



Kollaard Associates
Engineers

210 Prescott Street, Unit 1
P.O. Box 189
Kemptville, Ontario K0G 1J0

Civil • Geotechnical •
Structural • Environmental •
Hydrogeology •

(613) 860-0923

FAX: (613) 258-0475

REPORT ON

**HYDROGEOLOGICAL
STUDY
PROPOSED COACH HOUSE
2050 RIVER ROAD
OSGOODE WARD
CITY OF OTTAWA, ONTARIO**

Submitted to:

NG Real Estates Canada Inc.
1408-238 Besserer Street
Ottawa, Ontario
K1N 6B1

DATE February 3, 2020

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190830



February 3, 2020

190830

NG Real Estates Canada Inc.
1408-238 Besserer Street
Ottawa, Ontario
K1N 6B1

RE: HYDROGEOLOGICAL AND TERRAIN STUDY
PROPOSED COACH HOUSE
2050 RIVER ROAD
OSGOODE WARD
CITY OF OTTAWA, ONTARIO

Kollaard Associates Inc. was retained by NG Real Estates Canada Inc. to undertake a hydrogeological and terrain study for a proposed coach house on River Road in Ottawa, Ontario (Key Plan, Figure 1).

It is understood that it is being proposed to construct a coach house on the existing ~0.82 hectare (~2.04 acre) property. There is an existing dwelling on the property that is to be abandoned in favour of a new main house, coach house and a separate garage. A recently constructed well exists on the property. The main and coach houses will share both a well and a (proposed) sewage system. The attached Site Plan, Figure 2, indicates the approximate location of the proposed main house, proposed coach house, proposed garage, existing 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 there was sufficient water of acceptable quality to service the existing and proposed residential development. Kollaard Associates Inc. put down two test pits in the area of the proposed sewage system 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 recently constructed 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 guidelines; 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 dolomite and limestone of the Oxford Formation.

The surficial geology map indicates that the soil type at the site consists of fine textured glaciomarine deposits, consisting of silt and clay with minor sand and gravel.

Two test pits were put down at the site on August 17, 2017, using a hand shovel. The approximate locations of the test pits are shown on the attached Site Plan, Figure 2. The test pits encountered topsoil overlying silty clay. There was no groundwater intrusion into the test pits which were terminated at depths of 0.85 to 0.90 metres below existing ground surface. The test pit logs are provided as Table II.

A well record for the newly constructed well and a Certificate of Well Compliance were provided by the client (Attachment A). The well record indicates that the well was drilled on November 30, 2019 by Air Rock Drilling Co. Ltd. of Richmond, Ontario. The well was drilled to a depth of about 37.5 metres into a limestone aquifer with about 21.9 metres of casing set into the ground. The overburden depth at the well is indicated to be 20.1 metres.

Area Well Records

A review of five area well records was carried out. The well depths are indicated to be between 30 to 48 metres depth obtaining water from a limestone bedrock aquifer. These area wells are considered to be in the same formation as the subject well which is about 37.5 metres in depth. Test pumping rates indicated on the well records for wells were between 10 and 20 gpm (45 to 90 litres/minute). Overburden depth in area wells is about 16 to 21 metres, consisting of clay and boulders or glacial till (described as hardpan).

Water Quantity

A pumping test was carried out on December 12, 2019, at the well on the site which is currently not connected to any dwelling. The well is a drilled, cased well with about casing extended 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, total dissolved solids (conductivity) and turbidity. Chlorine residuals were measured prior to obtaining a water sample for lab submission and free chlorine was measured to be zero. 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 15.4 litres per minute. Over the course of the pumping test, the water level in the well dropped some 1.4 metres. At the end of



pumping, 90 percent recovery of the total drawdown in the static water level created during pumping was measured after about 3 hours, with 100 percent recovery occurring after ~5.5 hours.

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

It should be noted that the well response prior to, during and after the pumping test showed significant interference. Water levels fluctuated by about 1.6 metres. The test well is not connected to any pumps and is not yet in service. After inquiring with the property owner, it was confirmed that the adjacent property at 2052 River Road has a groundwater source heat pump. It is considered that the well interference was due to this well. The lowest the water level dropped was to about 3.9 metres below the top of well casing (compared to the static water level of 2.5 metres below top of casing measured prior to the test). The ability to interpret the data to determine transmissivity was compromised by the interference. However, the analysis is sufficient to demonstrate that the well is sufficient to provide water to the site.

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 about 280 to 1790 m²/day. However, the transmissivity value from the test is not reliable as the duration of the test and the pump rate used are not sufficient to accurately determine the aquifer transmissivity.

The test was sufficient to demonstrate that at a flow rate of 15.4 litres per minute, very little drawdown occurred in the well, indicating that the well could likely sustain a higher flow rate. 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 15.4 litres per minute. During the course of the six hour pumping period (and including the additional drawdown observed from external sources) about 5 percent of the available drawdown in the test well was utilized, based on the recommended pump depth at 30.5 metres and a static water level of 2.5 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 one bedroom and that the proposed coach house will contain one bedroom. It is presumed that the occupancy of each dwelling will consist of two people, for a total of four occupants (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/person/minute, equivalent to 15 litres/minute. This peak demand rate is assumed to occur for a period of two hours each day. The pump rate used for the test was slightly above this minimum test rate (15.4 L/min) and for 6 hours duration.



It is considered that sufficient available drawdown exists at the well for sustained pumping at 15 litres per minute without causing excessive drawdown at the well.

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 chemical, physical and bacteriological analyses of the water samples obtained from the test well are provided in Attachment C. A summary of the water quality measured in the field are provided as Table I, Water Quality Measurements for Test Well. The pH, TDS and temperature remained stable for the final three hours of the six hour test, indicating that water quality was stable. Consequently, the sample obtained after the six hour test was considered to be representative of expected water quality.

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 total dissolved solids (TDS), hardness and iron. The sodium level in the untreated water is 54 milligrams per litre, slightly above the 20 milligrams per litre level. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/l, so the information may be relayed to local physicians for those requiring a sodium-restricted diet.

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 is 276 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.

Total Dissolved Solids

The total dissolved solids (TDS) were measured at 536 milligrams per litre for the water sample obtained during the pumping test, above the ODWS of 500 milligrams per litre. The Ryznar Stability Index (RSI) and Langelier Saturation Index (LSI) were calculated for the sample and gave an RSI value of 6.8 and LSI of 0.7, indicating that the water has a small potential for scale formation. The effect of elevated TDS levels on drinking water palatability also depends on the individual components, which are principally chlorides, sulphates, calcium, magnesium and bicarbonates. Depending on which parameters are elevated, TDS exceedances can include hardness, taste, mineral deposition or corrosion. Elevated TDS may impact water palatability as the individual parameters (chlorides, sodium and hardness) contribute to the water palatability. Hardness, chlorides and sodium are all within their aesthetic objectives. Based on the above noted information regarding TDS and the corresponding RSI and LSI results, it is considered that the water supply is not corrosive or scale forming.



Iron

The iron level measured in the water sample was 0.42 milligrams per litre, above the ODWSOG aesthetic objective of 0.30 milligrams per litre. Elevated iron can cause discolouration of laundered goods, fixtures and the water and may produce an astringent taste and contribute to iron bacteria growth in water mains and service pipes. If iron related aesthetic issues occur, it can be reduced using ion exchange water softeners. The lab based turbidity was measured to be 3.0 NTU, compared to the field measured value of 0.8 NTU. It is considered that the elevated lab based turbidity result was likely due to the iron presence. Turbidity was within the aesthetic objective of 5 NTU.

Bacteriological Water Quality

Total coliforms were measured at a level of 4 counts per 100 millilitres after the pumping test. The water sample was obtained directly from a discharge hose after the pumping test. The well is also newly constructed. Bacteriological testing indicated that the water sample had 4 counts/100 ml of total coliforms. This MECP Procedure D-5-5 states the following with regards to total coliforms.

While the stated ODWS for Total Coliforms is 0 counts per 100 ml of sample, it is recognized that the objective had been set as an indicator of inadequate disinfection within the distribution systems associated with water works. For private water wells not subject to approval under the OWRA, the MOEE and Health Units have historically used the limit of <5 counts per 100 ml in the absence of a chlorine residual as indicating acceptable water quality.

The following is the City of Ottawa policy for well water with regards to total coliform levels of between 1 and 5 (and the absence of E. Coli).

Safety is doubtful on the basis of a single test. Safe for drinking only if testing of three samples collected one to three weeks apart shows no higher and the condition is judged stable, and the well is protected and located at least 30 m (100 ft.) away from any source of human or animal waste.

It is considered that the presence of total coliforms is related to the well being of recent construction and being stagnant at the time of the pumping test (December 2019). It is recommended that prior to servicing any future dwelling at the subject site, the well should be shock chlorinated. This is normally carried out by the plumber at the time the trench to the well is constructed and pump and electrical equipment is installed. Following chlorination, the water supply should be flushed to remove chlorine and a water sample should be submitted for testing of E.Coli and total coliforms.

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 hydrogeologic 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 2.04 acres (0.82 hectares). The lot size is less than one hectare. Therefore, the minimum lot size is not met. Test pits put down in the proposed sewage system area encountered 0.85 to 0.90 metres of soils including topsoil and silty clay. Surficial geology maps indicate the site is underlain by low permeable silt and clay deposits and well records for the site well and area wells indicate that the soil depth is between 16 to 21 metres for the site and surrounding area, consisting of clay and/or glacial till soils. There is likely an isolating layer at the site. However, to support isolation argument, further site investigation (including drilling and soil testing) would be required to support isolation criteria. It is sufficient to state that the site is not hydrogeologically sensitive given the extensive clay layer that overlies the water supply aquifer.

As a result, Step 3 should be used to address the development.

An assessment of the sewage attenuating capacity of the subject lands was carried out as follows. Topographic, soil and land cover infiltration factors were selected from Table 2 of the MECP Hydrogeological Technical Information Requirements for Land Development Applications (April 1995). The site is considered to be rolling (based on topographic survey carried out on the subject site by Kollaard Associates Inc.). A soil infiltration factor of 0.10 was used for the site based on the silty clay soils which exist at the subject property. The type of land cover at the site is considered to consist of a mixture of cultivated and woodland, due to the presence of mature trees across the site. In order to determine what the water surplus available on the site is expected to be, consideration is given to the type of overburden at the site. The City of Ottawa publishes historical water surplus data for various soil types, including silty clay, glacial till, sand and fractured bedrock. In this case, the predominant soil cover across the site is expected to be silty clay soils. The City of Ottawa Water Surplus Data for silty clay indicates that the average surplus for 1993 – 2003 is 307.6 millimetres. That value was used to estimate the net potential infiltration rate (NPI) for the site.



Using the above noted information and the lot size (excluding the post-development hard surface area), the expected impact of septic systems at this site was determined by considering the attenuation of nitrate in the effluent from an assumed 10 milligrams per litre (mg/l) (NO_3 as N) after secondary treatment to the property boundary by dilution as a result of the infiltration of meteoric water only. The results of the calculations indicate that the expected concentration of nitrate at the site boundary due to the sewage system is about 9.9 milligrams per litre (Attachment D). This is the expected nitrate concentration at the down gradient property boundary. In this case, the down gradient property boundary is the Rideau River. There are no down gradient wells. Consequently, the impairment of down gradient water resources is unlikely to occur at this site.

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.



Results and Recommendations

The water quality has hardness, total dissolved solids and iron. Sodium is above the medical advisory limit of 20 mg/l for those on sodium restricted diets. Water softening by conventional sodium ion exchange is recommended to reduce hardness and iron. However, it 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.

It is also required to chlorinate the well after it is connected to the dwelling and a pump installed.

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 proposed 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 1	Summary of Hourly Field Water Quality
	Table 2	Test Pit Logs
	Figure 1	Key Plan
	Figure 2	Site Plan
	Attachment A	TW1-Well Record for Site and Area Wells
	Attachment B	TW1-Pumping Test Data
	Attachment C	TW1-Laboratory Water Testing Results
	Attachment D	Septic Effluent Dilution Calculations

TABLE I
FIELD WATER QUALITY MEASUREMENTS
FOR TEST WELL

Time Since Pumping Test Started (min)	Temp. (°C)	pH	Turbidity (NTU)	Total Dissolved Solids (ppm)	Conductivity (µS)	Free chlorine (ppm)
60	-	-	-	-	-	-
120	9.2	6.7	11.7	320	636	-
180	9.2	7.0	4.5	333	665	0.0
240	9.7	6.9	1.7	350	695	-
300	9.7	7.0	1.3	352	690	-
360	9.8	7.2	0.8	357	720	0.0



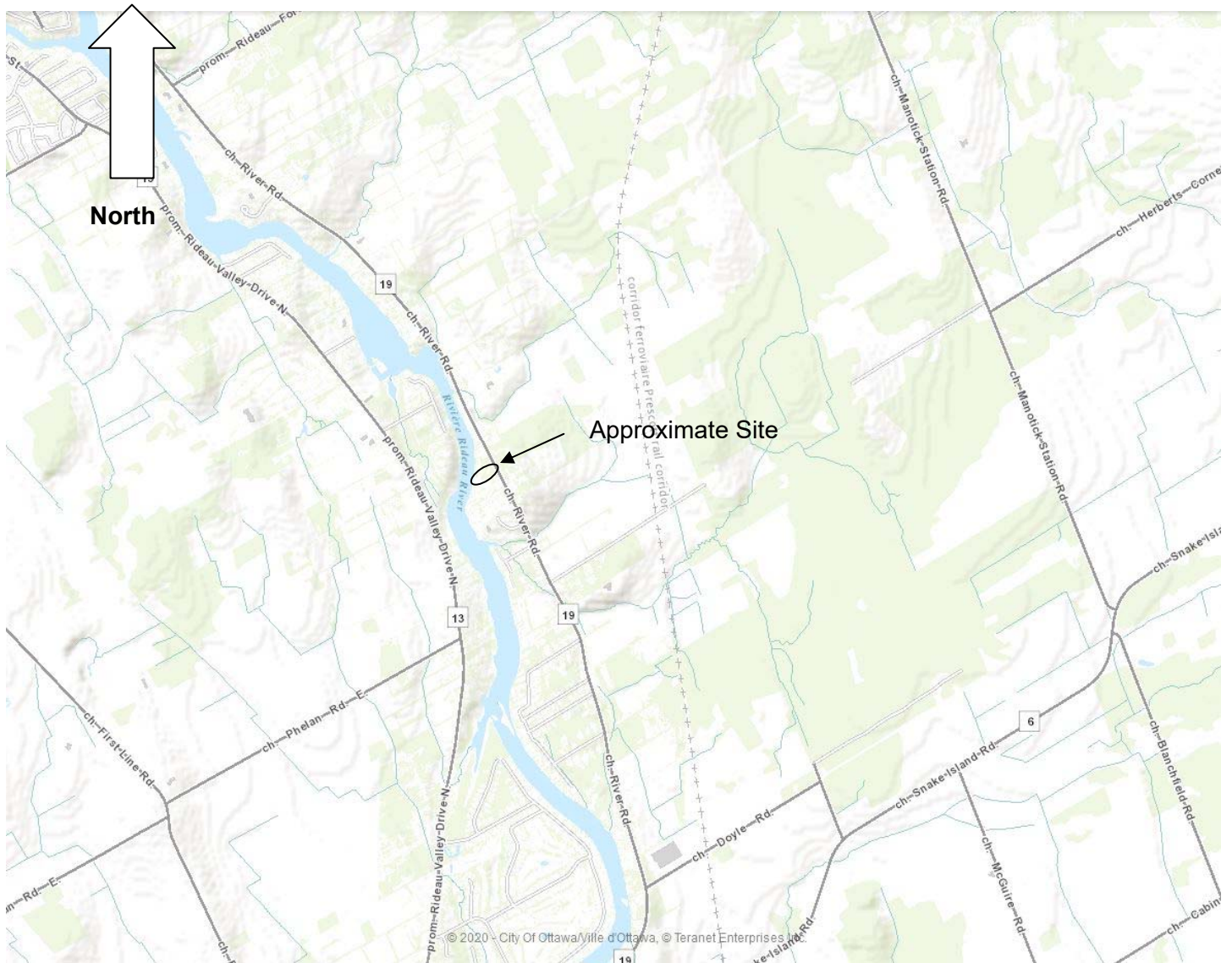
TABLE II

RECORD OF TEST PITS
2050 RIVER ROAD
CITY OF OTTAWA, ONTARIO

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP1	0.0 – 0.25	TOPSOIL
	0.25 – 0.65	Grey brown SILTY CLAY, trace sand
	0.65 – 0.90	Grey brown SILTY CLAY
	0.90	End of test pit
Test pit dry, August 17, 2017.		
TP2	0.0 – 0.30	TOPSOIL
	0.30 – 0.85	Grey brown SILTY CLAY trace sand
	0.85	End of test pit
Test pit dry, August 17, 2017.		

KEY PLAN

FIGURE 1

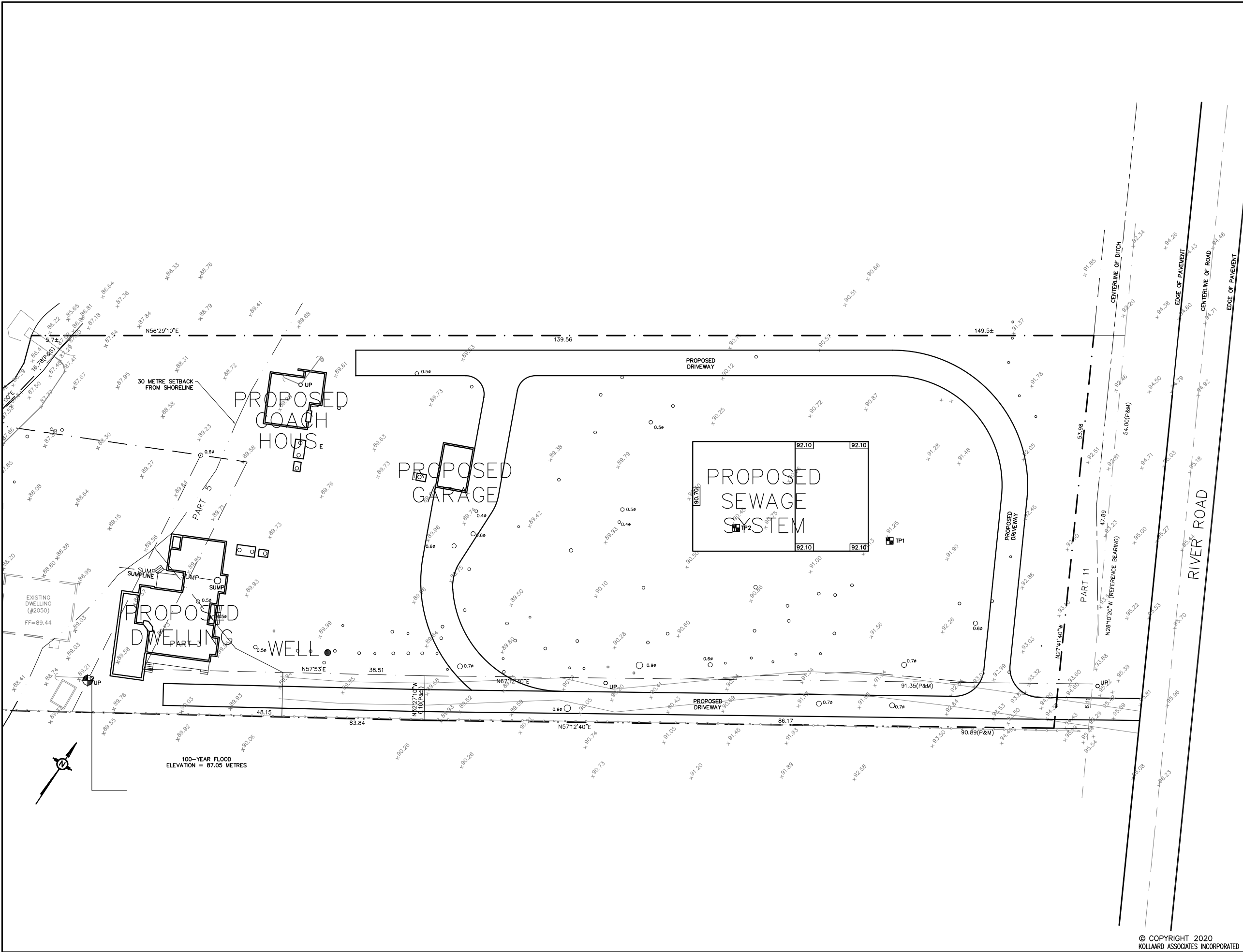


NOT TO SCALE



Kollaard Associates
Engineers

Project No. 190830
Date February 2020



DRAWING NUMBER:
FIGURE 2, SITE PLAN

● Well (location approximate)

REV.	NAME	DATE	DESCRIPTION
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Kollaard Associates

Engineers

210 PRESCOTT STREET
 PO BOX 189
 KEMPTVILLE ONTARIO
 K0G 1J0

(613) 860-0923

 FAX (613) 258-0475
 www.kollaard.ca
 info@kollaard.ca

CLIENT:
NG REAL ESTATES CANADA INC

PROJECT:
HYDROGEOLOGY AND TERRRAIN STUDY

LOCATION:
2050 RIVER ROAD
R.PLAN 4R-18646, PARTS 1-7
LOT 13, CONC. 1,
OSGOODE,
CITY OF OTTAWA, ONTARIO

DESIGNED BY: —	DATE: FEB 2020
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DRAWN BY: CV	SCALE: NTS
-----------------	---------------

KOLLAARD FILE NUMBER:
190830



ATTACHMENT A
MOE WELL RECORD AND CERTIFICATE OF WELL COMPLIANCE
FOR TEST WELL
AND
MOE AREA WELL RECORDS

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization NG Real Estates Canada Inc.	E-mail Address	<input type="checkbox"/> Well Constructed by Well Owner
Mailing Address (Street Number/Name) 1408-238 Besserer street	Municipality Ottawa	Province ON	Postal Code K1N 6B1

Well Location

Address of Well Location (Street Number/Name) 2050 River Road	Township Osgoode	Lot P/L 13	Concession 1
County/District/Municipality Ottawa Carleton	City/Town/Village Manotick	Province Ontario	Postal Code
UTM Coordinates Zone Easting NAD 83 18 450021	Northings 5004857	Municipal Plan and Sublot Number 4R-18646	Other Part 1-7

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m)
Grey	Clay			0' to 10'
	Sand & Gravel	Boulders		10' to 66'
Grey	Black Limestone			66' to 80'
Grey	Black Limestone			80' to 99'
Grey	Black Limestone			99' to 114'
Grey	Black Limestone			114' to 123'

Annular Space			
Depth Set at (m)	Type of Sealant Used (Material and Type)	Volume Placed (m³)	
72' to 82'	Neat cement	10.9	
82' to 0'	Bentonite slurry	25.2	

Method of Construction		Well Use	
<input type="checkbox"/> Cable Tool <input type="checkbox"/> Rotary (Conventional) <input type="checkbox"/> Rotary (Reverse) <input type="checkbox"/> Boring <input checked="" type="checkbox"/> Air percussion <input type="checkbox"/> Other, specify	<input type="checkbox"/> Diamond <input type="checkbox"/> Jetting <input type="checkbox"/> Driving <input type="checkbox"/> Digging	<input checked="" type="checkbox"/> Public <input type="checkbox"/> Domestic <input type="checkbox"/> Livestock <input type="checkbox"/> Irrigation <input type="checkbox"/> Industrial <input type="checkbox"/> Other, specify	<input type="checkbox"/> Commercial <input type="checkbox"/> Not used <input type="checkbox"/> Municipal <input type="checkbox"/> Dewatering <input type="checkbox"/> Test Hole <input type="checkbox"/> Monitoring <input type="checkbox"/> Cooling & Air Conditioning

Construction Record - Casing				Status of Well	
Inside Diameter (cm)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm)	Depth (m)	From	To
6 1/4"	Steel	.188"	+2'	72'	
6 1/8"	Open Hole		72'	123'	

<input checked="" type="checkbox"/> Water Supply <input type="checkbox"/> Replacement Well <input type="checkbox"/> Test Hole <input type="checkbox"/> Recharge Well <input type="checkbox"/> Dewatering Well <input type="checkbox"/> Observation and/or Monitoring Hole <input type="checkbox"/> Alteration (Construction) <input type="checkbox"/> Abandoned, Insufficient Supply <input type="checkbox"/> Abandoned, Poor Water Quality <input type="checkbox"/> Abandoned, other, specify <input type="checkbox"/> Other, specify
--

Construction Record - Screen			
Outside Diameter (cm)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m)
			From To

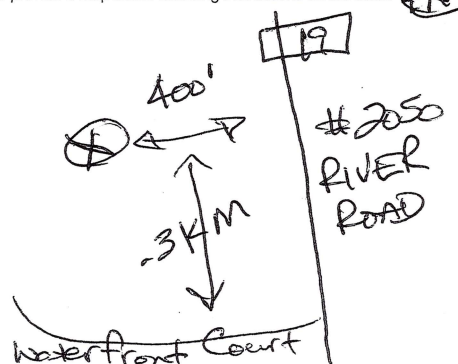
Water Details		Hole Diameter	
Water found at Depth 80' (m)	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested	Depth (m)	Diameter (cm)
Water found at Depth 99' (m)	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested	0' to 72'	9 3/4"
Water found at Depth 114' (m)	Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested	72' to 123'	6 1/8"

Well Contractor and Well Technician Information			
Business Name of Well Contractor Air Rock Drilling Co. Ltd.	Well Contractor's Licence No. 7881		
Business Address (Street Number/Name) 6559 Franktown Road	Municipality Richmond		
Province ON	Postal Code K0A 2Z0	Business E-mail Address air-rock@sympatico.ca	
Bus. Telephone No. (inc. area code) 6138382170	Name of Well Technician (Last Name, First Name) Hogan, Dan		
Well Technician's Licence No. T3058	Signature of Technician and/or Contractor	Date 2019 11 30	

Results of Well Yield Testing				
d, water was: and free Not tested ued, give reason:	Draw Down		Recovery	
	Time (min)	Water Level (m/ft)	Time (min)	Water Level (m/ft)
Static Level	11.8"			30.5"
	1	18.8	1	18.3
(m/ft)	2	21.7	2	14.6
(GPM)	3	23.2	3	13.6
	4	24.3	4	13.1
min	5	25.2	5	12.9
of pumping (m/ft)	10	27	10	12.4
(min / GPM)	15	28	15	11.8
	20	28.5	20	11.8
p depth (m/ft)	25	29	25	11.8
p rate	30	29.4	30	11.8
(l/min / GPM)	40	29.8	40	11.8
	50	30.2	50	11.8
	60	30.5"	60	11.8"

Map of Well Location

Please provide a map below following instructions on the back.

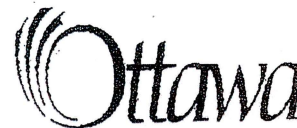


Comments:

3/4HP-15 GPM Set @ 100 ft

Well owner's information		Ministry Use Only	
Date Package Delivered 2019 10 31	Audit No. 2316938		
Date Work Completed 2019 10 28	Received		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			

CERTIFICATE OF WELL COMPLIANCE



I (Jeremy Hanna) AIR ROCK DRILLING CO. LTD. - DO HEREBY CERTIFY

that I am licensed to drill water wells in the Province of Ontario, and that I have supervised the drilling of the water well on the property of :

OWNER: NG REAL ESTATES CANADA INC.

Location: # 2050 RIVER ROAD, Manotick

LOT: Part 13 CON: 1 PLAN # 4R-18646 # Part 1 to 7

Ottawa-Carleton / Geographical Township of Osgoode

I CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

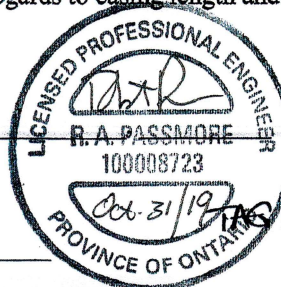
Signed this 28TH Day of OCTOBER, 2019

Jeremy Hanna (T3632)

Air Rock Drilling Co. Ltd. (C-7681)

The Engineer on behalf of the Landowner set out above, Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg 903, this report and the Hydrogeological Report with regards to casing length and grouting requirements.

Signed this 31ST day of October, 2019

(Engineer)

2019741
A274430



Shaping our future together
Ensemble, formons notre avenir

City of Ottawa
Client Service Centre
8782 Victoria Street

Ville d'Ottawa
Centre de service
8782 rue Victoria

[Go Back to Map](#)

Well ID

Well ID Number: 7268610

Well Audit Number: Z223103

Well Tag Number: A195951

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	2052 RIVER RD
Township	OSGOODE TOWNSHIP
Lot	
Concession	
County/District/Municipality	OTTAWA-CARLETON
City/Town/Village	OSGOODE
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 18 Easting: 450016.00 Northing: 5004814.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
----------------	----------------------	-----------------	---------------------	------------	----------

BRWN	SAND	STNS		0 ft	10 ft
BRWN	SAND	STNS	TILL	10 ft	19 ft
GREY	GRVL	SAND	BLDR	19 ft	75 ft
GREY	LMSN			75 ft	134 ft

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 ft	45 ft	BENTONITE GROUT	
44 ft	55 ft	CEMENT GROUT	
55 ft	76 ft	BENTONITE GROUT	

Method of Construction & Well Use

Method of Construction	Well Use
Air Percussion	
ROTARY MUD	Domestic

Status of Well

Water Supply

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
6.25 inch	STEEL	-2 ft	76 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
------------------	----------	------------	----------

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 4879

Results of Well Yield Testing

After test of well yield, water was	OTHER
If pumping discontinued, give reason	
Pump intake set at	120 ft
Pumping Rate	16 GPM
Duration of Pumping	1 h:0 m
Final water level	15.14 ft
If flowing give rate	
Recommended pump depth	80 ft
Recommended pump rate	15 GPM
Well Production	
Disinfected?	Y

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL	12.2 ft		
1	13.55 ft	1	13.6 ft
2	13.62 ft	2	13.59 ft
3	13.75 ft	3	13.5 ft
4	13.88 ft	4	13.42 ft
5	13.92 ft	5	13.34 ft
10	14.21 ft	10	13.23 ft
15	14.35 ft	15	13.09 ft
20	14.47 ft	20	13.06 ft
25	14.55 ft	25	12.94 ft
30	14.72 ft	30	12.88 ft
40	14.85 ft	40	12.82 ft
45		45	
50	14.98 ft	50	12.7 ft
60	15.14 ft	60	12.7 ft

Water Details

Water Found at Depth	Kind
124 ft	Untested

Hole Diameter

Depth From	Depth To	Diameter
76 ft	134 ft	6 inch

Audit Number: Z223103

Date Well Completed: July 18, 2016

Date Well Record Received by MOE: August 12, 2016

Updated: October 29, 2019

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Tags

- [Environment and energy](#),
- [Drinking water](#)



[Ministry of the Environment, Conservation and Parks](#)

The Ministry of the Environment, Conservation and Parks works to protect and sustain the quality of Ontario's air, land, and water. We also coordinate Ontario's actions on climate change in the name of healthier communities, ecological protection and economic prosperity.

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twitter

316/49.



WATER RESOURCES
DIVISION
15 No
JUL 6 1964
ONTARIO WATER
RESOURCES COMMISSION

7077

UTM, 18Z 449980E

Lot 5R 5004740N

Elev. 4R 0295

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin 25 Carleton

Township, Village, Town or City Osgoode

County or District

Pt of South half

Date completed 17

Apr

64

(day)

month

year)

16 Monkland Ave., Ottawa, Ont.

Casing and Screen Record

Inside diameter of casing 2"
Total length of casing 71'
Type of screen -
Length of screen -
Depth to top of screen -
Diameter of finished hole 2"

Pumping Test

Static level 5"
Test-pumping rate 15 G.P.M.
Pumping level 20 feet
Duration of test pumping 1 hour
Water clear or cloudy at end of test clear
Recommended pumping rate 5 G.P.M.
with pump setting of 40 feet below ground surface

Well Log

Overburden and Bedrock Record

Clay and gravel
Boulders, sand & gravel
Grey limestone

From
ft.To
ft.Depth(s) at
which water(s)
foundKind of water
(fresh, salty,
sulphur)

155

fresh

0

5

5

69

69

157

Water Record

For what purpose(s) is the water to be used? Cottage

Is well on upland, in valley, or on hillside? valley

Drilling or Boring Firm J.B. DUFRESNE & CO. LTD.,

1014 Maitland Ave.,

Address Ottawa 5, Ont.

Licence Number 1307

Name of Driller or Borer F. Cossette

Address 1510 BaseLine Road, Ottawa, Ont.

Date 8 May, 1964

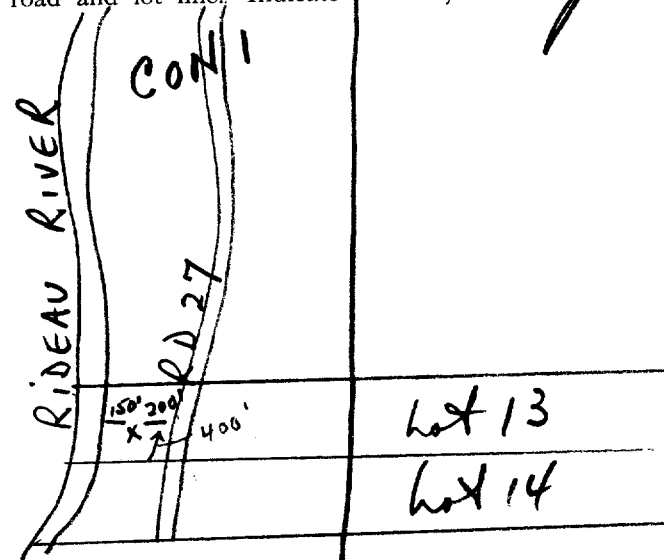
(Signature of Licensed Drilling or Boring Contractor)

Form 7 10M-62-1152

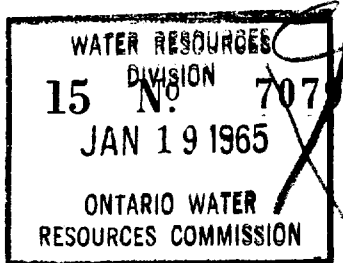
OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



316/49



UTM 11812 449980E
CON BF
LO 15135004749N
Elev. 41R 0290

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin 25
County or District Carleton Township, Village, Town or City Osgoode
Con. 1 BF Lot 13 Date completed 22 September 1964.
(day month year)
Address 251 Melwood Ave., Ottawa.

Casing and Screen Record

Inside diameter of casing 5"
Total length of casing 54' of 5" & 19'10" of 4"
Type of screen nil
Length of screen nil
Depth to top of screen nil
Diameter of finished hole 4"

Pumping Test

Static level 23'
Test-pumping rate 10 G.P.M.
Pumping level 25'
Duration of test pumping 1 hour
Water clear or cloudy at end of test cloudy
Recommended pumping rate 10 G.P.M.
with pump setting of 30' feet below ground surface

Well Log

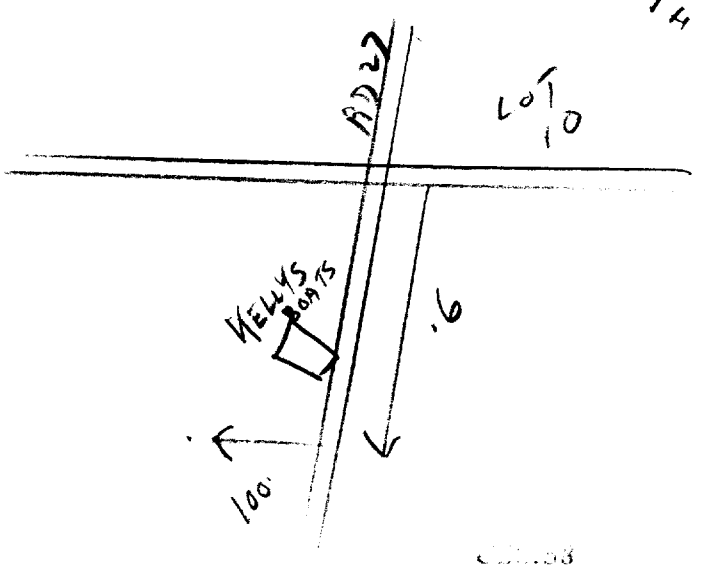
Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
<u>Clay & Boulders</u>	<u>0'</u>	<u>54'</u>		
<u>Broken Limestone</u>	<u>54'</u>	<u>60'</u>		
<u>Limestone</u>	<u>60'</u>	<u>98'</u>	<u>98'</u>	<u>fresh</u>

For what purpose(s) is the water to be used? Cottage
Is well on upland, in valley, or on hillside? Upland
Drilling or Boring Firm Blair Phillips Drilling Co., Ltd.
Address 1119 Balaise Rd., Ottawa
Licence Number 1474
Name of Driller or Borer J. Moore
Address Kars
Date 22 Sept 1964
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.





ATTACHMENT B
PUMPING TEST DATA



ATTACHMENT C
WATER QUALITY RESULTS

Certificate of Analysis

Client: Kollaard Associates Inc.
210 Prescott St., Box 189
Kemptville, ON
K0G 1J0
Attention: Ms. Colleen Vermeersch
PO#: 190830
Invoice to: Kollaard Associates Inc.

Report Number: 1922699
Date Submitted: 2019-12-13
Date Reported: 2019-12-20
Project: 190830
COC #: 198964

Page 1 of 5

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:

APPROVAL: _____

Addrine Thomas, Inorganics Supervisor

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

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Kemptville, ON
K0G 1J0
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PO#: 190830
Invoice to: Kollaard Associates Inc.

Report Number: 1922699
Date Submitted: 2019-12-13
Date Reported: 2019-12-20
Project: 190830
COC #: 198964

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1472115 Water 2019-12-12 2050 River Road
Group	Analyte	MRL	Units	Guideline	
Anions	Cl	1	mg/L	AO 250	104
	F	0.10	mg/L	MAC 1.5	0.85
	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	55
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	221
	Colour	2	TCU	AO 5	3
	Conductivity	5	uS/cm		824
	DOC	0.5	mg/L	AO 5	0.8
	pH	1.00		6.5-8.5	8.16
	S2-	0.01	mg/L	AO 0.05	0.04
	TDS (COND - CALC)	1	mg/L	AO 500	536*
	Turbidity	0.1	NTU	AO 5.0	3.0
Hardness	Hardness as CaCO3	1	mg/L	OG 100	276*
Indices/Calc	Ion Balance	0.01			0.94
Metals	Ca	1	mg/L		48
	Fe	0.03	mg/L	AO 0.3	0.42*
	K	1	mg/L		5
	Mg	1	mg/L		38
	Mn	0.01	mg/L	AO 0.05	<0.01
	Na	2	mg/L	AO 200	54
Nutrients	N-NH3	0.010	mg/L		0.155
Subcontract-Inorg	Phenols	0.001	mg/L		<0.001
	Tannin & Lignin	0.1	mg/L		<0.1
	Total Kjeldahl Nitrogen	0.1	mg/L		0.2

Guideline = ODWSOG
*** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Certificate of Analysis

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 377458 Analysis/Extraction Date 2019-12-13 Analyst AAR Method C SM2130B			
Turbidity	<0.1 NTU	100	70-130
Run No 377484 Analysis/Extraction Date 2019-12-13 Analyst K_J Method SM2320,2510,4500H/F			
Alkalinity (CaCO ₃)	<5 mg/L	103	90-110
Conductivity	<5 uS/cm	100	90-110
F	<0.10 mg/L	107	90-110
pH		99	90-110
Run No 377547 Analysis/Extraction Date 2019-12-17 Analyst K_J Method SM 5310B			
DOC	<0.5 mg/L	100	80-120
Run No 377551 Analysis/Extraction Date 2019-12-17 Analyst K_J Method C SM2120C			
Colour	<2 TCU	105	90-110
Run No 377574 Analysis/Extraction Date 2019-12-17 Analyst AET Method C SM4500-S2-D			
S2-	<0.01 mg/L	92	80-120

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Certificate of Analysis

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PO#: 190830
Invoice to: Kollaard Associates Inc.

Report Number: 1922699
Date Submitted: 2019-12-13
Date Reported: 2019-12-20
Project: 190830
COC #: 198964

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 377619 Analysis/Extraction Date 2019-12-17 Analyst REE Method SUBCONTRACT P-INORG			
Phenols	<0.001 mg/L	96	69-132
Tannin & Lignin	<0.1 mg/L	90	
Total Kjeldahl Nitrogen	<0.1 mg/L	99	81-126
Run No 377659 Analysis/Extraction Date 2019-12-18 Analyst SKH Method M SM3120B-3500C			
Calcium	<1 mg/L	105	90-110
Potassium	<1 mg/L	96	87-113
Magnesium	<1 mg/L	105	76-124
Sodium	<2 mg/L	106	82-118
Run No 377705 Analysis/Extraction Date 2019-12-18 Analyst Z_S Method SM 4110			
N-NO2	<0.10 mg/L	98	90-110
N-NO3	<0.10 mg/L	109	90-110
SO4	<1 mg/L	100	90-110
Run No 377713 Analysis/Extraction Date 2019-12-18 Analyst AET Method EPA 350.1			
N-NH3	<0.010 mg/L	110	80-120

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PO#: 190830
Invoice to: Kollaard Associates Inc.

Report Number: 1922699
Date Submitted: 2019-12-13
Date Reported: 2019-12-20
Project: 190830
COC #: 198964

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 377734 Analysis/Extraction Date 2019-12-19 Analyst Z_S Method SM 4110			
Chloride	<1 mg/L	100	90-110
Run No 377745 Analysis/Extraction Date 2019-12-19 Analyst AET Method C SM2340B			
Hardness as CaCO ₃			
Ion Balance			
TDS (COND - CALC)			
Run No 377746 Analysis/Extraction Date 2019-12-19 Analyst H_D Method EPA 200.8			
Iron	<0.03 mg/L	97	91-109
Manganese	<0.01 mg/L	99	92.9-107

Guideline = ODWSOG

* = Guideline Exceedence

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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: 1922710
Date Submitted: 2019-12-13
Date Reported: 2019-12-16
Project: 190830
COC #: 198964

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:

APPROVAL:

Dragana Dzeletovic-Andic, Microbiology

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K0G 1J0
Attention: Ms. Colleen Vermeersch
PO#:
Invoice to: Kollaard Associates Inc.

Report Number: 1922710
Date Submitted: 2019-12-13
Date Reported: 2019-12-16
Project: 190830
COC #: 198964

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1472200 Water 2019-12-12 2050 River Road
Group	Analyte	MRL	Units	Guideline	
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0	0
	Faecal Coliforms	0	ct/100mL		0
	Heterotrophic Plate Count	0	ct/1mL		67
	Total Coliforms	0	ct/100mL	MAC 0	4*

Guideline = ODWSOG

* = Guideline Exceedence

Results relate only to the parameters tested on the samples submitted.

Analytical Method: AMBCOLM1

additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range



ATTACHMENT D
SEPTIC DILUTION CALCULATIONS



SEPTIC EFFLUENT DILUTION CALCULATIONS

Number of Lots 1
Gross Site Area 8255 m²

Hard Surface Area Post-Development: 271
Net Surface Area 7984

Infiltration Reduction Factor:

Topography (rolling) 0.20
Soil (clay) 0.10
Cover (cultivated/woodland mix) 0.15
Total 0.45

NPI (for silty clay) 307.60

Septic Dilution For 1 Septic Systems:

$$\frac{\text{Number of Lots} \times 365 \text{ m}^3 \text{ Effluent Per Year} \times 40 \text{ mg/L NO}_3}{\text{Number of Lots} \times 365 \text{ m}^3 \text{ Effluent Per Year} + (\text{Net Infiltration Area} \times \text{NPI} \times \text{IRF})} = 9.9 \text{ mg/L NO}_3$$