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REPORT ON

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
819 BURRITTS RAPIDS ROAD
MERRICKVILLE-WOLFORD, ONTARIO

Project # 210816

Submitted to:

2873633 Ontario Inc.
210 Prescott Street
Kemptville, ON
K0G 1J0

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January 2025

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January 6, 2025 210816

2873633 Ontario Inc.
210 Prescott Street, Unit 1
Kemptville, ON
K0G 1J0

RE: GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
819 COUNTY ROAD 23
MERRICKVILLE-WOLFORD, ONTARIO

1.0 INTRODUCTION

This report presents the results of a geotechnical investigation carried out for the above noted proposed residential development to be located at 819 Burritts Rapids Road in Merrickville-Wolford, Ontario (see Key Plan, Figure 1).

The purpose of the investigation was to:

- Identify the subsurface conditions at the site by means of a limited number of test pits;
- Based on the factual information obtained, provide recommendations and guidelines on the geotechnical engineering aspects of the project design; including bearing capacity and other construction considerations, which could influence design decisions.

2.0 BACKGROUND INFORMATION AND SITE GEOLOGY

2.1 Existing Conditions and Site Geology

The subject site for this assessment consists of about a 22.7 hectares (56 acres) irregular-shaped property located at 819 County Road 23 in Merrickville-Wolford, Ontario (see Key Plan, Figure 1).

For the purposes of this assessment, project north lies in a direction perpendicular to County Road 23, located south of the site.

Surrounding land use is currently a mixture of scattered residential development and agricultural land. The site is bordered on the north and west by the Rideau River, on the east by agricultural land, and on the south by Burritts Rapids Road followed by scattered residential development. The site is currently occupied by a single family dwelling.

The ground surface at the site is in general sloped to the north and west towards the Rideau River.

Based on a review of the surficial geology map for the site area, it is expected that the site is underlain by fine textured glaciomarine deposits (silty clay) and modern alluvial deposits (sand and gravel). Bedrock geology maps indicate that the bedrock underlying the site consists of limestone and dolomite of the Beekmantown Formation.

Based on a review of overburden thickness mapping for the site area, the overburden is estimated to be between about 5 to 12 metres in thickness above bedrock.

Groundwater flow often reflects topographic features and typically flows toward nearby lakes, rivers and wetland areas. Based on the topography of the area, it is expected that the local shallow groundwater flow is to the north and west towards the Rideau River.

2.2 Proposed Development

It is understood that preliminary plans are being prepared for the construction of a residential subdivision at the site. It is understood that the residential development will consist of single family dwellings. It is understood that the buildings will be wood framed with some brick veneer and cast-in-place concrete construction with conventional concrete spread footing foundations with basements. The proposed buildings will be provided with an asphaltic concrete driveway. The proposed buildings will be serviced by private wells and septic systems.

Surface drainage for the proposed buildings will be by means of road side ditches and swales.

3.0 PROCEDURE

The field work for this investigation was carried out on March 2, 2023, at which time ten test pits were put down at the site. The test pits locations were located in the field by a member of our field staff at the time of the field work. Ten test pits numbered TP01 to TP10 were put within the area of the proposed residential development using a track mounted excavator owned and operated by a local excavation contractor.

The test pits put down during the subsurface investigation were for geotechnical purposes only. Identification of the presence or absence of surface or subsurface contamination was outside the scope of work for the investigation. As such, an environmental technician was not on site for environmental sampling or assessment purposes.

The test pits were advanced to depths of about 3.1 to 3.6 metres below the existing ground surface. In situ vane shear testing (ASTM D-2573 Standard Test Method for Field Shear Test in Cohesive Soil) was completed within the cohesive materials encountered at the test pits.

The subsurface conditions encountered at the test pits were classified based on visual and tactile examination of the materials exposed on the sides and bottom of the test pits (ASTM D2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), an assessment of the difficulty of digging, as well as laboratory test results on select samples recovered from the test pits. The soils were classified using the Unified Soil Classification System. The groundwater conditions were observed in the open test pits at the time of excavating. The test pits were loosely backfilled with the excavated materials upon completion of the fieldwork.

Two soil samples (TP04 – 1.6 m & TP09 – 2.5 m) were submitted for Particle Size Analysis (ASTM D422). One soil sample (TP08 – 1.6 m) was submitted for Atterberg Limits (D4318) and Moisture Content (ASTM D2216). The samples were selected based on depth and tactile examination to be representative of the various soil conditions encountered at the site. The soils were classified using the Unified Soil Classification System.

A total of eleven soil samples recovered from the test pits were also tested for moisture content (ASTM D2216).

One soil sample (TP08 – 1.6 m) was delivered to a chemical laboratory for testing for any indication of potential soil sulphate attack on concrete and corrosivity to buried steel.

The field work was supervised throughout by a member of our engineering staff who located the test pits in the field, logged the test pits and cared for the samples obtained. A description of the subsurface conditions encountered at the test pits are attached in Table I, Record of Test Pits following this report. The results of the laboratory testing of the soil samples are presented in the Laboratory Test Results section and Attachment A and B following the text in this report. The approximate locations of the test pits are shown on the attached Site Plan, Figure 2.

The location of the ten (10) test pits and ground surface elevations were determined by members of our engineering staff. All of the test holes are indicated on the attached Site Plan, Figure 2.

4.0 SUBSURFACE CONDITIONS

4.1 General

As previously indicated, a description of the subsurface conditions encountered at the test pits is provided in the attached Record of Test Pit Sheets following the text of this report. The test pit logs indicate the subsurface conditions at the specific test hole 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 test hole locations may vary from the conditions encountered at the test holes.

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 test hole 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 test pits.

4.2 Topsoil

About a 0.3 to 0.4 metre thickness of topsoil was encountered below the ground surface at all of the test holes. 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.

4.3 Silty Clay

Beneath the topsoil, a deposit of red brown to grey brown silty clay was encountered at all of the test pits. In situ vane shear tests carried out in the silty clay deposit in the test pits gave undrained shear strength values of greater than 120 kilopascals in the test pits. 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.

Test pits TP01 to TP08 and TP10 were terminated within the silty clay deposit at depths ranging from 3.1 to 3.6 metres below the existing ground surface. The silty clay was fully penetrated in test pit TP9. The silty clay was fully penetrated in TP09, the thickness was about 0.5 metres.

The results of Atterberg Limits tests and moisture content (ASTM D422) conducted on one soil sample (TP08 – 1.6 m) of the silty clay are presented in the following table and in Attachment A at the end of the report. The tested silty clay sample classifies as high plasticity in accordance with the Unified Soil Classification System.

Table I – Atterberg Limit and Water Content Results

Sample	Depth(metres)	LL (%)	PL (%)	PI (%)
TP08	1.6	52.7	25.4	27.4

LL: Liquid Limit PL: Plastic Limit Pl: Plasticity Index w: water content
CH: Inorganic High Plastic Clays

The results of a hydrometer test (ASTM D422 and D2216) on one sample of soil (TP4 – 1.6 m) indicates the sample has the following:

Sample	Depth(metres)	% Gravel	% Sand	% Silt	% Clay
TP04	1.6	0.0	1.6	44.4	54.0

The results of the laboratory testing are located in Attachment A.

4.4 Glacial Till

A deposit of red brown to grey brown to grey glacial till was encountered beneath the silty clay at test pit TP9. The glacial till consists of silty sand with some gravel, cobbles, boulders and a trace of clay (Glacial Till). The glacial till was encountered at a depth of 0.8 metres below the existing ground surface. Test pit TP8 was terminated within the glacial till at a depth of about 3.1 metres below the ground surface.

The results of a hydrometer test (ASTM D422 and D2216) on a sample of soil (TP09 – 2.5 m) indicate the sample has the following:

Sample	Depth(metres)	% Gravel	% Sand	% Silt	% Clay
TP09	2.5	10.6	41.6	38.8	9.0

The results of the laboratory testing are located in Attachment A.

4.5 Moisture Contents

A total of eleven soil samples recovered from the test pits were tested for moisture content (ASTM D2216). The measured moisture contents of the silty clay soil samples ranged from about 17 to 39 percent. The results of the moisture contents are located on the Record of Test Pit sheets following the text of this report.

4.6 Groundwater

Some groundwater seepage was encountered within some of the test pits at the time of the field work. The groundwater levels ranged from about 0.8 to 3.6 metres below the existing ground surface. It should be noted that the groundwater levels may be higher during wet periods of the year such as the early spring.

4.7 Corrosivity on Reinforcement and Sulphate Attack on Portland Cement

The results of the laboratory testing of a soil sample submitted for chemistry testing related to corrosivity is summarized in the following table.

TP08 – 1.6 m

Item	Threshold of Concern	Test Result	Comment
Chlorides (Cl)	Cl > 0.04 %	<0.0005	Negligible concern
pH	pH < 5.5	7.67	Basic Negligible concern
Resistivity	R < 20,000 ohm-cm	7810	Moderately Corrosive
Sulphates (SO_4)	SO_4 > 0.1%	<0.0020	Negligible concern

The results were compared with Canadian Standards Association (CSA) Standards A23.1 for sulphate attack potential on concrete structures and possess a "negligible" risk for sulphate attack on concrete materials and accordingly, conventional GU or MS Portland cement may be used in the construction of the proposed concrete elements.

The pH value for the soil sample was reported to be 7.67, indicating a durable condition against corrosion. This value was evaluated using Table 2 of Building Research Establishment (BRE) Digest 362 (July 1991).The pH is greater than 5.5 indicating the concrete will not be exposed to attack from acids.

The chloride content of the sample was also compared with the threshold level and presents negligible concrete corrosion potential.

Corrosivity Rating for soils ranges from extremely corrosive to non-corrosive as follows:

Soil Resistivity (ohm-cm)	Corrosivity Rating
> 20,000	non- corrosive
10,000 to 20,000	mildly corrosive
5,000 to 10,000	moderately corrosive
3,000 to 5,000	corrosive
1,000 to 3,000	highly corrosive
< 1,000	extremely corrosive

The Soil resistivity was found to be 7810 ohm-cm for the sample analyzed making the soil moderately corrosive for buried steel. Consideration to increasing the specified strength and/or adding air entrainment into any reinforced concrete in contact with the soil should be given. Consideration should also be given to increasing the minimum concrete cover over reinforcing steel. Alternatively, GFRP reinforcement may be used in place of steel reinforcement.

Based on the chemical test results, Type GU General Use Hydraulic Cement may be used for this proposed development. Additional special protection is not required for reinforcement steel within the concrete walls.

5.0 GEOTECHNICAL GUIDELINES AND RECOMMENDATIONS

5.1 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 test holes 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 subsurface 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 offsite sources are outside the terms of reference for this report.

5.2 Foundations for Proposed Residential Buildings

The subsurface conditions encountered at the test pits advanced during the investigation consisted of topsoil followed by silty clay or silty clay overlying glacial till. Based on the undrained shear strength measurements within the silty clay deposit, the silty clay has a very stiff consistency. The allowable bearing pressure for any footings depends on the depth of the footings below original

ground surface, the width of the footings, and the height above the original ground surface of any landscape grade raise adjacent to the foundations and the thickness of the soils deposit beneath the footings.

5.3 Foundation Design and Bearing Capacity for Proposed Residential Buildings

With the exception of the topsoil, the subsurface conditions encountered at the test holes advanced during the investigation are suitable for the support of the proposed buildings on conventional spread footing foundations placed on a native subgrade or on engineered fill placed on the native subgrade. The excavations for the foundations should be taken through any topsoil or otherwise deleterious material to expose the native, undisturbed red brown silty clay. It is suggested that the buildings be founded either directly on the underlying silty clay or on engineered fill placed on the silty clay.

Strip and pad footings, a minimum 0.5 metres in width bearing on the native undisturbed silty clay at a founding depth of no more than 0.5 metres below the existing ground surface and above the groundwater level or on a suitably constructed engineering pad placed on the native silty clay may be designed using a maximum allowable bearing pressure of 100 kilopascals for serviceability limit states and 150 kilopascals for the factored ultimate bearing resistance.

The above allowable bearing pressure is subject to a maximum allowable grade raise of 2.5 metres. There is no maximum strip footing width or length.

Provided that any loose and/or disturbed soil is removed from the bearing surfaces prior to pouring concrete, the total and differential settlement of the footings should be less than 25 millimetres and 20 millimetres, respectively.

5.4 Engineered Fill

Any fill required to raise the footings for the proposed buildings to founding level should consist of imported granular material (engineered fill). The engineered fill should consist of granular material meeting Ontario Provincial Standards Specifications (OPSS) requirements for Granular A or Granular B Type II and should be compacted in maximum 300 millimetre thick loose lifts to at least 98 percent of the standard Proctor maximum dry density. It is considered that the engineered fill

should be compacted using dynamic compaction with a large diameter vibratory steel drum roller or diesel plate compactor. If a diesel plate compactor is used, the lift thickness may need to be restricted to less than 300 mm to achieve proper compaction. Compaction should be verified by a suitable field compaction test method.

To allow the spread of load beneath the footings, the engineered fill should extend out 0.5 metres horizontally and then down and out from the edges of the footing at 1 horizontal to 1 vertical, or flatter. The excavations for the proposed buildings should be sized to accommodate this fill placement.

The first lift of engineered fill material should have a thickness of 300 millimetres in order to protect the subgrade during compaction. It is considered that the placement of a geotextile fabric between the engineered fill and the subgrade is not necessary where granular materials meeting the grading requirements for OPSS Granular B Type II or OPSS Granular A are placed on a silty clay subgrade above the normal groundwater level. It is recommended that trucks are not used to place the engineered fill on the subgrade. The fill should be dumped at the edge of the excavation and moved into place with a tracked bulldozer or excavator.

The native silty clay and glacial till 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.

5.5 Excavation Considerations

5.5.1 Foundation Excavation for Proposed Residential Buildings

Any excavation for the proposed structures will likely be carried out through topsoil and silty clay to bear within the native silty clay subgrade. The sides of the excavations should be sloped in accordance with the requirements of Ontario Regulation 213/91, s. 226 under the Occupational Health and Safety Act. According to the Act, the native soils at the site can be classified as Type 3 soil, however this classification should be confirmed by qualified individuals as the site is excavated and if necessary, adjusted.

It is expected that the side slopes of the excavation will be stable in the short term provided the walls are sloped at 1H:1V through the topsoil and silty clay to 1.2 metres or less from the bottom of the excavation and provided no excavated materials are stockpiled within 3 metres of the top of the excavations.

5.5.2 Groundwater in Excavation and Construction Dewatering

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

Groundwater was observed within the test pits at depths ranging between about 0.8 to 3.6 metres below the existing ground surface. Based on the groundwater levels observed and the depth of excavations, water intrusion into the excavation is not considered likely and as such dewatering will not be required.

It is considered unlikely that a permit to take water will be required prior to excavation. It is considered however that registration under the Environmental Activity and Sector Registry as per O. Reg 63/15 may be required.

5.6 Frost Protection Requirements for Spread Footing Foundations

In general, all exterior foundation elements and those in any unheated parts of the proposed buildings should be provided with at least 1.5 metres of earth cover for frost protection purposes. Isolated, unheated foundation elements adjacent to surfaces, which are cleared of snow cover during winter months should be provided with a minimum 1.8 metres of earth cover for frost protection purposes.

5.7 Foundation Wall Backfill and Drainage

The native soils encountered at this site are considered to be frost susceptible. As such, to prevent possible foundation frost jacking due to frost adhesion, the backfill against the foundation walls and isolated walls should consist of free draining, non-frost susceptible material. If imported material is required, it should consist of sand or sand and gravel meeting OPSS Granular B Type I grading

requirements. Alternatively, foundations could be backfilled with native material in conjunction with the use of an approved proprietary drainage layer system such as "System Platon" against the foundation wall. It is pointed out that there is potential for possible frost jacking of the upper portion of some types of these drainage layer systems if frost susceptible material is used as backfill. This could be mitigated by backfilling the upper approximately 0.6 metres with non-frost susceptible granular material.

Where the backfill material will ultimately support a pavement structure or walkway, it is suggested that the foundation wall backfill material be compacted in 250 millimetre thick lifts to 95 percent of the standard Proctor dry density value. In that case any native material proposed for foundation backfill should be inspected and approved by the geotechnical engineer.

A conventional, perforated perimeter drain, with a 150 millimetre surround of 20 millimetre minus crushed stone, should be provided at the founding level for the cast-in-place concrete basement floor slab and should lead by gravity flow to a sump equipped with a sump pump.Where a sump pump is used the sump should be equipped with a battery powered backup and alarm and/or backup pump and generator. The sump discharge should be equipped with a backup flow protector.

5.8 Basement Floor Slab Support

As stated above, it is expected that the proposed buildings will be founded on native silty clay or on an engineered pad placed on the native subgrade. For predictable performance of the proposed concrete basement floor slab all topsoil and any otherwise deleterious material should be removed from below the proposed floor slab area. The exposed native subgrade surface should then be inspected and approved by geotechnical personnel. Any soft areas evident should be subexcavated and replaced with suitable engineered fill.

The fill materials beneath the proposed concrete floor 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, or other material approved by the Geotechnical Engineer. The fill materials should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density.

Alternatively, clear stone could be used in place of OPSS Granular A and Granular B Type material beneath the concrete basement floor slab. In order to facilitate the clear stone, a minimum of 6 ounce per square yard nonwoven geotextile filter cloth should be placed on the native subgrade followed by a 200mm thick layer of 20mm stone. The clear crushed stone should be well compacted to prevent future consolidation using a minimum of three passes with a large diesel plate compactor.

The slab should be structurally independent from walls and columns, which are supported by the foundations. This is to reduce any structural distress that may occur as a result of differential soil movement. If it is intended to place any internal non-load bearing partitions directly on the slab-on-grade, such walls should also be structurally independent from other elements of the building founded on the conventional foundation system so that some relative vertical movement between the floor slab and foundation can occur freely.

The concrete floor slab should be saw cut at regular intervals to minimize random cracking of the slab due to shrinkage 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 the lesser of 25 times the slab thickness or 4.5 metres. The slab should be cut as soon as it is possible to work on the slab without damaging the surface of the slab.

5.9 Seismic Design for the Proposed Residential Buildings

5.9.1 Seismic Site Classification

Based on the limited information from the boreholes, for seismic design purposes, in accordance with the 2017 OBC Section 4.1.8.4, Table 4.1.8.4.A., the site classification for seismic site response is Site Class D.

The assumed underside of footing level is at a maximum of about 0.5 metres below the existing ground surface. The footings will be bearing on silty clay with a plasticity index of greater than 20 and a moisture content of greater than 20%.

5.9.2 National Building Code Seismic Hazard Calculation

The online 2015 National Building Code Seismic Hazard Calculation was used to verify the seismic conditions at the site. The design Peak Ground Acceleration (PGA) for the site was calculated as 0.203 with a 2% probability of exceedance in 50 years based on the interpolation of the 2015 National Building Code Seismic Hazard calculation. The results of the calculation are attached following the text of this report.

5.9.3 Potential for Soil Liquefaction

As previously indicated, the subsurface soils in general consist of high plasticity clay and/or glacial till. Soils of this nature are not considered to be susceptible to liquefaction under seismic conditions. As such there is no risk to the buildings or services at the site resulting from seismic liquefaction.

6.0 ROADWAY PAVEMENTS

6.1 Subgrade Preparation

In preparation for pavement construction at this site any topsoil and any soft, wet or deleterious materials should be removed from the proposed roadway areas. The exposed subgrade surface should then be proof rolled, inspected and approved by geotechnical personnel. Based on the results of the boreholes, the subsurface conditions in the roadway areas in general consist of topsoil followed by silty clay. Any soft or unacceptable areas evident should be subexcavated and replaced with suitable earth borrow material. 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.

If the subgrade surface consists of native silty clay, the proposed roadway pavement should consist of:

40 millimetres of Superpave 12.5 asphaltic concrete over
50 millimetres of Superpave 19 asphaltic concrete over
150 millimetres of OPSS Granular A base over
300 millimetres of OPSS Granular B, Type II subbase over
(50 or 100 millimetre minus crushed stone)

Performance grade PG 58-34 asphaltic concrete should be specified. 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 sub-grade, that is, one where any roadway fill and service trench backfill has been adequately compacted. If the roadway sub-grade 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 sub-grade surface and the granular subbase material. The adequacy of the design of the pavement thickness should be assessed by the geotechnical personnel at the time of construction.

7.0 CONSTRUCTION CONSIDERATIONS

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.

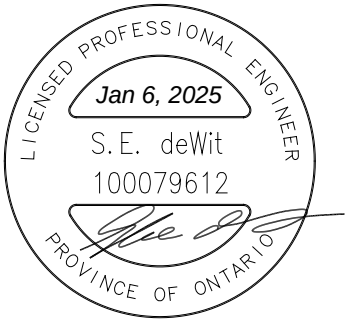
All foundation areas and any engineered fill areas for the proposed residential buildings should be inspected by Kollaard Associates Inc. to ensure that a suitable sub-grade has been reached and properly prepared. The placing and compaction of any granular materials beneath the foundations should be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

The subgrade for the access roadways 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 silty clay and glacial till deposits 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.



Dean Tataryn, B.E.S., EP.

Steven DeWit, P.Eng.

Kollaard Associates Engineers

RECORD OF TEST PIT TP01

PROJECT: Proposed Subdivision
CLIENT: 2873633 Ontario Inc
LOCATION: 819 Burritts Rapids Road

PROJECT NUMBER: 210816
DATE OF EXCAVATING: 23-3-2
SHEET 1 of 1
DATUM: GEODETIC

DEPTH SCALE (meters)	SOIL PROFILE DESCRIPTION	DEPTH (m)	STRATA PLOT	ELEV. (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES SHEAR STRENGTH (kPa)	UNDIST SHEAR STRENGTH x Cu. kPa x / REM SHEAR STRENGTH o Cu. kPa o (0 20 40 60 80 100)	WATER CONTENT (%) (0 20 40 60 80 100)	ADDITIONAL LAB RESULTS	PIEZOMETER OR STANDPIPE INSTALLATION
	TOPSOIL	0.00		95.3							Some groundwater observed at about 3.6 metres below the existing ground surface, March 2, 2023.
0.5	Red brown SILTY CLAY	0.40		94.9							
	Grey brown SILTY CLAY	0.70		94.6		VA	>120				
1.0						VA	>110				
1.5						VA	>100				
						VA	>120				
2.0											
						VA	>120				
2.5											
3.0											
3.5											
	End of test pit in SILTY CLAY	3.60		91.7							

DEPTH SCALE: 1 to 25
LOGGED: CI

EXCAVATOR TYPE: Track-Mounted Excavator
CHECKED: SD

GEOTECH TP KOLLAARD 210816 - TP LOGS.GPJ GINT STD CANADA.GDT 25-1-9

Kollaard Associates Engineers

RECORD OF TEST PIT TP02

PROJECT: Proposed Subdivision
CLIENT: 2873633 Ontario Inc
LOCATION: 819 Burritts Rapids Road

PROJECT NUMBER: 210816
DATE OF EXCAVATING: 23-3-2
SHEET 1 of 1
DATUM: GEODETIC

DEPTH SCALE (meters)	SOIL PROFILE: DESCRIPTION	DEPTH (m)	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	SHEAR STRENGTH (kPa)	UNDIST SHEAR STRENGTH x Cu. kPa x / REM SHEAR STRENGTH o Cu. kPa o (0 20 40 60 80 100)	WATER CONTENT (%) (0 20 40 60 80 100)	ADDITIONAL LAB RESULTS	PIEZOMETER OR STANDPIPE INSTALLATION
	TOPSOIL	0.00		95.99							Test pit dry, March 2, 2023.
	Red brown SILTY CLAY	0.30		95.69							
0.5											
1.0											
	Grey brown SILTY CLAY	1.20		94.79		VA	>120				
1.5											
2.0						VA	>120				
2.5											
3.0											
	End of test pit in SILTY CLAY	3.30		92.69							

DEPTH SCALE: 1 to 25
LOGGED: CI

EXCAVATOR TYPE: Track-Mounted Excavator
CHECKED: SD

Kollaard Associates Engineers

RECORD OF TEST PIT TP03

PROJECT: Proposed Subdivision
CLIENT: 2873633 Ontario Inc
LOCATION: 819 Burritts Rapids Road

PROJECT NUMBER: 210816
DATE OF EXCAVATING: 23-3-2
SHEET 1 of 1
DATUM: GEODETIC

DEPTH SCALE (meters)	SOIL PROFILE: DESCRIPTION	DEPTH (m)	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: SHEAR STRENGTH (kPa)	UNDIST SHEAR STRENGTH x Cu. kPa x / REM SHEAR STRENGTH o Cu. kPa o: 0 20 40 60 80 100	WATER CONTENT (%): 0 20 40 60 80 100	ADDITIONAL LAB RESULTS	PIEZOMETER OR STANDPIPE INSTALLATION
	TOPSOIL	0.00		95.11							
0.5	Red brown SILTY CLAY	0.30		94.81							
1.0	Grey brown SILTY CLAY	0.90		94.21		VA	>120				Test pit dry, March 2, 2023.
1.5						VA	>120				
2.0											
2.5											
3.0											
	End of test pit in SILTY CLAY	3.30		91.81							

DEPTH SCALE: 1 to 25
LOGGED: CI

EXCAVATOR TYPE: Track-Mounted Excavator
CHECKED: SD

GEOTECH TP KOLLAARD 210816 - TP LOGS.GPJ GINT STD CANADA.GDT 25-1-9

Kollaard Associates Engineers

RECORD OF TEST PIT TP04

PROJECT: Proposed Subdivision
CLIENT: 2873633 Ontario Inc
LOCATION: 819 Burritts Rapids Road

PROJECT NUMBER: 210816
DATE OF EXCAVATING: 23-3-2
SHEET 1 of 1
DATUM: GEODETIC

DEPTH SCALE (meters)	SOIL PROFILE: DESCRIPTION	DEPTH (m)	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: SHEAR STRENGTH (kPa)	UNDIST SHEAR STRENGTH x Cu. kPa x / REM SHEAR STRENGTH o Cu. kPa o: 0 20 40 60 80 100	WATER CONTENT (%): 0 20 40 60 80 100	ADDITIONAL LAB RESULTS	PIEZOMETER OR STANDPIPE INSTALLATION
	TOPSOIL	0.00		94.28							
	Red brown SILTY CLAY	0.30		93.98							Test pit dry, March 2, 2023.
0.5											
1.0	Grey brown SILTY CLAY	1.00		93.28		VA	>120				
1.5											
						VA	>120				
2.0											
2.5											
3.0											
	End of test pit in SILTY CLAY	3.30		90.98							

DEPTH SCALE: 1 to 25
LOGGED: CI

EXCAVATOR TYPE: Track-Mounted Excavator
CHECKED: SD

Kollaard Associates Engineers

RECORD OF TEST PIT TP05

PROJECT: Proposed Subdivision
CLIENT: 2873633 Ontario Inc
LOCATION: 819 Burritts Rapids Road

PROJECT NUMBER: 210816
DATE OF EXCAVATING: 23-3-2
SHEET 1 of 1
DATUM: GEODETIC

DEPTH SCALE (meters)	SOIL PROFILE: DESCRIPTION	DEPTH (m)	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	SHEAR STRENGTH (kPa)	UNDIST SHEAR STRENGTH x Cu. kPa x / REM SHEAR STRENGTH o Cu. kPa o (0 20 40 60 80 100)	WATER CONTENT (%) (0 20 40 60 80 100)	ADDITIONAL LAB RESULTS	PIEZOMETER OR STANDPIPE INSTALLATION
	TOPSOIL	0.00		91.63							
	Red brown SILTY CLAY	0.30		91.33							
0.5											
	Grey brown SILTY CLAY	0.80		90.83							
1.0											
1.5						VA	>120				
						VA	>120				
2.0											
2.5											
3.0											
	End of test pit in SILTY CLAY	3.30		88.33							

Some groundwater observed at about 3.3 metres below the existing ground surface, March 2, 2023.

▽

DEPTH SCALE: 1 to 25
LOGGED: CI

EXCAVATOR TYPE: Track-Mounted Excavator
CHECKED: SD

Kollaard Associates Engineers

RECORD OF TEST PIT TP06

PROJECT: Proposed Subdivision
CLIENT: 2873633 Ontario Inc
LOCATION: 819 Burritts Rapids Road

PROJECT NUMBER: 210816
DATE OF EXCAVATING: 23-3-2
SHEET 1 of 1
DATUM: GEODETIC

DEPTH SCALE (meters)	SOIL PROFILE: DESCRIPTION	DEPTH (m)	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	SHEAR STRENGTH (kPa)	UNDIST SHEAR STRENGTH x Cu. kPa x / REM SHEAR STRENGTH o Cu. kPa o (0 20 40 60 80 100)	WATER CONTENT (%) (0 20 40 60 80 100)	ADDITIONAL LAB RESULTS	PIEZOMETER OR STANDPIPE INSTALLATION
	TOPSOIL	0.00		93.41							Test pit dry, March 2, 2023.
0.5	Red brown SILTY CLAY	0.30		93.11							
	Grey brown SILTY CLAY	0.70		92.71							
1.0						VA	>120				
1.5											
						VA	>120				
2.0											
2.5											
3.0											
	End of test pit in SILTY CLAY	3.30		90.11							

DEPTH SCALE: 1 to 25
LOGGED: CI

EXCAVATOR TYPE: Track-Mounted Excavator
CHECKED: SD

Kollaard Associates Engineers

RECORD OF TEST PIT TP07

PROJECT: Proposed Subdivision
CLIENT: 2873633 Ontario Inc
LOCATION: 819 Burritts Rapids Road

PROJECT NUMBER: 210816
DATE OF EXCAVATING: 23-3-2
SHEET 1 of 1
DATUM: GEODETIC

DEPTH SCALE (meters)	SOIL PROFILE: DESCRIPTION	DEPTH (m)	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: SHEAR STRENGTH (kPa)	UNDIST SHEAR STRENGTH x Cu. kPa x / REM SHEAR STRENGTH o Cu. kPa o (0 20 40 60 80 100)	WATER CONTENT (%) (0 20 40 60 80 100)	ADDITIONAL LAB RESULTS	PIEZOMETER OR STANDPIPE INSTALLATION
	TOPSOIL	0.00		94.34							
0.5	Red brown SILTY CLAY	0.30		94.04							
	Grey brown SILTY CLAY	0.60		93.74							
1.0						VA	>120				
1.5											
						VA	>120				
2.0											
2.5											
3.0											
	End of test pit in SILTY CLAY	3.30		91.04							

Some groundwater observed at about 3.3 metres below the existing ground surface, March 2, 2023.

▽

DEPTH SCALE: 1 to 25
LOGGED: CI

EXCAVATOR TYPE: Track-Mounted Excavator
CHECKED: SD

GEOTECH TP KOLLAARD 210816 - TP LOGS.GPJ GINT STD CANADA.GDT 25-1-9

Kollaard Associates Engineers

RECORD OF TEST PIT TP08

PROJECT: Proposed Subdivision
CLIENT: 2873633 Ontario Inc
LOCATION: 819 Burritts Rapids Road

PROJECT NUMBER: 210816
DATE OF EXCAVATING: 23-3-2
SHEET 1 of 1
DATUM: GEODETIC

DEPTH SCALE (meters)	SOIL PROFILE: DESCRIPTION	DEPTH (m)	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: SHEAR STRENGTH (kPa)	UNDIST SHEAR STRENGTH x Cu. kPa x / REM SHEAR STRENGTH o Cu. kPa o: 0 20 40 60 80 100	WATER CONTENT (%): 0 20 40 60 80 100	ADDITIONAL LAB RESULTS	PIEZOMETER OR STANDPIPE INSTALLATION
	TOPSOIL	0.00		96.02							
	Red brown SILTY CLAY	0.30		95.72							Test pit dry, March 2, 2023.
0.5											
1.0											
	Grey brown SILTY CLAY	1.20		94.82		VA	>120				
1.5											
						VA	>120				
2.0											
2.5											
3.0											
	End of test pit in SILTY CLAY	3.10		92.92							

DEPTH SCALE: 1 to 25
LOGGED: CI

EXCAVATOR TYPE: Track-Mounted Excavator
CHECKED: SD

Kollaard Associates Engineers

RECORD OF TEST PIT TP09

PROJECT: Proposed Subdivision
CLIENT: 2873633 Ontario Inc
LOCATION: 819 Burritts Rapids Road

PROJECT NUMBER: 210816
DATE OF EXCAVATING: 23-3-2
SHEET1 of 1
DATUM: GEODETIC

DEPTH SCALE (meters)	SOIL PROFILE DESCRIPTION	DEPTH (m)	STRATA PLOT	ELEV. (m)	SAMPLES NUMBER	SAMPLES TYPE	SHEAR STRENGTH (kPa)
	TOPSOIL	0.00		95.2			
0.5	Red brown SILTY CLAY	0.30		94.9			
1.0	Red brown silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)	0.80		94.4			
1.5	Grey brown silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)	1.20		94			
2.0							
2.5	Grey silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)	2.30		92.9			
3.0							
	End of test pit in GLACIAL TILL	3.10		92.1			

UNDIST SHEAR STRENGTH x Cu. kPa x
REM SHEAR STRENGTH o Cu. kPa o
0 20 40 60 80 100

WATER CONTENT (%)
0 20 40 60 80 100

ADDITIONAL LAB RESULTS

PIEZOMETER OR STANDPIPE INSTALLATION

Some groundwater observed at about 0.8 metres below the existing ground surface, March 2, 2023. ▽

DEPTH SCALE: 1 to 25
LOGGED: CI

EXCAVATOR TYPE: Track-Mounted Excavator
CHECKED: SD

GEOTECH TP KOLLAARD 210816 - TP LOGS.GPJ GINT STD CANADA.GDT 25-1-9

Kollaard Associates Engineers

RECORD OF TEST PIT TP10

PROJECT: Proposed Subdivision
CLIENT: 2873633 Ontario Inc
LOCATION: 819 Burritts Rapids Road

PROJECT NUMBER: 210816
DATE OF EXCAVATING: 23-3-2
SHEET 1 of 1
DATUM: GEODETIC

DEPTH SCALE (meters)	SOIL PROFILE: DESCRIPTION	DEPTH (m)	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	SHEAR STRENGTH (kPa)	UNDIST SHEAR STRENGTH x Cu. kPa x / REM SHEAR STRENGTH o Cu. kPa o (0 20 40 60 80 100)	WATER CONTENT (%) (0 20 40 60 80 100)	ADDITIONAL LAB RESULTS	PIEZOMETER OR STANDPIPE INSTALLATION
	TOPSOIL	0.00		98.02							Some groundwater observed at about 3.4 metres below the existing ground surface, March 2, 2023.
0.5	Red brown SILTY CLAY	0.40		97.62							
	Grey brown SILTY CLAY	0.80		97.22							
1.0											
1.5											
2.0						VA	>120				
2.5											
3.0											
	End of test pit in SILTY CLAY	3.40		94.62							

DEPTH SCALE: 1 to 25
LOGGED: CI

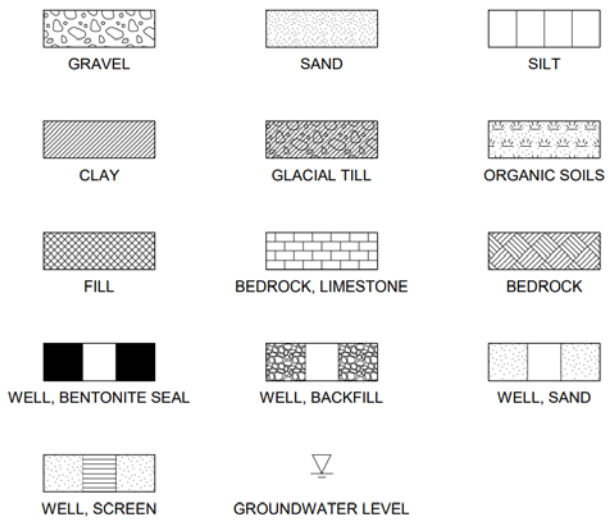
EXCAVATOR TYPE: Track-Mounted Excavator
CHECKED: SD

GEOTECH TP KOLLAARD 210816 - TP LOGS.GPJ GINT STD CANADA.GDT 25-1-9

LIST OF ABBREVIATIONS AND TERMINOLOGY

SAMPLE TYPES	
AS	Auger Sample
CS	Chunk Sample
DO	Drive Open
MS	Manual Sample
RC	Rock Core
SS	Split Spoon Sample
TO	Thin-Walled Open Shelby Tube
WS	Wash Sample

PENETRATION RESISTANCE	
Standard Penetration Resistance (N) The number of blows by a 63.5 kg hammer dropped 760 millimeters required to drive a 50 mm drive open sampler for a distance of 300 mm.	
Dynamic Penetration Resistance The number of blows by a 63.5 kg hammer dropped 760 mm to drive a 50 mm diameter, 60° cone attached to 'A' size drill rods for a distance of 300 mm.	
WH	Sampler advanced by static weight of hammer and drill rods.
WR	Sampler advanced by static weight of drill rods.
PH	Sampler advanced by hydraulic pressure from drill rig.
PM	Sampler advanced by manual pressure.



SOIL DESCRIPTIONS

Relative Density	'N' Value
Very Loose	0 – 4
Loose	4 – 10
Compact	10 – 30
Dense	30 – 50
Very Dense	>50

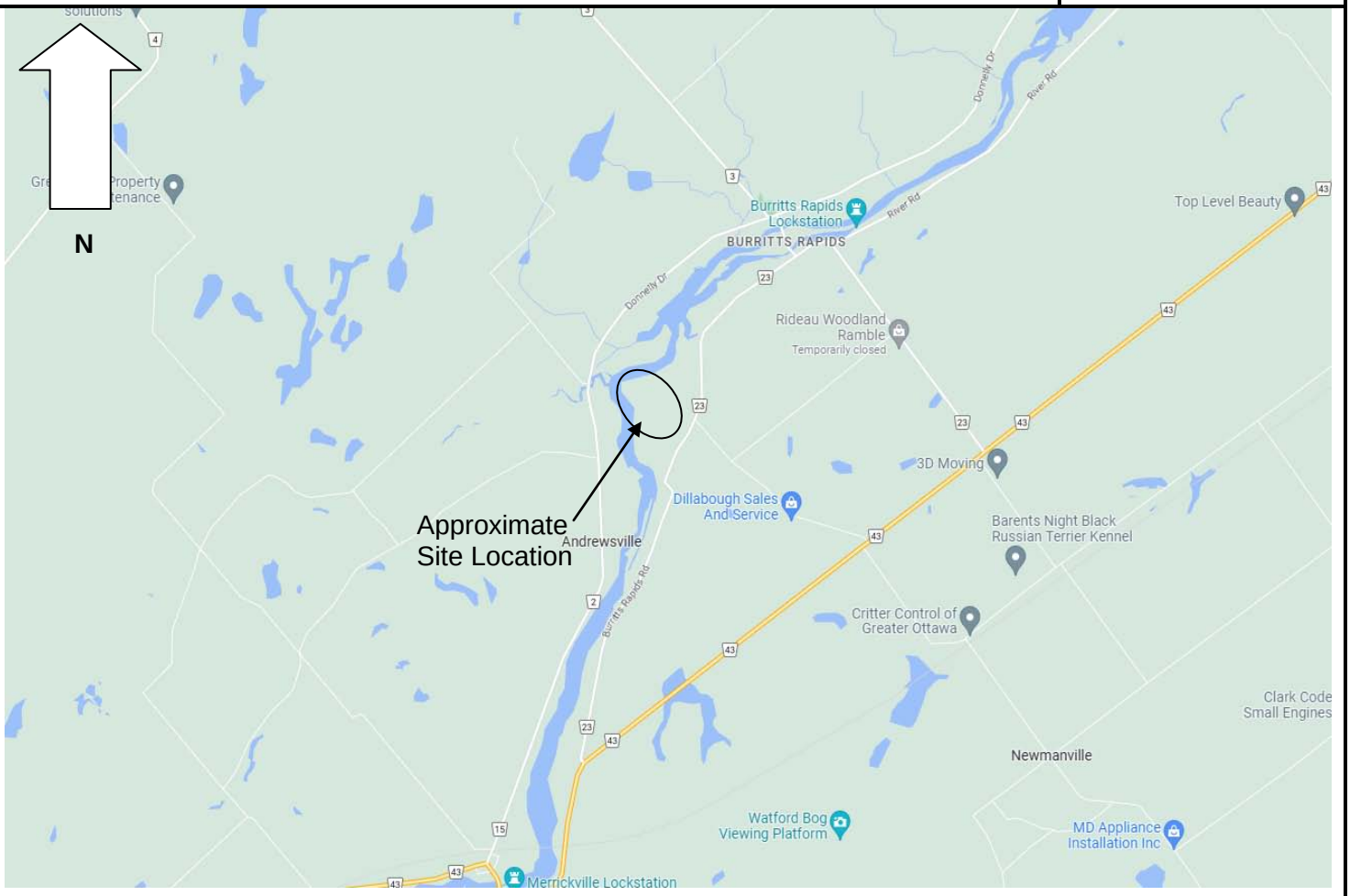
Consistency	Cu, kPa
Very Soft	0 – 12
Soft	12 – 25
Firm	25 – 50
Stiff	50 – 100
Very Stiff	>100

LIST OF COMMON SYMBOLS	
Cu	Undrained Shear Strength
e	Void Ratio
Cc	Compression Index
Cv	Coefficient of Consolidation
k	Coefficient of Permeability
PI	Plasticity Index
n	Porosity
u	Pore Pressure
W	Moisture Content
LL	Liquid Limit
PL	Plastic Limit
r	Unit Weight of Soil
y	Unit Weight of Submerged Soil
cr	Normal Stress

SOIL TESTS	
C	Consolidation Test
H	Hydrometer Analysis
M	Sieve Analysis
MH	Sieve and Hydrometer Analysis
U	Unconfined Compression Test
Q	Undrained Triaxial Test
VA	Field Vane, Undisturbed and Remolded Shear Strength

KEY PLAN

FIGURE 1



NOT TO SCALE

Kollaard Associates
Engineers

Project No. 210816

Date January 2025

DRAWING NUMBER:

SITE PLAN, FIGURE 2

LEGEND:

TP1 APPROXIMATE TEST PIT LOCATION

REFERENCE: PLAN SUPPLIED BY GOOGLE MAPS.

SPECIAL NOTE: THIS DRAWING TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REV.	NAME	DATE	DESCRIPTION

Kollaard Associates
Engineers

PO, BOX 189, 210 PRESCOTT ST
KEMPTVILLE ONTARIO
K0G 1J0 FAX (613) 258-0475
http://www.kollaard.ca

(613) 860-0923
info@kollaard.ca

CLIENT:

PROJECT:

GEOTECHNICAL INVESTIGATION FOR PROPOSED RESIDENTIAL DEVELOPMENT

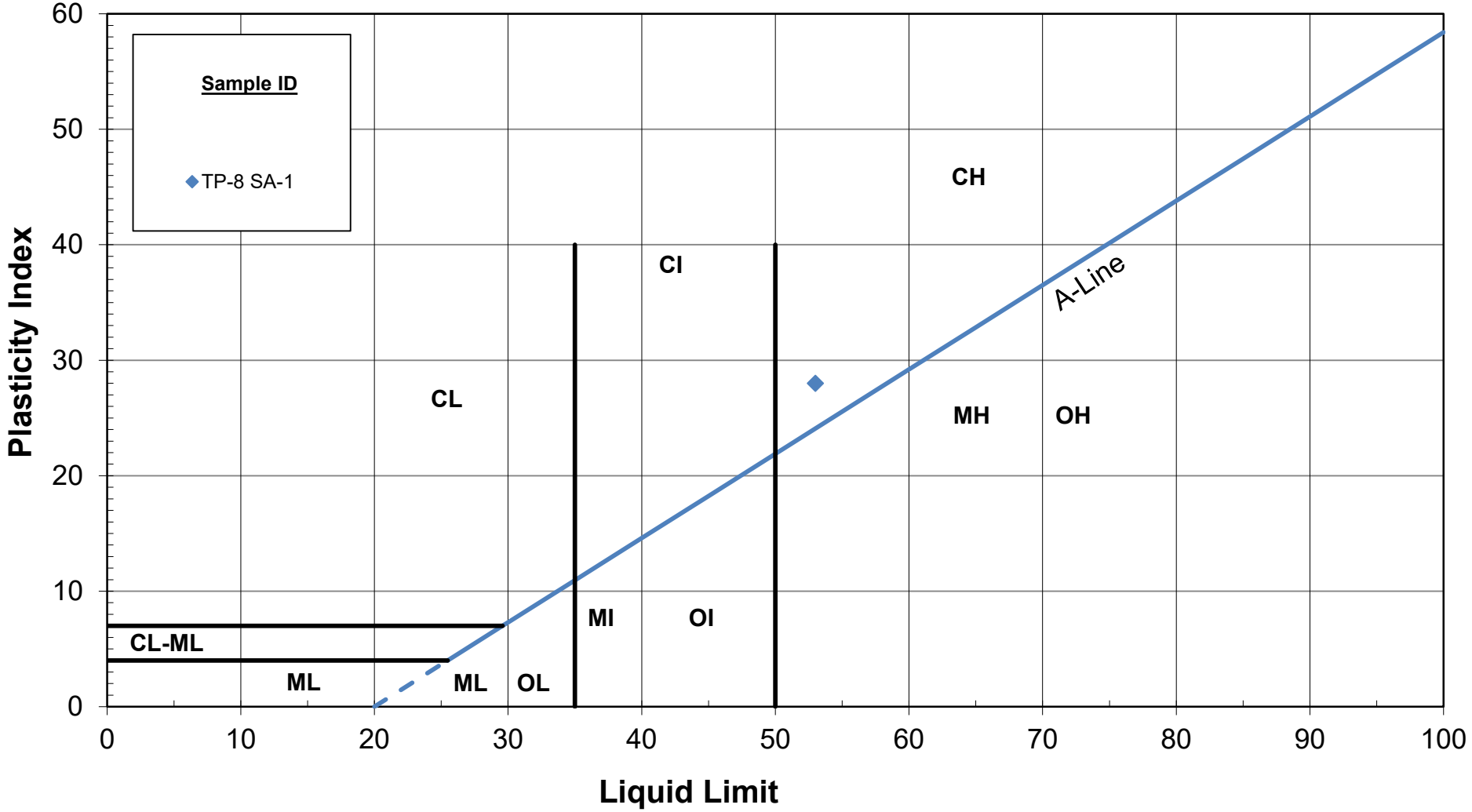
LOCATION:

DESIGNED BY:	*DATE:*
– –	
DRAWN BY: DT	*SCALE:* N.T.S

KOLLAARD FILE NUMBER: 210816

ATTACHMENT A

Laboratory Test Results for Physical Properties



Stantec

Kollaard Associates, File #210816

819 Burrits Rapids Road

PLASTICITY CHART

Figure No.

Project No. 122410003

Stantec Consulting Ltd.
2781 Lancaster Rd, Suite 100 A&B, Ottawa ON K1B 1A7

March 16, 2023
File: 122410003

Client: Kollaard Associates Engineers., File #210816

Reference: ASTM D4318 Atterberg Limit & D2216 Moisture Content
819 Burrits Rapids Road

The following table summarizes Atterberg Limit & Moisture Contents results.

Source	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
TP-4 SA-1	37.2			
TP-8 SA-1	38.3	52.7	25.4	27.4
TP9 SA-2	14.4			

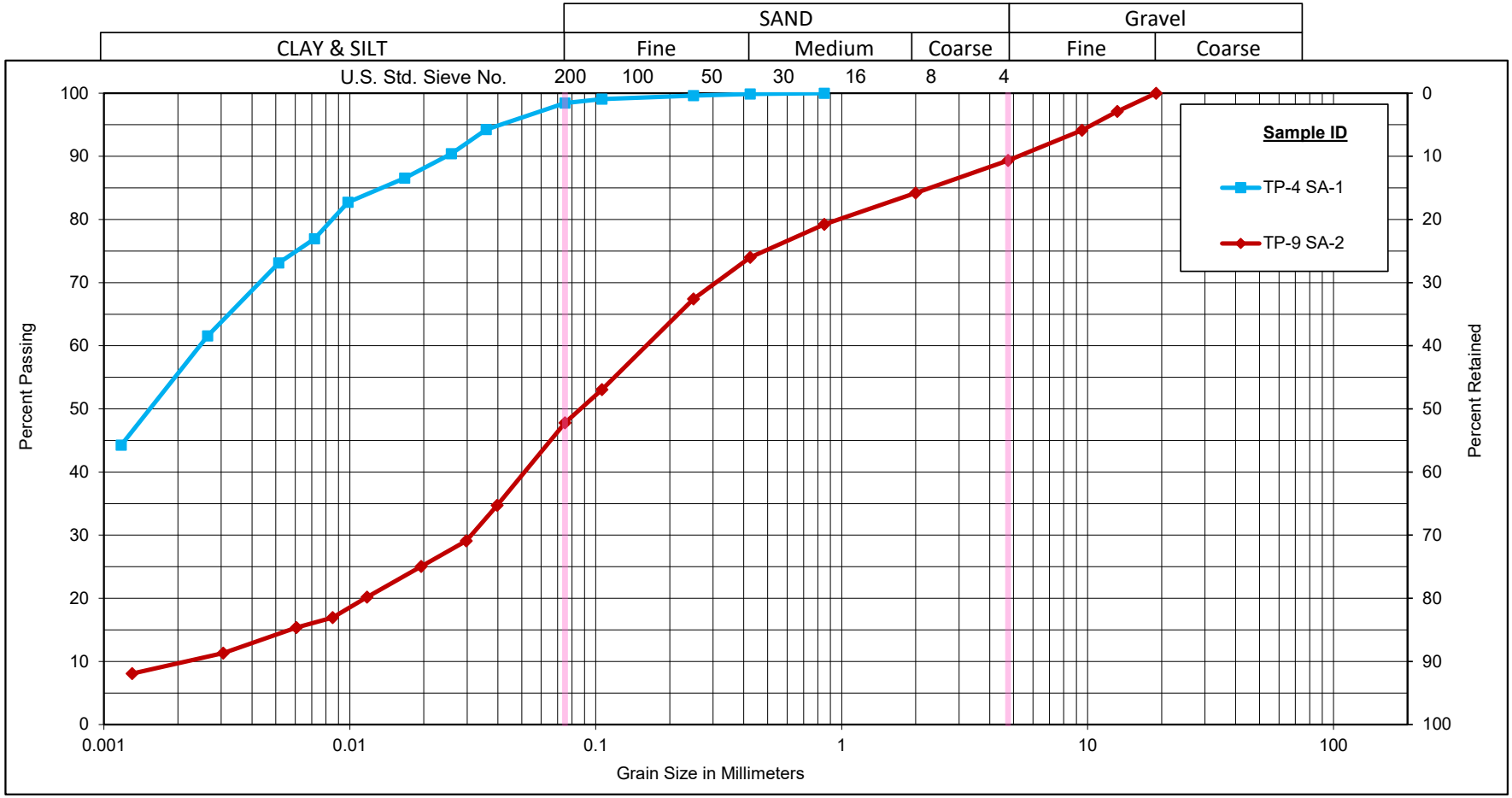
Sincerely,

Stantec Consulting Ltd.

Brian Prevost
For: Laboratory Supervisor
Tel: 613-738-6075
Fax: 613-722-2799
brian.prevost@stantec.com

Attachments: Plasticity Chart

Unified Soil Classification System



Sample ID	Depth	% Gravel	% Sand	% Silt	% Clay
TP-4 SA-1	N/A	0.0	1.6	44.4	54.0
TP-9 SA-2	N/A	10.6	41.6	38.8	9.0

Stantec

GRAIN SIZE DISTRIBUTION

Kollaard Associates Engineers, File #210816

819 Burrits Rapids Road

Figure No.

Project No. 122410003

Stantec

Particle-Size Analysis of Soils

LS702

AASHTO T88

PROJECT DETAILS			
Client:	**Kollaard Associates Engineers, File #210816**	Project No.:	**122410003**
Project:	**819 Burrits Rapids Road**	Test Method:	**LS702**
Material Type:	**Soil**	Sampled By:	**Kollaard Associates Engineers**
Source:	**TP-4**	Date Sampled:	**March 8, 2023**
Sample No.:	**SA-1**	Tested By:	**Brian Prevost**
Sample Depth	**N/A**	Date Tested:	**March**

WASH TEST DATA	
Oven Dry Mass In Hydrometer Analysis (g)	50.86
Sample Weight after Hydrometer and Wash (g)	0.88
Percent Passing No. 200 Sieve (%)	**98.3**
Percent Passing Corrected (%)	**98.27**

PERCENT LOSS IN SIEVE	
Sample Weight Before Sieve (g)	**180.40**
Sample Weight After Sieve (g)	**179.60**
Percent Loss in Sieve (%)	**0.44**

SOIL INFORMATION		
Liquid Limit (LL)		
Plasticity Index (PI)		
Soil Classification		
Specific Gravity (G_s)	2.750	
Sg. Correction Factor (α)	0.978	
Mass of Dispersing Agent/Litre	48	g

CALCULATION OF DRY SOIL MASS	
Oven Dried Mass (W_o), (g)	42.58
Air Dried Mass (W_a), (g)	43.05
Hygroscopic Corr. Factor ($F=W_o/W_a$)	0.9891
Air Dried Mass in Analysis (M_a), (g)	51.42
Oven Dried Mass in Analysis (M_o), (g)	50.86
Percent Passing 2.0 mm Sieve (P_{10}), (%)	100.00
Sample Represented (W), (g)	50.86

HYDROMETER DETAILS	
Volume of Bulb (V_B), (cm^3)	63.0
Length of Bulb (L_2), (cm)	14.47
Length from '0' Reading to Top of Bulb (L_1), (cm)	10.29
Scale Dimension (h_s), (cm/Div)	0.155
Cross-Sectional Area of Cylinder (A), (cm^2)	27.25
Meniscus Correction (H_m), (g/L)	1.0

SIEVE ANALYSIS		
Sieve Size mm	**Cum. Wt. Retained**	**Percent Passing**
75.0		100.0
63.0		100.0
53.0		100.0
37.5		100.0
26.5		100.0
19.0		100.0
13.2		100.0
9.5		100.0
4.75		100.0
2.00	0.0	100.0
Total (C + F)[1]	179.60	
0.850	0.00	100.00
0.425	0.07	99.86
0.250	0.19	99.63
0.106	0.48	99.06
0.075	0.80	98.43
PAN	0.82	

Note 1: (C + F) = Coarse + Fine

START TIME 8:57 AM

HYDROMETER ANALYSIS

Date	Time	Elapsed Time T Mins	H_s Divisions g/L	H_c Divisions g/L	Temperature T_c °C	Corrected Reading $R = H_s - H_c$ g/L	Percent Passing P %	L cm	η Poise	K	Diameter D mm
#VALUE!	8:58 AM	1	57.0	8.0	20.5	49.0	94.26	7.37904	9.96839	0.013205	0.03587
#VALUE!	8:59 AM	2	55.0	8.0	20.5	47.0	90.41	7.68904	9.96839	0.013205	0.02589
#VALUE!	9:02 AM	5	53.0	8.0	20.5	45.0	86.57	7.99904	9.96839	0.013205	0.01670
#VALUE!	9:12 AM	15	51.0	8.0	20.5	43.0	82.72	8.30904	9.96839	0.013205	0.00983
#VALUE!	9:27 AM	30	48.0	8.0	20.0	40.0	76.95	8.77404	10.09098	0.013286	0.00719
#VALUE!	9:57 AM	60	46.0	8.0	20.5	38.0	73.10	9.08404	9.96839	0.013205	0.00514
#VALUE!	1:07 PM	250	40.0	8.0	20.5	32.0	61.5587	10.01404	9.96839	0.013205	0.00264
#VALUE!	8:57 AM	1440	31.0	8.0	20.5	23.0	44.2453	11.40904	9.96839	0.013205	0.00118

Remarks:

Reviewed By: Brian Prevost

Date: March 16, 2023

V:\01216\active\laboratory_standing_offers\2023-Laboratory Standing Offers\122410003 Kollaard Associates\March 8, Hyd_Limit_MC, Kollaard #210816\Hydrometer-Lab Standing Offers.xlsx

Stantec

Particle-Size Analysis of Soils

LS702

AASHTO T88

PROJECT DETAILS			
Client:	**Kollaard Associates Engineers, File #210816**	Project No.:	**122410003**
Project:	**819 Burrits Rapids Road**	Test Method:	**LS702**
Material Type:	**Soil**	Sampled By:	**Kollaard Associates Engineers**
Source:	**TP-9**	Date Sampled:	**March 8, 2023**
Sample No.:	**SA-2**	Tested By:	**Brian Prevost**
Sample Depth	**N/A**	Date Tested:	**March**

WASH TEST DATA	
Oven Dry Mass In Hydrometer Analysis (g)	101.99
Sample Weight after Hydrometer and Wash (g)	44.94
Percent Passing No. 200 Sieve (%)	**55.9**
Percent Passing Corrected (%)	**47.10**

PERCENT LOSS IN SIEVE	
Sample Weight Before Sieve (g)	**869.60**
Sample Weight After Sieve (g)	**868.40**
Percent Loss in Sieve (%)	**0.14**

SOIL INFORMATION		
Liquid Limit (LL)		
Plasticity Index (PI)		
Soil Classification		
Specific Gravity (G_s)	2.750	
Sg. Correction Factor (α)	0.978	
Mass of Dispersing Agent/Litre	24	g

CALCULATION OF DRY SOIL MASS	
Oven Dried Mass (W_o), (g)	79.40
Air Dried Mass (W_a), (g)	79.53
Hygroscopic Corr. Factor ($F=W_o/W_a$)	0.9984
Air Dried Mass in Analysis (M_a), (g)	102.16
Oven Dried Mass in Analysis (M_o), (g)	101.99
Percent Passing 2.0 mm Sieve (P_{10}), (%)	84.20
Sample Represented (W), (g)	121.13

SIEVE ANALYSIS		
Sieve Size mm	**Cum. Wt. Retained**	**Percent Passing**
75.0		100.0
63.0		100.0
53.0		100.0
37.5		100.0
26.5		100.0
19.0	0.0	100.0
13.2	25.2	97.1
9.5	50.9	94.1
4.75	92.6	89.4
2.00	137.4	84.2
Total (C + F)[1]	868.40	
0.850	6.03	79.22
0.425	12.36	74.00
0.250	20.33	67.42
0.106	37.72	53.06
0.075	44.12	47.78
PAN	44.46	

Note 1: (C + F) = Coarse + Fine

HYDROMETER DETAILS	
Volume of Bulb (V_B), (cm^3)	63.0
Length of Bulb (L_2), (cm)	14.47
Length from '0' Reading to Top of Bulb (L_1), (cm)	10.29
Scale Dimension (h_s), (cm/Div)	0.155
Cross-Sectional Area of Cylinder (A), (cm^2)	27.25
Meniscus Correction (H_m), (g/L)	1.0

START TIME 9:23 AM

HYDROMETER ANALYSIS

Date	Time	Elapsed Time T Mins	H_s Divisions g/L	H_c Divisions g/L	Temperature T_c °C	Corrected Reading $R = H_s - H_c$ g/L	Percent Passing P %	L cm	η Poise	K	Diameter D mm
#VALUE!	9:24 AM	1	47.0	4.0	20.0	43.0	34.73	8.92904	10.09098	0.013286	0.03970
#VALUE!	9:25 AM	2	40.0	4.0	20.0	36.0	29.08	10.01404	10.09098	0.013286	0.02973
#VALUE!	9:28 AM	5	35.0	4.0	20.0	31.0	25.04	10.78904	10.09098	0.013286	0.01952
#VALUE!	9:38 AM	15	29.0	4.0	20.0	25.0	20.19	11.71904	10.09098	0.013286	0.01174
#VALUE!	9:53 AM	30	25.0	4.0	20	21.0	16.96	12.33904	10.09098	0.013286	0.00852
#VALUE!	10:23 AM	60	23.0	4.0	20.5	19.0	15.35	12.64904	9.96839	0.013205	0.00606
#VALUE!	1:33 PM	250	18.0	4.0	20.5	14.0	11.31	13.42404	9.96839	0.013205	0.00306
#VALUE!	9:23 AM	1440	14.0	4.0	20.5	10.0	8.08	14.04404	9.96839	0.013205	0.00130

Remarks:

Reviewed By: Brian Prevost

Date: March 16, 2023

V:\01216\active\laboratory_standing_offers\2023-Laboratory Standing Offers\122410003 Kollaard Associates\March 8, Hyd_Limit_MC, Kollaard #210816\Hydrometer-Lab Standing Offers.xlsx

ATTACHMENT B

Laboratory Test Results for Chemical Properties

CERTIFICATE OF ANALYSIS

Work Order	: **WT2305795**	Page	: 1 of 3
Client	: **Kollaard Associates Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Dean Tataryn	Account Manager	: Costas Farassoglou
Address	: 210 Prescott Street Unit 1 Kemptville ON Canada K0G1J0	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: 613 860 0923	Telephone	: 613 225 8279
Project	: 210816	Date Samples Received	: 09-Mar-2023 11:15
PO	: ----	Date Analysis Commenced	: 12-Mar-2023
C-O-C number	: ----	Issue Date	: 20-Mar-2023 14:26
Sampler	: CLIENT		
Site	: ----		
Quote number	: SOA 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances

LOR: Limit of Reporting (detection limit).

Unit	*Description*
µS/cm	microsiemens per centimetre
mg/kg	milligrams per kilogram
ohm cm	ohm centimetres (resistivity)
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: Soil/Solid (Matrix: Soil/Solid)					Client sample ID	TP5	----	----	----	----
					Client sampling date / time	02-Mar-2023 12:00	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit		WT2305795-001	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
Conductivity (1:2 leachate)	----	E100-L	5.00	µS/cm		128	----	----	----	----
pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units		7.67	----	----	----	----
Resistivity	----	EC100R	100	ohm cm		7810	----	----	----	----
Leachable Anions & Nutrients										
Chloride, soluble ion content	16887-00-6	E236.Cl	5.0	mg/kg		<5.0	----	----	----	----
Sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg		<20	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2305795**	Page	: 1 of 5
Client	: **Kollaard Associates Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Dean Tataryn	Account Manager	: Costas Farassoglou
Address	: 210 Prescott Street Unit 1 Kemptville ON Canada K0G1J0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 613 860 0923	Telephone	: 613 225 8279
Project	: 210816	Date Samples Received	: 09-Mar-2023 11:15
PO	: ----	Issue Date	: 20-Mar-2023 14:13
C-O-C number	: ----		
Sampler	: CLIENT		
Site	: ----		
Quote number	: SOA 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
LDPE bag TP5	E236.Cl	02-Mar-2023	14-Mar-2023	30 days	12 days	✓	14-Mar-2023	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
LDPE bag TP5	E236.SO4	02-Mar-2023	14-Mar-2023	30 days	12 days	✓	14-Mar-2023	28 days	0 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
LDPE bag TP5	E100-L	02-Mar-2023	14-Mar-2023	30 days	12 days	✓	14-Mar-2023	18 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
LDPE bag TP5	E108A	02-Mar-2023	12-Mar-2023	----	----		15-Mar-2023	30 days	13 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	860609	1	20	5.0	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	860613	1	20	5.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	860612	1	19	5.2	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	860611	1	19	5.2	5.0	✓
Laboratory Control Samples (LCS)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	860609	2	20	10.0	10.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	860613	1	20	5.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	860612	2	19	10.5	10.0	✓
Water Extractable Sulfate by IC	E236.SO4	860611	2	19	10.5	10.0	✓
Method Blanks (MB)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	860609	1	20	5.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	860612	1	19	5.2	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	860611	1	19	5.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L Waterloo - Environmental	Soil/Solid	CSSS Ch. 15 (mod)/APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Conductance is measured in the fluid that is observed in the upper layer.
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) and is carried out in accordance with procedures described in the Analytical Protocol (prescriptive method). A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling, or decanting and then analyzed using a pH meter and electrode.
Water Extractable Chloride by IC	E236.Cl Waterloo - Environmental	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Water Extractable Sulfate by IC	E236.SO4 Waterloo - Environmental	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Resistivity Calculation for Soil Using E100-L	EC100R Waterloo - Environmental	Soil/Solid	APHA 2510 B	Soil Resistivity (calculated) is determined as the inverse of the conductivity of a 2:1 water:soil leachate (dry weight). This method is intended as a rapid approximation for Soil Resistivity. Where high accuracy results are required, direct measurement of Soil Resistivity by the Wenner Four-Electrode Method (ASTM G57) is recommended.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Waterloo - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Leach 1:2 Soil : 0.01CaCl2 - As Received for pH	EP108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling or decanting and then analyzed using a pH meter and electrode.
Anions Leach 1:10 Soil:Water (Dry)	EP236 Waterloo - Environmental	Soil/Solid	EPA 300.1	5 grams of dried soil is mixed with 50 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

QUALITY CONTROL REPORT

Work Order	: **WT2305795**	Page	: 1 of 4
Client	: Kollaard Associates Inc.	Laboratory	: Waterloo - Environmental
Contact	: Dean Tataryn	Account Manager	: Costas Farassoglou
Address	: 210 Prescott Street Unit 1 Kemptville ON Canada K0G1J0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: 613 225 8279
Project	: 210816	Date Samples Received	: 09-Mar-2023 11:15
PO	: ----	Date Analysis Commenced	: 12-Mar-2023
C-O-C number	: ----	Issue Date	: 20-Mar-2023 14:13
Sampler	: CLIENT 613 860 0923		
Site	: ----		
Quote number	: SOA 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 860609)											
WT2305604-011	Anonymous	Conductivity (1:2 leachate)	----	E100-L	5.00	µS/cm	0.287 mS/cm	291	1.38%	20%	----
Physical Tests (QC Lot: 860613)											
EO2301923-001	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	7.58	7.68	1.31%	5%	----
Leachable Anions & Nutrients (QC Lot: 860611)											
EO2301923-001	Anonymous	Sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	5840	5350	8.72%	30%	----
Leachable Anions & Nutrients (QC Lot: 860612)											
EO2301923-001	Anonymous	Chloride, soluble ion content	16887-00-6	E236.Cl	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 860609)						
Conductivity (1:2 leachate)	----	E100-L	5	µS/cm	<5.00	----
Leachable Anions & Nutrients (QCLot: 860611)						
Sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	<20	----
Leachable Anions & Nutrients (QCLot: 860612)						
Chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	<5.0	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 860609)									
Conductivity (1:2 leachate)	----	E100-L	5	µS/cm	1409 µS/cm	95.6	90.0	110	----
Physical Tests (QCLot: 860613)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	100	98.0	102	----
Leachable Anions & Nutrients (QCLot: 860611)									
Sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	5000 mg/kg	101	80.0	120	----
Leachable Anions & Nutrients (QCLot: 860612)									
Chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	5000 mg/kg	100	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

Reference Material (RM) Report									
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method					
Physical Tests (QCLot: 860609)									
	RM	Conductivity (1:2 leachate)	----	E100-L	1875.8 µS/cm	94.8	70.0	130	----
Leachable Anions & Nutrients (QCLot: 860611)									
	RM	Sulfate, soluble ion content	14808-79-8	E236.SO4	589 mg/kg	117	70.0	130	----
Leachable Anions & Nutrients (QCLot: 860612)									
	RM	Chloride, soluble ion content	16887-00-6	E236.Cl	466 mg/kg	96.4	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affi

Environmental Division
Waterloo
Work Order Reference
WT2305795

COC Number: 17 -

Page of

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	Kollaard Associates (27196)
Contact:	Dean Tataryn
Phone:	613.860.0923, ext.225
	Company address below will appear on the final report
Street:	210 Prescott Street, Unit 1 P.O. Box 189
City/Province:	Kemptville, Ontario
Postal Code:	K0G 1J0
Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☐ ED
Quality Control (QC) Report with Report	☐ YES
☐ Compare Results to Criteria on Report - provide details below	
Select Distribution:	☐ EMAIL ☐ MAIL ☐ F
Email 1 or Fax	dean@kollaard.ca
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mary@kollaard.ca
Email 2	

Project Information	
ALS Account # / Quote #:	Q71021
Job #:	210816
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only):	WT2305795

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Melanie M.	Sampler:

w - Contact your AM to confirm all E&P TATs (surcharges may apply)

ard TAT if received by 3 pm - business days - no surcharges apply

EMERGENCY

1 Business day [E1 - 100%]

Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]

al E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Corrosivity (KOLLAARD-CORR-WT)	VOC, F1-F4 (VOC-RSH-ELF-WT)	Metals & Inorganics (RSH-INORG-WT)	PAH (PAH-511-WT)	BTEX / F1-F4	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)
	TP5	Mar 2, 2023	12:00	SOIL	X						

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	
Are samples for human consumption/ use? ☐ YES ☐ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No	☐
Ice Packs ☐ Ice Cubes ☐		Custody seal intact	Yes ☐	No	☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
15.1				4.9			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: Mar 8 2023	Time: 3:00	Received by:	Date: 3/9/23	Time: 11:15	Received by:	Date: 3/10/23	Time: 7:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 F

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

SOL040

ATTACHMENT C

National Building Code Seismic Hazard Calculation

2015 National Building Code Seismic Hazard Calculation

INFORMATION: Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

Site: 44.961N 75.816W **User File Reference:** 819 Burritts Rapids Road 2023-03-30 13:05 UT

Probability of exceedance per annum	0.000404	0.001	0.0021	0.01
Probability of exceedance in 50 years	2 %	5 %	10 %	40 %
Sa (0.05)	0.304	0.177	0.110	0.034
Sa (0.1)	0.368	0.222	0.143	0.049
Sa (0.2)	0.319	0.195	0.128	0.046
Sa (0.3)	0.249	0.154	0.101	0.037
Sa (0.5)	0.184	0.113	0.075	0.027
Sa (1.0)	0.097	0.060	0.039	0.014
Sa (2.0)	0.048	0.029	0.019	0.006
Sa (5.0)	0.013	0.007	0.004	0.001
Sa (10.0)	0.005	0.003	0.002	0.001
PGA (g)	0.203	0.123	0.079	0.026
PGV (m/s)	0.153	0.090	0.057	0.018

Notes: Spectral (Sa(T), where T is the period in seconds) and peak ground acceleration (PGA) values are given in units of g (9.81 m/s^2). Peak ground velocity is given in m/s. Values are for "firm ground" (NBCC2015 Site Class C, average shear wave velocity 450 m/s). NBCC2015 and CSAS6-14 values are highlighted in yellow. Three additional periods are provided - their use is discussed in the NBCC2015 Commentary. Only 2 significant figures are to be used. **These values have been interpolated from a 10-km-spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the directly calculated values.**

References

National Building Code of Canada 2015 NRCC no. 56190; Appendix C: Table C-3, Seismic Design Data for Selected Locations in Canada

Structural Commentaries (User's Guide - NBC 2015: Part 4 of Division B)
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File 7893 Fifth Generation Seismic Hazard Model for Canada: Grid values of mean hazard to be used with the 2015 National Building Code of Canada

See the websites www.EarthquakesCanada.ca and www.nationalcodes.ca for more information