October 16, 2018

Geotechnical Investigation for Proposed Residential Redevelopment, 2116 and 2122 Dixie Road and 1357 Wealthy Place, City of Mississauga

Project 08*3368 BRUCE A BROWN ASSOCIATES LIMITED
CONSULTANTS IN THE ENVIRONMENTAL AND APPLIED EARTH SCIENCES

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Distribution: 2 copies and 1 pdf to Client, mmonass@cityparkhomes.ca

1 pdf to Bruce McCall-Richmond, bruceMR@gsai.ca

1 pdf to Michael Hall, mike@condeland.com

1 copy to file .

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Project 08*3368
October 16, 2018

Attn: Mr. Chris Zeppa

Central by City Park Homes Inc.

950 Nashville Road

Kleinburg, ON

L0J 1C0

Dear Mr. Zeppa,

Re: Geotechnical Report for
Proposed Residential Redevelopment,
2116 & 2122 Dixie Road and 1357 Wealthy Place, Mississauga

1.0 Introduction

Brown Associates Limited was authorized by Mr. Chris Zeppa of City Park Homes to conduct a geotechnical investigation for proposed redevelopment of 2116 and 2122 Dixie Road and 1357 Wealthy Place, City of Mississauga. This investigation has been carried out in conformity with the provision of the Statement of Limitations for geotechnical investigations, which is attached as **Appendix A**, and forms a part of this report.

This investigation involved the advancement of five test pits to about 4m depth below grade, using a track-mounted hydraulic backhoe, and one geotechnical borehole in the driveway of 1357 Wealthy Place. Test pits stood open for sufficient time for groundwater to equilibrate before backfilling, and the borehole was developed as a well with flushmount cover plate. Test pits are shown on the borehole and test pit plan, attached in **Appendix B**.

1.1 Previous Investigations

No previous geotechnical investigations for this site are known. Earlier studies by Brown Associates include a designated substances investigation prior to the demolition of the former house and garage on this site, an initial Phase 1 environmental report in 2008, when the residence was still standing, and an updated Phase 1 environmental report in 2018, post demolition.

1.2 Site Description

The site is located on the west side of Dixie Road, just north of the Queen Elizabeth Way and North Service Road, incorporating the vacant lot at 2116-2122 Dixie Road, and a single family residence on Wealthy Court number 1357, having a detached bungalow residence. A Site Location Plan, in **Appendix B**, is attached for reference.

The property has a frontage of approximately 109.4m on Dixie Road. The Dixie parcel has mature deciduous and conifer trees on perimeters and surrounding the former residence and garage. The original pavements for circular driveway and garage slab remain. It is nearly flat-lying, sloping to the west. The site has full municipal services, including sanitary sewers, gas, water and hydro. The occupied residence on Wealthy is a single storey residence with full basement.

1.3 Regional Soil Conditions

The area is underlain by shallow sediments, predominantly fine sand, extending to Georgian Bay Formation bedrock which is anticipated within 4 to 6 meters from grade. Georgian Bay Formation comprises shale with limestone layers of Lower Ordovician age.

2.0 Field Investigations

2.1 Clearing of Services

Public underground services were cleared under the Ontario One Call Program under ticket number 20183722843 (Promark-Telecon Inc.).

2.2 Site Investigations

2.2.1 Test Pits

On October 4, five test pits were excavated using a track-mounted Komatsu PC 88 HR excavator operated by Turbo Contracting. A Borehole and Test Pit Plan, Appendix B, and Test Pit Logs, Appendix C, are attached.

Representative soil samples were obtained from face of test pit or retrieved from the bucket by our principal geotechnical engineer. A pocket penetrometer was also used on faces of excavation.

Logs of the excavations and subsurface condition were made, and are attached as **Appendix C**. Grades are related to geodetic elevations taken from an available topographic survey. All soils were found to be aesthetically clean without evidence of potential environmental concerns. All soils were undisturbed except in the top 0.9m of Test Pit 2 where a vitrified 100mm tile was found, originating as part of the former Class 4 onsite private waste system serving the former residence.

A geotechnical borehole using a continuous flight power augur was advanced in the Wealthy Place driveway near the front lotline on October 10. The borehole was advanced to refusal on shale bedrock at 4.7m using 100mm solid stem augurs. Because of equipment breakdown, Penetration Resistances could not be provided. The groundwater equilibrated at 106.9m geodetic as soon as the well was completed.

2.3 Subsurface Conditions

A consistent depth of 150mm of loose sandy black topsoil was found in all test locations, underlain by compact fine ochre sand with silt, grading to fine ochre sand with trace silt by 0.9m and to uniform compact light grey-brown fine sand by about 1m. Fine sand became dense by 1.3m depth and showed traces of depositional bedding plane for the remaining depth. By 2.5m depth, sand transitioned to fine sand with medium sand and by 3m depth transitioned to medium sand with fine sand and to medium light grey wet sand by about 3.3m depth below grade. Test Pits extended to between 3.75 and 5.2m below grade. Water equilibrated at the base of each test pit together with minor caving of side walls below depth of saturation after about 15 to 20 minutes.

The borehole cored through HL-4 asphaltic concrete and 150mm of bedding, underlain by original undisturbed silty fine sand with an ochre colour. This graded to compact undisturbed fine sand by 1m depth and to fine to medium sand becoming dense by 2.5m, and to uniform medium grain size sand by water table elevation of 106.9m. Sand becomes coarser to the shale interface at about 104.6m, and refusal on shale was encountered at 104.38m geodetic.

Water equilibrated immediately at 106.9 m geodetic, and remained the same when inspected again on October 16. The borehole/monitoring well log is attached as **Appendix D**.

3.0 Recommendations

3.1 Foundation Requirements – Slab-on-Grade

Slab-on-grade construction requires stripping of all topsoil and roots to depths of at least 200mm from present grades. Additional soil surcharge should be compacted in minimal lifts to achieve at least 95% Standard Proctor Density. A concrete slab reinforced with 00-00 welded wire mesh generally will require 150mm of clear 19mm limestone bedding for lightly loaded structures.

3.2 Foundation Requirements - Conventional Footings

The existing native sand is compact and becomes dense by frost penetration depths, permitting use of conventional strip footings and column pads founded on original, undisturbed soils, with minimum depth of cover of 1.4m. A safe allowable bearing capacity of 140 kPa SLS (240 KPA SLS) is available. Full depth foundations for basements will be founded on dense fine sand at 2m below grade for which a safe allowable bearing capacity of 200 kPa SLS (350 ULS) is available on undisturbed material. Below 3m depth, design bearing is reduced by a factor of 2 because of proximity to saturated sand.

Excavated sand from below about 1m depth is not frost-susceptible and may be used without limitation for structural backfill. It is responsive to compactive effort using vibratory smooth drum equipment. Three 15M rebars are recommended to be supported on bricks or chairs to obtain at least 75mm cover beneath, for all load-bearing bases or walls. Minimum dimension of column pads shall be 750mm to prevent punching.

3.3 Bedding for Services

New services between depths of 1.5m and 3.0m may be bedded on native sand which will generally meet mechanical requirements of Granular "B", and local material may be used for backfill material up to spring line and to full depth. Any service trench deeper than 4m will require use of a moveable shear box because of the depth of saturation of medium sand.

3.4 Pavement Design

Any excavation shall be backfilled with Granular "B" soils or available recycled crusher-run concrete compacted to 95% Standard Proctor Density or better. The new internal road shall have a minimum of 200mm of Granular "B" compacted to at least 95% of Standard Proctor Density. An additional 2000mm of Granular "A" or 19mm crusher-run limestone shall be compacted in two or more lifts to 95% Standard Proctor Density or better.

A 75mm thickness of HL-8 base course asphaltic concrete shall be placed, and may stand through a full season, if required, before finishing with 30mm top course of HL-3 asphaltic concrete. A tack coat will be required on top of base course pavements when top course is deferred.

3.5 Earthquake Design

Earthquake factors for v and F, as applied in the Ontario Building Code, may be taken as 0.05 and 1.0 respectively for this site. All shallow overburden is Class C for earthquake design purposes.

The 2015 National Building Code of Canada interpolated seismic hazard values are determined for a 2% in 50-year (0.000404 per annum) probability of exceedance. Values are for "*firm ground*" (NBCC soil Class C, such the sand found at this site) with average overburden shear wave velocities of 360 – 760 $m.s^{-1}$.) Median (50th percentile) values are given in units of g for spectral acceleration (Sa(T) where T is the period in seconds) and peak ground accelerations (PGA).

Only two significant figures are used. These values have been interpolated using Sheppard's Method from a 10-km spaced grid of points, based on site coordinates of 43.599527^{o} North and 79.571437^{o} West.

National Building Code Seismic Hazard Values

2% in 50 years (0.000424 per annum) probability:

Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)	PGA
0.226	0.117	0.059	0.028	0.145g

3.6 Soil Permeability

Drywells or infiltration trenches should be effective means for surface water control. They should be designed based on a minimum depth of 1.25m to be below the silty sand zone and into the uniform sand which has superior hydraulic conductivity, estimated 5 x 10^{-5} m.sec^{-1}. The best performance would be to excavate trenches to at least 1.25m depth, provide 100mm of 20-50mm clear stone base and use proprietary prefabricated arches to maximize storage volumes prior to backfilling.

Drywalls with inverts between 2.5 and 3.25m depth below grade will encounter coarser sand with a marginally better hydraulic conductivity of 7.5 x 10^{-5} m.sec^{-1}; however capacity may become limited by the effect of true water table mounding beneath such structures.

3.7 Deep Excavation and Shoring

Excavation to frost depth for perimeters and column pads may have vertical cuts to 1.4m depth, from underside of topsoil horizon. Deeper excavations shall not have vertical cuts beyond 1.4m faces, and near surface materials shall be trimmed back, as required, at 1:1 to match surrounding grades. For services cuts, in the alternative, a moveable shear box can be used to protect personnel.

A geotechnical engineer, on examination, may be able to certify free-standing vertical faces between 0.5 and 2.5m depths below grade. Excavations below 3.5m depth will require shoring or slopes to be cut back to 2.5:1 H:V.

If deeper excavations are required, lateral soil pressure for permanent or temporary structures may be determined using the following equation:

$P = K(\gamma H + q)$ where,

P = lateral earth pressure kPa	kPa
K = lateral earth pressure coefficient	0.4
γ = unit weight of fine sand or granular	21.0 kN/m^3
H = depth of wall below finished grade	m
q = surcharge loads adjacent to wall	kPa

This formula assumes free-draining conditions created by perimeter drainage systems to prevent any hydrostatic pressures from building behind perimeter walls, and is therefore valid to depths of 3.5m below original grade.

For temporary shoring, where there are building foundations or services behind temporary shoring within a distance of 0.5H, K= Ko = earth pressure coefficient at rest should be 4.0, and where there are services between 0.5H and H beyond the wall and a minor amount of movement for temporary shoring is acceptable, K= may be 0.33. Where slight to moderate ground movement is acceptable on the Balsam Street frontage only, for temporary shoring K = Ka = 0.25 active earth pressure coefficient.

4.0 Qualification

Brown Associates has 47 years of experience in the geo-environmental characterization of sites in the Toronto centered region. This firm carries $2M environmental liability insurance and $2M errors and omissions insurance, and enjoys a claims-free status.

5.0 Closure

Thank you for this opportunity to be of service. Should questions arise, please do not hesitate to call.

Yours very truly,

BRUCE A. BROWN ASSOCIATES LIMITED

Bruce A. Brown, Ph.D., MCIP, RPP, P.Eng., QPESA

REGISTERED PROFESSIONAL ENGINEER
B. A. BROWN
18/10/17
PROVINCE OF ONTARIO

Appendix A: Statement of Limitations for Geotechnical Evaluations

Bruce A. Brown Associates Limited

Geo-environmental Report
General Conditions and Limitations

Section 1: Use of the Report

1.1 The factual data, interpretations and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location or elevation or if the project is not initiated within two years of the date of the report, Brown Associates should be given an opportunity to confirm that the recommendations are still valid.

1.2 Subsoils, groundwater, or other conditions which may affect design or implementation may differ between actual test locations and may not be appropriate for areas beyond those investigated.

1.3 The comments given in this report are intended only for the guidance of the design engineer. The number of test holes to determine all the relevant underground conditions which may affect construction costs, techniques and equipment choice, scheduling and sequence of operations, would be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual test hole data, as to how subsurface conditions may affect their work.

1.4 With the exception of instances where this firm is specifically retained to confirm field conditions, or to supervise construction or excavation, the responsibility of Bruce A. Brown Associates Limited shall be restricted to accurate interpretation of conditions at test location(s). No responsibility can be taken for the procedures or the sequence of effort carries out by any contractor, even when his final result would be to implement the recommended design, unless field supervision is requested form this firm.

Section 2: Follow Up

2.1 All details of the design and proposed construction may not be known at the time of submission of Brown Associates' report. It is recommended that Brown Associates be retained during the final design stage to review the design drawings and specifications related to foundations, earthworks, retaining systems and drainage, to determine that they are consistent with the intent of Brown Associates' report.

2.2 Retaining Brown Associates during construction is recommended to confirm and to document that the subsurface conditions throughout the site do not materially differ from those given in Brown Associates' report and to confirm and to document that construction activities did not adversely affect the design intent of Brown Associates' recommendations.

Section 3: Soil and Rock Conditions

3.1 Soils and rock descriptions in this report are based on commonly accepted methods of classification and identification employed in professional geotechnical practice. Classification and identification of soil and rock involves judgement and Brown Associates does not guarantee descriptions as exact, but implies accuracy only to the extent that is common in current geotechnical practice.

3.2 The soils and rock conditions described in this report are those observed at the time of study. Unless otherwise noted, those conditions form the basis of the recommendations in the report. The condition of the soil and rock may be significantly altered by construction activities (traffic, excavation, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil and rock must be protected from these changes or disturbances during and after construction.

Section 4: Logs of Test Holes and Subsurface Interpretations

4.1 Soil and rock formations are variable to a greater or lesser extent. The test hole logs indicate the approximate subsurface conditions only at the locations of the test holes. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. The precision with which subsurface conditions are indicated depends on the method of boring, the frequency of sampling and the uniformity of subsurface conditions. The spacing of test holes, frequency of sampling and type of boring also reflect budget and schedule considerations.

4.2 Subsurface conditions between test holes are inferred and may vary significantly from conditions encountered at the test holes.

4.3 Groundwater conditions described in this report refer only to those observed at the place and time of observation noted in the report. These conditions may vary seasonally or as a consequence of construction activities on the site or on adjacent sites.

Section 5: Changed Conditions

5.1 Where conditions encountered at the site differ significantly from those anticipated in this report, either due to a natural variability of subsurface conditions or due to construction activities, it is a condition of the use, or reliance by the client, of this report that Brown Associates be notified of the changes and provided with an opportunity to review the recommendations of this report. Recognition of changed soil and rock conditions requires experience and it is recommended that an experienced geotechnical engineer be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Section 6: Drainage

6.1 Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage systems can have serious consequences. Brown Associates can assume no responsibility for the effects of drainage unless Brown Associates is specifically involved in the detailed design and follow-up site supervision and inspection during construction of the drainage system.

Appendix B: Figure 1-0 Site Location Plan
Figure 2-0 Borehole and Test Pit Plan

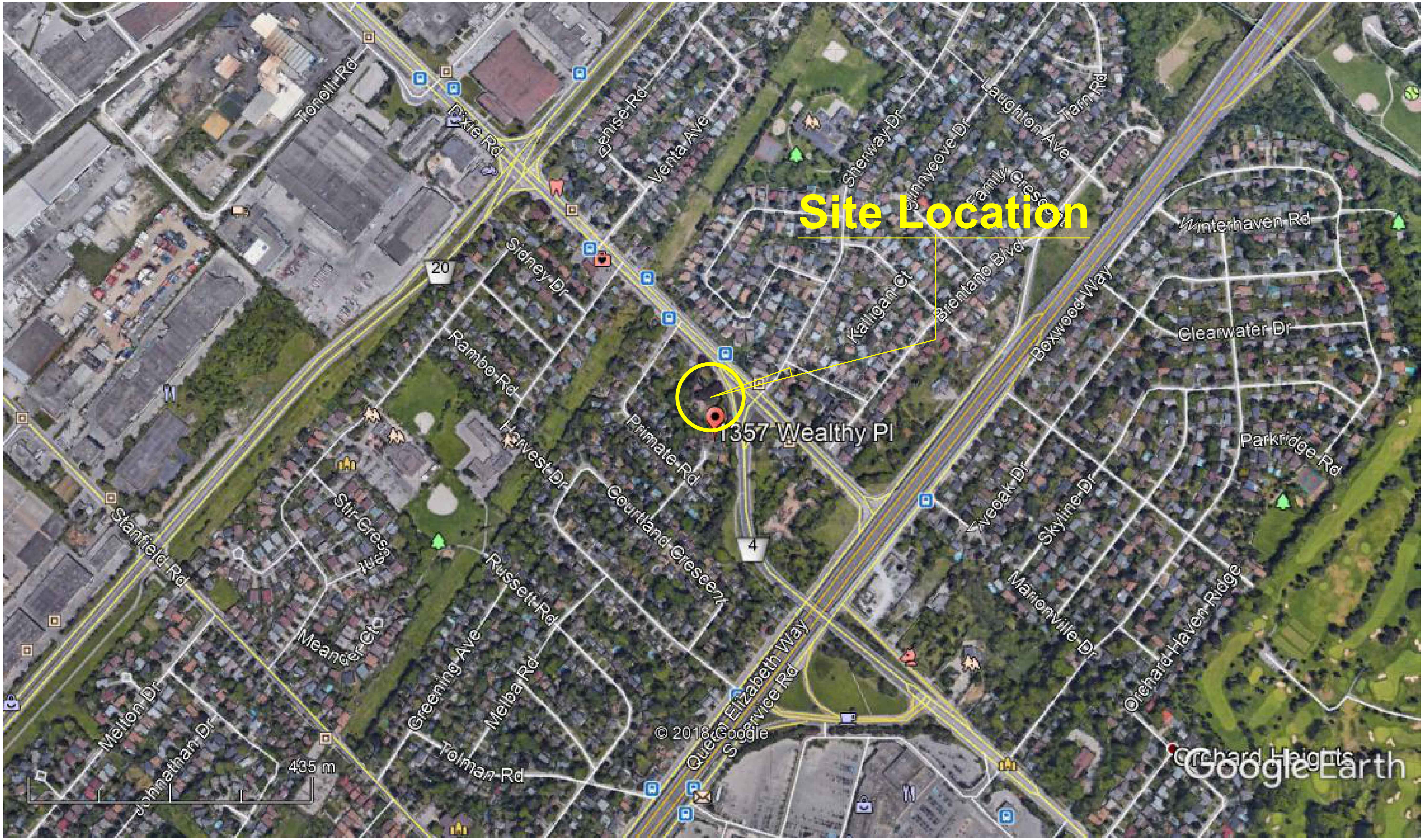
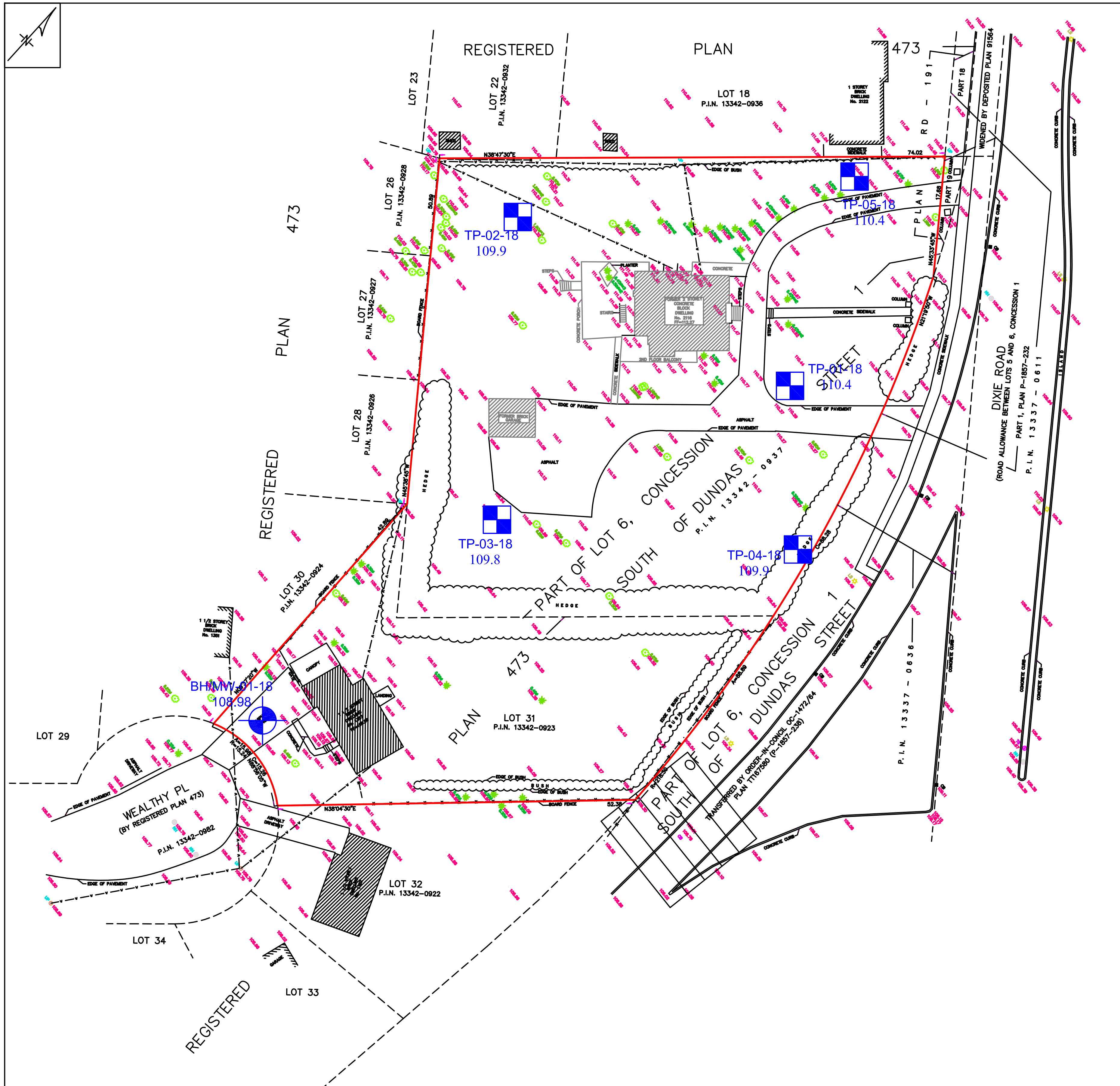


Figure: 1-0	Title: **Site Location Plan** 2116 Dixie Road & 1357 Wealthy Place, Mississauga, Ontario	Client: CENTRAL BY CITY PARK HOMES INC. 950 Nashville Road, Kleinburg, ON L0J 1C0	Drawn By: C. Colbourne, A.Sc.T.	Date: October 16, 2018	BRUCE A. BROWN ASSOCIATES LIMITED Consultants in the Environmental and Applied Earth Sciences 101–102 Aerodrome Crescent Toronto, Ontario M4G 4J4 Tel [416] 424–3355
			Project No.: 08*3368	Drawing No.: 336818I016-00I	



SKETCH SHOWING ELEVATIONS OF PART OF LOT 6, CONCESSION 1 SOUTH OF DUNDAS STREET AND LOT 31, REGISTERED PLAN 473 CITY OF MISSISSAUGA REGIONAL MUNICIPALITY OF PEEL

SCALE 1:250

RADY-PENTEK & EDWARD SURVEYING LTD., O.L.S.

METRIC

DISTANCES SHOWN ON THIS SKETCH ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

LEGEND

CB	DENOTES CATCH BASIN
HV	DENOTES HYDRO VAULT
UP	DENOTES UTILITY POLE
LS	DENOTES LAMP STANDARD
MH	DENOTES MANHOLE
WV	DENOTES WATER VALVE
—W—	DENOTES OVERHEAD WIRE
TS	DENOTES TRAFFIC SIGNAL
FF	DENOTES FINISHED FLOOR ELEVATION
⌀	DENOTES DIAMETER
	DENOTES DECIDUOUS TREE
	DENOTES CONIFEROUS TREE

UNDERGROUND SERVICES

UNDERGROUND SERVICES HAVE NOT BEEN SHOWN ON THIS SKETCH. THE MARKOUT OF UNDERGROUND SERVICES IS ADVISED PRIOR TO EXCAVATION AND CONSTRUCTION.

BOUNDARY NOTE:

BOUNDARY INFORMATION SHOWN HEREON IS DERIVED FROM REGISTRY OFFICE RECORDS AND SURVEY RECORDS OF RADY-PENTEK & EDWARD SURVEYING LTD, O.L.S. THE BOUNDARY IS SUBJECT TO CLARIFICATION UPON THE INCORPORATION OF ADDITIONAL DOCUMENTARY AND FIELD SURVEY EVIDENCE.

BENCHMARK NOTE

ELEVATIONS SHOWN HEREON ARE REFERRED TO THE CITY OF MISSISSAUGA BENCHMARK No. 351 HAVING AN ELEVATION OF 108.675 METRES LOCATED ON THE EAST FACE AT THE MAIN ENTRANCE OF APPLEWOOD PUBLIC SCHOOL ON THE WEST SIDE OF HARVEST DRIVE, 30.5 METRES SOUTH OF KENDALL ROAD.

CAUTION

TO OBTAIN GEODETIC ELEVATIONS (1978 G.S.C. RE-ADJUSTMENT), SUBTRACT 0.121m (0.397') FROM THE VALUES SHOWN HEREON.

Notes

(1) Boundary highlighted from survey
(2) All test pit and borehole location(s) are as indicated +/-.

Denotes Site Boundary

Borehole, advanced by Bruce A. Brown Associates Limited on October 10, 2018.

Test Pit, advanced by Client October 4, 2018.

Figure:	Title:	Client:	Drawn By:	Date:	
2-0	**Borehole and Test Pit Plan** 2116 Dixie Road & 1357 Wealthy Place, Mississauga, Ontario	Central by City Park Homes Inc., 950 Nashville Road Kleinburg, ON, L0J 1C0	C. Colbourne, A.Sc.T.	October 16, 2018	BRUCE A. BROWN ASSOCIATES LIMITED Consultants in the Environmental and Applied Earth Sciences 101–102 Aerodrome Crescent Toronto, Ontario M4G 4J4 Tel [416] 424–3355
			Project No.: 08*3368	Drawing No.: 3368181016-002	

Appendix C: Test Pit Logs

Test Pit 1. Elevation 110.4 geodetic. Invert 106.6 masl.

0.0 Loose, black sandy topsoil. Non-cohesive, non-plastic, with roots.
0.18 Ochre to light brown fine sand with silt. Loose, uniform, non-plastic, becoming firm by 0.5m and compact by 1.0m depth.
1.0 Light brown fine sand, compact, uniform, dry, grading to light grey-brown becoming dense by 2m depth.
2.0 Dense, fine grained grey-brown uniform sand, minor horizontal bedding plane, grading to fine sand with medium sand, to medium dense sand by 3m depth.
3.8 Invert of test pit in uniform light grey medium sand. Saturated below 3.3m. Water equilibration at 3.5m after one hour with minor side wall collapse below 3.5m depth.

Test Pit 2. Elevation 109.9 geodetic. Invert 106.15 masl.

0.0 Loose, black sandy topsoil. Non-cohesive, non-plastic, with roots.
0.15 Ochre to light brown fine sand with silt. Loose, uniform, non-plastic, becoming firm by
1.0 0.5m and compact by 1.0m depth. Vitrified clay pipe at 0.9m depth, no stone bedding. Light brown fine sand, compact, uniform, dry, grading to light grey-brown becoming dense by 2m depth. Non-plastic, non-cohesive.
2.0 Dense, fine grained grey-brown uniform sand, minor horizontal bedding plane, grading to fine sand with medium sand, to medium dense sand by 3m depth.
3.9 Invert of test pit in uniform light grey medium sand. Saturated below 3.3m. Water equilibration at 3.6m after one hour with minor side wall collapse below 3.5m depth.

Test Pit 3. Elevation 109.8 geodetic. Invert 106.2 masl.

0.0 Loose, black sandy topsoil. Non-cohesive, non-plastic, with roots.
0.20 Ochre to light brown fine sand with silt. Loose, uniform, non-plastic, becoming firm by 0.5m and compact by 1.2m depth.
1.0 Light brown fine sand, compact, uniform, dry, grading to light grey-brown becoming dense by 2m depth.

3.0 Dense, fine grained grey-brown uniform sand, minor horizontal bedding plane, grading to fine sand with medium sand, to medium dense sand by 3m depth.

3.9 Invert of test pit in uniform light grey medium sand. Saturated below 3.3m. Water equilibration at 3.6m after one hour with minor side wall collapse below 3.4m depth.

Test Pit 4. Elevation 109.9 geodetic. Invert 106.0 masl.

0.0 Loose, black sandy topsoil. Non-cohesive, non-plastic, with roots.

0.22 Ochre to light brown fine sand with silt. Loose, uniform, non-plastic, becoming firm by 0.3m and compact by 0.9m depth.

1.0 Light brown fine sand, compact, uniform, dry, grading to light grey-brown becoming dense by 2m depth.

3.0 Dense, medium grained grey-brown uniform sand, minor horizontal bedding plane, by 3m depth.

3.9 Invert of test pit in uniform light grey medium sand. Saturated below 3.3m. Water equilibration at 3.3m after one hour with minor side wall collapse below 3.6m depth.

Test Pit 5. Elevation 110.4 geodetic. Invert 106.4 masl.

Loose, black sandy topsoil. Non-cohesive, non-plastic, with roots.

0.17 Ochre to light brown fine sand with silt. Loose, uniform, non-plastic, becoming firm by 0.5m and compact by 1.0m depth.

1.0 Light brown fine sand, compact, uniform, dry, grading to light grey-brown becoming dense by 2m depth.

2.0 Dense, fine grained grey-brown uniform sand, minor horizontal bedding plane, grading to fine sand with medium sand, to medium dense sand by 3m depth.

4.2 Invert of test pit in uniform light grey medium sand. Saturated below 3.3m. Water equilibration at 3.5m after one hour with minor side wall collapse below 3.5m depth.

All test pits backfilled and compacted to grade on completion of program.

Appendix D: Borehole/MW Log   BH/MW-01-18

BRUCE A. BROWN ASSOCIATES LIMITED
Consultants in the Environmental and Applied Earth Sciences

101-102 Aerodrome Crescent
Toronto, Ontario, Canada M4G 4J4
Tel: (416) 424-3355, Email bruce@brownassociates.ca

Project Location:	1357 Wealthy Place, Mississauga, ON	**Project Number:**	08*3368	**Technologist:**	C.W. Colbourne, A.Sc.T.
Client:	Central by City Park Homes Inc.	**Date of Borehole:**	10-Oct-18	**Drilling Contractor:**	Sonic Soil Sampling, Track Mount advancing 100mm solid stem flight augurs and 50mm x 0.75mm split spoon sampler.
BH/MW Location:	See site drawing	**Bench Mark:**	GEODETIC	**TOR Elevation:**	108.83

BOREHOLE LOG No. BH/MW-01-18

Depth in Metres	Sample Interval	Description	Elevation	Moisture Content (x) / Dynamic Penetration Test (0)	Lab Sample No.	PID READING	% Recovery	Standard Penetration N-Blows per 0.30m	Moisture Content %
0			108.98m						
0.1–0.6	SS-1	Grade to 0.6mbgs <50mm of ASPHALT PAVEMENT underlain by 150mm of CRUSHER RUN LIMESTONE underlain by NATIVE – SAND, brown / ochre, slightly moist, non-plastic, non-cohesive, loose to medium dense, dark ochre staining, organic staining present.	108.38 (0.6)				100 (0.3)	10 (0.3)	
0.6–1.5	Augur 1	At 0.76mbgs Standard Force Hammer becomes un-operational, unable to determine "N" values from this point on. The 100mm flight augurs are advanced to locate shale bedrock interface.	107.48 (1.5)						
1.5–3.0	Augur 2	From 0.76mbgs to 4.6mbgs Observations noted SAND becomes increasingly coarse with depth	106.90 (2.1)						
3.0–4.5	Augur 3		105.98 (3.0) 104.98 (4.0)						
4.5–4.6	Augur 4	At 4.6mbgs Augur refusal on SHALE fragments recovered from tip of flight augur.	104.48 (4.5) 104.38 (4.6)						
5.3–5.9		Borehole terminated at 4.6mbgs. 50mm x 1.5m piezometer set at 4.02mbgs followed by 50mm solid stand pipe to 0.15mbgs. Piezometer backfilled with well sand to 0.6m above the screened interval, followed by bentonite to 0.3mbgs. Standpipe fitted with a 50mm J-plug and well fitted with a flush mounted protective cover concrete cemented into place.							
6.4–6.8		Groundwater level measured on October 10, 2018 six hours after placement of well, and groundwater determined to be 2.08mbgs. On October 16, 2018 groundwater measured to be 2.08mbgs.							
10.0									

Tests scale: 20 40 60 80

Borehole Log Key and Soil Classification Key

Major Divisions			Colour / Symbol	Letter Symbol	Typical Description
Coarse Grained Soils, More than 50% of material is larger than No. 200 sieve size.	Gravel and Gravelly Soils, More than 50% of coarse fractions retained on No. 4 sieve	Clean Gravels (little or no fines)		GW	Well- graded gravels, gravel sand mixtures, little or no fines
				GP	Poorly grade gravels, gravel-sand mixtures, little or no fines
		Gravels With Fines (Appreciable amount of fines)		GM	Silty gravels, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand clay mixtures
	Sand and Sandy Soils, more than 50% of coarse fraction passing No. 4 sieve	Clean Sand (Little or no fines)		SW	Well-graded sands, gravelly sands, little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
		Sands with Fines (Appreciable amount of fines)		SM	Silty-sands, sand-silt mixtures.
				SC	Clayey sands, sand-clay mixtures
Fine Grained Soils, more than 50% of material is smaller than No. 200 sieve size	Silts and Clays,	Liquid limit less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
				OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays,	Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts
Highly Organic Soils				PT	Peat, humus, swamp soils with high organic contents

Bruce A. Brown Associates Limited.