199.219	9.275	-8.393	5.30
59	199.732	9.275	-8.341	5.25
60	200.16	9.275	-8.297	5.21
61	200.473	9.275	-8.265	5.18
62	200.758	9.275	-8.236	5.15
63	200.986	9.275	-8.213	5.12
64	201.072	9.275	-8.204	5.11
65	201.214	9.275	-8.189	5.10
66	201.357	9.275	-8.175	5.09
67	201.471	9.275	-8.163	5.07
68	201.471	9.275	-8.163	5.07
69	201.585	9.275	-8.152	5.06
70	201.557	9.275	-8.154	5.06
71	201.614	9.275	-8.149	5.06
72	201.699	9.275	-8.14	5.05
73	201.728	9.275	-8.137	5.05
74	201.785	9.275	-8.131	5.04
75	201.842	9.275	-8.125	5.04
76	201.785	9.275	-8.131	5.04
77	201.756	9.275	-8.134	5.04
78	201.813	9.275	-8.128	5.04
79	201.813	9.275	-8.128	5.04
80	201.813	9.275	-8.128	5.04
81	201.785	9.275	-8.131	5.04
82	201.785	9.275	-8.131	5.04
83	201.785	9.275	-8.131	5.04
84	201.756	9.275	-8.134	5.04
85	201.756	9.275	-8.134	5.04
86	201.699	9.275	-8.14	5.05

87	201.728	9.275	-8.137	5.05
88	201.756	9.275	-8.134	5.04
89	201.671	9.275	-8.143	5.05
90	201.699	9.275	-8.14	5.05
91	201.699	9.275	-8.14	5.05
92	201.728	9.275	-8.137	5.05
93	201.728	9.275	-8.137	5.05
94	201.756	9.275	-8.134	5.04
95	201.728	9.275	-8.137	5.05
96	201.728	9.275	-8.137	5.05
97	201.756	9.275	-8.134	5.04
98	201.728	9.275	-8.137	5.05
99	201.813	9.275	-8.128	5.04
100	201.756	9.275	-8.134	5.04
101	201.699	9.275	-8.14	5.05
102	201.699	9.275	-8.14	5.05
103	201.671	9.275	-8.143	5.05
104	201.728	9.275	-8.137	5.05
105	201.699	9.275	-8.14	5.05
106	201.642	9.275	-8.146	5.06
107	201.642	9.275	-8.146	5.06
108	201.671	9.275	-8.143	5.05
109	201.671	9.275	-8.143	5.05
110	201.642	9.275	-8.146	5.06
111	201.642	9.275	-8.146	5.06
112	201.671	9.275	-8.143	5.05
113	201.728	9.275	-8.137	5.05
114	201.642	9.275	-8.146	5.06
115	201.614	9.275	-8.149	5.06
116	201.671	9.275	-8.143	5.05
117	201.671	9.275	-8.143	5.05
118	201.614	9.275	-8.149	5.06
119	201.557	9.275	-8.154	5.06
120	201.614	9.275	-8.149	5.06
121	201.671	9.275	-8.143	5.05
122	201.642	9.275	-8.146	5.06
123	201.642	9.275	-8.146	5.06
124	201.585	9.275	-8.152	5.06
125	201.671	9.275	-8.143	5.05
126	201.614	9.275	-8.149	5.06
127	201.557	9.275	-8.154	5.06
128	201.671	9.275	-8.143	5.05
129	201.642	9.275	-8.146	5.06
130	201.642	9.275	-8.146	5.06
131	201.699	9.275	-8.14	5.05
132	201.699	9.275	-8.14	5.05
133	201.699	9.275	-8.14	5.05
134	201.671	9.275	-8.143	5.05
135	201.813	9.275	-8.128	5.04
136	201.728	9.275	-8.137	5.05
137	201.728	9.275	-8.137	5.05
138	201.699	9.275	-8.14	5.05
139	201.728	9.275	-8.137	5.05
140	201.699	9.275	-8.14	5.05
141	201.699	9.275	-8.14	5.05
142	201.728	9.275	-8.137	5.05
143	201.756	9.275	-8.134	5.04
144	201.728	9.275	-8.137	5.05
145	201.671	9.275	-8.143	5.05
146	201.699	9.275	-8.14	5.05
147	201.671	9.275	-8.143	5.05
148	201.699	9.275	-8.14	5.05
149	201.728	9.275	-8.137	5.05
150	201.671	9.275	-8.143	5.05
151	201.699	9.275	-8.14	5.05
152	201.756	9.275	-8.134	5.04
153	201.728	9.275	-8.137	5.05
154	201.699	9.275	-8.14	5.05
155	201.671	9.275	-8.143	5.05
156	201.614	9.275	-8.149	5.06
157	201.699	9.275	-8.14	5.05
158	201.756	9.275	-8.134	5.04
159	201.785	9.275	-8.131	5.04
160	201.671	9.275	-8.143	5.05
161	201.699	9.275	-8.14	5.05
162	201.756	9.275	-8.134	5.04
163	201.642	9.275	-8.146	5.06
164	201.5	9.275	-8.16	5.07
165	201.5	9.275	-8.16	5.07
166	201.414	9.275	-8.169	5.08
167	201.328	9.275	-8.178	5.09
168	201.328	9.275	-8.178	5.09
169	201.3	9.275	-8.181	5.09
170	201.186	9.275	-8.192	5.10
171	201.214	9.275	-8.189	5.10
172	201.157	9.275	-8.195	5.11
173	201.129	9.275	-8.198	5.11
174	201.1	9.275	-8.201	5.11
175	201.1	9.275	-8.201	5.11
176	201.1	9.275	-8.201	5.11
177	201.072	9.275	-8.204	5.11
178	201.072	9.275	-8.204	5.11
179	201.043	9.275	-8.207	5.12

180	201.043	9.275	-8.207	5.12
181	201.072	9.275	-8.204	5.11
182	201.043	9.275	-8.207	5.12
183	201.072	9.275	-8.204	5.11
184	201.015	9.275	-8.21	5.12
185	201.043	9.275	-8.207	5.12
186	200.986	9.275	-8.213	5.12
187	200.929	9.275	-8.218	5.13
188	200.958	9.275	-8.216	5.13
189	200.958	9.275	-8.216	5.13
190	200.929	9.275	-8.218	5.13
191	200.929	9.275	-8.218	5.13
192	200.958	9.275	-8.216	5.13
193	200.872	9.275	-8.224	5.13
194	200.901	9.275	-8.221	5.13
195	200.872	9.275	-8.224	5.13
196	200.901	9.275	-8.221	5.13
197	200.872	9.275	-8.224	5.13
198	200.844	9.275	-8.227	5.14
199	200.872	9.275	-8.224	5.13
200	200.787	9.275	-8.233	5.14
201	200.758	9.275	-8.236	5.15
202	200.758	9.275	-8.236	5.15
203	200.758	9.275	-8.236	5.15
204	200.758	9.275	-8.236	5.15
205	200.701	9.275	-8.242	5.15
206	200.73	9.275	-8.239	5.15
207	200.701	9.275	-8.242	5.15
208	200.758	9.275	-8.236	5.15
209	200.787	9.275	-8.233	5.14
210	200.787	9.275	-8.233	5.14
211	200.844	9.275	-8.227	5.14
212	200.844	9.275	-8.227	5.14
213	200.872	9.275	-8.224	5.13
214	200.844	9.275	-8.227	5.14
215	200.872	9.275	-8.224	5.13
216	200.872	9.275	-8.224	5.13
217	200.872	9.275	-8.224	5.13
218	200.844	9.275	-8.227	5.14
219	200.872	9.275	-8.224	5.13
220	200.872	9.275	-8.224	5.13
221	200.872	9.275	-8.224	5.13
222	200.901	9.275	-8.221	5.13
223	200.872	9.275	-8.224	5.13
224	200.872	9.275	-8.224	5.13
225	200.901	9.275	-8.221	5.13
226	200.872	9.275	-8.224	5.13
227	200.844	9.275	-8.227	5.14
228	200.815	9.275	-8.23	5.14
229	200.844	9.275	-8.227	5.14
230	200.872	9.275	-8.224	5.13
231	200.872	9.275	-8.224	5.13
232	200.844	9.275	-8.227	5.14
233	200.872	9.275	-8.224	5.13
234	200.844	9.275	-8.227	5.14
235	200.844	9.275	-8.227	5.14
236	200.787	9.275	-8.233	5.14
237	200.815	9.275	-8.23	5.14
238	200.844	9.275	-8.227	5.14
239	200.872	9.275	-8.224	5.13
240	200.901	9.275	-8.221	5.13
241	200.844	9.275	-8.227	5.14
242	200.844	9.275	-8.227	5.14
243	200.844	9.275	-8.227	5.14
244	200.815	9.275	-8.23	5.14
245	200.787	9.275	-8.233	5.14
246	200.815	9.275	-8.23	5.14
247	200.815	9.275	-8.23	5.14
248	200.844	9.275	-8.227	5.14
249	200.844	9.275	-8.227	5.14
250	200.901	9.275	-8.221	5.13
251	200.872	9.275	-8.224	5.13
252	200.872	9.275	-8.224	5.13
253	200.901	9.275	-8.221	5.13
254	200.872	9.275	-8.224	5.13
255	200.815	9.275	-8.23	5.14
256	200.872	9.275	-8.224	5.13
257	200.872	9.275	-8.224	5.13
258	200.872	9.275	-8.224	5.13
259	200.844	9.275	-8.227	5.14
260	200.787	9.275	-8.233	5.14
261	200.815	9.275	-8.23	5.14
262	200.815	9.275	-8.23	5.14
263	200.73	9.275	-8.239	5.15
264	200.815	9.275	-8.23	5.14
265	200.815	9.275	-8.23	5.14
266	200.787	9.275	-8.233	5.14
267	200.787	9.275	-8.233	5.14
268	200.787	9.275	-8.233	5.14
269	200.872	9.275	-8.224	5.13
270	200.815	9.275	-8.23	5.14
271	200.815	9.275	-8.23	5.14
272	200.787	9.275	-8.233	5.14

273	200.844	9.275	-8.227	5.14
274	200.758	9.275	-8.236	5.15
275	200.787	9.275	-8.233	5.14
276	200.787	9.275	-8.233	5.14
277	200.701	9.275	-8.242	5.15
278	200.673	9.275	-8.245	5.16
279	200.673	9.275	-8.245	5.16
280	200.673	9.275	-8.245	5.16
281	200.673	9.275	-8.245	5.16
282	200.644	9.275	-8.248	5.16
283	200.673	9.275	-8.245	5.16
284	200.644	9.275	-8.248	5.16
285	200.616	9.275	-8.25	5.16
286	200.673	9.275	-8.245	5.16
287	200.616	9.275	-8.25	5.16
288	200.673	9.275	-8.245	5.16
289	200.644	9.275	-8.248	5.16
290	200.673	9.275	-8.245	5.16
291	200.644	9.275	-8.248	5.16
292	200.644	9.275	-8.248	5.16
293	200.673	9.275	-8.245	5.16
294	200.644	9.275	-8.248	5.16
295	200.673	9.275	-8.245	5.16
296	200.701	9.275	-8.242	5.15
297	200.644	9.275	-8.248	5.16
298	200.587	9.275	-8.253	5.16
299	200.616	9.275	-8.25	5.16
300	200.673	9.275	-8.245	5.16
301	200.644	9.275	-8.248	5.16
302	200.644	9.275	-8.248	5.16
303	200.701	9.275	-8.242	5.15
304	200.673	9.275	-8.245	5.16
305	200.616	9.275	-8.25	5.16
306	200.673	9.275	-8.245	5.16
307	200.644	9.275	-8.248	5.16
308	200.616	9.275	-8.25	5.16
309	200.929	9.275	-8.218	5.13
310	201.129	9.275	-8.198	5.11
311	201.357	9.275	-8.175	5.09
312	201.414	9.275	-8.169	5.08
313	201.528	9.275	-8.157	5.07
314	201.585	9.275	-8.152	5.06
315	201.671	9.275	-8.143	5.05
316	201.756	9.275	-8.134	5.04
317	201.756	9.275	-8.134	5.04
318	201.813	9.275	-8.128	5.04
319	201.842	9.275	-8.125	5.04
320	201.87	9.275	-8.123	5.03
321	201.899	9.275	-8.12	5.03
322	201.956	9.275	-8.114	5.02
323	201.956	9.275	-8.114	5.02
324	201.956	9.275	-8.114	5.02
325	201.956	9.275	-8.114	5.02
326	201.984	9.275	-8.111	5.02
327	201.956	9.275	-8.114	5.02
328	201.927	9.275	-8.117	5.03
329	201.956	9.275	-8.114	5.02
330	201.956	9.275	-8.114	5.02
331	201.956	9.275	-8.114	5.02
332	201.956	9.275	-8.114	5.02
333	201.927	9.275	-8.117	5.03
334	201.984	9.275	-8.111	5.02
335	201.956	9.275	-8.114	5.02
336	201.956	9.275	-8.114	5.02
337	202.013	9.275	-8.108	5.02
338	201.984	9.275	-8.111	5.02
339	201.927	9.275	-8.117	5.03
340	202.013	9.275	-8.108	5.02
341	201.984	9.275	-8.111	5.02
342	202.013	9.275	-8.108	5.02
343	202.013	9.275	-8.108	5.02
344	201.984	9.275	-8.111	5.02
345	202.013	9.275	-8.108	5.02
346	202.041	9.275	-8.105	5.02
347	202.013	9.275	-8.108	5.02
348	202.07	9.275	-8.102	5.01
349	202.041	9.275	-8.105	5.02
350	202.041	9.275	-8.105	5.02
351	202.013	9.275	-8.108	5.02
352	202.041	9.275	-8.105	5.02
353	202.041	9.275	-8.105	5.02
354	202.07	9.275	-8.102	5.01
355	202.07	9.275	-8.102	5.01
356	202.041	9.275	-8.105	5.02
357	202.041	9.275	-8.105	5.02
358	202.098	9.275	-8.099	5.01
359	202.013	9.275	-8.108	5.02
360	202.07	9.275	-8.102	5.01
361	202.07	9.275	-8.102	5.01
362	202.127	9.275	-8.096	5.01
363	202.07	9.275	-8.102	5.01

TW1- WELL RECOVERY VS. TIME - KOLLAARD FILE 220471



RECOVERY DATA TW-1

t'	t / t'	Abs Pres (kPa)	Temp (°C)	Water Level (m)	Drawdown (m)	Recovery (%)
1	364	202.041	9.275	-8.105	5.02	0%
2	182.5	208.259	9.275	-7.471	4.38	13%
3	122.0	219.996	9.275	-6.274	3.18	36%
4	91.8	228.918	9.275	-5.364	2.27	55%
5	73.6	235.358	9.275	-4.708	1.62	68%
6	61.5	239.827	9.275	-4.252	1.16	77%
7	52.9	242.751	9.275	-3.954	0.86	83%
8	46.4	244.586	9.275	-3.767	0.68	86%
9	41.3	245.704	9.275	-3.653	0.56	89%
10	37.3	246.363	9.275	-3.585	0.50	90%
11	34.0	246.736	9.275	-3.547	0.46	91%
12	31.3	246.966	9.275	-3.524	0.43	91%
13	28.9	247.109	9.275	-3.509	0.42	92%
14	26.9	247.195	9.275	-3.501	0.41	92%
15	25.2	247.253	9.275	-3.495	0.41	92%
16	23.7	247.339	9.275	-3.486	0.40	92%
17	22.4	247.367	9.275	-3.483	0.39	92%
18	21.2	247.425	9.275	-3.477	0.39	92%
19	20.1	247.453	9.275	-3.474	0.38	92%
20	19.2	247.482	9.275	-3.471	0.38	92%
21	18.3	247.568	9.275	-3.463	0.37	93%
22	17.5	247.568	9.275	-3.463	0.37	93%
23	16.8	247.568	9.275	-3.463	0.37	93%
24	16.1	247.798	9.275	-3.439	0.35	93%
25	15.5	247.884	9.275	-3.43	0.34	93%
26	15.0	247.769	9.275	-3.442	0.35	93%
27	14.4	247.769	9.275	-3.442	0.35	93%
28	14.0	245.302	9.275	-3.694	0.60	88%
29	13.5	240.888	9.275	-4.144	1.05	79%
30	13.1	243.697	9.275	-3.857	0.77	85%
31	12.7	245.36	9.275	-3.688	0.60	88%
32	12.3	246.363	9.275	-3.585	0.50	90%
33	12.0	246.966	9.275	-3.524	0.43	91%
34	11.7	247.339	9.275	-3.486	0.40	92%
35	11.4	247.511	9.275	-3.468	0.38	92%
36	11.1	247.626	9.275	-3.457	0.37	93%
37	10.8	247.654	9.275	-3.454	0.36	93%
38	10.6	247.712	9.275	-3.448	0.36	93%
39	10.3	247.74	9.275	-3.445	0.36	93%
40	10.1	247.769	9.275	-3.442	0.35	93%
41	9.9	247.798	9.275	-3.439	0.35	93%
42	9.6	247.798	9.275	-3.439	0.35	93%
43	9.4	247.826	9.275	-3.436	0.35	93%
44	9.3	247.855	9.275	-3.433	0.34	93%
45	9.1	247.884	9.275	-3.43	0.34	93%
46	8.9	247.884	9.275	-3.43	0.34	93%

47	8.7	247.912	9.275	-3.428	0.34	93%
48	8.6	247.912	9.275	-3.428	0.34	93%
49	8.4	247.912	9.275	-3.428	0.34	93%
50	8.3	247.912	9.275	-3.428	0.34	93%
51	8.1	247.97	9.275	-3.422	0.33	93%
52	8.0	247.941	9.275	-3.425	0.34	93%
53	7.8	247.912	9.275	-3.428	0.34	93%
54	7.7	247.884	9.275	-3.43	0.34	93%
55	7.6	247.798	9.275	-3.439	0.35	93%
1605		manual		-3.27	0.18	96%



ATTACHMENT D

WATER QUALITY TEST RESULTS AND STRONTIUM FACT SHEET



Environment Testing

Certificate of Analysis

Client: Kollaard Associates Inc.
210 Prescott St., Box 189
Kemptville, ON
K0G 1J0
Attention: Ms. Colleen Vermeersch
PO#: Kollaard Associates Inc.
Invoice to: Kollaard Associates Inc.

Report Number: 1978299
Date Submitted: 2022-06-02
Date Reported: 2022-06-09
Project: 220471
COC #: 891327

Page 1 of 9

Dear Colleen Vermeersch:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

Emma-
Dawn
Ferguson
2022.06.09
13:40:45
-04'00'

APPROVAL: _____
Emma-Dawn Ferguson, Chemist

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: <http://www.cala.ca/scopes/2602.pdf>.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is licensed by the Ontario Ministry of the Environment, Conservation, and Parks (MECP) for specific tests in drinking water (license #2318). A copy of the license is available upon request.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official provincial or federal guideline as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.



Environment Testing

Certificate of Analysis

Client: Kollaard Associates Inc.
 210 Prescott St., Box 189
 Kemptville, ON
 K0G 1J0
 Attention: Ms. Colleen Vermeersch
 PO#:
 Invoice to: Kollaard Associates Inc.

Report Number: 1978299
 Date Submitted: 2022-06-02
 Date Reported: 2022-06-09
 Project: 220471
 COC #: 891327

Group	Analyte	MRL	Units	Guideline	1628646 Water 2022-05-31 TW1-6hr
Anions	Cl	1	mg/L	AO 250	9
	F	0.10	mg/L	MAC 1.5	0.57
	N-NO2	0.10	mg/L	MAC 1.0	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	<0.10
	SO4	1	mg/L	AO 500	87
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 30-500	257
	Colour (True)	2	TCU		<2
	Conductivity	5	uS/cm		610
	pH	1.00		6.5-8.5	7.88
	Phenols	0.001	mg/L		<0.001
	S2-	0.01	mg/L	AO 0.05	<0.01
	TDS (COND - CALC)	1	mg/L	AO 500	396
Hardness	Turbidity	0.1	NTU	AO 5	0.9
	Hardness as CaCO3	1	mg/L	OG 80-100	331*
Indices/Calc Metals	Ion Balance	0.01			0.98
	Ag	0.0001	mg/L		<0.0001
	Al	0.01	mg/L	OG 0.1	<0.01
	As	0.001	mg/L	IMAC 0.01	<0.001
	B	0.01	mg/L	IMAC 5.0	0.25
	Ba	0.01	mg/L	MAC 1.0	0.04
	Be	0.0005	mg/L		<0.0005
	Ca	1	mg/L		65
	Cd	0.0001	mg/L	MAC 0.005	<0.0001
	Co	0.0002	mg/L		<0.0002
	Cr	0.001	mg/L	MAC 0.05	<0.001

Guideline = ODWSOG * = **Guideline Exceedence**

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Certificate of Analysis

Environment Testing

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 210 Prescott St., Box 189
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Metals	Cu	0.001	mg/L	AO 1	<0.001
	Fe	0.03	mg/L	AO 0.3	0.04
	Hg	0.0001	mg/L	MAC 0.001	<0.0001
	K	1	mg/L		7
	Mg	1	mg/L		41
	Mn	0.01	mg/L	AO 0.05	<0.01
	Mo	0.005	mg/L		<0.005
	Na	1	mg/L	AO 200	7
	Ni	0.005	mg/L		<0.005
	Pb	0.001	mg/L	MAC 0.010	<0.001
	Sb	0.0005	mg/L	IMAC 0.006	<0.0005
	Se	0.001	mg/L	MAC 0.05	<0.001
	Sr	0.001	mg/L		14.8
	Tl	0.0001	mg/L		<0.0001
Nutrients	U	0.001	mg/L	MAC 0.02	<0.001
	V	0.001	mg/L		<0.001
	Zn	0.01	mg/L	AO 5	0.03
	N-NH3	0.010	mg/L		0.208
	Total Kjeldahl Nitrogen	0.100	mg/L		0.663
Subcontract	Tannin & Lignin	1	mg/L		<1.0
	DOC	0.5	mg/L	AO 5	2.5

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 423035 Analysis/Extraction Date 2022-06-02 Analyst NF			
Method C SM2130B			
Turbidity	<0.1 NTU	100	70-130
Run No 423052 Analysis/Extraction Date 2022-06-02 Analyst SD			
Method EPA 200.8			
Silver	<0.0001 mg/L	104	80-120
Aluminum	<0.01 mg/L	103	80-120
Arsenic	<0.001 mg/L	103	80-120
Boron (total)	<0.01 mg/L	108	80-120
Barium	<0.01 mg/L	107	80-120
Beryllium	<0.0005 mg/L	103	80-120
Cadmium	<0.0001 mg/L	103	80-120
Cobalt	<0.0002 mg/L	110	80-120
Chromium Total	<0.001 mg/L	115	80-120
Copper	<0.001 mg/L	116	80-120
Iron	<0.03 mg/L	107	80-120
Mercury	<0.0001 mg/L	99	80-120
Manganese	<0.01 mg/L	105	80-120

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Molybdenum	<0.005 mg/L	105	80-120
Nickel	<0.005 mg/L	114	80-120
Lead	<0.001 mg/L	117	80-120
Antimony	<0.0005 mg/L	82	80-120
Selenium	<0.001 mg/L	99	80-120
Strontium	<0.001 mg/L	104	80-120
Thallium	<0.0001 mg/L	115	80-120
Uranium	<0.001 mg/L	102	80-120
Vanadium	<0.001 mg/L	110	80-120
Zinc	<0.01 mg/L	108	80-120
Run No 423081	Analysis/Extraction Date 2022-06-03	Analyst AsA	
Method C SM2120C			
Colour (True)	<2 TCU	104	80-120
Run No 423100	Analysis/Extraction Date 2022-06-06	Analyst AaN	
Method SM 4110			
Chloride	<1 mg/L	100	90-110
N-NO2	<0.10 mg/L	103	90-110
N-NO3	<0.10 mg/L	105	90-110

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 423155 Method EPA 351.2	Analysis/Extraction Date 2022-06-03	Analyst SKH	
Total Kjeldahl Nitrogen	0.101 mg/L	106	70-130
Run No 423177 Method C SM4500-S2-D	Analysis/Extraction Date 2022-06-06	Analyst AsA	
S2-	<0.01 mg/L	108	80-120
Run No 423185 Method EPA 350.1	Analysis/Extraction Date 2022-06-06	Analyst ML	
N-NH3	<0.010 mg/L	93	80-120
Run No 423197 Method M SM3120B-3500C	Analysis/Extraction Date 2022-06-06	Analyst Z S	
Calcium	<1 mg/L	106	90-110
Potassium	<1 mg/L	107	87-113
Magnesium	<1 mg/L	100	76-124
Sodium	<1 mg/L	112	82-118
Run No 423198 Method SM5530D/EPA420.2	Analysis/Extraction Date 2022-06-06	Analyst IP	
Phenols	<0.001 mg/L	103	50-120

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 423221 Method SM 4110	Analysis/Extraction Date 2022-06-07	Analyst AaN	
SO4	<5 mg/L	105	90-110
Run No 423249 Method SM2320,2510,4500H/F	Analysis/Extraction Date 2022-06-06	Analyst AsA	
Alkalinity (CaCO3)	<5 mg/L	100	90-110
Conductivity	<5 uS/cm	99	90-110
F	<0.10 mg/L	100	90-110
pH		99	90-110
Run No 423281 Method C SM2340B	Analysis/Extraction Date 2022-06-07	Analyst AET	
Hardness as CaCO3			
Ion Balance			
TDS (COND - CALC)			
Run No 423385 Method SUBCONTRACT-A	Analysis/Extraction Date 2022-06-07	Analyst AET	
Tannin & Lignin	<1.0 mg/L	103	
Run No 423455 Method SUBCONTRACT-CA-INORG	Analysis/Extraction Date 2022-06-08	Analyst AET	

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
DOC			

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Date Submitted: 2022-06-02
Date Reported: 2022-06-09
Project: 220471
COC #: 891327

Sample Comment Summary

Sample ID: 1628646 TW1-6hr SO4 MRL elevated due to matrix interference (dilution was done).

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Report Number: 1978303
Date Submitted: 2022-06-02
Date Reported: 2022-06-06
Project: 220471
COC #: 891327

Page 1 of 2

Dear Colleen Vermeersch:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:


Emma-Dawn
Ferguson
2022.06.06
10:05:07 -04'00'

APPROVAL: _____
Emma-Dawn Ferguson, Chemist

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: <http://www.cala.ca/scopes/2602.pdf>.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is licensed by the Ontario Ministry of the Environment, Conservation, and Parks (MECP) for specific tests in drinking water (license #2318). A copy of the license is available upon request.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official provincial or federal guideline as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.



Environment Testing

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Report Number: 1978303
 Date Submitted: 2022-06-02
 Date Reported: 2022-06-06
 Project: 220471
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Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0	1628660 Water 2022-05-31 TW1-6hr
	Heterotrophic Plate Count	0	ct/1mL		
	Total Coliforms	0	ct/100mL	MAC 0	

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Analytical Method: **AMBCOLM1**

additional QA/QC information available on request.

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STRONTIUM IN DRINKING WATER

Questions and Answers for the Public

WHAT IS STRONTIUM?

Strontium is a naturally occurring element that can be found nearly everywhere in the environment in small amounts. Air, dust, soil, foods, and drinking water can all contain traces of strontium. We are all exposed to some strontium; however, eating or drinking small amounts of strontium is not harmful. There is a radioactive form of strontium that does not occur in nature and is usually associated with nuclear power plants or nuclear weapons testing which is not discussed here.

Strontium is a naturally occurring element that is widely distributed in the environment and has been identified in many different minerals. Natural strontium is not radioactive and exists as a mixture of four stable isotopes (^{84}Sr , ^{86}Sr , ^{87}Sr , ^{88}Sr). Radioactive isotopes of strontium can be formed in nuclear reactors or during the explosion of nuclear weapons (^{90}Sr) while other radioactive isotopes (^{89}Sr) are made for use in medical imaging.^{1,2}

Strontium is the 15th most abundant element in the earth's crust, found at a concentration of approximately 0.04% and is present in sea water at a concentration of 0.0008% (or 8 mg/L). In its pure form, strontium is a hard white coloured metal; however, it is rarely found in its pure form in the earth's crust. Strontium dissolved in water is a result of water coming into contact (running through and/or over) rocks and/or soil containing strontium. Strontium readily reacts with water and oxygen and is often found as strontium carbonate (SrCO_3) and strontium sulphate (SrSO_4) in minerals but may also exist in other compounds such as strontium phosphate [$\text{Sr}_3(\text{PO}_4)_2$].^{1,2}

HOW CAN STRONTIUM GET INTO MY WELL WATER?

Some types of rock are rich in strontium. If there is water in this type of rock then the strontium will dissolve and move from the rock into the water. If a well draws water from strontium rich rock, the water will most likely contain higher than average levels of strontium. The amount of strontium within bedrock can vary so that some parts may be rich in strontium while others are not.

People may be exposed to low levels of strontium through eating food, drinking water, breathing air or ingesting small amounts of soil and dust containing strontium. Food and drinking water represent the main sources of exposure to strontium; however, the contribution from these sources can be highly variable.^{1,2}

The concentration of strontium in Canadian drinking water can vary greatly, depending on the anthropogenic activities and/or geological formations situated near the drinking water source. Drinking water from groundwater typically has a higher strontium concentration than drinking water sourced from surface water (lakes and rivers). A survey of strontium concentrations in drinking water measured in various location across Canada (from lakes, rivers and groundwater) found mean (185 µg/L), median (115 µg/L) and 75th percentile (250 µg/L) strontium concentrations in raw drinking water (n= 124; 41

samples from lakes, 48 from rivers, 35 from wells).² Dietary exposure to strontium among Canadian adults and young children (6 months to 4 years) were estimated to range from 19.1 – 26.7 (µg/kg bw/day) and 64.9 – 69.6 (µg/kg bw/day), respectively.² Grains, dairy products and leafy vegetables contribute the greatest percentage of dietary strontium to humans.¹

CAN STRONTIUM AFFECT MY HEALTH?

No health related effects from exposure to strontium have been observed at levels typically found in an average diet and the surrounding environment. Strontium is very similar to calcium and can, under certain conditions, replace calcium in the bone. Infants and young children with calcium and/or vitamin D deprived diets who ingest too much strontium can develop a strontium-related bone condition, called strontium rickets. Strontium rickets is a bone disorder that may weaken or soften bones, stunt growth or cause bone deformities. Individuals who do not get enough calcium and/or vitamin D are more susceptible to the effects of strontium.

Strontium has been shown to have both beneficial and adverse effects to the bone of animals and humans. Multiple clinical trials have observed that supplementation with strontium salts (strontium ranelate – a prescription drug approved in 2004 for use in the European Union for treating osteoporosis in the elderly but its use was later restricted) of 680 – 1,360 mg strontium per day resulted in improved bone density in osteoporotic patients.²

The adverse effects of strontium on bone formation are related to its chemical similarity to calcium.^{1,2} Because strontium is similar to calcium in terms of its chemical properties, shared metabolic pathways, and interactions with similar cellular and molecular components of the organism, strontium can replace calcium in bones, potentially causing rickets – a bone disorder that can weaken or soften bones, stunt growth, or cause bones deformities.^{2,3} The young are particularly susceptible to the effects of strontium due to the inability to discriminate between strontium and calcium during specific periods of bone formation and growth.¹

The Agency for Toxic Substances and Disease Registry (ATSDR) indicated that there are ‘...no harmful effects of stable strontium in humans at the levels typically found in the environment’; however, effects on bone can occur when children are both exposed to high concentrations (doses were not specified) of strontium while also experiencing calcium and vitamin D deficiencies.^{1,2} Although many animal studies (involving laboratory mice and rats) have observed bone abnormalities (rickets with reduce bone mineralization and osteoid accumulation) following exposure to high doses of strontium (through food, drinking water or supplements), only a few epidemiological studies have documented the effects of environmental exposure to strontium on humans. Health Canada summarized a study by Özgür et al. (1996) that reported a possible link between high strontium exposures and rickets in Turkish children aged 6 – 60 months (n = 2,140) living in an area with elevated concentrations of strontium in soil (> 350 ppm) and where nutrition was based primarily on grain cereals.^{2,4}

The toxic effects of strontium on bone formation may be reduced in the presence of elevated calcium in drinking water or through adequate levels of calcium in the diet. Sufficient levels of calcium and vitamin D in the body can lower the amount of strontium incorporated into bones, decreasing the likelihood of adverse effects of strontium on the bones of children with adequate calcium and vitamin D status.²

ARE THERE STANDARDS FOR STRONTIUM IN DRINKING WATER?

There are currently no Ontario standards for strontium in drinking water. There are no national standards for strontium in the United States, Europe or Australia. The World Health Organization also has not set a standard for strontium.

Health Canada recently developed a drinking water guideline for strontium. The maximum acceptable concentration (MAC) for strontium in drinking water is 7,000 µg/L (or 7 mg/L) to protect infants (identified as the most sensitive age group) from strontium-related adverse effects on bone formation. The MAC for strontium was developed using toxicity information from a study that investigated the effects of strontium on bones in young rats that were supplemented with strontium through their drinking water.

The United States Environmental Protection Agency (US EPA) does not currently have a federal drinking water standard for strontium; however, the US EPA reports a lifetime health advisory level (HAL) of 4,000 µg/L (or 4 mg/L).³ HALs are established for 1 day, 10 days, and life-time exposure periods and can be defined as 'an estimate of acceptable drinking water levels for a chemical substance based on health effects information. HALs are not a legally enforceable Federal standard, but serve as a technical guidance to assist Federal, State, and local officials.⁵ The lifetime HAL for strontium was based on a study in young rats where high strontium in the diet caused weakened bones. The dose at which no strontium related effects occur was taken from this study. This dose, the No-Observed-Adverse-Effect-Level (or NOAEL), was then reduced by a factor of 300 times, to be cautious when applying the study results to people, resulting in an oral reference dose (RfD) of 0.6 mg/kg/day.⁶ Assuming a body weight of 70 kg, a daily drinking water rate of 2 L/day and a 20% source allocation factor, a lifetime HAL of 4mg/L of strontium was derived.⁵

The [Health Canada Drinking Water Guidelines provide a maximum acceptable concentration \(MAC\) for strontium](#) of 7,000 µg/L (of 7 mg/L). The Health Canada MAC was derived to protect infants (identified as the most sensitive age group) from strontium-related adverse effects on bone formation (i.e., decreased bone mineralization) using toxicity information from Marie et al. (1985) who investigated the effects of strontium on bone mineralization rates in young weaning male rats supplemented with strontium (via drinking water) over a 9 week period.² From this study, a No-Observed-Adverse-Effect-Level (NOAEL) of 425,000 (µg/kg body weight/day) for the reduction in bone mineralization was identified. A 300-fold total uncertainty factor (10 for interspecies variability, 10 for intraspecies variability including sensitivities in pregnant women and adolescents, and 3 for database deficiencies) was applied to the NOAEL, resulting in a tolerable daily intake (TDI) for strontium of 1,417 (µg/kg body weight/day). Applying a drinking water source allocation factor of 0.5, an average body weight (of 7 kg) and a drinking water rate (of 0.75 L/day) for infants (age 0 to 6 months) to the TDI (of 1,417 µg/kg body weight/day), a MAC for strontium of 7,000 µg/L was developed.²

HOW DO I KNOW HOW MUCH STRONTIUM IS IN MY WELL WATER?

Water containing strontium will not taste, smell, or look different. If your water comes from a well, especially where the water has been running through strontium rich rock, it may contain a high level of strontium. In this case, testing the water for strontium will tell you how much is present.

Have your well water tested by an accredited laboratory to find out how much uranium, if any, is in your well water. A list of laboratories licensed to perform drinking water tests in Ontario is available at:

<https://www.ontario.ca/page/list-licensed-laboratories>. The laboratory will provide you with a sample bottle and instructions on how to take a sample.

WHAT SHOULD I DO IF STRONTIUM IS FOUND IN MY WELL WATER?

You are responsible for ensuring your well water is safe to drink.

If you live in a region with high strontium, you can obtain professional advice about ways to reduce strontium in your drinking water. There are forms of water treatment that are effective in reducing strontium levels in water. A water treatment professional should be consulted before you decide on what type of treatment may be suitable for your water supply. You can also use an alternative source of drinking water including bottled water or water from a public system.

Strontium exposure through skin contact or inhalation of vapours while showering or bathing does not pose a health risk. If drinking water contains high levels of strontium, there are methods to remove it.³

At a municipal scale, chemical precipitation, ion exchange, nanofiltration (NF) and reverse osmosis (RO) are potential available treatment technologies for total strontium reduction.^{2,3,7,8} Other strategies for reducing exposure to strontium include blending and interconnecting with another water system or switching to a new source.² On an individual residential basis, NF, RO or treatment devices using ion exchange would be effective at removing strontium.^{2,3,7,8} While organizations that like NSF have not certified technology for this purpose, the treatment technologies discussed here have demonstrated effectiveness and testing the treated water for strontium will demonstrate how effective it is for a given design and source water matrix. In addition to testing, metrics like conductivity could be used after calibration on a given system design on a specific source water matrix to indicate effectiveness of any ion reducing technologies, like RO and NF. It is noted that reverse osmosis systems should be installed only at the point of use as treated water maybe corrosive to plumbing components.^{2,3}

References for Strontium

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