



**CHUNG & VANDER DOELEN**  
ENGINEERING LTD.

**GEOTECHNICAL INVESTIGATION  
MILL COURTLAND COMMUNITY CENTRE RENOVATION AND  
ADDITION**

**216 Mill Street, Kitchener**  
Kitchener, Ontario

**SUBMITTED TO:**

City of Kitchener  
Facilities Management  
200 King Street West  
Kitchener ON  
N2G 4G7

**ATTENTION:**

Ms. Kristina Schneider



**CHUNG & VANDER DOELEN**  
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July 5, 2024  
**File No.:** 1874

City of Kitchener  
Facilities Management  
200 King Street West  
Kitchener ON  
N2G 4G7

Attention: Ms. Kristina Schneider

**RE:     Geotechnical Investigation**  
**Mill Courtland Community Centre Renovation and Addition**  
**216 Mill Street, Kitchener, Ontario**

We take pleasure in enclosing one (1) copy of our Geotechnical Investigation Report carried out at the above-referenced Site. Soil samples will be retained for a period of three (3) months and will thereafter be disposed of unless we are otherwise instructed.

If you have any questions or clarifications are required, please contact the undersigned at your convenience.

We thank you for giving us this opportunity to be of service to you.

Yours truly,  
**CHUNG & VANDER DOELEN ENGINEERING LTD.**

Eric Y. Chung, M. Eng., P.Eng.  
Principal Engineer

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## 1.0 INTRODUCTION

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) has been retained by the City of Kitchener to carry out a geotechnical investigation for the proposed renovation of the Mill Courtland Community Centre, located at 216 Mill Street in Kitchener, Ontario.

It is understood that a new single-storey building addition, approximately 250 m<sup>2</sup> in size, is proposed in the rear play area. It is presumed that both the finished floor elevation (FFE) and height of the addition will match that of the existing building. Additionally, the scope of work will include the removal and re-surfacing of the existing exterior asphalt and pathways, along with the expansion of a new exterior parking lot, as can be seen in Drawing No. 1.

The purpose of this investigation was to determine the subsurface conditions at the site and, based on the findings, to make geotechnical recommendations for:

- Foundation design recommendations;
- Excavation condition;
- Groundwater control during and after construction;
- Backfilling recommendations;
- Floor slab construction;
- Foundation soil classification for seismic design per OBC 2012;
- Foundation and retaining wall design;
- Pavement design construction;
- Infiltration of storm water; and
- Discussion of analytical chemistry results for excess soil.

## 2.0 FIELD WORK

Eleven (11) boreholes were advanced to depths between 2.15± and 5.20± m below existing grades on May 29, 2024 in order to investigate the subsurface conditions at the site. The borehole locations are illustrated on the Borehole Location Plan, Drawing No. 1. The fieldwork was carried out under the supervision of a member of our engineering team, who logged the boreholes, collected subsurface soil samples, and monitored the groundwater conditions.

The boreholes were advanced using a CME-55 track-mounted drilling rig, supplied, and operated by Davis Drilling Ltd. of Milton, Ontario. The drill rig was equipped with continuous flight 100 mm outer diameter solid stem augers and standard soil sampling equipment. Standard penetration tests (SPTs) in accordance with ASTM Specification D1586, were carried out at frequent intervals of depth, and the results are shown on the Borehole Logs as Penetration Resistance or “N”-values. A Dynamic Cone Penetration Test (DCPT) was conducted at Borehole 1 to confirm the compactness condition of the deposits. The compactness condition or consistency of the soil strata has been inferred from these various test results.



The borehole locations, temporary benchmark, and associated ground surface elevations were surveyed by CVD for the purpose of this report using a Network RTK Global Navigation Satellite System (GNSS) Receiver. The survey data was collected using The UTM Zone 17N Projection, NAD83(CSRS)v7-2010 datum and Canada Geoid Model HT2\_2010v70 (CGVD28).

The referenced temporary benchmark (TBM) is described below:

TBM: Top of manhole located in southwestern section of parking lot, 25 m northeast from Mill Street road edge, as shown on Drawing No. 1

Elevation: 285.24 m (Geodetic)

### 3.0 LABORATORY TESTING

Soil samples obtained from the in-situ tests were examined in the field and subsequently brought to our laboratory for visual and tactile examination to confirm field classification. Moisture content determination was performed on all retrieved samples.

In addition, two (2) grain size distribution analyses were performed on major soil deposits taken from Boreholes 1 and 2 to confirm field identification and to provide information on the soil hydraulic conductivity. The results of these tests are presented in Enclosures 12 and 13.

Furthermore, three (3) grain size distribution analyses were performed on the granular base samples taken from Boreholes 5, 8, and 10 to confirm whether the existing granular base can be reused and incorporated into the new pavement structure. The results of these tests are presented in Enclosures 14 to 16.

Five (5) soil samples were submitted to AGAT Laboratories of Mississauga, Ontario for analysis of metals and inorganics, benzene, ethylbenzene, toluene, and xylene (BTEX), and Petroleum Hydrocarbons (PHCs F1-F4). The chemical testing was conducted to provide a preliminary assessment of the environmental quality of potential excess soil which may be generated and removed off-site during construction.

The results and laboratory certificates of chemical analysis provided by AGAT Laboratories of Mississauga, Ontario are enclosed in Appendix "B". A comparison of the soil chemistry results to the applicable regulatory standard is included in Appendix "C". A detailed discussion of the results can be found in Section 7.0.



#### 4.0 EXISTING SITE CONDITIONS

The site is located in the centre of Kitchener in a mixed residential and industrial area. North and east of the property exist multiple auto-repair shops and businesses, while residential properties are predominantly found south and southwest of the site.

The majority of the 3257 m<sup>2</sup> property is occupied by the existing 727 m<sup>2</sup> Mill Courtland Community Centre and surrounding asphalt-paved parking lots and driveways. A construction trailer and other minor structures can be found along the eastern fence line of the property, north of the existing Community Centre. A grass-covered recreational area covers approximately the upper third of the site. A plethora of medium to large-sized trees and small landscaped vegetation surround and follow the property limits. Railway tracks of the Canadian National Railway exist just north of the northern boundary line. Historically, the site was an auto garage/storage yard prior to being redeveloped into the present recreational facility in the late 1990's.

In terms of topography, the south of the property is relatively flush with Mill Street. However, towards the north, the site increasingly lowers in elevation in comparison to Stirling Avenue South. Generally, within property bounds the land is relatively flat with elevations typically ranging between 326± and 330± m. The ground surface elevations at the borehole locations ranged between 328.61 and 329.70 m.

#### 5.0 SUBSURFACE CONDITIONS

The detailed subsurface conditions encountered in the eleven (11) boreholes advanced as part of this investigation are shown on the Borehole Log Sheets, Enclosures 1 to 11, inclusive. Enclosure A provides explanations of the various soil abbreviations and terms used on these borehole log sheets.

The following sections provide descriptions of the major soil deposits encountered in the boreholes. The stratigraphic boundaries shown on the borehole logs are inferred from non-continuous sampling conducted during advancement of the borehole drilling procedures, and therefore, represent transitions between soil types rather than exact planes of geologic change. The subsurface conditions will vary between and beyond the borehole locations.

##### 5.1 Topsoil and Pavement

Topsoil was encountered at the ground surface of Borehole 11 with a measured thickness of 180 mm. The thickness of topsoil could vary between and beyond the borehole locations.

A pavement structure was encountered at the ground surface of Boreholes 1 to 10, with measured asphalt thicknesses of 50 to 80 mm and granular base thicknesses of 280 to 460 mm. Results of three (3) grain size distribution analyses on the existing granular base from Boreholes 5, 8, and 10, are shown graphically on Enclosures 14 to 16. The granular base materials contain 10.4% to 23.2% of grain size passing the #200 sieve, indicating more than 8% silt content, and consequently, these samples do not meet the OPSS Granular "B": Type I gradation specification.



## 5.2 Fill

Fill material was encountered below the surficial topsoil and/or pavement structure at all eleven (11) boreholes and extended to depths between  $1.5\pm$  and  $2.15\pm$  m below existing grades. The composition of the fill material generally varied from sandy silt to sand with some silt. Occasional clay and silt seams as well as trace amounts of topsoil, clay, and gravel were frequently encountered. Clayey silt as well as sand and gravel deposits were also found within the fill layer. Trace organics were observed within Boreholes 10 and 11, and occasional wood fragments were locally found in Borehole 5. Boreholes 4 to 8, 10, and 11 were all terminated within the fill layer at a depth of  $2.15\pm$  m below existing grades.

The SPT “N”-values measured within the fill ranged from 3 to 38 blows per 300 mm of penetration, indicating a very loose to dense compactness condition. Natural moisture contents were measured between 3 and 21%, generally indicating damp to moist moisture condition. The elevated moisture content in some samples is likely due to the presence of organics.

## 5.3 Fine Granular Deposits

Underlying the fill layer, a fine granular deposit, varying in composition from a fine sand with some silt to a silty sand to a silt with some sand, was found in Boreholes 1 to 3, and 9. Trace to some gravel and occasional silt and/or clay lenses/seams were observed. The fine granular deposits extended to depths between  $3.35\pm$  and at least  $5.2\pm$  m below existing grades at which point Boreholes 2, 3, and 9 were terminated. Results of two (2) grain size distribution analyses from Boreholes 1 and 2, are shown graphically on Enclosures 12 and 13.

The SPT “N”-values measured within the fine granular deposits ranged between 8 and 43 blows per 300 mm of penetration, indicating a loose to dense compactness condition; however, the deposit predominantly exhibited a compact compactness condition. Natural moisture contents were measured from 3 to 11%, indicating a damp to moist moisture condition.

## 5.4 Gravelly Sand

A brown gravelly sand deposit with trace amounts of silt, extending from  $3.5\pm$  to  $5.2\pm$  m below existing grade, the termination depth, was encountered in BH 1.

Standard penetration testing within the gravelly sand deposit yielded “N”-values between 4 and 43 blows per 300 mm; however, DCPT results from  $5.35\pm$  to  $5.95\pm$  m depth, just below the borehole termination depth, showed values ranging from 56 to 70 blows per 300 mm. Based on these results, it is likely that the deposit has a dense compactness condition. Natural moisture contents were measured between 1 and 2%, indicating damp moisture conditions.



## 5.5 Groundwater

Groundwater conditions were monitored during and following completion of borehole sampling. No notable groundwater presence was observed, and it is anticipated that no issues should arise during construction within the current project scope. A saturated silt seam (23% moisture content) was encountered at the bottom of Borehole 9; however, this is highly likely just a local, temporary condition.

It is noted that the observed groundwater table will fluctuate seasonally, such as during the spring following the period of peak snow melt, and in response to major weather events.





## 6.0 DISCUSSION AND RECOMMENDATIONS

### 6.1 General

It is understood that a new single-storey building addition, approximately 250 m<sup>2</sup> in size, is proposed in the rear play area. It is presumed that both the finished floor elevation (FFE) and height of the addition will match that of the existing building. Additionally, the scope of work will include the removal and re-surfacing of the existing exterior asphalt and pathways, along with the expansion of a new exterior parking lot, as can be seen in Drawing No. 1.

In general, the surficial topsoil/pavement was underlain by very loose to compact fill materials extending to depths between 1.5± and 2.15± m below existing grades. Aside from occasional wood fragments in Borehole 5 and trace organics in Boreholes 10 and 11, no serious deleterious materials were encountered. Boreholes 4 to 8, 10, and 11 were all terminated within the fill layer. All three (3) grain size analyses performed on granular base samples taken from the pavement boreholes failed to stay within the limits of OPSS 1010 Granular “B”: Type I due to silt content exceedances.

Following the fill layer, the remaining boreholes (Boreholes 1 to 3, and 9) were predominantly composed of compact to dense fine granular deposits ranging from fine sand with some silt to silt with trace sand. The fine granular deposits extended to depths between 3.5± and 5.2± m below existing grades, and Boreholes 2, 3, and 9 were both terminated within the deposit at a depth of 5.2± m below ground surface. A dense gravelly sand deposit was encountered in Borehole 1 from 3.5± to 5.2± m depth.

Based on field observations and moisture contents, aside from a small, localized wet silt seam encountered in Borehole 9, no notable groundwater conditions were observed, and no groundwater related issues are anticipated during construction.

### 6.2 Footing Foundations

It is understood that the FFE of the proposed addition will match that of the existing community centre at an elevation of 329.80 m.

Conventional strip and spread footing foundations can be used to support the proposed addition. Footings cast on the competent native fine granular deposits can be designed using a Geotechnical Reaction at SLS of 250 kPa and a Factored Geotechnical Resistance at ULS of 400 kPa.

These soil bearing pressures can be achieved provided that the founding subgrade is undisturbed during construction. In addition, the footings should be founded below any existing fill materials and former building/structure foundations, on competent native undisturbed soils.

The maximum total and differential settlements of footings designed to the above recommended soil bearing pressure are expected to be less than 25 and 20 mm, respectively, and these are considered tolerable for the structure being contemplated. The majority of the settlements will take place during construction and the first loading cycle of the building.



The following table summarizes the highest founding level and elevation for the footing at the borehole locations:

Borehole No.	Existing Ground Elevation (m)	Highest Founding Depth (m)	Highest Founding Elevation (m)
1	329.68	1.58	328.1±
2	329.36	1.56	327.8±
3	329.59	1.59	328.0±

If excavations are to occur near/below the existing footings, care needs to be taken not to undermine these foundations. Spacing between adjacent footing steps should not be steeper than 10H to 7V.

Exterior footings and footings in unheated portions of the building should be provided with a soil cover of not less than 1.2 m or equivalent synthetic thermal insulation for adequate frost protection. The founding subgrade soils must be protected from frost penetration during winter construction.

It is recommended that the footing excavations be inspected by the geotechnical engineer to ensure adequate soil bearing and proper subgrade preparation occur.

### 6.3 Engineered Fill Construction

It is anticipated that minor amounts of engineered fill will be required for the proposed addition. Engineered fill is recommended for use in areas where fill materials or loose native soils are encountered and required to be removed. Imported sand and gravel (OPSS Granular "B" Type I) containing less than 8% silt sized particles can be used to construct the engineered fill under controlled and supervised conditions. The moisture content of the soil is required to be within 3% dry of its optimum moisture condition to achieve the specified degree of compaction

Engineered fill should be constructed in accordance with the following procedures to support building foundations and floor slabs:

- 1) All vegetation, topsoil, any deleterious materials, and loose native soil are to be stripped/removed from building area;
- 2) The exposed inorganic earth subgrade is to be thoroughly recompacted by large heavy compaction equipment (10 tonne vibratory smooth drum compactor is recommended) and inspected by qualified geotechnical personnel. Any loose or soft areas identified should be excavated to the level of competent soil;



- 3) The required grades can then be achieved by placing approved on-site granular soil or imported OPSS Granular B Type I in maximum 300 mm thick loose lifts and compacting to a minimum of 98% Standard Proctor maximum dry density (SPMDD) in areas to support building foundations. The compaction can be reduced to 95% SPMDD to support the floor slabs;
- 4) The moisture content of all fill materials should be within 3% below their optimum moisture contents to achieve the specified degrees of compaction;
- 5) Engineered fill must be placed such that the fill pad extends horizontally outwards from all footings at least the same distance as how thick the engineered fill pad will exist between the underside of future footings and the approved native earth subgrade; and
- 6) All engineered fill placement and compaction operations must be supervised on a full-time basis by qualified geotechnical personnel to approve fill material and ensure the specified degrees of compaction have been achieved.

Footings founded on the approved engineered fill can be designed using the Geotechnical Reaction of 150 kPa at SLS and Factored Geotechnical Resistance of 250 kPa at ULS.

Vibration could be generated from various construction equipment during construction, such as compactors and rollers which could be harmful to surrounding structures and buildings. Peak particle velocity (PPV) of ground motion is widely accepted as the best descriptor of potential for vibration damage to structures. The safe vibration limit can be set to 8 to 25 mm/s PPV, depending on frequency of vibrations and the sensitivity of surrounding structures to vibration.

Vibration monitoring can be carried out to measure the PPV of ground motion from vibration generated from typical compaction equipment at the beginning of the project in the potentially critical areas. This will set criteria and establish the type of equipment to be used for this project. A pre-construction condition survey could be conducted to document the condition of the existing structures within the possible zone of influence, if necessary.

## 6.4 Floor Slab Construction

The floor slab for the proposed building addition can be constructed as conventional slab-on-grade on the engineered fill constructed per Section 6.3, Engineered Fill Construction. At the time of floor slab construction, the exposed subgrade should be proof-rolled with a heavy roller in conjunction with an inspection by the geotechnical engineer. Any soft and/or unstable areas detected should be replaced with imported granular base or reused local native sand and gravel which should be compacted to at least 95% SPMDD.

Following the proof-rolling of the subgrade, it is recommended that a minimum 150 mm thick layer of OPSS Granular "A" be placed and compacted to at least 100% SPMDD beneath the concrete floor slabs to provide uniform support.



A modulus of subgrade reaction ( $k_s$ ) of  $50 \text{ MN/m}^3$  may be used to the design of the floor slabs assuming a fine granular subgrade will exist.

The floor slabs should be separated structurally from the columns and foundation walls. Sawcut control joints should be provided at regular spacing (less than 30 times the concrete slab thickness) and to depths between one-third and one-quarter of the slab thickness.

Care should be taken to ensure that the backfill against foundations walls, interior piers/columns and concrete pits are placed in thin layers and each layer compacted to at least 95% SPMDD. These types of confined areas should be backfilled with on-site soil or imported granular soil such as OPSS Granular B Type I.

## 6.5 Construction and Groundwater Control

Excavations are generally expected to be in the order of up to  $1.0\pm$  to  $2.0\pm$  m deep for foundation construction, pavement reconstruction, and installing site servicing. The excavations will generally penetrate loose to compact fill materials and potentially loose to compact native fine granular deposits. These materials are considered to be Type 3 Soils in accordance with the latest Occupational Health and Safety Act.

Excavations in the Type 3 Soils are expected to remain stable during the construction period provided that side slopes are cut to 1H : 1V from the bottom of the excavation. Where seepage or perched groundwater is encountered, side slopes should be cut to more stable angles of 3H : 1V. The side slopes should be suitably protected from erosion processes.

Uncontrollable groundwater is not expected within the anticipated depths of excavation. Drainage of the native granular deposits should be sufficient, but it is still recommended that excavations for future development are completed during the typically drier summer months when groundwater conditions would be expected to lie at lower elevations. Surface run-off which inadvertently enters the excavation can be controlled by using conventional filtered sump pumping techniques, as and where required.



6.6 Lateral Earth Pressure

The unbalanced foundation walls and any other soil retaining structures should be designed to resist the lateral earth pressure acting against these walls. The following formula may be used to calculate the unfactored earth pressure distribution. The factored resistance can be calculated by using a factor of 0.8.

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

where:

P =	lateral earth pressure	kPa
K =	earth pressure coefficient, 0.5 for non-yielding foundation wall earth pressure coefficient, 0.3 for yielding retaining wall	
γ =	unit weight of granular backfill, compacted to 95% SPMDD	21 kN/m <sup>3</sup>
H =	unbalanced height of wall	m
q =	surcharge load at ground surface	kPa

The backfill for the foundation walls and retaining walls should be free-draining granular materials which should have less than 8% silt particles (OPSS Granular “B” Type I). The backfill should be placed in thin layers and compacted to 95% SPMDD. Over-compaction adjacent to the foundation/retaining walls should be avoided. Compaction should be carried out with hand operated equipment within 1 m of the foundation wall or retaining wall. Weeping tiles leading to a frost-free outlet or weep holes should be installed to effect drainage behind the retaining wall.

The sliding resistance of the retaining wall footings should be checked. The unfactored horizontal resistance against sliding between cast-in-place concrete and the various soils can be calculated using the following unit weight and friction coefficient:

Soil	Unit Weight (kN/m <sup>3</sup> )	Friction Coefficient
Well-compact Granular Backfill	21	0.45
Compact to Dense Fine Granular Deposits	20	0.30 to 0.35



6.7 Earthquake Considerations

In accordance with The Ontario Building Code 2012 (OBC), the proposed structure should be designed to resist earthquake load and effects as per OBC Subsection 4.1.8.

Based on the condition of the underlying soils encountered at the boreholes, the site can be classified as a **Site Class C** as per OBC Table 4.1.8.4.A (Page B4-24).

6.8 Pavement Structure

The earth subgrade in pavement areas is expected to consist of fine granular fill soils and native fine granular deposits. The following flexible pavement structures are recommended based on an assumed CBR value, the observed groundwater conditions, and the frost susceptibility of the subgrade soils:

Component	Light Duty Pavement (mm)	Heavy Duty Pavement (mm)
Asphaltic Concrete HL3	40	40
Asphaltic Concrete HL8	50	50
Granular “A” Base	150	150
Granular “B” Sub-base	250	350

The pavement design considers that pavement construction will be carried out during the drier time of the year and that the subgrade is stable, not heaving under construction equipment traffic. If the subgrade is wet or unstable, additional granular sub-base or lean mix concrete may be required.

Prior to the placement of the granular subbase, the subgrade will be stripped of existing pavements, topsoil, and any deleterious materials. The exposed subgrade should be thoroughly recompactd with a heavy vibratory compactor and inspected by a qualified geotechnical inspector. Any soft spots encountered during the process should be excavated to the level of competent soil. The required grades can then be achieved by placing approved on-site soils in maximum 200 to 300 thick lifts which should be compacted to 95% SPMDD.

The base and sub-base materials should be produced in accordance with the current OPSS specifications, placed and uniformly compacted to at least 100% SPMDD. The existing granular base materials contain 10.4% to 23.2% of grain size passing the #200 sieve, indicating more than 8% silt content, and consequently, these samples do not meet the OPSS Granular “B”: Type I gradation specification, and cannot be reused or incorporated into the pavement structure.



The asphaltic concrete should be placed and compacted in accordance with OPSS.MUNI 310 Table 10 and to at least 92% of the Marshall Density (MRD). Frequent in-situ density testing by this office should be carried out to verify that the specified degree of compaction is being achieved and maintained.

SS-1 or SS-1HH tack coat should be applied to all binder course surfaces and vertical surfaces (i.e., curbs, pavement joints, etc.) prior to placement of asphalt. Refer to OPSS 310 and OPSS 1101 for additional details.

It should be noted that even well compacted trench backfill could settle for a period of time after construction. In this regard, the surface course of the asphaltic concrete should be placed at least one (1) year after trench backfill is completed to allow any minor settlements to occur within the trench backfill. The incomplete pavement structure may not be capable of supporting construction traffic. Consequently, minor repairs of the sub-base, base and asphaltic concrete may be required prior to paving with the base course and/or the surface course asphaltic concrete.

The prepared earth subgrade and final pavement surfaces should be graded to direct water runoff away from buildings, sidewalks, and other similar pertinent structures. Positive drainage outlets should be provided at all low points of the prepared earth subgrade, such as stub drains extended from the catch-basins. Systematic drainage of the granular base materials will promote the longevity of the pavement structures.

## 6.9 On-Site Infiltration

Two (2) grain size distribution analyses were conducted on various fine granular deposits collected from Boreholes 1 and 2, and the results are provided in Enclosures 12 to 13.

Based on the grain size distribution analyses and our experience, the coefficient of permeability and infiltration rate of the major native soil deposit are estimated and provided in the following table:

MATERIAL	PERMEABILITY (K) (cm/sec)	INFILTRATION RATE (mm/hr)
Fine Sand, some silt (Enclosure 12)	$3 \times 10^{-3}$ to $1 \times 10^{-2}$	50 to 75
Silty Sand (Enclosure 13)	$3 \times 10^{-3}$	50

Considering the high infiltration rates of the aforementioned soil deposits, and the groundwater table located at least 5.2 m below grade, on-site infiltration is feasible.



## 7.0 GEO-ENVIRONMENTAL CONSIDERATIONS

Excess soil may be generated and removed off-site during the construction activities associated with the proposed site works. The management of excess soil is now governed by O.Reg. 406/19, MECP document entitled “On-Site and Excess Soil Management Regulation”. In accordance with the regulation, the Project Leader is responsible for the handling, storage, reuse, transportation, and removal of all soil. To support off-site removal of excess soil, the following is required:

- Planning Documentation
  - Assessment of Past Use
  - Sampling and Analysis Plan
  - Excess Soil Characterization Report
  - Excess Soil Destination Report
- Tracking
- Registry
- Record Keeping

An initial testing program was conducted during the geotechnical investigation and the analytical results are discussed in the following sections of this report. Additional soil sampling and analysis may be required as per the above-noted MECP document and/or as per the requirement of the receiving site owner(s), depending on the volume of excess soil generated during construction. The analytical results and environmental assessment findings must be disclosed to the receiving site owner(s) and approval by the receiving site owner(s) be obtained prior to exporting/transferring the materials.

It is noted that the soils condition may differ between and beyond the sampled locations. If any impacted soils are discovered during construction, CVD should be contacted for further sampling and testing to determine the limit of the impacted soils.

Any soils identified during construction to have been environmentally impacted are to be separately stockpiled and analysed to determine the appropriate measures for handling and disposal. Waste characterization testing (TCLP) to classify the material for disposal as prescribed in O.Reg. 347/558 is required. Leachate analysis (mSPLP) is to be carried out if the excess soil is to be disposed to receiving sites under O.Reg. 406/19. Similarly, groundwater encountered during construction works must also be suitably assessed and handled.





## 7.1 Applicable Regulatory Standards

The Soil, Ground Water and Sediment Standards for Use Under the New Soil Rules and Excess Soil Quality Standards established in accordance with the O.Reg. 406/19 as amended were consulted in the assessment of the soil at the project site.

The analytical results for soils were compared to the following O. Reg. 406/19 regulatory standards:

- Table 1 (Full Depth Background Site Condition Standards) for Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use (Table 1 RPIICC ESQS)
- Table 2.1 (Full Depth Generic Excess Soil Quality Standards in a Potable Ground Water Condition) for Residential/Parkland/Institutional Property Use (Table 2.1 RPI ESQS)
- Table 2.1 (Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition) for Industrial/Commercial/Community Property Use (Table 2.1 ICC ESQS)

## 7.2 Handling of Excess Soils

In support of on-site and excess soil management, an initial chemical testing program was conducted as part of this geotechnical investigation. Five (5) samples were collected and submitted to AGAT Laboratories for analysis of metals and inorganics, Petroleum Hydrocarbons (PHCs) F1 to F4, and Benzene, Toluene, Ethylbenzene and Xylene (BTEX).

The table below outlines a summary of the samples submitted for chemical analysis and all exceedances:

Sample	Table 1	Table 2.1 RPI	Table 2.1 ICC
BH 1 – SA 1	Exceeds – SAR	✓	✓
BH 2 – SA 2	Exceeds – SAR, EC	Exceeds – SAR, EC	✓
BH 3 – SA 1	Exceeds – SAR, EC	Exceeds – SAR, EC	✓
BH 6 – SA 1	Exceeds – SAR, EC, F4	Exceeds – SAR, EC	✓
BH 8 – SA 1	Exceeds – SAR, EC	✓	✓

✓ - Meets applicable standard for all parameters analyzed



The analytical results for sodium adsorption ratio (SAR) and electrical conductivity (EC) indicate that the tested soils from Borehole 1, Sample 1 and Borehole 8, Sample 1 exceed the allowable concentration limits under Table 1 standards.

The tested soils from Borehole 2, Sample 2, Borehole 3, Sample 1, and Borehole 6, Sample 1 all exceed the allowable concentration limits under Table 2.1 RPI standards for SAR and EC. Higher concentrations of SAR and EC are not uncommon in existing parking lots and are potentially caused by the use of road salts during the winter.

Furthermore, the tested soil from Borehole 6, Sample 1 exceeds the allowable concentration limits for the petroleum hydrocarbon F4 under Table 1 standards. Since the exceedance is small, it is possible that it was caused by a small inclusion of asphalt from the overlying pavement.

**If excess soils are anticipated to be generated, further analytical testing should be completed prior to or during the construction phase to delineate the extent of the SAR, EC, and F4 impacted soils. Additionally, a TCLP should be completed at that time. CVD can provide excess soil management recommendations for the impacted areas after delineation and additional testing is completed.**

It is noted that the soil conditions may differ between and beyond the sample locations. If environmentally impacted soil is encountered during construction, the soil should be segregated, stockpiled, and CVD should be contacted for further assessment of the impacted soils.

The results and laboratory certificates of chemical analysis provided by AGAT Laboratories of Mississauga are enclosed in Appendix "B". A comparison of the soil chemistry results to the applicable regulatory standard is included in Appendix "C".

CVD further recommends that a disposal plan for excess soils be established to manage the quantity, as well as where and how the excess soils can be disposed of off-site.



## 8.0 CLOSURE

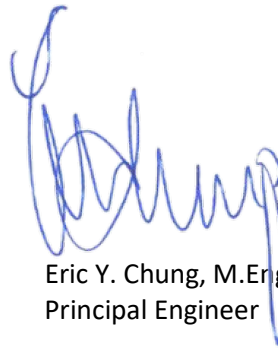
The Limitations of Report, as quoted in Appendix A, is an integral part of this report.

We trust that the information presented in this report is complete within our terms of reference. If there are any further questions concerning this report, please do not hesitate to contact our office.

Yours truly,  
**CHUNG & VANDER DOELEN ENGINEERING LTD.**



Yaroslav Chudin, E.I.T.  
Geotechnical Engineering Intern



Eric Y. Chung, M.Eng., P.Eng.  
Principal Engineer



## APPENDIX A

### LIMITATIONS OF REPORT



# APPENDIX “A”

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## LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the testhole locations. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Soils Engineer be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the testholes.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of testholes and their respective depths may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusion as to how the subsurface conditions may affect their work.

The benchmark and elevations mentioned in this report were obtained strictly for use in the geotechnical design of the project and by this office only, and should not be used by any other parties for any other purposes.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. CHUNG & VANDER DOELEN ENGINEERING LIMITED accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

This report does not reflect the environmental issues or concerns unless otherwise stated in the report.



## APPENDIX B

### SOIL CHEMISTRY RESULTS



**CLIENT NAME: CHUNG AND VANDER DOELEN**  
**311 VICTORIA STREET NORTH**  
**KITCHENER, ON N2H5E1**  
**(519) 742-8979**

**ATTENTION TO: Yaroslav Chudin**

**PROJECT: 1874**

**AGAT WORK ORDER: 24T159893**

**SOIL ANALYSIS REVIEWED BY: Sukhwinder Randhawa, Inorganic Team Lead**

**TRACE ORGANICS REVIEWED BY: Pinkal Patel, Report Reviewer**

**DATE REPORTED: Jun 17, 2024**

**PAGES (INCLUDING COVER): 11**

**VERSION\*: 1**

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

\*Notes

**Disclaimer:**

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.
- For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.



## Certificate of Analysis

AGAT WORK ORDER: 24T159893

PROJECT: 1874

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CLIENT NAME: CHUNG AND VANDER DOELEN

SAMPLING SITE: 216 Mill Street, Kitchener

ATTENTION TO: Yaroslav Chudin

SAMPLED BY: R.S

### O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2024-06-07

DATE REPORTED: 2024-06-13

Parameter	Unit	SAMPLE DESCRIPTION:				BH1-SA1	BH2-SA2	BH3-SA1	BH6-SA1	BH8-SA1
		SAMPLE TYPE:				Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:				2024-05-29	2024-05-29	2024-05-29	2024-05-29	2024-05-29
		G / S: A	G / S: B	G / S: C	RDL	5916023	5916028	5916029	5916030	5916031
Antimony	µg/g	1.3	40	7.5	0.8	<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]
Arsenic	µg/g	18	18	18	1	2[<A]	2[<A]	3[<A]	2[<A]	3[<A]
Barium	µg/g	220	670	390	2.0	24.0[<A]	14.1[<A]	18.2[<A]	30.6[<A]	23.1[<A]
Beryllium	µg/g	2.5	8	4	0.5	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Boron	µg/g	36	120	120	5	<5[<A]	<5[<A]	<5[<A]	<5[<A]	<5[<A]
Boron (Hot Water Soluble)	µg/g	NA	2	1.5	0.10	<0.10[<C]	<0.10[<C]	<0.10[<C]	0.24[<C]	<0.10[<C]
Cadmium	µg/g	1.2	1.9	1.2	0.5	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Chromium	µg/g	70	160	160	5	7[<A]	6[<A]	8[<A]	9[<A]	9[<A]
Cobalt	µg/g	21	80	22	0.8	2.5[<A]	1.8[<A]	2.7[<A]	3.1[<A]	2.5[<A]
Copper	µg/g	92	230	140	1.0	8.7[<A]	8.1[<A]	7.8[<A]	9.6[<A]	13.9[<A]
Lead	µg/g	120	120	120	1	9[<A]	8[<A]	9[<A]	13[<A]	38[<A]
Molybdenum	µg/g	2	40	6.9	0.5	<0.5[<A]	<0.5[<A]	0.8[<A]	<0.5[<A]	<0.5[<A]
Nickel	µg/g	82	270	100	1	5[<A]	3[<A]	5[<A]	6[<A]	5[<A]
Selenium	µg/g	1.5	5.5	2.4	0.8	<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]
Silver	µg/g	0.5	40	20	0.5	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Thallium	µg/g	1	3.3	1	0.5	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Uranium	µg/g	2.5	33	23	0.50	<0.50[<A]	<0.50[<A]	<0.50[<A]	<0.50[<A]	<0.50[<A]
Vanadium	µg/g	86	86	86	2.0	13.3[<A]	11.7[<A]	17.6[<A]	16.7[<A]	14.9[<A]
Zinc	µg/g	290	340	340	5	57[<A]	66[<A]	49[<A]	60[<A]	111[<A]
Chromium, Hexavalent	µg/g	0.66	8	8	0.2	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
Cyanide, WAD	µg/g	0.051	0.051	0.051	0.040	<0.040[<A]	<0.040[<A]	<0.040[<A]	<0.040[<A]	<0.040[<A]
Mercury	µg/g	0.27	0.27	0.27	0.10	<0.10[<A]	<0.10[<A]	<0.10[<A]	<0.10[<A]	<0.10[<A]
Electrical Conductivity (2:1)	mS/cm	0.57	1.4	0.7	0.005	0.390[<A]	1.07[C-B]	0.783[C-B]	0.913[C-B]	0.574[A-C]
Sodium Adsorption Ratio (2:1) (Calc.)	N/A	2.4	12	5	N/A	4.24[A-C]	11.4[C-B]	10.1[C-B]	10.6[C-B]	4.70[A-C]
pH, 2:1 CaCl2 Extraction	pH Units				NA	6.59	6.60	6.63	6.81	6.68

Certified By:







# Certificate of Analysis

AGAT WORK ORDER: 24T159893

PROJECT: 1874

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CLIENT NAME: CHUNG AND VANDER DOELEN

SAMPLING SITE: 216 Mill Street, Kitchener

ATTENTION TO: Yaroslav Chudin

SAMPLED BY: R.S

## O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2024-06-07

DATE REPORTED: 2024-06-13

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, B Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - Com/Ind, C Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - RP  
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

**5916023-5916031** EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by \*)

Certified By:



*Y. Chudin*



## Certificate of Analysis

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PROJECT: 1874

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CLIENT NAME: CHUNG AND VANDER DOELEN

SAMPLING SITE: 216 Mill Street, Kitchener

ATTENTION TO: Yaroslav Chudin

SAMPLED BY: R.S

### O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2024-06-07

DATE REPORTED: 2024-06-11

SAMPLE DESCRIPTION:						BH1-SA1	BH2-SA2	BH3-SA1	BH6-SA1	BH8-SA1
SAMPLE TYPE:						Soil	Soil	Soil	Soil	Soil
DATE SAMPLED:						2024-05-29	2024-05-29	2024-05-29	2024-05-29	2024-05-29
Parameter	Unit	G / S: A	G / S: B	G / S: C	RDL	5916023	5916028	5916029	5916030	5916031
Benzene	µg/g	0.02	0.02	0.02	0.02	<0.02[<A]	<0.02[<A]	<0.02[<A]	<0.02[<A]	<0.02[<A]
Toluene	µg/g	0.2	0.2	0.2	0.05	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]
Ethylbenzene	µg/g	0.05	0.05		0.05	<0.05[<B]	<0.05[<B]	<0.05[<B]	<0.05[<B]	<0.05[<B]
m & p-Xylene	µg/g				0.05	<0.05	<0.05	<0.05	<0.05	<0.05
o-Xylene	µg/g				0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylenes (Total)	µg/g	0.05	0.091	0.091	0.05	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]
F1 (C6 to C10)	µg/g	25			5	<5[<A]	<5[<A]	<5[<A]	<5[<A]	<5[<A]
F1 (C6 to C10) minus BTEX	µg/g	25	25	25	5	<5[<A]	<5[<A]	<5[<A]	<5[<A]	<5[<A]
F2 (C10 to C16)	µg/g	10	26	10	10	<10[<A]	<10[<A]	<10[<A]	<10[<A]	<10[<A]
F3 (C16 to C34)	µg/g	240	240	240	50	<50[<A]	<50[<A]	<50[<A]	180[<A]	<50[<A]
F4 (C34 to C50)	µg/g	120	3300	2800	50	<50[<A]	<50[<A]	<50[<A]	196[A-C]	<50[<A]
Gravimetric Heavy Hydrocarbons	µg/g	120			50	NA[B]	NA[B]	NA[B]	NA[B]	NA[B]
Moisture Content	%				0.1	22.8	43.0	30.3	34.6	33.3
Surrogate	Unit	Acceptable Limits								
Toluene-d8	% Recovery	60-140				89	119	106	81	105
Terphenyl	%	60-140				78	83	86	89	74

Certified By:

*Yaroslav Chudin*



**AGAT** Laboratories

## Certificate of Analysis

AGAT WORK ORDER: 24T159893

PROJECT: 1874

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CLIENT NAME: CHUNG AND VANDER DOELEN

SAMPLING SITE: 216 Mill Street, Kitchener

ATTENTION TO: Yaroslav Chudin

SAMPLED BY: R.S

### O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2024-06-07

DATE REPORTED: 2024-06-11

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, B Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - Com/Ind, C Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - RP  
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

**5916023-5916031** Results are based on sample dry weight.  
The C6-C10 fraction is calculated using Toluene response factor.  
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.  
C6-C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.  
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.  
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.  
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.  
The chromatogram has returned to baseline by the retention time of nC50.  
Total C6 - C50 results are corrected for BTEX contribution.  
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.  
nC6 and nC10 response factors are within 30% of Toluene response factor.  
nC10, nC16 and nC34 response factors are within 10% of their average.  
C50 response factor is within 70% of nC10 + nC16 + nC34 average.  
Linearity is within 15%.  
Extraction and holding times were met for this sample.  
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.  
Quality Control Data is available upon request.

Analysis performed at AGAT Toronto (unless marked by \*)

Certified By:



## Exceedance Summary

AGAT WORK ORDER: 24T159893

PROJECT: 1874

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CLIENT NAME: CHUNG AND VANDER DOELEN

ATTENTION TO: Yaroslav Chudin

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
5916023	BH1-SA1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	2.4	4.24
5916028	BH2-SA2	ON 406/19 T2.1 RP	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	0.7	1.07
5916028	BH2-SA2	ON 406/19 T2.1 RP	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	5	11.4
5916028	BH2-SA2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	0.57	1.07
5916028	BH2-SA2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	2.4	11.4
5916029	BH3-SA1	ON 406/19 T2.1 RP	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	0.7	0.783
5916029	BH3-SA1	ON 406/19 T2.1 RP	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	5	10.1
5916029	BH3-SA1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	0.57	0.783
5916029	BH3-SA1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	2.4	10.1
5916030	BH6-SA1	ON 406/19 T2.1 RP	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	0.7	0.913
5916030	BH6-SA1	ON 406/19 T2.1 RP	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	5	10.6
5916030	BH6-SA1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	0.57	0.913
5916030	BH6-SA1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	2.4	10.6
5916030	BH6-SA1	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	F4 (C34 to C50)	µg/g	120	196
5916031	BH8-SA1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	0.57	0.574
5916031	BH8-SA1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1) (Calc.)	N/A	2.4	4.70



## Quality Assurance

CLIENT NAME: CHUNG AND VANDER DOELEN

PROJECT: 1874

SAMPLING SITE: 216 Mill Street, Kitchener

AGAT WORK ORDER: 24T159893

ATTENTION TO: Yaroslav Chudin

SAMPLED BY: R.S

### Soil Analysis

RPT Date:			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	5920719		<0.8	<0.8	NA	< 0.8	114%	70%	130%	94%	80%	120%	76%	70%	130%
Arsenic	5920719		1	1	NA	< 1	107%	70%	130%	96%	80%	120%	99%	70%	130%
Barium	5920719		27.6	33.4	19.0%	< 2.0	107%	70%	130%	108%	80%	120%	73%	70%	130%
Beryllium	5920719		<0.5	<0.5	NA	< 0.5	100%	70%	130%	112%	80%	120%	85%	70%	130%
Boron	5920719		7	8	NA	< 5	80%	70%	130%	100%	80%	120%	112%	70%	130%
Boron (Hot Water Soluble)	5920719		0.19	0.14	NA	< 0.10	101%	60%	140%	103%	70%	130%	111%	60%	140%
Cadmium	5920719		<0.5	<0.5	NA	< 0.5	106%	70%	130%	99%	80%	120%	103%	70%	130%
Chromium	5920719		10	9	NA	< 5	100%	70%	130%	101%	80%	120%	98%	70%	130%
Cobalt	5920719		1.9	1.8	NA	< 0.8	95%	70%	130%	95%	80%	120%	92%	70%	130%
Copper	5920719		5.6	5.1	9.3%	< 1.0	95%	70%	130%	99%	80%	120%	76%	70%	130%
Lead	5920719		2	3	NA	< 1	95%	70%	130%	101%	80%	120%	94%	70%	130%
Molybdenum	5920719		<0.5	<0.5	NA	< 0.5	97%	70%	130%	97%	80%	120%	100%	70%	130%
Nickel	5920719		4	5	NA	< 1	97%	70%	130%	95%	80%	120%	87%	70%	130%
Selenium	5920719		<0.8	<0.8	NA	< 0.8	110%	70%	130%	95%	80%	120%	74%	70%	130%
Silver	5920719		<0.5	<0.5	NA	< 0.5	100%	70%	130%	97%	80%	120%	101%	70%	130%
Thallium	5920719		<0.5	<0.5	NA	< 0.5	95%	70%	130%	100%	80%	120%	71%	70%	130%
Uranium	5920719		<0.50	0.60	NA	< 0.50	94%	70%	130%	98%	80%	120%	72%	70%	130%
Vanadium	5920719		16.7	16.8	0.6%	< 2.0	104%	70%	130%	96%	80%	120%	70%	70%	130%
Zinc	5920719		31	36	14.9%	< 5	100%	70%	130%	99%	80%	120%	109%	70%	130%
Chromium, Hexavalent	5915765		<0.2	<0.2	NA	< 0.2	85%	70%	130%	84%	80%	120%	72%	70%	130%
Cyanide, WAD	5916031	5916031	<0.040	<0.040	NA	< 0.040	98%	70%	130%	103%	80%	120%	101%	70%	130%
Mercury	5920719		<0.10	<0.10	NA	< 0.10	100%	70%	130%	93%	80%	120%	94%	70%	130%
Electrical Conductivity (2:1)	5920886		0.162	0.139	15.3%	< 0.005	106%	80%	120%						
Sodium Adsorption Ratio (2:1) (Calc.)	5915766		0.344	0.362	5.1%	NA									
pH, 2:1 CaCl2 Extraction	5916023	5916023	6.59	6.58	0.2%	NA	100%	80%	120%						

Comments: NA signifies Not Applicable.

pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Duplicate NA: results are under 5X the RDL and will not be calculated.

### O. Reg. 153(511) - Metals & Inorganics (Soil)

Electrical Conductivity (2:1)	5915766	0.163	0.178	8.8%	< 0.005	99%	80%	120%
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Certified By: \_\_\_\_\_





## Quality Assurance

CLIENT NAME: CHUNG AND VANDER DOELEN

PROJECT: 1874

SAMPLING SITE: 216 Mill Street, Kitchener

AGAT WORK ORDER: 24T159893

ATTENTION TO: Yaroslav Chudin

SAMPLED BY: R.S

### Trace Organics Analysis

RPT Date:			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE		MATRIX SPIKE			
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits	Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower		Upper	Lower		Upper	Lower

#### O. Reg. 153(511) - PHCs F1 - F4 (Soil)

Benzene	5917289		<0.02	<0.02	NA	< 0.02	77%	60%	140%	72%	60%	140%	87%	60%	140%
Toluene	5917289		<0.05	<0.05	NA	< 0.05	78%	60%	140%	87%	60%	140%	74%	60%	140%
Ethylbenzene	5917289		<0.05	<0.05	NA	< 0.05	79%	60%	140%	71%	60%	140%	71%	60%	140%
m & p-Xylene	5917289		<0.05	<0.05	NA	< 0.05	82%	60%	140%	96%	60%	140%	76%	60%	140%
o-Xylene	5917289		<0.05	<0.05	NA	< 0.05	82%	60%	140%	75%	60%	140%	77%	60%	140%
F1 (C6 to C10)	5917289		<5	<5	NA	< 5	97%	60%	140%	93%	60%	140%	98%	60%	140%
F2 (C10 to C16)	5910420		< 10	< 10	NA	< 10	113%	60%	140%	101%	60%	140%	98%	60%	140%
F3 (C16 to C34)	5910420		< 50	< 50	NA	< 50	115%	60%	140%	123%	60%	140%	127%	60%	140%
F4 (C34 to C50)	5910420		< 50	< 50	NA	< 50	78%	60%	140%	69%	60%	140%	71%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

*Yaroslav Chudin*

## Method Summary

**CLIENT NAME: CHUNG AND VANDER DOELEN**
**PROJECT: 1874**
**SAMPLING SITE: 216 Mill Street, Kitchener**
**AGAT WORK ORDER: 24T159893**
**ATTENTION TO: Yaroslav Chudin**
**SAMPLED BY: R.S**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
<b>Soil Analysis</b>			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET 93 -6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide, WAD	INOR-93-6052	modified from ON MOECC E3015, SM 4500-CN- I, G-387	SEGMENTED FLOW ANALYSIS
Mercury	MET-93-6103	modified from EPA 7471B and SM 3112 B	ICP-MS
Electrical Conductivity (2:1)	INOR-93-6075	modified from MSA PART 3, CH 14 and SM 2510 B	PC TITRATE
Sodium Adsorption Ratio (2:1) (Calc.)	INOR-93-6007	modified from EPA 6010D & Analytical Protocol	ICP/OES
pH, 2:1 CaCl <sub>2</sub> Extraction	INOR-93-6075	modified from EPA 9045D, MCKEAGUE 3.11 E3137	PC TITRATE

## Method Summary

**CLIENT NAME: CHUNG AND VANDER DOELEN**
**AGAT WORK ORDER: 24T159893**
**PROJECT: 1874**
**ATTENTION TO: Yaroslav Chudin**
**SAMPLING SITE: 216 Mill Street, Kitchener**
**SAMPLED BY: R.S**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
<b>Trace Organics Analysis</b>			
Benzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Toluene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Ethylbenzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
m & p-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
o-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Xylenes (Total)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
F1 (C6 to C10)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method	P&T GC/FID
Toluene-d8	VOL-91-5009	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID





## Laboratory Use Only

Work Order #: 247159893

Cooler Quantity: 1 med

Arrival Temperatures: 6.7 / 6.1 / 6.2

Custody Seal Intact: ☒ Yes ☐ No ☐ N/A

Notes: F/I

## Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT  
\*TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

## Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

### Report Information:

Company: CVD Engineering Ltd.  
Contact: Yaroslav Chudin  
Address: 34 Victoria St. N., Kitchener  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Reports to be sent to:  
1. Email: yaroslav.chudin@cvdengineering.com  
2. Email: \_\_\_\_\_

### Regulatory Requirements:

(Please check all applicable boxes)

☒ Regulation 153/04

☒ Regulation 406

☐ Sewer Use

☐ Sanitary ☐ Storm

Table 1 RPT/IC  
Indicate One

Table 2-1 RPT/IC  
Indicate One

Region \_\_\_\_\_

☐ Ind/Com

☐ Res/Park

☐ Agriculture

☐ Regulation 558

☐ Prov. Water Quality Objectives (PWQO)

Soil Texture (Check One)

☐ Coarse

☐ CCME

☐ Fine

☐ Other

Indicate One

Is this submission for a Record of Site Condition?

☐ Yes ☒ No

Report Guideline on Certificate of Analysis

☒ Yes ☐ No

### Project Information:

Project: 1874  
Site Location: 216 Mill Street, Kitchener  
Sampled By: R.S.  
AGAT Quote #: \_\_\_\_\_ PO: \_\_\_\_\_  
Please note: If quotation number is not provided, client will be billed full price for analysis.

### Invoice Information:

Bill To Same: Yes ☒ No ☐

Company: \_\_\_\_\_  
Contact: \_\_\_\_\_  
Address: \_\_\_\_\_  
Email: \_\_\_\_\_

### Sample Matrix Legend

GW Ground Water  
O Oil  
P Paint  
S Soil  
SD Sediment  
SW Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y / N	Field Filtered - Metals, Hg, CrVI, DOC	0. Reg 153	0. Reg 558	0. Reg 406	Potentially Hazardous or High Concentration (Y/N)
1. <u>RH 1 - SAP</u>	<u>May 29/25</u>	<u>AM</u>	<u>3</u>	<u>S</u>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
2. <u>RH 2 - SAP</u>	<u>"</u>	<u>AM</u>	<u>"</u>	<u>"</u>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
3. <u>RH 3 - SAP</u>	<u>"</u>	<u>AM</u>	<u>"</u>	<u>"</u>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
4. <u>RH 6 - SAP</u>	<u>"</u>	<u>AM</u>	<u>"</u>	<u>"</u>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
5. <u>RH 8 - SAP</u>	<u>"</u>	<u>AM</u>	<u>"</u>	<u>"</u>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
6.		<u>AM</u>									
7.		<u>AM</u>									
8.		<u>AM</u>									
9.		<u>AM</u>									
10.		<u>AM</u>									
11.		<u>AM</u>									

Samples Relinquished By (Print Name and Sign): <u>Yaroslav Chudin</u> <u>SCM</u>	Date: <u>June 7/24</u>	Time: <u>12:00</u>	Samples Received By (Print Name and Sign): <u>Anna L. B</u>	Date: <u>7.6.24</u>	Time: <u>2:45pm</u>
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:

Page 1 of 1

Nº: T-151607

## APPENDIX C

### COMPARISON OF THE SOIL CHEMISTRY RESULTS TO THE APPLICABLE REGULATORY CRITERIA



## ANALYTICAL RESULTS FOR SOIL

Ontario Regulation 406/19 (as amended) - Excess Soil Quality Standards

		T1 RPICC <sup>1</sup>	T2.1 RPI <sup>2</sup>	T2.1 ICC <sup>3</sup>	BH 1 - SA 1	BH 2 - SA 2	BH 3 - SA 1	BH 6 - SA 1	BH 8 - SA 1
Metals & Inorganics	Antimony (Sb)	1.3	7.5	40	<0.8	<0.8	<0.8	<0.8	<0.8
	Arsenic (As)	18	18	18	2	2	3	2	3
	Barium (Ba)	220	390	670	24	14.1	18.2	30.6	23.1
	Beryllium (Be)	2.5	4	8	<0.5	<0.5	<0.5	<0.5	<0.5
	Boron (B)	36	120	120	<5	<5	<5	<5	<5
	Boron, Hot Water Soluble	-	1.5	2	<0.10	<0.10	<0.10	0.24	<0.10
	Cadmium (Cd)	1.2	1.2	1.9	<0.5	<0.5	<0.5	<0.5	<0.5
	Chromium (Cr)	70	160	160	7	6	8	9	9
	Cobalt (Co)	21	22	80	2.5	1.8	2.7	3.1	2.5
	Copper (Cu)	92	140	230	8.7	8.1	7.8	9.6	13.9
	Lead (Pb)	120	120	120	9	8	9	13	38
	Molybdenum (Mo)	2	6.9	40	<0.5	<0.5	0.8	<0.5	<0.5
	Nickel (Ni)	82	100	270	5	3	5	6	5
	Selenium (Se)	1.5	2.4	5.5	<0.8	<0.8	<0.8	<0.8	<0.8
	Silver (Ag)	0.5	20	40	<0.5	<0.5	<0.5	<0.5	<0.5
	Thallium (Tl)	1	1	3.3	<0.5	<0.5	<0.5	<0.5	<0.5
	Uranium (U)	2.5	23	33	<0.50	<0.50	<0.50	<0.50	<0.50
	Vanadium (V)	86	86	86	13.3	11.7	17.6	16.7	14.9
	Zinc (Zn)	290	340	340	57	66	49	60	111
	Chromium, Hexavalent - Cr(VI)	0.66	8	8	<0.2	<0.2	<0.2	<0.2	<0.2
	Cyanide	0.051	0.051	0.051	<0.040	<0.040	<0.040	<0.040	<0.040
	Mercury (Hg)	0.27	0.27	0.27	<0.10	<0.10	<0.10	<0.10	<0.10
	Electrical Conductivity (EC)	0.57	0.7	1.4	0.39	1.07	0.783	0.913	0.574
	Sodium Adsorption Ratio (SAR)	2.4	5	12	4.24	11.4	10.1	10.6	4.7
	pH	-	-	-	6.59	6.6	6.63	6.81	6.68
BTEX	Benzene	0.02	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Ethylbenzene	0.05	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Toluene	0.2	0.2	0.2	<0.05	<0.05	<0.05	<0.05	<0.05
	Xylenes (Total)	0.05	0.091	0.091	<0.05	<0.05	<0.05	<0.05	<0.05
Petroleum Hydrocarbons (F1-F4)	F1 (C6-C10)	25	25	25	<5	<5	<5	<5	<5
	F2 (C10-C16)	10	10	26	<10	<10	<10	<10	<10
	F3 (C16-C34)	240	240	240	<50	<50	<50	180	<50
	F4 (C34-C50)	120	2800	3300	<50	<50	<50	196	<50

### NOTES:

<sup>1</sup> Table 1: Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Uses

<sup>2</sup> Table 2.1: Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition (Volume Independent) for Residential / Parkland / Institutional Uses

<sup>3</sup> Table 2.1: Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition (Volume Independent) for Industrial / Commercial / Community Uses

1. Units = ug/g (excluding pH/EC/SAR)

2. "-" = Parameter not included in chemical analysis

3. Test results exceed Table 1 RPICC ESQS

4. Test results exceed Table 2.1 RPI ESQS

5. Test results exceed Table 2.1 ICC ESQS

**ENCLOSURES**



# Soil Abbreviations and Terms Used on Record of Borehole Sheets

## TERMINOLOGY DESCRIBING COMMON SOIL TYPES:

<b>Topsoil</b>	-	mixture of soil and humus capable of supporting vegetation
<b>Peat</b>	-	mixture of visible and invisible fragments of decayed organic matter
<b>Till</b>	-	unstratified glacial deposit which may range from clay to boulders
<b>Fill</b>	-	soil materials identified as being placed anthropologically

## CLASSIFICATION (UNIFIED SYSTEM)

Clay	<0.002mm
Silt	0.002 to .075mm
Sand	0.075 to 4.75mm
	Fine 0.075 to 0.425 mm
	Medium 0.425 to 2.0 mm
	Coarse 2.0 to 4.75 mm
Gravel	4.75 to 75mm
	Fine 4.75 to 19 mm
	Coarse 19 to 75 mm
Cobbles	75 to 300mm
Boulders	>300mm

## TERMINOLOGY

Soil Composition	% by Weight
"traces"	<10%
"some"(eg. some silt)	10-20%
Adjective (eg. sandy)	20-35%
"and"(eg. sand and gravel)	35-50%

**Standard Penetration Resistance (SPT):** Standard Penetration Resistance ('N' Values) refers to the number of blows required to advance a standard (ASTM D1586) 51 mm Ø (2 inch) split-spoon sampler by the use of a free falling, 63.5 Kg (140lbs) hammer. The number of blows from the drop weight is recorded for every 15 cm (6 inches). The hammer is dropped from a distance of 0.76m (30 inches) providing 474.5 Joules per blow. When the sampler is driven a total of 45 cm (18 inches) into the soil, the standard penetration index ('N' Value) is the total number of blows for the last 30 cm (12 inches).

**Dynamic Cone Penetration Resistance (DCPT):** Dynamic Cone Penetration Resistance is similar to a SPT with the 474.5 Joule/blow impulse provided by the free falling hammer where the split-spoon sampler is replaced by a 51 mm Ø, 60° conical point and the number of blows is recorded continuously for every 30 cm (12 inches).

## COHESIVE SOILS CONSISTENCY

	(kPa)	(P.S.F.)	Nominal 'N' Value
Very Soft	<12	<250	0-2
Soft	12-25	250-500	2-4
Firm	25-50	500-1000	4-8
Stiff	50-100	1000-2000	8-15
Very Stiff	100-200	2000-4000	15-30
Hard	>200	>4000	>30

## RELATIVE DENSITY OF COHESIONLESS SOIL

	'N' Value
Very Loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

## MOISTURE CONDITIONS:

Cohesive Soil
DTPL- Drier than plastic limit
APL- About plastic limit
WTPL- Wetter than plastic limit
MWTPL- Much wetter than plastic limit

Cohesionless Soil
Damp
Moist
Wet
Saturated

## SAMPLE TYPES AND ADDITIONAL FIELD TESTS

<b>SS</b>	Split Spoon Sample (obtained from SPT)	<b>GS</b>	Grab Sample	<b>PP</b>	Pocket Penetrometer
<b>AS</b>	Auger Sample	<b>BS</b>	Bulk Sample	<b>VANE</b>	Peak & Remolded shear
		<b>TW</b>	Thin Wall Sample or Shelby Tube	<b>DMT</b>	Flat Plate Dilatometer

## LABORATORY TESTS





<b>SG</b>	Specific Gravity	<b>S</b>	Sieve Analysis	<b>W</b>	Water Content
<b>H</b>	Hydrometer	<b>P</b>	Field Permeability	<b>K</b>	Lab Permeability
<b>W<sub>p</sub></b>	Plastic Limit	<b>W<sub>l</sub></b>	Liquid Limit	<b>I<sub>p</sub></b>	Plasticity Index
<b>GSA</b>	Grain Size Analysis	<b>C</b>	Consolidation	<b>UNC</b>	Unconfined compression



**CHUNG & VANDER DOELEN**  
ENGINEERING LTD.























**Enclosure A**

**FILE No: 1874****BOREHOLE No. 1**Client: **City of Kitchener**Project: **Mill Courtland Community Centre  
Renovation and Addition**Location: **216 Mill Street, Kitchener, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**  
Method: **Solid Stem Auger**  
Size: **100 mm O.D.**Date: **May 29 - 24 TO May 29 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50    100    150    200				W <sub>P</sub> W   W <sub>L</sub> ↔ — ○ —↔					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20    40    60    80									
	Ground Elevation: <b>329.68 m</b>															
329.17 0.51	80 mm ASPHALT 430 mm GRANULAR BASE	0.5		1	SS	14	●						○			0.5
	compact, dark brown to brown FILL, sand and silt to sandy silt trace gravel, trace topsoil occ. clay seams moist	1.0		2	SS	15	●						○			1.0
328.18 1.50	compact to dense, brown Fine SAND some silt trace to some gravel occ. clay lenses damp to moist	2.0		3	SS	23	●						○			2.0
	150 mm silty sand seam with clay lenses	2.5		4	SS	35	●						○			2.5
326.18 3.50	dense to loose, brown GRAVELLY SAND trace silt damp	3.5		5	SS	43	●						○			3.5
		4.0		6	SS	4	●						○			4.0
324.48 5.20	End of Borehole	5.0		7	SS	5	●						○			5.0
		5.5														5.5
		6.0														6.0
																borehole open and dry to 5.2 m depth upon withdrawal of drilling augers
																DCPT conducted between 5.35 and 5.95 m depth



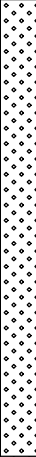
PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN  
ENGINEERING LTD.**311 Victoria Street North  
Kitchener, Ontario N2H 5E1  
ph. (519) 742-8979, fx. (519) 742-7739

**FILE No: 1874****BOREHOLE No. 2**Client: **City of Kitchener**Project: **Mill Courtland Community Centre  
Renovation and Addition**Location: **216 Mill Street, Kitchener, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**  
Method: **Solid Stem Auger**  
Size: **100 mm O.D.**Date: **May 29 - 24 TO May 29 - 24**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS		
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W <sub>p</sub> W W <sub>L</sub> ↗ ○ ↖						
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30						
328.86 0.50	65 mm ASPHALT 430 mm GRANULAR BASE	0.5		1	SS	13									0.5		
327.86 1.50	compact, brown  FILL, sand and silt trace gravel, trace rootlets  moist	1.0		2	SS	15										1.0	
	compact to dense, brown  SILTY SAND to some silt trace gravel  occ. silt seams  moist	1.5		3	SS	21										1.5	
		2.0															
		2.5		4	SS	26										2.5	
		3.0															
		3.5		5	SS	26										3.5	
		4.0															
		4.5		6	SS	30										4.0	
		5.0															
		5.5		7	SS	29										5.0	
324.16 5.20	End of Borehole	5.5															borehole open and dry to 5.2 m depth upon withdrawal of drilling augers
		6.0															

borehole open and dry to  
5.2 m depth upon  
withdrawal of drilling  
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN  
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**FILE No: 1874****BOREHOLE No. 3**Client: **City of Kitchener**Project: **Mill Courtland Community Centre  
Renovation and Addition**Location: **216 Mill Street, Kitchener, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**  
Method: **Solid Stem Auger**  
Size: **100 mm O.D.**Date: **May 29 - 24 TO May 29 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W <sub>p</sub> W W <sub>L</sub> ↗ ○ ↖					
Ground Elevation: 329.59 m							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
329.08 0.51	50 mm ASPHALT 460 mm GRANULAR BASE	0.5		1	SS	9	●						○			
	loose to compact, brown FILL, silty sand trace to some gravel occ. clay seams moist	1.0		2	SS	16	●						○			
328.09 1.50	compact, brown SILTY SAND occ. silt seams moist	1.5		3	SS	22	●						○			
		2.0														
		2.5		4	SS	13	●									
		3.0														
326.59 3.00	compact, brown Fine SAND trace to some silt trace gravel occ. silt lenses/seams moist	3.0		5	SS	24	●						○			
		3.5														
		4.0		6	SS	26	●						○			
		4.5														
		5.0		7	SS	27	●									
		5.5														
324.39 5.20	bottom 50 mm silt seam End of Borehole															borehole open and dry to 5.2 m depth upon withdrawal of drilling augers
		6.0														

borehole open and dry to  
5.2 m depth upon  
withdrawal of drilling  
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN  
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**FILE No: 1874****BOREHOLE No. 4**Client: **City of Kitchener**Project: **Mill Courtland Community Centre  
Renovation and Addition**Location: **216 Mill Street, Kitchener, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**  
Method: **Solid Stem Auger**  
Size: **100 mm O.D.**Date: **May 29 - 24 TO May 29 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)				WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W <sub>P</sub> W W <sub>L</sub> ↗ ○ ↖							
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30							
328.93 0.36	80 mm ASPHALT 280 mm GRANULAR BASE																	
	FILL, sand and silt compact to very loose dark brown to brown  FILL, sand, some silt trace gravel, trace topsoil  moist	0.5		1	SS	17												
		1.0		2	SS	3												
		1.5																
		2.0		3	SS	3												
	327.14 2.15	End of Borehole																borehole open and dry to 2.15 m depth upon withdrawal of drilling augers
	2.5																	
	3.0																	
	3.5																	
	4.0																	
4.5																		
		5.0																
		5.5																
		6.0																








borehole open and dry to  
2.15 m depth upon  
withdrawal of drilling  
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN  
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**FILE No: 1874****BOREHOLE No. 5**Client: **City of Kitchener**Project: **Mill Courtland Community Centre  
Renovation and Addition**Location: **216 Mill Street, Kitchener, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**  
Method: **Solid Stem Auger**  
Size: **100 mm O.D.**Date: **May 29 - 24 TO May 29 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS				
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W <sub>P</sub> W W <sub>L</sub> ↗ ○ ↖									
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30									
Ground Elevation: 329.52 m																				
329.02 0.50	65 mm ASPHALT 430 mm GRANULAR BASE	0.5		1	SS	17	●						○			0.5				
	compact to dense dark brown to brown  FILL, silty sand some gravel to gravelly  occ. clay seams  contains wood fragments  moist  ----- FILL, sand and gravel																			
		2		SS	38		●							○						
		3		SS	15		●								○					
327.37 2.15	End of Borehole	2.0															borehole open and dry to 2.15 m depth upon withdrawal of drilling augers			
		2.5																		
		3.0																		
		3.5																		
		4.0																		
		4.5																		
		5.0																		
		5.5																		
		6.0																		


borehole open and dry to  
2.15 m depth upon  
withdrawal of drilling  
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN  
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**FILE No: 1874****BOREHOLE No. 6**Client: **City of Kitchener**Project: **Mill Courtland Community Centre  
Renovation and Addition**Location: **216 Mill Street, Kitchener, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**  
Method: **Solid Stem Auger**  
Size: **100 mm O.D.**Date: **May 29 - 24 TO May 29 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W <sub>P</sub> W W <sub>L</sub>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
329.21 0.49	80 mm ASPHALT 410 mm GRANULAR BASE	0.5		1	SS	20									0.5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
	compact, dark brown to brown  FILL, sand and silt to silty sand trace to some gravel  occ silt seams occ. clay seams  moist			2	SS	29											1.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
327.55 2.15		End of Borehole	3												SS	12											2.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																


borehole open and dry to  
2.15 m depth upon  
withdrawal of drilling  
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN  
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**FILE No: 1874****BOREHOLE No. 7**Client: **City of Kitchener**Project: **Mill Courtland Community Centre  
Renovation and Addition**Location: **216 Mill Street, Kitchener, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**  
Method: **Solid Stem Auger**  
Size: **100 mm O.D.**Date: **May 29 - 24 TO May 29 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W <sub>p</sub> W W <sub>L</sub> ↗ ○ ↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
328.89 0.38	50 mm ASPHALT 330 mm GRANULAR BASE	0.5  1.0  1.5  2.0		1	SS	15	●						○			
	compact to loose, brown															
	FILL, sand and silt to silty sand trace gravel, trace clay															
	occ. silt seams															
	moist															









borehole open and dry to  
2.15 m depth upon  
withdrawal of drilling  
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN  
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**FILE No: 1874****BOREHOLE No. 8**Client: **City of Kitchener**Project: **Mill Courtland Community Centre  
Renovation and Addition**Location: **216 Mill Street, Kitchener, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**  
Method: **Solid Stem Auger**  
Size: **100 mm O.D.**Date: **May 29 - 24 TO May 29 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W <sub>P</sub> W W <sub>L</sub> ↗ ○ ↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
328.89 0.51	80 mm ASPHALT 430 mm GRANULAR BASE	0.5		1	SS	12	●						○			borehole open and dry to 2.15 m depth upon withdrawal of drilling augers
	FILL, sand and silt ----- very loose to compact dark brown to brown  FILL, silty sand trace gravel  occ. silt seams  moist	2		SS	3	●						○				
3		SS		4	●						○					
327.25 2.15		End of Borehole														
		2.5														
		3.0														
		3.5														
		4.0														
		4.5														
		5.0														
		5.5														
		6.0														


borehole open and dry to  
2.15 m depth upon  
withdrawal of drilling  
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN  
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**FILE No: 1874****BOREHOLE No. 9**Client: **City of Kitchener**Project: **Mill Courtland Community Centre  
Renovation and Addition**Location: **216 Mill Street, Kitchener, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**  
Method: **Solid Stem Auger**  
Size: **100 mm O.D.**Date: **May 29 - 24 TO May 29 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)				WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W <sub>P</sub> W W <sub>L</sub> ↗ ○ ↖						
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30						
329.04 0.46	80 mm ASPHALT 380 mm GRANULAR BASE	0.5		1	SS	18										borehole open and dry to 2.15 m depth upon withdrawal of drilling augers	
	compact, brown FILL, silty sand trace gravel, trace clay moist																
	----- FILL, clayey silt occ. silt lenses	2	SS	11													
	328.00 1.50																
327.35 2.15	loose, brown SILT trace sand, trace clay occ. clay seams wet	1.5		3	SS	8											
	End of Borehole																
		2.0															
		2.5															
		3.0															
		3.5															
		4.0															
		4.5															
		5.0															
		5.5															
		6.0															



borehole open and dry to  
2.15 m depth upon  
withdrawal of drilling  
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN  
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**FILE No: 1874****BOREHOLE No. 10**Client: **City of Kitchener**Project: **Mill Courtland Community Centre  
Renovation and Addition**Location: **216 Mill Street, Kitchener, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**  
Method: **Solid Stem Auger**Size: **100 mm O.D.**Date: **May 29 - 24 to May 29 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50    100    150    200				W <sub>p</sub> W   W <sub>L</sub> ↗   ○   ↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20    40    60    80				10   20   30					
Ground Elevation: <b>329.41 m</b>																
328.91 0.50	65 mm ASPHALT 430 mm GRANULAR BASE	0.5		1	SS	11	●						○			wet borehole cave-in to 1.35 m depth upon withdrawal of drilling augers
	FILL, silty sand ----- loose to compact, brown  FILL, clayey silt some sand to sandy trace gravel trace organics  moist															
		2		SS	6	●								○		
327.26 2.15	End of Borehole	1.5														
		3	SS	13	●								○			
		2.0														
		2.5														
		3.0														
		3.5														
		4.0														
		4.5														
		5.0														
		5.5														
		6.0														

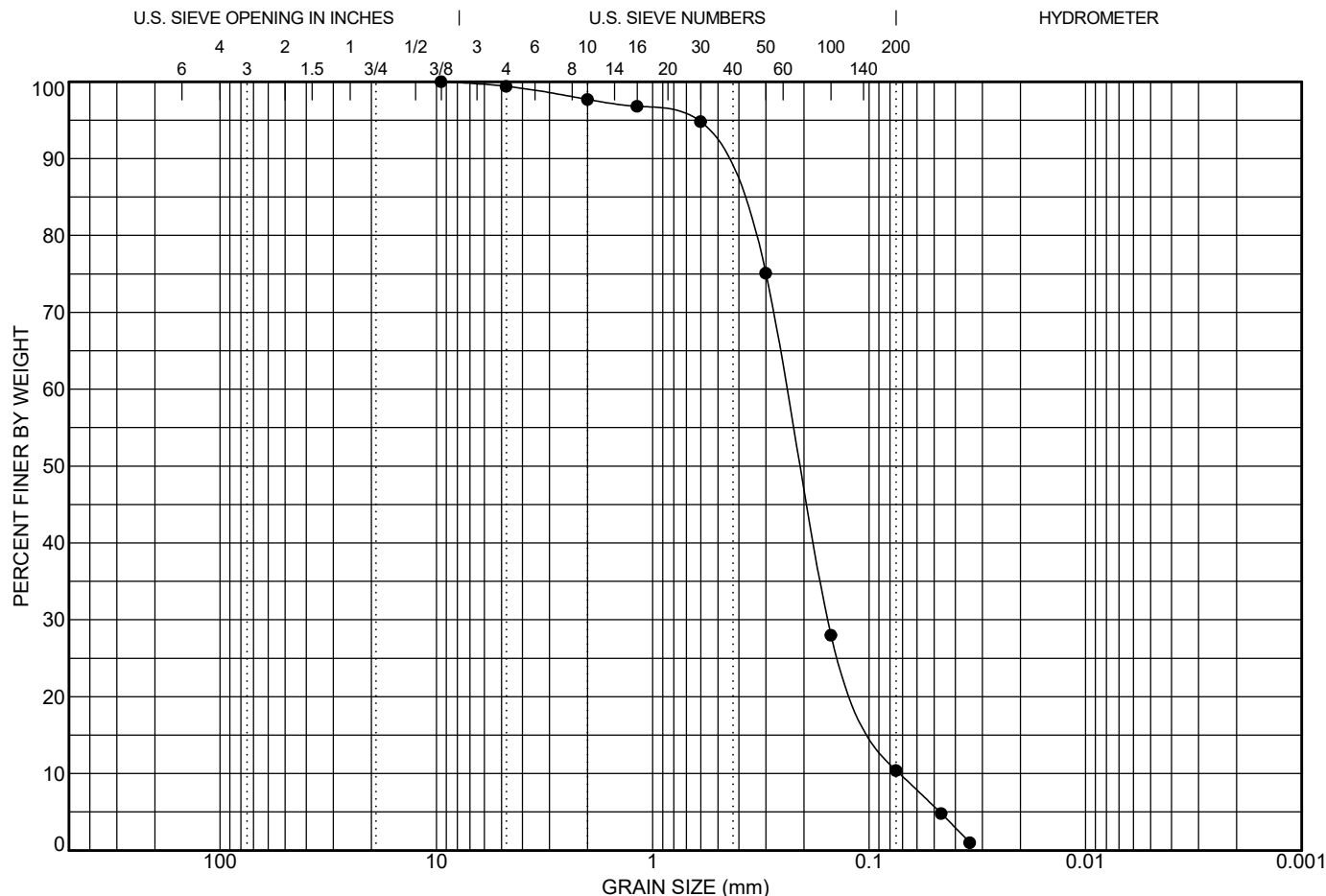
PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN  
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**FILE No: 1874****BOREHOLE No. 11**Client: **City of Kitchener**Project: **Mill Courtland Community Centre  
Renovation and Addition**Location: **216 Mill Street, Kitchener, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**  
Method: **Solid Stem Auger**  
Size: **100 mm O.D.**Date: **May 29 - 24 TO May 29 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50    100    150    200				W <sub>P</sub> W   W <sub>L</sub> ↗   ○   ↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20    40    60    80				10   20   30					
Ground Elevation: <b>328.61 m</b>																
328.25 0.36	180 mm TOPSOIL			1	SS	7	●						○			borehole open and dry to 2.15 m depth upon withdrawal of drilling augers
	loose, dark brown to brown  FILL, silty sand trace gravel trace organics  moist  ----- some silt  ----- FILL, clayey silt	0.5														
		1.0		2	SS	5	●						○			
		1.5														
		2.0		3	SS	4	●							○		
326.46 2.15	End of Borehole															
		2.5														
		3.0														
		3.5														
		4.0														
		4.5														
		5.0														
		5.5														
		6.0														

borehole open and dry to  
2.15 m depth upon  
withdrawal of drilling  
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN  
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.37	3.31	9.5	0.24	0.154	0.072	0.6	89.0	10.4	

**Date:** Jun. 10 - 2024  
**Client:** City of Kitchener  
**Contractor:**  
**Source:**  
**Sampled From:** BH 1 - SA 4; 2.30 to 2.75 m depth  
**Sample No.:** 1-4  
**Date Sampled:** May. 29 - 2024  
**Sampled By:** YC  
**Lab No.:** 539  
**Date Tested:** Jun. 10 - 2024  
**Type of Material:** Fine Sand, some silt, trace gravel

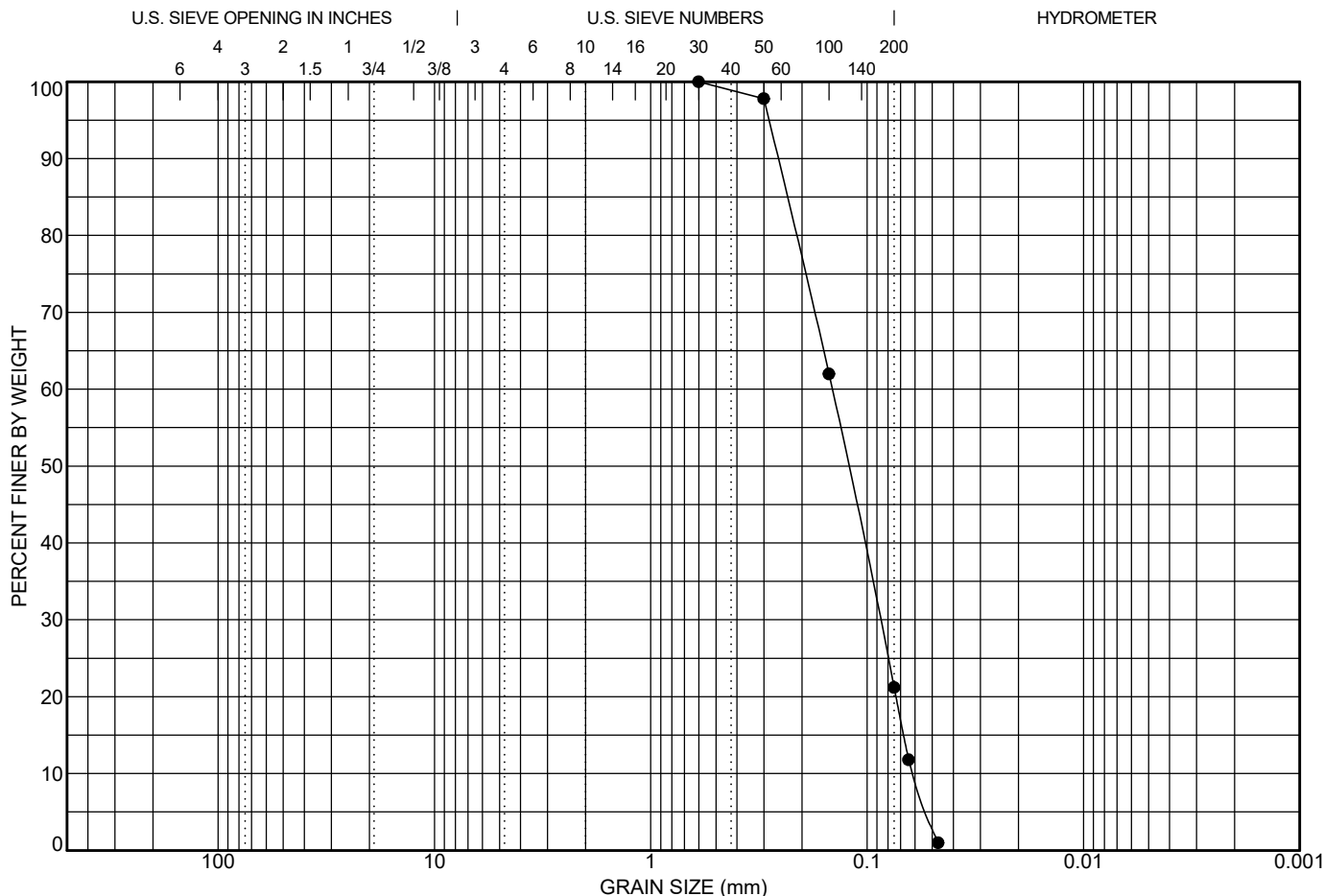
Sieve Size (mm)	Percent Passing	No Specifications



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 311 Victoria Street North  
 Kitchener, Ontario N2H 5E1  
 Telephone: 519-742-8979  
 Fax: 519-742-7739  
 e-mail: info@cvdengineering.com

## GRAIN SIZE DISTRIBUTION

**Project:** Mill Courtland Community Centre Renovation and Addition  
**Location:** 216 Mill Street, Kitchener, Ontario  
**File No.:** 1874  
**Enclosure No.:** 12



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.86	2.38	0.6	0.145	0.087	0.061	0.0	78.8	21.2	

**Date:** Jun. 10 - 2024  
**Client:** City of Kitchener  
**Contractor:**  
**Source:**  
**Sampled From:** BH 2 - SA 4; 2.30 to 2.75 m depth  
**Sample No.:** 2-4  
**Date Sampled:** May. 29 - 2024  
**Sampled By:** YC  
**Lab No.:** 540  
**Date Tested:** Jun. 10 - 2024  
**Type of Material:** Silty Sand

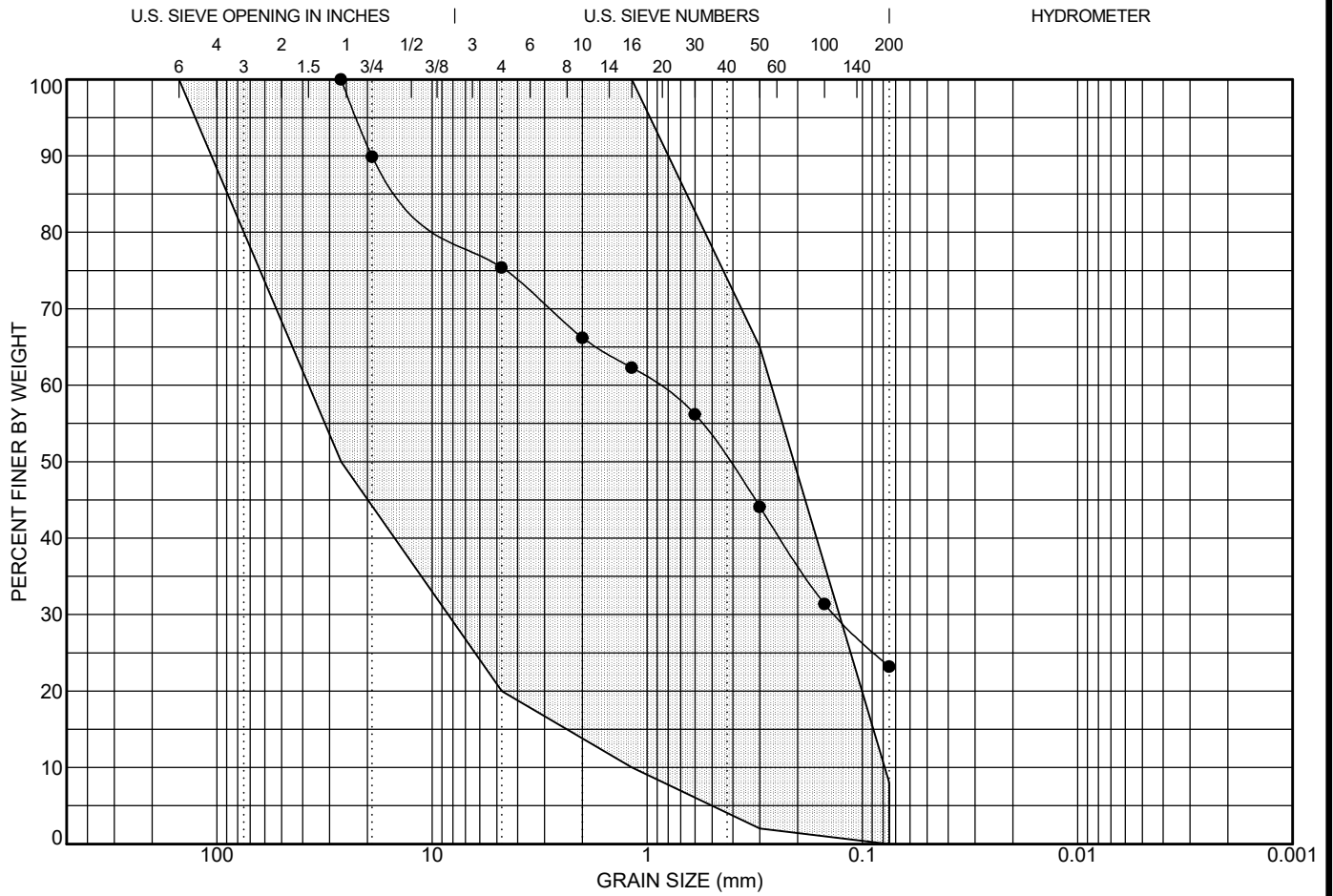
**Sieve Size (mm)**  
**Percent Passing**  
**No Specifications**



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## GRAIN SIZE DISTRIBUTION

**Project:** Mill Courtland Community Centre Renovation and Addition  
**Location:** 216 Mill Street, Kitchener, Ontario  
**File No.:** 1874  
**Enclosure No.:** 13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					26.5	0.914	0.133		24.6	52.2	23.2	

**Date:** Jun. 10 - 2024  
**Client:** City of Kitchener  
**Contractor:**  
**Source:**  
**Sampled From:** BH 5 - SA 1; 0.10 to 0.25 m depth  
**Sample No.:** 5-1  
**Date Sampled:** May. 29 - 2024  
**Sampled By:** YC  
**Lab No.:** 541  
**Date Tested:** Jun. 10 - 2024  
**Type of Material:** Granular Base

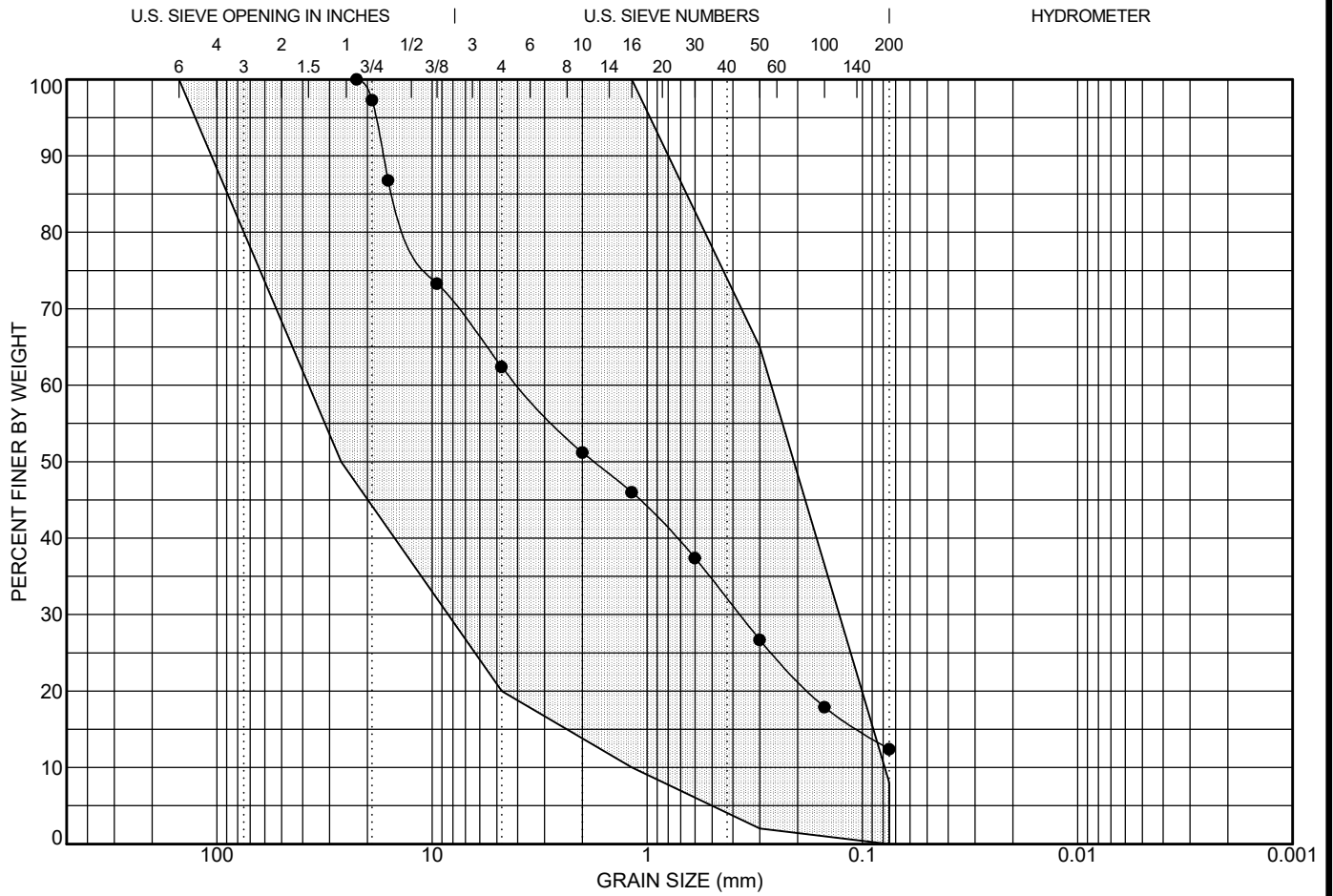
Sieve Size (mm)	Percent Passing	OPSS 1010 Granular 'B' Type I
150		100
26.5	100.0	50 - 100
4.75	75.4	20 - 100
1.18	62.3	10 - 100
0.300	44.1	2 - 65
0.075	23.2	0 - 8

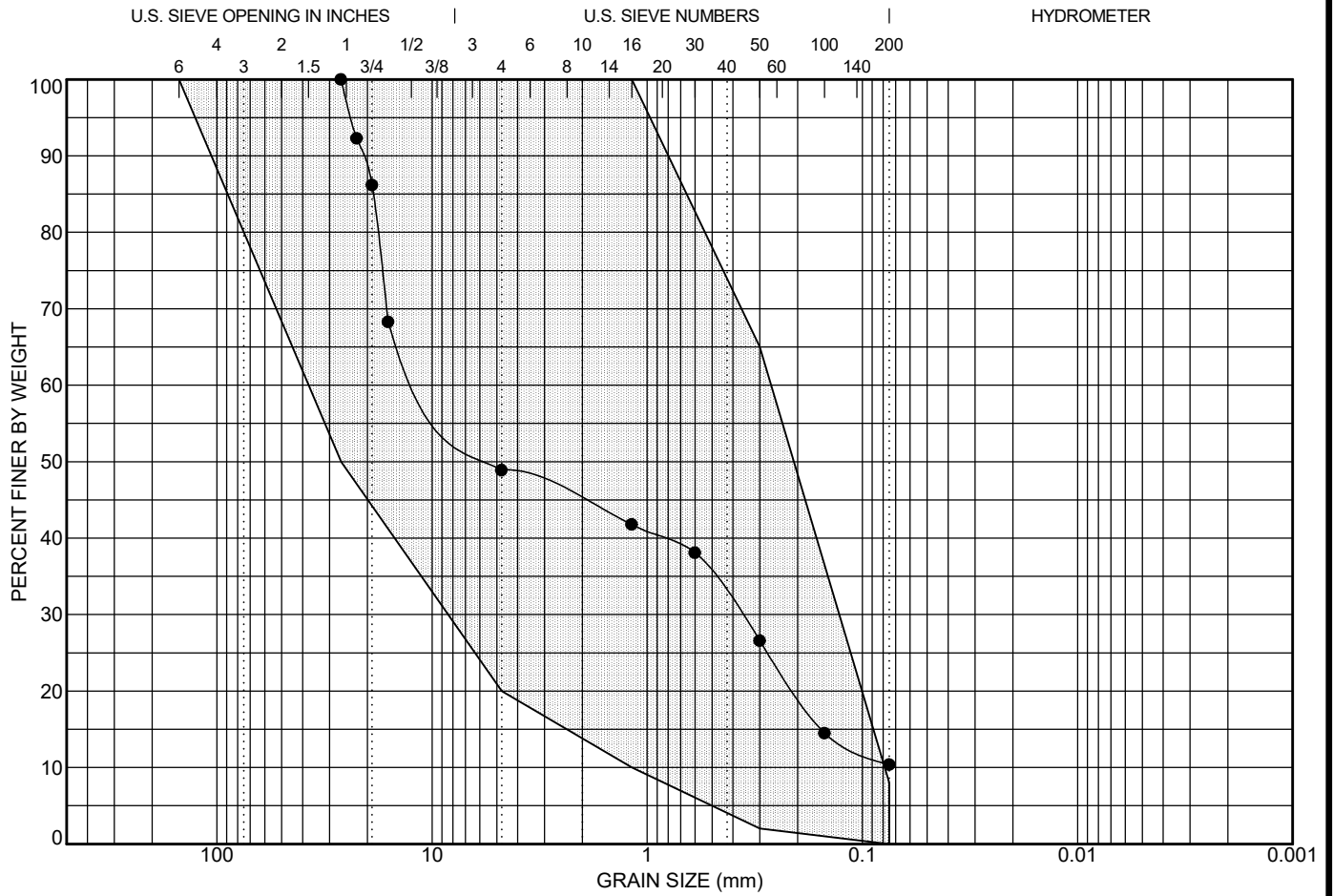


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## GRAIN SIZE DISTRIBUTION

**Project:** Mill Courtland Community Centre Renovation and Addition  
**Location:** 216 Mill Street, Kitchener, Ontario  
**File No.:** 1874  
**Enclosure No.:** 14





COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.20	135.76	26.5	9.516	0.368		51.1	38.5	10.4	

**Date:** Jun. 10 - 2024  
**Client:** City of Kitchener  
**Contractor:**  
**Source:**  
**Sampled From:** BH 10 - SA 1; 0.10 to 0.25 m depth  
**Sample No.:** 10-1  
**Date Sampled:** May. 29 - 2024  
**Sampled By:** YC  
**Lab No.:** 543  
**Date Tested:** Jun. 10 - 2024  
**Type of Material:** Granular Base

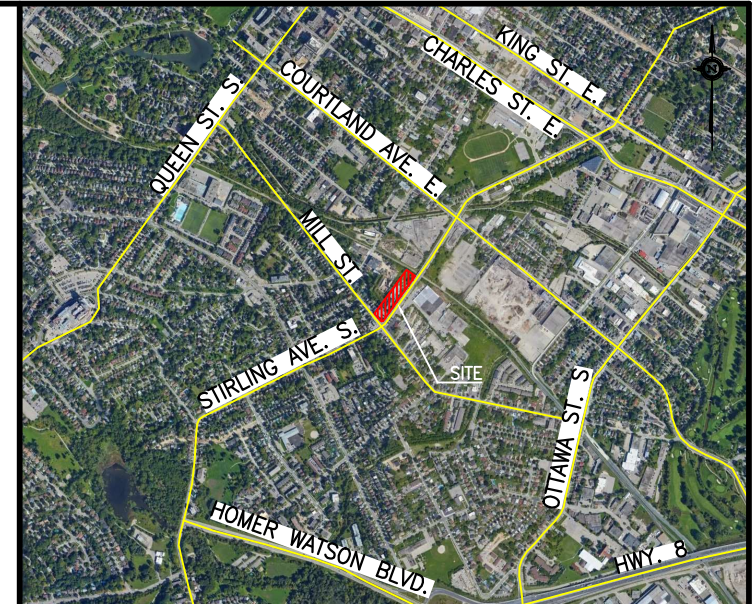
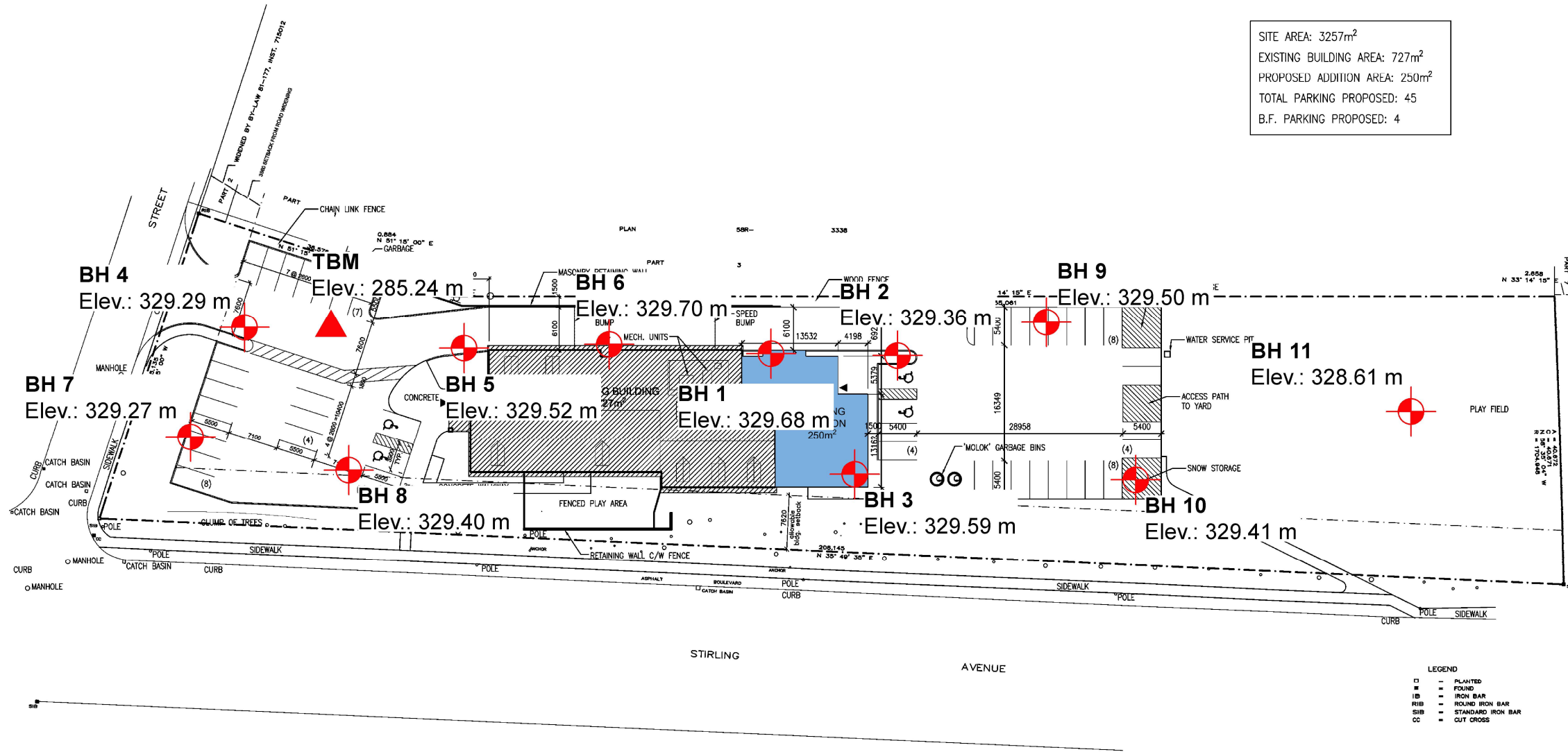
Sieve Size (mm)	Percent Passing	OPSS 1010 Granular 'B' Type I
150		100
26.5	100.0	50 - 100
4.75	48.9	20 - 100
1.18	41.8	10 - 100
0.300	26.6	2 - 65
0.075	10.4	0 - 8



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## GRAIN SIZE DISTRIBUTION

**Project:** Mill Courtland Community Centre Renovation and Addition  
**Location:** 216 Mill Street, Kitchener, Ontario  
**File No.:** 1874  
**Enclosure No.:** 16



KEY PLAN SOURCE: Google Earth

**LEGEND**

TBM: Top of manhole located in southwestern section of parking lot, 25 m northeast from Mill Street road edge Elev.: 285.24 m (Geodetic)

Borehole Location

Elev. Ref.: The borehole locations and associated ground surface elevations were surveyed using a Network RTK Global Navigation Satellite System (GNSS) Receiver. The survey data was collected using UTM Zone 17N Projection, NAD83(CSRS)v7-2010 datum and Canada Geoid Model HT2\_2010v70 (CGVD28).

DWG. Ref.: Barry Bryan Associates; "Proposed Site Plan - Mill Courtyard Community Centre, Kitchener, Ontario"; Project No.: 24015; 2024-04-18

BOREHOLE LOCATION PLAN

Mill Court Community Centre  
Expansion and Addition

216 Mill Street  
Kitchener, Ontario



**CHUNG & VANDER DOELEN**  
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311 VICTORIA STREET NORTH  
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Drawn By: JR	Date: June 2024	File No.: 1874
Checked By: EYC	Scale: 1:750	Drawing No.: 1