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REPORT ON

GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL BUILDING
1344 BARFIELD ROAD
OSGOODE WARD, GREELY
CITY OF OTTAWA, ONTARIO

Submitted to:

Wicked Garage Inc.
2760 Carousel Crescent - Apt 1104
Ottawa, Ontario K1T 2N4

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December 22, 2010 100667

Wicked Garage Inc.
2760 Carousel Crescent - Apt 1104
Ottawa, Ontario K1T 2N4

RE: GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL BUILDING
1344 BARFIELD ROAD
OSGOODE WARD, GREELY
CITY OF OTTAWA, ONTARIO

Dear Sirs:

This report presents the results of a geotechnical investigation carried out for the above noted proposed commercial building located on the west side of Barfield Road just north of Parkway Road in the City of Ottawa, Ontario. The purpose of the investigation was to identify the subsurface conditions at the site based on a limited number of boreholes. Based on the factual information obtained, Kollaard Associates Inc. was to provide guidelines on the geotechnical engineering aspects of the project design; including construction considerations, which could influence design decisions.

BACKGROUND INFORMATION AND SITE GEOLOGY

The site consists of a rectangular parcel of land some 0.2 hectares (0.64 acres) in plan area located on the west side of Barfield Road just north of Parkway Road in the City of Ottawa, Ontario (see Key Plan, Figure 1). It is understood that plans are being prepared for the construction of a one storey commercial building with an associated parking lot, and an access roadway. The commercial building has a plan area of approximately 520 m^2. The building is likely to be a steel frame construction with a thickened edge, cast-in-place, concrete, slab on grade foundation. Surface drainage for the proposed building will be by means of swales and ditches.

The site is located within a commercial/ industrial park. The site is bordered on the south and west sides by vacant, undeveloped land, on the north by a property occupied by a gravel surfaced parking area with several parked vehicles and equipment and on the east by Barfield Road followed by commercial development.

Based on a review of the surficial geology map for the site area, it is expected that the site is underlain by sand. A review of the bedrock geology map indicates that the bedrock underlying the site consists of dolomite and limestone of the Oxford Formation. Based on a review of the topographical map for the site area, it is expected that the upper groundwater flow at the site is towards Shields Creek that exists about 270 metres south of the site.

PROCEDURE

The field work for this investigation was carried out on November 15, 2010 at which time two boreholes, numbered BH1 to BH2 were put down at the site using a truck mounted drill rig equipped with a hollow stem auger owned and operated by OGS Inc. of Almonte, Ontario.

Sampling of the overburden materials encountered at the boreholes was carried out at regular 0.75 metre depth intervals using a 50 millimetre diameter drive open conventional split spoon sampler in conjunction with standard penetration testing to depths of about 7.6 and 6.9 metres below the existing ground surface in BH1 and BH2, respectively.

The subsurface soil conditions at BH1 and BH2 were identified based on visual examination of the samples recovered and the results of the standard penetration tests. In situ vane shear testing was carried out in the cohesive materials encountered at BH2. Groundwater conditions at the boreholes were noted at the time of drilling. The boreholes were loosely backfilled with the auger cuttings upon completion of drilling.

The field work was supervised throughout by a member of our engineering staff who located the boreholes in the field, logged the boreholes and cared for the samples obtained. A description of the subsurface conditions encountered at BH1 and BH2 are given in the attached Record of Borehole Sheets. The approximate locations of the boreholes are shown on the attached Site Plan, Figure 2.

SUBSURFACE CONDITIONS

General

As previously indicated, a description of the subsurface conditions encountered at the boreholes is provided in the attached Record of Borehole Sheets following the text of this report. The borehole logs indicate the subsurface conditions at the specific drill locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. Subsurface conditions at locations other than borehole locations may vary from the conditions encountered at the boreholes.

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and Kollaard Associates Inc. does not guarantee descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice.

The groundwater conditions described in this report refer only to those observed at the location and on the date the observations were noted in the report and on the borehole logs. Groundwater conditions may vary seasonally, or may be affected by construction activities on or in the vicinity of the site.

The following is a brief overview of the subsurface conditions encountered at the boreholes.

Topsoil

A layer of topsoil, approximately 0.4 to 0.5 metres in thickness, was encountered at BH1 and BH2 directly below the existing ground surface. The material was classified as topsoil based on the colour and the presence of organic materials. The identification of the topsoil layer is for geotechnical purposes only and does not constitute a statement as to the suitability of this layer for cultivation and sustainable plant growth.

Silty Clay

A deposit of grey brown silty clay was encountered below the topsoil layers at BH1 and BH2 at depths of approximately 0.4 and 0.5 metres, respectively, below the existing ground surface. The clay layer was fully penetrated and found to be about 1.6 to 2.0 metres in thickness.

The results of the in situ vane shear testing gave undrained shear strength values ranging from 108 to 114 kilopascals with an average value of 111 kilopascal. The results of the in situ vane shear testing and tactile examination carried out for the silty clay material indicate that the silty clay is very stiff in consistency.

Silty Sand

A deposit of grey silty sand was encountered below the silty clay layer at BH1 and BH2 at depths of 3.0 and 2.1 metres, respectively, below the existing ground surface. The sand layer was fully penetrated and found to be about 0.6 to 1.6 metres in thickness. The results of the standard penetration tests carried out in the sand gave N values of about 5 to 20 blows per 0.3 metres of penetration, indicating a loose to compact state of compaction.

Glacial Till

Glacial till was encountered beneath the silty sand layer at both boreholes. The glacial till consisted of gravel, cobbles and boulders in a matrix of grey silty sand, with a trace of clay. BH1 and BH2 encountered glacial till at a depth of 3.6 and 3.7 metres respectively, and were terminated in the glacial till at a depth of approximately 7.5 and 6.7 metres, respectively, below the existing ground

surface level. Based on the standard penetration test results of 18 to 45 blows per 0.3 metres, the glacial till is indicated to be in a compact to dense state of packing.

Groundwater

No groundwater seepage was observed in the boreholes at the time of drilling. It should be noted that the groundwater levels may be higher during wet periods of the year such as the early spring.

Sulphate, Resistivity and pH

A sample of soil obtained from BH2 was delivered to a chemical laboratory for testing for any indication of potential soil sulphate attack and soil corrosion on buried concrete and steel. The results of the chemical laboratory testing of the soil gave a percent sulphate (SO4) for the soil sample of 0.07 and an ohm-cm resistivity and pH of 1790 and 8.0, respectively.

PROPOSED COMMERCIAL BUILDING

General

This section of the report provides engineering guidelines on the geotechnical design aspects of the project based on our interpretation of the information from the boreholes and the project requirements. It is stressed that the information in the following sections is provided for the guidance of the designers and is intended for this project only. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety and equipment capabilities.

The professional services for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or contamination resulting from previous uses or activities at this site or adjacent properties, and/or resulting from the introduction onto the site of materials from off site sources are outside the terms of reference for this report.

Foundation for Proposed Commercial Building

With the exception of the topsoil materials, the subsurface conditions encountered at the boreholes advanced during the investigation are suitable for the support of the proposed commercial building on a thickened edge, cast-in-place, concrete, slab on grade foundation. The excavations for the foundation should be taken through any topsoil or otherwise deleterious material to expose the native, undisturbed silty clay.

For predictable performance of the proposed foundation, all existing topsoil and any deleterious materials should be removed from within the proposed foundation area and should be replaced to the proposed founding level using suitable engineered fill. It is expected that the subgrade, beneath the topsoil, consists of native undisturbed silty clay. The subgrade surface should then be inspected and approved by geotechnical personnel. To allow the spread of load beneath the foundations, the engineered fill should extend down and out from the outside edges of the thickened edge slabs at 1 horizontal to 1 vertical, or flatter. The excavations for the structure should be sized to accommodate this fill placement.

The fill materials beneath the proposed thickened edge slab on grade should consist of a minimum of 150 millimetre thickness of crushed stone meeting OPSS Granular A immediately beneath the concrete floor slab followed by sand, or sand and gravel meeting the OPSS for Granular B Type I or crushed stone meeting OPSS grading requirements for Granular B Type II. The engineered fill materials should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density. Currently, OPSS documents allow recycled asphaltic concrete to be used in Granular A and Granular B Type II materials. Since the source of recycled material cannot be determined, it is suggested that any granular materials used below the founding level be composed of virgin material only.

The proposed commercial building, when founded on engineered fill as described above, should be designed with a maximum allowable bearing pressure of 100 kilopascals for serviceability limit states design and a maximum of 300 kPa for factored ultimate limit states design; when considering the thickened edge portion of the slab only. The maximum total and differential settlement of the footings are expected to be less than 25 millimetres and 20 millimetres, respectively, using the above allowable bearing pressure and resistance. The above allowable bearing pressure and resistance are subject to a maximum grade raise of 2.0 metres.

The native soils at this site will be sensitive to disturbance from construction operations and from rainwater or snowmelt, and frost. In order to minimize disturbance, construction traffic operating directly on the subgrade should be kept to an absolute minimum and the subgrade should be protected from below freezing temperatures.

The thickened edged slab could be saw cut at regular intervals to prevent random cracking of the slab due to shrinkage and expansion of the concrete. The saw cut depth should be about one quarter of the thickness of the slab. The crack control cuts should be placed at a grid spacing not exceeding 5.0 metres.

Alternatively, to eliminate the requirement for frost protection in the form of high density polystyrene insulation, a minimum 1.2 metre thickness of engineered fill consisting of OPSS Granular B Type I or Type II could be used.

Provided the proposed finished floor surface is above the exterior finished grade and provided the exterior grade is adequately sloped away from the proposed commercial building, no perimeter foundation drainage systems are required.

Under slab drainage is not considered necessary provided that the floor slab level is everywhere above the finished exterior ground surface level. If any areas of the proposed commercial building are to remain unheated during the winter period, thermal protection of the slab on grade may be required. Further details on the insulation requirements could be provided, if necessary.

Groundwater inflow from the native soils into the excavations during construction, if any, should be handled by pumping from sumps within the excavations.

Seismic Design for the Proposed Commercial Building

Based on the limited information from the test pits, for seismic design purposes, in accordance with the 2006 OBC Section 4.1.8.4, Table 4.1.8.4.A., the site classification for seismic site response is Site Class D.

Potential for Soil Liquefaction

As indicated above, the results of the boreholes indicate that the native deposits underlying the site consist of very stiff to stiff silty clay followed by compact sand then glacial till. As these materials are not prone to liquefaction, it is considered that no damage to the proposed commercial building should occur due to liquefaction of the native subgrade under seismic conditions.

Access Roadway and Parking Area Pavements

In preparation for pavement construction at this site the topsoil and any soft, wet or deleterious materials should be removed from the proposed access roadway and parking lot area. The exposed subgrade should be inspected and approved by geotechnical personnel and any soft areas evident should be subexcavated and replaced with suitable earth borrow approved by the geotechnical engineer. The subgrade should be shaped and crowned to promote drainage of the roadway and parking area granulars. Following approval of the preparation of the subgrade, the pavement granulars may be placed.

For any areas of the site that require the subgrade to be raised to proposed roadway and parking area subgrade level, the material used should consist of OPSS select subgrade material or OPSS Granular B Type I or Type II. Materials used for raising the subgrade to proposed roadway and parking area subgrade level should be placed in maximum 300 millimetre thick loose lifts and be compacted to at least 95 percent of the standard Proctor maximum dry density using suitable compaction equipment.

For pavement areas subject to cars and light trucks the pavement should consist of:

50 millimetres of hot mix asphaltic concrete (HL3) over
150 millimetres of OPSS Granular A base over
300 millimetres of OPSS Granular B, Type II subbase
(50 or 100 millimetre minus crushed stone)
or
200 millimetres of OPSS Granular A base over
300 millimetres of OPSS Granular B, Type II subbase

(50 or 100 millimetre minus crushed stone)

For pavement areas subject to heavy truck loading the pavement should consist of:

40 millimetres of hot mix asphaltic concrete (HL3) over
40 millimetres of hot mix asphaltic concrete (HL8) over
150 millimetres of OPSS Granular A base over
350 millimetres of OPSS Granular B, Type II subbase
(50 or 100 millimetre minus crushed stone)
or
250 millimetres of OPSS Granular A base over
400 millimetres of OPSS Granular B, Type II subbase
(50 or 100 millimetre minus crushed stone)

Compaction of the granular pavement materials should be carried out in maximum 300 millimetre thick loose lifts to 100 percent of the standard Proctor maximum dry density value using suitable vibratory compaction equipment.

The above pavement structures will be adequate on an acceptable subgrade, that is, one where any roadway fill and service trench backfill has been adequately compacted. If the roadway subgrade is disturbed or wetted due to construction operations or precipitation, the granular thicknesses given above may not be adequate and it may be necessary to increase the thickness of the Granular B Type II subbase and/or incorporate a non-woven geotextile separator between the roadway subgrade surface and the granular subbase material.

CONSTRUCTION CONSIDERATIONS

It is suggested that the final design drawings for the site, including the proposed site grading plan, be reviewed by the geotechnical engineer to ensure that the guidelines provided in this report have been interpreted as intended.

The engagement of the services of the geotechnical consultant during construction is recommended to confirm that the subsurface conditions throughout the proposed development do

not materially differ from those given in the report and that the construction activities do not adversely affect the intent of the design.

All foundation areas and any engineered fill areas for the proposed commercial building should be inspected by Kollaard Associates Inc. to ensure that a suitable subgrade has been reached and properly prepared. The placing and compaction of any granular materials beneath the foundation should be inspected to ensure that the materials used conform to the grading and compaction specifications.

The subgrade for the access roadway and parking areas should be inspected and approved by geotechnical personnel. In situ density testing should be carried out on the pavement granular materials to ensure the materials meet the specifications from a compaction point of view.

The native topsoil and silty clay at this site will be sensitive to disturbance from construction operations, from rainwater or snow melt, and frost. In order to minimize disturbance, construction traffic operating directly on the subgrade should be kept to an absolute minimum and the subgrade should be protected from below freezing temperatures.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report or if we may be of further services to you, please do not hesitate to contact our office.

Regards,
Kollaard Associates Inc.

LICENSED PROFESSIONAL ENGINEER
Dec 23/10
S.E. deWit
100079612
PROVINCE OF ONTARIO

for

D. Karges, B.Eng.

Steve DeWit, P.Eng.

Attachments: Record of Boreholes
Figures 1 and 2

File 100667

RECORD OF BOREHOLE 1

PROJECT: Proposed Commercial Building
CLIENT: Wicked Garage Inc.
LOCATION: 1344 Barfield Road, Greely, City of Ottawa
PENETRATION TEST HAMMER: 63.5kg, Drop, 0.76mm

PROJECT NUMBER: 100667
DATE OF BORING: November 16, 2010
SHEET 1 of 1
DATUM: Local

DEPTH SCALE (meters)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (M)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	UNDIST. SHEAR STRENGTH × Cu, kPa (20 40 60 80) / REM. SHEAR STRENGTH ○ Cu, kPa (20 40 60 80)	DYNAMIC CONE PENETRATION TEST blows/300 mm (10 30 50 70 90)	ADDITIONAL LAB TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
	Ground Surface									
0	TOPSOIL		0.00	0	NA	NA				
	Stiff, grey brown SILTY CLAY		0.40							
1				1	SS	5				
2				2	SS	6				
	Firm, grey brown SILTY CLAY		2.44	3	SS	7				
3	Grey SILTY SAND, some clay		3.05	4	SS	40				
	Grey SILTY SAND, some gravel, cobbles and boulders, trace clay (GLACIAL TILL)		3.66	5	SS	18				
4										
				6	SS	45				No water was observed in the borehole soil samples. 11/16/2010
5				7	SS	27				
				8	SS	33				
6										
				9	SS	45				
7	End of borehole		7.50							
8										

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Engineers

DEPTH SCALE: 1 to 45
BORING METHOD: Power Auger
AUGER TYPE: 200 mm Hollow Stem
LOGGED: DK
CHECKED: SD

RECORD OF BOREHOLE 2

PROJECT: Proposed Commercial Building
CLIENT: Wicked Garage Inc.
LOCATION: 1344 Barfield Road, Greely, City of Ottawa
PENETRATION TEST HAMMER: 63.5kg, Drop, 0.76mm

PROJECT NUMBER: 100667
DATE OF BORING: November 16, 2010
SHEET 1 of 1
DATUM: Local

DEPTH SCALE (meters)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (M)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	UNDIST. SHEAR STRENGTH / REM. SHEAR STRENGTH Cu, kPa (20 40 60 80)	DYNAMIC CONE PENETRATION TEST blows/300 mm (10 30 50 70 90)	ADDITIONAL LAB TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
	Ground Surface									
0	TOPSOIL		0.00	0	NA	NA				
	Stiff to firm, grey brown SILTY CLAY		0.46	1	SS	7				
1										
				2	SS	7				
2	Grey SILTY SAND, some clay		2.13							
				3	SS	10				
3				4	SS	32				
	Grey SILTY SAND, some gravel, cobbles and boulders, trace clay (GLACIAL TILL)		3.73	5	SS	42				
4										
				6	SS	42				No water was observed observed in the borehole soil samples. 11/16/2010
5										
				7	SS	35				
6										
				8	SS	39				
	End of borehole		6.71							
7										
8										

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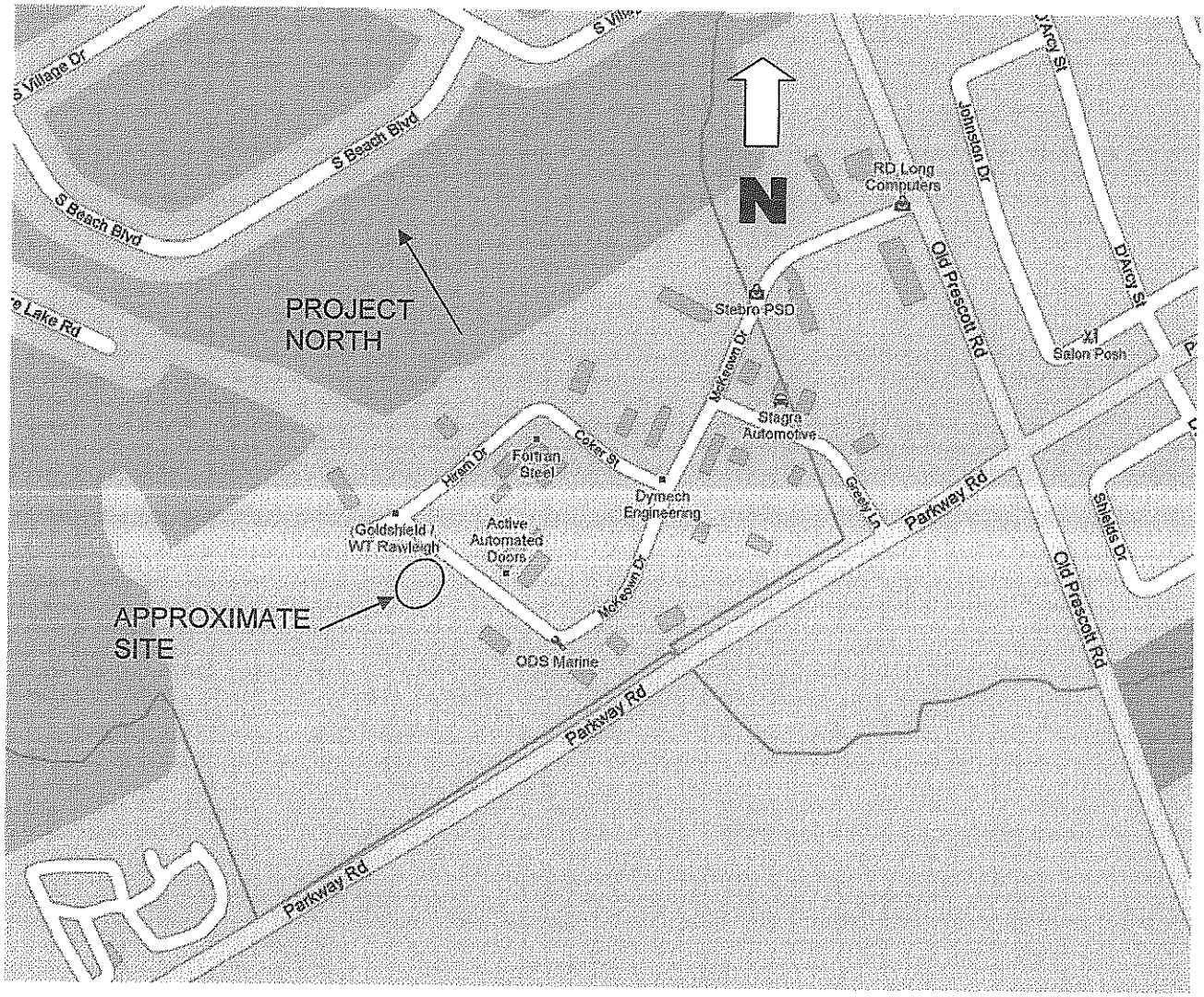
DEPTH SCALE: 1 to 45
BORING METHOD: Power Auger
AUGER TYPE: 200 mm Hollow Stem
LOGGED: DK
CHECKED: SD

KEY PLAN

FIGURE 1



NOT TO SCALE

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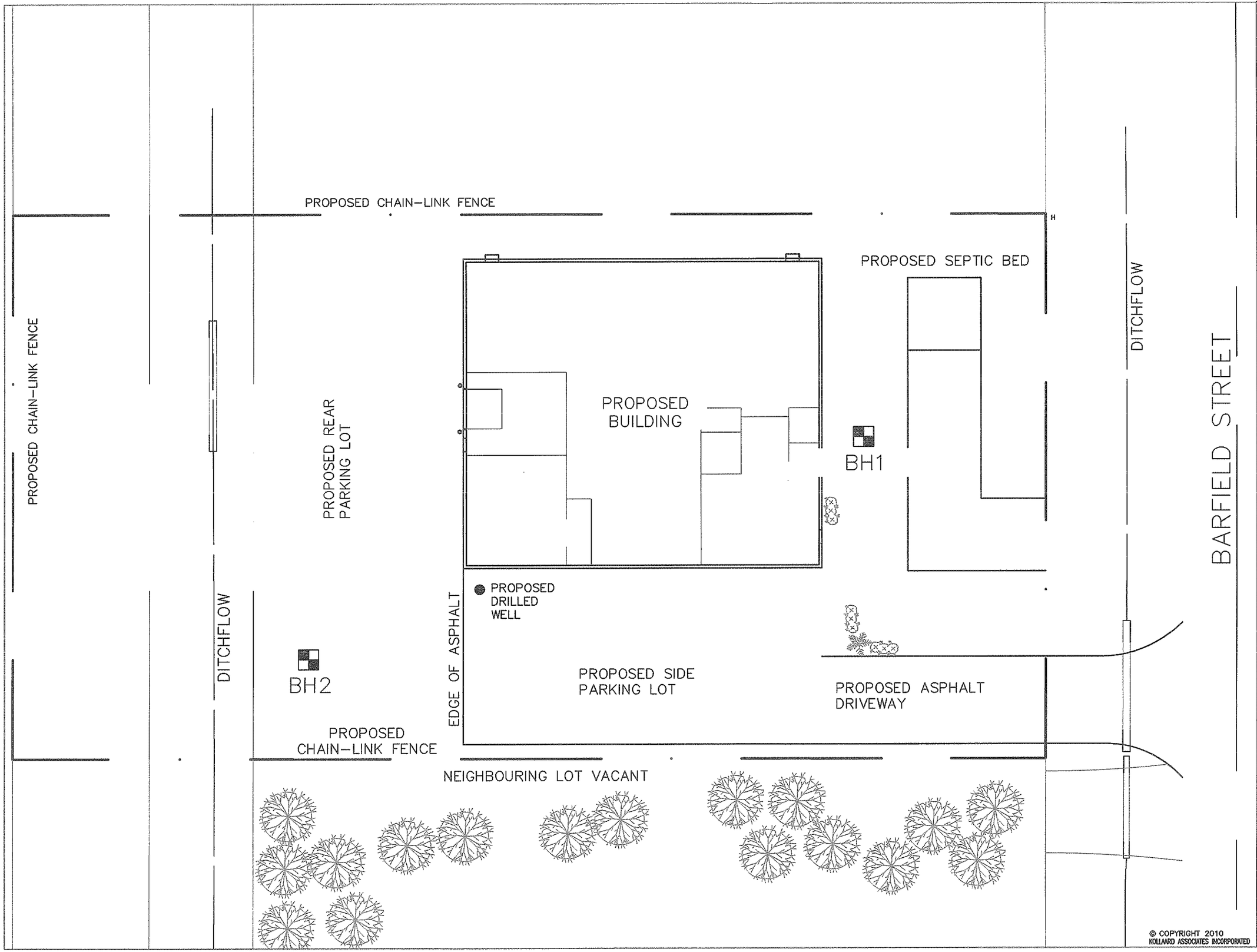
Project No. 100667

Date ~~November~~ 2010

Rec.



SITE PLAN, FIGURE 2

LEGEND

Approximate borehole locations

BH1 Borehole # 1

REFERENCE: Plan provided by client. Map provided by Ottawa emaps, 2010.

SPECIAL NOTE:
This drawing to be read in conjunction with the accompanying report.

REV.	NAME	DATE	DESCRIPTION

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CLIENT:
WICKED GARAGE INC.

PROJECT:
PROPOSED COMMERCIAL BUILDING

LOCATION
1344 BARFIELD ROAD
OSGOODE WARD, GREELY
CITY OF OTTAWA, ONTARIO
K4P1A1

DESIGNED BY:	DATE:
n/a	DECEMBER 2010
DRAWN BY:	SCALE:
DK	1:250

KOLLAARD FILE NUMBER:
100667