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September 20, 2024 File: 61899.04

Cardel Homes
301 Moodie Drive, Suite 100
Ottawa, Ontario
K2H 9C4

Attention: Tyler Ferguson, Land Manager

Re: Preliminary Geotechnical Considerations
Proposed Park Land, Creekside 2 Development
2780 Eagleson Road
Ottawa, Ontario

This letter presents preliminary geotechnical considerations relating to the proposed park land within the Creekside 2 Development to be located at 2780 Eagleson Road in Ottawa, Ontario.

The purpose of this letter is to address the City of Ottawa's comments regarding the suitability of the proposed park land for construction of a conventional city park (i.e., soccer/football fields, play structures, etc.) based on the previously completed boreholes at the site. The boreholes were advanced at the site by GEMTEC, during a previous investigation phase, and also by others.

This letter should be read in conjunction with our previous geotechnical and hydrogeological investigation report titled:

- Report titled "Geotechnical and Hydrogeological Investigation, Proposed Residential Development, Creekside 2 – Village of Richmond, 2770 Eagleson Road, Ottawa, Ontario", dated February 1, 2022 (Project No. 61899.04).

PROJECT DESCRIPTION

Plans are being prepared for a residential development identified as Creekside 2 which will be constructed in the Village of Richmond in Ottawa, Ontario. Based on the conceptual plan provided, the development site is irregular in shape with plan dimensions of about 1,200 metres from north to south and ranges from about 750 metres to 1,000 metres from east to west (about 105 hectares). The site is currently agricultural lands. The Creekside residential development is located to the west side of the site (adjacent to Shea Road).

A park is proposed for the central portion of the site with approximate dimensions of about 65 by 125 metres, which is the subject of this letter. No details on the proposed park are available at this time.

SUBSURFACE CONDITIONS

Six boreholes have previously been advanced within the vicinity of the park land by GEMTEC and others. These are identified as 20-06, 20-07A, 20-07B, 20-09, 20-11, 20-12, and 13-1. Borehole 20-07B was advanced, without sampling, adjacent to borehole 20-07A for the installation of a monitoring well (shown as borehole 20-07 on the site plan).

The borehole logs, which provided descriptions of the subsurface conditions encountered in the boreholes, are attached to this letter. The approximate locations of the boreholes are shown on the Site Plan, Figure 1, following the text of this letter. A summary of the subsurface conditions according to these boreholes is provided below:

- A layer of topsoil was encountered at the ground surface at the borehole locations with a thickness ranging from about 50 to 200 millimetres;
- Deposits of silty clay were encountered below the topsoil in all of the boreholes. Where fully penetrated, the silty clay is present to depths of 3.4 to 5.7 metres below ground surface. At one location, borehole 20-06, the underside of the silty clay was not encountered within the upper 6.6 metres of the soil profile.
    - The upper portion of the silty clay, and at some locations the full profile of the silty clay, has been weathered to a grey brown crust. The weathered crust in general has a stiff to very stiff consistency.
    - Where not weathered over the full profile depth, the lower portion of silty clay is grey, with a firm to stiff consistency. The results of Atterberg limit testing indicates that samples of silty clay deposit have a medium plasticity;
- A deposit of very loose clayey silt with some sand and trace gravel was encountered below the silty clay in borehole 20-11. The clayey silt deposit has a thickness of about 1.0 metre and extends to a depth of about 5.5 metres below ground surface;
- Glacial till, consisting of silty sand with trace to some gravel and clay to gravelly silty sand with some clay, was encountered below the silty clay and clayey silt in the boreholes, with the exception of borehole 20-06. The glacial till also contains cobbles and boulders. The glacial till has a loose to compact density, according to the measured SPT N values. The glacial till was not fully penetrated in the boreholes but was proven to depths of up to 8.2 metres below ground surface;
    - A layer of sand with trace to some gravel was encountered below the glacial till in borehole 20-12. This layer is likely also of glacial origin. The sand layer has a compact density according to the measured SPT N values. The sand deposit was not fully penetrated but was proven to a depth of about 6.7 metres below the existing ground surface;

- Auger refusal was encountered in borehole 20-07A at a depth of about 6.5 metres below ground surface within the glacial till. The presence of bedrock at this level was not confirmed. All other boreholes were terminated at the scheduled depths;
- Well screens were installed in the overburden at all the borehole locations and measured on September 30, 2020. The measured water level ranges from about 2.0 to 2.6 metres below the existing ground surface.

GEOTECHNICAL CONSIDERATIONS

The follow sections address the City of Ottawa's concerns on the proposed park land. The geotechnical considerations are preliminary in nature and are subject to confirmation/further assessment once the final design of the park and any structures therein is known.

Suitability of Soil for Construction and Load Bearing

The area is considered suitable for a parkland development, from a geotechnical perspective. It is considered that standard design and construction practices can be used for proposed buildings and play structures within the park land, from a geotechnical point of view.

The topsoil and any fill materials, if encountered, are not considered suitable for the support of any grade sensitive structures or concrete slabs and should be removed from the proposed structure/slab footprints. The underlying native soils are suitable for the support of lightly loaded structures founded on conventional spread footing foundations. Excavations for foundations should be taken through topsoil to expose undisturbed native silty clay. No geotechnical constraints are anticipated in excavating the overburden using conventional hydraulic excavating equipment, noting that boulders should be anticipated in the glacial till deposit if deeper excavations are planned.

Spread footings founded on or within native undisturbed weathered silty clay crust, or on a pad of compacted granular material above native, undisturbed soil should be sized using an allowable bearing pressure of 75 kilopascals. Provided that any loose or disturbed soil is removed from the bearing surfaces, and the grade raise restrictions provided below are adhered to, the settlement of the footings should be less than 25 millimetres.

Site Grade Raise Restriction

The development is underlain by deposits of sensitive silty clay, which has a limited capacity to support loads imposed by grade raise fill material, pavement structures and foundations of any structures.

Based on the results of the subsurface investigation, the maximum thickness of any grade raise filling at the park land should be limited to 2.7 metres above the existing ground surface.

Groundwater Conditions

The groundwater level ranges from about 2.0 to 2.6 metres below the existing ground surface in the area of the proposed park land.

Based on our previous experience, groundwater inflow from the silty clay deposits into the excavations should be relatively small and controlled by pumping from filtered sumps within the excavations. It is not expected that short term pumping during excavation will have any significant effect on nearby structures and services.

The above groundwater control measures are typical of those given for the overall site (i.e., the groundwater conditions are generally considered consistent across the entire site).

CLOSURE

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

Alex Meacoe, P.Eng.
Senior Geotechnical Engineer

WAM/DC

Daire Cummins, M.Sc.

Enclosures
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ATTACHMENTS

Figure 1 – Site Plan
Record of Borehole Logs
Boreholes 20-06, 20-07, 20 09, 20-11, 20-12, and 13-1

RECORD OF BOREHOLE 20-06

CLIENT: Cardel Homes
PROJECT: Geotechnical & Hydrogeological Investigation
JOB#: 61899.04
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 14 2020

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger / Hollow Stem Auger (260mm OD)	Ground Surface		93.72					MH	Above Ground Protector & Bentonite
		TOPSOIL		93.52 / 0.20	1	SS	180	14		
1		Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)			2	SS	355	5		Soil Cuttings
2					3	SS	610	5		Bentonite
					4	SS	610	5		Filter Sand
3					5	SS	610	5		50 mm diameter, 1.52 metre length, slotted SCH 40 PVC Pipe
4		Stiff, grey SILTY CLAY		89.91 / 3.81	6	SS	610	WH		
5					7	SS	610	WH		Soil Cuttings
6					8	SS	610	WH		
		End of borehole		87.17 / 6.55						
7										
8										
9										
10										
11										
12										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % — W_P — W — W_L
10 20 30 40 50 60 70 80 90

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
20-09-30	2.0 ▽	91.7

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LOGGED: ML
CHECKED: WAM

GEO - BOREHOLE LOG 61899.04_BOREHOLE LOGS_R0_2020-07-17.GPJ GEMTEC 2018.GDT 11-30-20

RECORD OF BOREHOLE 20-07A

CLIENT: Cardel Homes
PROJECT: Geotechnical & Hydrogeological Investigation
JOB#: 61899.04
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 20 2020

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger / Hollow Stem Auger (210mm OD)	Ground Surface		93.80							
		TOPSOIL		93.65 / 0.15	1	SS	205	10			Above Ground Protector & Bentonite
1		Stiff to very stiff, grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)			2	SS	405	6			
2					3	SS	610	5			Soil Cuttings
					4	SS	610	4			
3				90.45 / 3.35	5	SS	610	6			
4		Very loose to compact, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)			6	SS	205	9			Bentonite
5					7	SS	205	3			Filter Sand
					8	SS	25	9			50 mm diameter, 1.52 metre length, slotted SCH 40 PVC Pipe
6					9	SS	100	26			
		Auger refusal		87.27 / 6.53							
7		End of borehole									
8											
9											
10											
11											
12											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
20-09-30	2.6 ▽	91.3

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LOGGED: ML
CHECKED: WAM

GEO - BOREHOLE LOG 61899.04_BOREHOLE LOGS_R0_2020-07-17.GPJ GEMTEC 2018.GDT 11-30-20

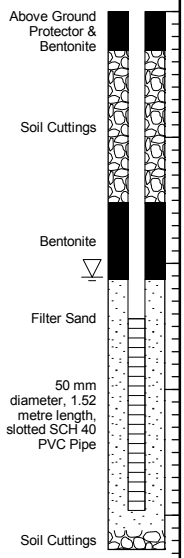
RECORD OF BOREHOLE 20-07B

CLIENT: Cardel Homes
PROJECT: Geotechnical & Hydrogeological Investigation
JOB#: 61899.04
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 17 2020

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger, Hollow Stem Auger (210mm OD)	Ground Surface		93.80							
		TOPSOIL		93.65 / 0.15							
1		Stiff to very stiff, grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)									
2											
3				90.45							
4		Very loose to compact, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		3.35 / 89.53							
		End of borehole Soil stratigraphy inferred from BH 20-7A		4.27							
5											
6											
7											
8											
9											
10											
11											
12											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
20-09-30	2.1 ▽	91.7

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LOGGED: ML
CHECKED: WAM

RECORD OF BOREHOLE 20-09

CLIENT: Cardel Homes
PROJECT: Geotechnical & Hydrogeological Investigation
JOB#: 61899.04
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 17 2020

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger / Hollow Stem Auger (210mm OD)	Ground Surface		93.81							
		TOPSOIL		0.05							
		Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)			1	SS	205	8			Above Ground Protector & Bentonite
1					2	SS	610	9			Soil Cuttings
2					3	SS	610	7			Bentonite
					4	SS	535	4			Filter Sand
3					5	SS	610	3			50 mm diameter, 1.52 metre length, slotted SCH 40 PVC Pipe
4		Stiff, grey SILTY CLAY		89.85 3.96							
					6	SS	610	1			
5											
		Compact, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		88.09 5.72	7	SS	355	15			
6		End of borehole		87.10 6.71							
7											
8											
9											
10											
11											
12											

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
20-09-30	2.2 ▽	91.6

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LOGGED: ML
CHECKED: WAM

GEO - BOREHOLE LOG 61899.04_BOREHOLE LOGS_R0_2020-07-17.GPJ GEMTEC 2018.GDT 11-30-20

RECORD OF BOREHOLE 20-11

CLIENT: Cardel Homes
PROJECT: Geotechnical & Hydrogeological Investigation
JOB#: 61899.04
LOCATION: See Site Plan, Figure 1

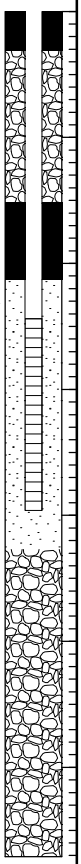
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 10 2020

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface	93.77					
		TOPSOIL	93.57 / 0.20	1	SS	125	9	
		Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		2	SS	230	6	
1								
				3	SS	610	5	
2								
				4	SS	610	4	
3								
				5	SS	610	3	
			90.11 / 3.66					
4		Firm, grey SILTY CLAY		6	SS	610	WH	
			89.30 / 4.47					
		Very loose to loose grey CLAYEY SILT, some sand, trace gravel		7	SS	405	4	MH
5								
			88.28 / 5.49	8	SS	205	23	
		Loose to compact, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)						
6				9	SS	455	10	
			87.06 / 6.71					
		End of borehole						
7								
8								
9								
10								
11								
12								

SOIL PROFILE / SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
20-09-30	2.3 ▽	91.5

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LOGGED: ML
CHECKED: WAM

RECORD OF BOREHOLE 20-12

CLIENT: Cardel Homes
PROJECT: Geotechnical & Hydrogeological Investigation
JOB#: 61899.04
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 17 2020

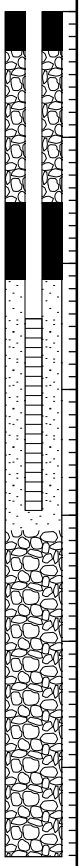
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Power Auger, Hollow Stem Auger (210mm OD)	Ground Surface		93.94				
		TOPSOIL		0.10	1	SS	100	12
1		Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)			2	SS	355	9
2					3	SS	610	5
					4	SS	610	4
3				90.49	5	SS	610	4
		Very loose to loose, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		3.45				
4					6	SS	255	4
5				88.61	7	SS	255	5
		Compact, grey SAND, some gravel		5.33	8	SS	355	28
6					9	SS	455	24
				87.23				
7		End of borehole		6.71				
8								
9								
10								
11								
12								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P W W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
20-09-30	2.6 ▽	91.3

GEMTEC
Consulting Engineers and Scientists

LOGGED: ML
CHECKED: WAM

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

LOG OF BOREHOLE BH13-1

PROJECT: Geotechnical Investigation - 5831/5873 Perth St. & 2770 Eagleson Rd. **DRILLING DATA**
CLIENT: Cardel Homes
Method: Hollow Stem Augers
PROJECT LOCATION: 5831/ 5873 Perth St. and 2770 Eagleson Rd., Ottawa
Diameter: 203mm
REF. NO.: 1776-710
DATUM: Geodetic
Date: Aug/02/2013
ENCL NO.:
BH LOCATION: See Borehole Location Plan N 5006187 E 435121

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (25 50 75 100 125)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (25 50 75)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (KN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
93.7												
93.6	**Topsoil**											
0.2	**Silty Clay** brown, moist, stiff, (weathered crust)		1	SS	7		93					
			2	SS	4							
			3	SS	6		92					
			4	SS	5		91				17.0	
90.7												
3.1	**Silty Clay** grey, moist, firm to stiff		5	SS	3							
				VANE			90	+ 4				
				VANE				+ 4				
88.8			6A	SS	1		89					
4.9	**Silty Clay** mixed with silty sand and some gravel		6B	SS	1							
88.5												
5.3	**Gravelly Silty Sand** grey, wet, compact (Till)						88					
			7	SS	9		87					29 39 (32)
			8	SS	6		86					
85.5												
8.2	**END OF BOREHOLE**											

Notes:
1) Upon completion, standing water in borehole at 4.2 m depth

GROUNDWATER ELEVATIONS
Shallow/ Single Installation ▽ ▼ Deep/Dual Installation ▽ ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

SPL SOIL LOG-OTTAWA 1776-710.GPJ SPL.GDT 23/1/14