TECHNICAL MEMORANDUM

DATE April 20, 2018 **PROJECT NO.** 1776275-5000

TO Claridge Homes Corporation

FROM Loren Bekeris and Brian Byerley **EMAIL** Loren_Bekeris@golder.com; Brian_Byerley@golder.com

DESKTOP HYDROGEOLOGICAL IMPACT ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
1981 MAPLE GROVE ROAD, STITTSVILLE, ONTARIO

This report presents the results of a desktop hydrogeological assessment carried out for the proposed residential development site north of Maple Grove Road in Ottawa, Ontario. It is understood that the hydrogeological assessment is required for draft plan approval.

The purpose of this hydrogeological assessment was to review the general soil and groundwater conditions across this site, by means of existing data from on-site test pits, and to address possible construction-related impacts to private water supply wells. The on-site information was enhanced with published mapping and publicly available information. The water well records in the Ministry of the Environment and Climate Change (MOECC) Water Well Information System (WWIS) were used to provide further information regarding hydrogeological conditions in the area and identify where nearby water well users may be in use.

1.0 DESCRIPTION OF PROJECT AND SITE

Plans are being prepared to construct a residential development to be located north of Maple Grove Road in Stittsville, Ontario. The project limits for the proposed development are shown on Figure 1.

The following is known about the site and proposed development:

- The site is located at the west end of Maple Grove Road.
- The site measures about 310 metres by 280 metres in plan area.
- The site has a relatively flat topography, is currently undeveloped, and is mostly vegetated with brush and mature trees.
- It is understood that the development will include a combination of single family homes and townhouse blocks.
- A City park will be located within the northeast corner of the site.

2.0 GEOLOGY AND HYDROGEOLOGY

The following sections describe the published local geology and hydrogeology in the vicinity of the site.

2.1 Surficial Geology

Based on published mapping (Figure 2), the surficial geology at the site is interpreted to consist of mostly shallow bedrock, except in the southeast corner where glacial till is mapped. Published mapping indicates the bedrock surface to be at depths in the range of 0 to 3 metres below the ground surface across the site (Figure 3).

2.2 Bedrock Geology

The Ontario Geological Survey bedrock geology mapping indicates that the site is underlain by the Bobcaygeon Formation limestone.

2.3 Hydrogeology

2.3.1 Overburden Aquifer

The shallow overburden deposits in the area are generally not capable of supplying sufficient quantities of groundwater to be considered an aquifer. As a result, the principal water supply aquifer within the vicinity of the site is considered to be the underlying bedrock formations.

2.3.2 Bedrock Aquifers

The Bobcaygeon formation is generally considered to provide a poor to moderate yield of potable water. Well yields in this formation have been reported from less than 10 to 15 L/min. Generally, the Bobcaygeon formation is capable of providing sufficient yields for domestic water supplies. Groundwater flow in the Bobcaygeon formation is controlled predominantly by fractures, as the massive crystalline limestone layers generally provide little to no water.

3.0 SITE SPECIFIC GEOLOGY AND HYDROGEOLOGY

3.1 General

Golder Associates completed a geotechnical investigation at this site in 2017, which included 9 test pits advanced across the site.

Based on a review of the geotechnical investigation results and published geological mapping, the subsurface conditions at the site are interpreted to consist of silty sand and sand over limestone bedrock. The Record of Test Pits is included as Table 1, and test pit locations are indicated on Figure 1.

3.2 Site Specific Geology

Topsoil and Fill

A surficial layer of topsoil exists at the ground surface at all of the test pit locations. The topsoil ranges from about 130 to 400 millimetres in thickness.

Silty Sand and Sand

Deposits of sand and silty sand exist below the topsoil at all of the test pit locations, except test pits 17-07 and 17-08. Where encountered, these sandy layers were found to have thicknesses varying from about 0.4 to 2.0 metres.

At test pit 17-03, cobbles and boulders were encountered at depths between about 0.7 and 2.1 metres below the existing ground surface. The boulders were noted to be between about 0.5 and 1.5 metres in diameter.

Bedrock

Refusal to excavating was encountered at all of the test pit locations at depths ranging from about 0.3 to 2.1 metres below the existing ground surface. At test pits 17-01, 17-02, 17-05, 17-07, 17-08, and 17-09, the bedrock could be excavated between about 0.1 and 0.9 metres below the bedrock surface.

The following table summarizes the ground surface, depth to refusal, and refusal elevations as encountered at the test pit locations.

Test Pit Number	Ground Surface Elevation (masl)	Bedrock Surface Depth (m)	Refusal Depth (mbgs)	Refusal Elevation (masl)
17-01	107.5	1.2	2.1	105.4
17-02	107.2	1.1	2.0	105.2
17-03	107.8	2.1	2.1	105.7
17-04	107.2	1.3	1.3	105.9
17-05	107.9	1.0	1.3	106.6
17-06	108.1	0.8	0.8	107.3
17-07	111.1	0.3	0.3	110.8
17-08	109.4	0.4	0.4	109.0
17-09	108.9	1.5	1.8	107.1

Notes: masl: metres above sea level; mbgs: metres below ground surface

3.3 Hydrogeology

Groundwater seepage was observed in test pits 17-01, 17-02, 17-03, 17-04 and 17-05 at depths of about 1.0 to 2.1 metres below the existing ground surface. Based on the materials encountered in the test pits, the water table is interpreted to lie near the interface of the sand and silty sand and the underlying bedrock.

It should be noted that groundwater levels are expected to fluctuate seasonally. Higher groundwater levels are expected during wet periods of the year, such as spring.

4.0 POTENTIAL IMPACTS TO EXISTING GROUNDWATER USERS

At the time of this assessment, the final design details for the proposed development were not available; therefore, the maximum depth of the proposed infrastructure (sewer and watermain) was assumed to be approximately 5 metres below ground surface. The water table was found to be at an average of 1.3 metres below ground surface; therefore, approximately 3.7 metres of dewatering will be required during construction of site services. Assuming the maximum hydraulic conductivity of the silty sand and sand or underlying bedrock is 10^{-5} metres/second, the maximum radius of influence associated with this dewatering is approximately 35 metres (at a distance of 35 metres, less than 0.1 metre of water level drawdown would occur after 14 days of dewatering). To ensure a conservative assessment of potential impacts to groundwater users, existing groundwater users within 100 metres of the site were considered.

4.1 Nearby Groundwater Supply Wells

There are a total of two wells in the WWIS database that were constructed as water supply wells, located within 100 metres of the site (see Figure 1). Based on aerial photographs and information from the well records, Well ID 1513368 appears to correspond with the residence at 1939 Maple Grove Road, and Well ID 1534762 appears to correspond with the residence at 1919 Maple Grove Road. Details regarding these water supply wells (based on information in the WWIS) are presented in the following table.

Well ID	Depth of Well (mbgs)	Depth to Static Water Level (mbgs)	Depth to Water Found (mbgs)	Available Drawdown (metres)	Type of Well
1513368	22.3	6.1	10.7, 14.6 and 21.9	16.2	Bedrock
1534762	39.6	5.0	36.9	34.6	Bedrock

Notes: mbgs: metres below ground surface

The available drawdown in Well ID 1513368 and Well ID 1534762, calculated as the difference between the static water level and the depth of the well, is 16.2 and 34.6 metres respectively. A temporary drawdown in the water table, due to construction dewatering for the installation of services, would affect groundwater levels within the overburden or bedrock within 5 metres of ground surface. It could also temporarily reduce the available drawdown in the water supply wells, but not likely to the degree that could negatively impact water supply. The “depth to water found” (10.7 to 36.9 mbgs) and the available drawdown (16.2 and 34.6 metres) indicate that construction of site services within 5 metres of ground surface would not likely impact the water supply wells. It is understood that there are no structures or land uses planned for the site that would permanently lower the groundwater levels in the area surrounding the site (i.e., deep drained foundations).

4.2 Recommended Monitoring Program

Prior to construction at the site, it is recommended that a well survey be completed at the residences at 1927 and 1939 Maple Grove Road. Information to be collected during the well survey could include the depth of the well, type of pump, and static water level. Water quality samples could be collected and analyzed for a typical suite of parameters (i.e. the ‘subdivision package’ as per MOECC Procedure D-5-5).

5.0 LIMITATIONS AND USE OF MEMORANDUM

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6.0 CLOSURE

We trust this submission satisfies the requirements for a desktop hydrogeological assessment of the proposed residential subdivision development at 1981 Maple Grove Road, in Stittsville, Ontario. If you have any questions regarding this report, please contact the undersigned.

GOLDER ASSOCIATES LTD.

LICENSED PROFESSIONAL ENGINEER
Apr. 20/18
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PROVINCE OF ONTARIO

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SPS/LEB/BTB/sg
https://golderassociates.sharepoint.com/sites/16628g/deliverables/hydrogeology/1776275-tm-rev 1-hydrogeology assessment_20apr2018.docx

Attachments: Table 1 – Record of Test Pits
Figure 1 – Site Plan
Figure 2 – Surficial Geology
Figure 3 – Drift Thickness

TABLE 1

RECORD OF TEST PITS

TEST PIT NUMBER (ELEVATION – METRES)	DEPTH (METRES)	DESCRIPTION
17-01 (107.49)	0.00 – 0.35 0.35 – 1.20 1.20 – 2.10 2.10	TOPSOIL – (SM) SILTY SAND; dark brown; moist (SM) SILTY SAND, trace gravel; brown; non-cohesive, moist Weathered LIMESTONE BEDROCK End of Test Pit – Refusal to excavating on LIMESTONE BEDROCK Note: Groundwater inflow at 1.2 metres depth Sample 1 – Depth (m) 0.9
17-02 (107.22)	0.00 – 0.40 0.40 – 1.05 1.05 – 1.95 1.95	TOPSOIL – (SM) SILTY SAND; dark brown; moist (SM) SILTY SAND, trace gravel; brown; non-cohesive; moist Weathered LIMESTONE BEDROCK End of Test Pit – Refusal to excavating on LIMESTONE BEDROCK Note: Groundwater inflow at 1.1 metres depth Sample 1 – Depth (m) 0.6

TABLE 1

RECORD OF TEST PITS

TEST PIT NUMBER (ELEVATION – METRES)	DEPTH (METRES)	DESCRIPTION
17-03 (107.80)	0.00 – 0.13 0.13 – 0.72 0.72 – 2.10 2.10	TOPSOIL – (SM) SILTY SAND; dark brown; moist (SM) SILTY SAND; brown; non-cohesive, moist (SM) SILTY SAND, some gravel; grey-brown, contains cobbles and boulders; non-cohesive, moist End of Test Pit – Refusal to excavating on LIMESTONE BEDROCK Note: 1) Groundwater inflow at 2.10 metres depth 2) Boulders: 0.5 to 1.5 metres in diameter Samples: 1, 2 — Depth (m): 0.5, 1.5
17-04 (107.16)	0.00 – 0.32 0.32 – 1.00 1.00 – 1.30 1.30	TOPSOIL – (SM) SILTY SAND; dark brown, moist (SM) SILTY SAND, trace gravel; brown; non-cohesive, moist (SM) SILTY SAND, some gravel; grey-brown; non-cohesive, moist End of Test Pit – Refusal to excavating on slightly weathered LIMESTONE BEDROCK Note: Water seeping in from top of bedrock Samples: 1, 2 — Depth (m): 0.50, 1.20

TABLE 1

RECORD OF TEST PITS

TEST PIT NUMBER (ELEVATION – METRES)	DEPTH (METRES)	DESCRIPTION
17-05 (107.90)	0.00 – 0.35 0.35 – 0.97 0.97– 1.25 1.25	TOPSOIL – (SM) SILTY SAND; dark brown, moist (SP) SAND, some fines; brown; non-cohesive, moist Weathered LIMESTONE BEDROCK End of Test Pit – Refusal to excavating on LIMESTONE BEDROCK Note: Water seeping in from top of weathered bedrock at 0.97 metres depth Samples: 1 — Depth (m): 0.5
17-06 (108.10)	0.00 – 0.35 0.35 – 0.63 0.63 – 0.75 0.75	TOPSOIL – (SM) SILTY SAND; dark brown; moist (SP) SAND, some fines, trace gravel; brown; non-cohesive, moist (SM) SILTY SAND, trace gravel; grey-brown; non-cohesive; moist End of Test Pit – Refusal to excavating on LIMESTONE BEDROCK Samples: 1, 2 — Depth (m): 0.6, 0.7

TABLE 1

RECORD OF TEST PITS

TEST PIT NUMBER (ELEVATION – METRES)	DEPTH (METRES)	DESCRIPTION
17-07 (111.07)	0.00 – 0.24 0.24 – 0.33 0.33	TOPSOIL – (SM) SILTY SAND; dark brown, moist Weathered LIMESTONE BEDROCK End of Test Pit – Refusal to excavating on LIMESTONE BEDROCK Note: Test pit dry upon completion Samples Depth (m) No Samples Taken
17-08 (109.38)	0.00 – 0.24 0.24 – 0.42 0.42	TOPSOIL – (SM) SILTY SAND; dark brown; moist Weathered LIMESTONE BEDROCK End of Test Pit – Refusal to excavating on LIMESTONE BEDROCK Note: Test pit dry upon completion Samples Depth (m) No Samples Taken

TABLE 1
RECORD OF TEST PITS

TEST PIT NUMBER (ELEVATION – METRES)	DEPTH (METRES)	DESCRIPTION
17-09 (108.85)	0.00 – 0.35 0.35 – 1.20 1.20 – 1.50 1.50 – 1.80 1.80	TOPSOIL – (SM) SILTY SAND; dark brown; moist (SM) SILTY SAND; brown; non-cohesive, moist (SP) SAND, trace fines; grey-brown; non-cohesive, moist Weathered LIMESTONE BEDROCK End of Test Pit – Refusal to excavating on LIMESTONE BEDROCK Note: Test pit dry upon completion Samples: 1, 2 Depth (m): 0.45, 1.4

https://golderassociates.sharepoint.com/sites/16628g/deliverables/geotechnical/final/1776275 record of test pits final.docx

KEY MAP

SCALE 1:50,000

LEGEND

- APPROXIMATE TEST PIT LOCATION
- MOECC WATER WELL LOCATION
- ROADWAY
- SITE BOUNDARY
- 100 METRE BUFFER ZONE

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2014
2. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28

0 25 50 100
1:2,500 METRES

CLIENT
CLARIDGE HOMES CORPORATION

PROJECT
HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
1981 MAPLE GROVE ROAD, STITTSVILLE, ONTARIO

TITLE
SITE PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2018-04-20
DESIGNED	----
PREPARED	JEM/BR
REVIEWED	SPS
APPROVED	BTB

PROJECT NO.	CONTROL	REV.	FIGURE
1776275	0006	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 0 25mm

348900 349000 349100 349200 349300 349400 349500 349600

5015300 5015200 5015100 5015000 5014900 5014800 5014700 5014600

7 1A R2

TP 17-01 TP 17-02 TP 17-03 TP 17-04 TP 17-05 TP 17-06 TP 17-07 TP 17-08 TP 17-09

1534762 1513368

JOHNWOODS ST MIKA ST MAPLE GROVE RD CANDOW CRES ALON ST DENALI WAY TONY GEORGE PL STITTSVILLE MAIN ST

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KEY MAP

SCALE 1:50,000

LEGEND

- APPROXIMATE TEST PIT LOCATION
- MOECC WATER WELL LOCATION
- ROADWAY
- SITE BOUNDARY
- 100 METRE BUFFER ZONE
- 7. ORGANIC DEPOSITS: MUCK & PEAT
- 1A. TILL, PLAIN WITH LOCAL RELIEF <5 M
- R2. BEDROCK: LIMESTONE, DOLOMITE, SANDSTONE & LOCAL SHALE

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. BÉLANGER, J. R. 2008 URBAN GEOLOGY OF THE NATIONAL CAPITAL AREA, GEOLOGICAL SURVEY OF CANADA, OPEN FILE 5311, 1 DVD.
2. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2014
3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28

0 25 50 100

1:2,500 METRES

CLIENT
CLARIDGE HOMES CORPORATION

PROJECT
HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
1981 MAPLE GROVE ROAD, STITTSVILLE, ONTARIO

TITLE
SURFICIAL GEOLOGY

CONSULTANT
GOLDER

YYYY-MM-DD	2018-04-20
DESIGNED	----
PREPARED	JEM/BR
REVIEWED	SPS
APPROVED	BTB

PROJECT NO.	CONTROL	REV.	FIGURE
1776275	0006	0	**2**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm 0

Path: N:\Active\Spatial_IM\City of Ottawa\1981_MapleGrove_Rd\99_PROJ\1776275_Claridge_GeoEnviro\40_PROD\0006_Hydrological\Assessment\1776275-0006-HS-0002.mxd

348900 349000 349100 349200 349300 349400 349500 349600

5016300 5016200 5016100 5016000 5015900 5015800 5015700

TP 17-01
TP 17-02
TP 17-03
TP 17-04
TP 17-05
TP 17-06
TP 17-07
TP 17-08
TP 17-09

1534762
1513368

PROPOSED NORTH STREET TO BE DEVELOPED BY ADJOINING HALF LOT DEVELOPER
SOUTH HALF LOT (HUNTLEY)
CONCESSION 12 (GOULBOURN)
BLOCK 68
BLOCK 67
PARK Area=6830 sq.m.
BLOCK 69
BLOCK 70
BLOCK 71
BLOCK 72
BLOCK 73
BLOCK 74
BLOCK 75
BLOCK 76
BLOCK 77
BLOCK 78
BLOCK 79
BLOCK 80
BLOCK 81
BLOCK 82
BLOCK 83
BLOCK 84
BLOCK 85
BLOCK 86
BLOCK 87
BLOCK 88
BLOCK