CHUNG & VANDER DOELEN
ENGINEERING LTD.

PRELIMINARY GEOTECHNICAL INVESTIGATION
FUTURE DEVELOPMENT OF BLOCK PLAN 3
STONE ROAD EAST AND VICTORIA ROAD SOUTH
GUELPH, ONTARIO

Submitted to:
Fusion Homes
500 Hanlon Creek Boulevard
Guelph, Ontario
N1C 0A1

Attention:
Mr. Ben Jones

FILE NO / G21257 **/** September 8, 2021

CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1
519-742-8979

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Fusion Homes
500 Hanlon Creek Boulevard
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Attention: Mr. Ben Jones

Re: **PRELIMINARY GEOTECHNICAL INVESTIGATION**
FUTURE DEVELOPMENT OF BLOCK PLAN 3
STONE ROAD EAST AND VICTORIA ROAD SOUTH
GUELPH, ONTARIO

We take pleasure in enclosing one (1) copy of our Geotechnical Investigation Report carried out at the above-mentioned location and we will be glad to discuss any questions arising from this work.

Soil samples will be retained for a period of three (3) months and will thereafter be disposed of unless we are otherwise instructed.

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

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.

Robert Vander Doelen, P. Eng.
Senior Engineer

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1.0 INTRODUCTION

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) has been retained by Fusion Homes to conduct a preliminary geotechnical investigation for the potential future development of Block Plan 3 located at the southeast corner of Stone Road East and Victoria Road South in Guelph, Ontario.

It is understood that seven (7) current properties comprise the 57± acre site, 40± acres of which are potentially developable (no development is assumed allowable in the 17± acres of Significant Natural Area located in the eastern portion of the site). No specific development concept plans or sketch(es) exist at this time. However, Fusion Homes forwarded the City of Guelph's Secondary Plan showing land use and height restrictions for potential future development of the overall area. The Secondary Plan designates the land use as residential and mixed-use corridor with maximum building heights between 6 and 10 storeys. It is understood that future development would be municipally serviced.

The purpose of this current investigation has been to determine the subsurface conditions and relevant soil properties at the subject site in order to provide preliminary geotechnical recommendations for the design and construction of site grading operations, municipal site servicing and pavement areas. Estimates of hydraulic conductivity and infiltration rates of the insitu soil deposits will be provided.

2.0 FIELD WORK

Eight (8) boreholes were drilled and sampled to depths between 6.4 and 9.6 m below existing grade across the site in order to preliminarily investigate the subsurface conditions. The locations of the boreholes are shown on Drawing No. 1, Borehole Location Plan.

The field work for this project was conducted during the period between July 21 and July 23, 2021 under the supervision of members of our engineering team, who logged the boreholes in the field, effected the subsurface sampling and monitored the groundwater conditions. Underground utility locates were completed prior to the commencement of borehole drilling.

The boreholes were advanced to the sampling depths using a power auger drilling rig equipped with continuous flight hollow stem augers and standard soil sampling equipment. Standard penetration tests (STPs) were carried out at frequent intervals of depth, and the results are shown on the Borehole Logs as Penetration Resistance or "N"-values. The compactness condition or consistency of the soil strata has been inferred from the test results.

Groundwater conditions were monitored in the boreholes during and following withdrawal of the drilling augers at each borehole location. 50 mm diameter monitoring wells with above-grade protective covers were installed in each of Boreholes 1, 3, 5, 6 and 8 to potentially enable long term monitoring of groundwater depths/elevations. Initial groundwater levels were measured by CVD on August 6, 2021.

Samples obtained from the in situ tests were examined in the field and subsequently taken to our laboratory for further examination and testing.

The borehole locations and associated ground surface elevations were surveyed by CVD for the purpose of this report using a Leica ICON GPS 70T Rover Global Navigation Satellite System (GNSS) Receiver. The vertical and horizontal accuracies of this instrument are 15 mm and 10 mm, respectively. The geodetic data pertaining to the ground surface at each borehole location is provided in the following table.

Borehole Location	Easting (X)	Northing (Y)	Elevation (Z) (m)
BH 1	5644.520	4821.342	336.87
BH 2	5644.904	4821.180	332.27
BH 3	5645.243	4820.988	331.03
BH 4	5643.647	4821.240	335.60
BH 5	5642.699	4821.111	335.27
BH 6	5641.240	4821.061	331.95
BH 7	5642.225	4820.982	332.25
BH 8	5644.019	4820.824	332.20

3.0 LABORATORY TESTING

Geotechnical testing performed at CVD's laboratory included moisture content determination of all retrieved soil samples. Six (6) grain size distribution analyses were conducted on representative soil samples collected during the field work program.

4.0 EXISTING SITE CONDITION

The combined site is 57± acres in size and is comprised of seven (7) separate parcels listed as follows:

- 527, 579, 707 and 717 Stone Road East exist as four (4) individual residentially developed properties
- 555 Stone Road East exists as a material recycling operation with numerous large stockpiles of soil, concrete, asphalt, and topsoil comprises the majority of the site. The eastern portion of the property is not developed and exists as natural bush area. A dumpster rental operation exists on this site adjacent to address #707 Stone Road East. An outdoor storage yard for camper trailers, boats and other automotive equipment also exists on this site adjacent to address #728 Victoria Road South
- 728 Victoria Road South is developed with two commercial buildings and a metal sided storage building. The remainder of the site exists as lawn space, open grassed fields and natural bush
- 760 Victoria Road South is developed with a school bus operation including offices, a repair and service building, parking lot and a refuelling station

The eastern area of the overall combined site is approximately 17 acres in size and is designated as significant natural area.

Ground surface elevations at the eight (8) borehole locations vary between 336.87 and 331.03 m.

5.0 SUBSURFACE CONDITION

The subsurface conditions encountered at the boreholes are detailed on the Borehole Log Sheets, Enclosures 1 to 8, inclusive. The following notes are intended to amplify and comment on the subsurface data obtained.

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 Fill

Fill materials were contacted at Boreholes 1, 2 and 5 and extended to depths between 2.9 and 3.8 m below existing grade. The fill at Boreholes 1 and 2 was comprised of dark brown topsoil with varying

percentages of gravel and cobbles. The fill at Borehole 5 was comprised of dark brown silty sand and gravel with inclusions of asphalt and slag-like materials to 1.3 m depth which was further underlain by topsoil and sandy silt with some gravel to 3.8 m depth. An organic content of 6.2% was determined on a sample of the topsoil fill collected at Borehole 1.

Standard Penetration testing within the fill yielded "N"-values between 3 and 28 blows per 300 mm, indicating a variable very loose to compact compactness condition. Natural moisture contents were measured between 9 and 19%, indicating a damp to moist moisture condition.

5.2 Native Topsoil

Native topsoil was encountered at the ground surface of Boreholes 3, 4, 6, 7 and 8 with measured thicknesses between 50 and 300 mm.

It is noted that the thicknesses of surficial native topsoil measured at the boreholes can vary substantially in between and beyond the borehole locations.

5.3 Sand and Silt to Sandy Silt

The fill at Borehole 2 and the native topsoil at Boreholes 3, 4, 6 and 8 were underlain by dark brown to orangy brown sand and silt or sandy silt with varying percentages of gravel and clay which extended to depths between 0.65 and 4.3 m below existing grade.

Standard Penetration testing within the sand and silt and sandy silt deposits yielded "N"-values between 3 and 17 blows per 300 mm, indicating a variable very loose to compact compactness condition. Natural moisture contents were measured between 11 and 12%, indicating a damp moisture condition.

5.4 Sandy Silt to Silt

The sand and silt at Borehole 8 was underlain by brown sandy silt to silt with trace to some sand and silt with trace to some clay and trace sand which extended to 5.4 m below existing grade. One (1) grain size distribution analysis was conducted on a representative sample of the silt deposit and the results are graphically presented on Enclosure 14.

Standard Penetration testing within these deposits yielded "N"-values between 12 and 33 blows per 300 mm, indicating a compact to dense compactness condition. Natural moisture contents were measured between 13 and 19%, indicating a generally moist moisture condition.

5.5 Granular Deposits

The fill at Boreholes 1 and 5, the topsoil at Borehole 7, the sand and silt to sandy silt at Boreholes 2, 3, 4 and 6, and the silt at Borehole 8 were underlain by brown granular deposits varying in composition from sand and gravel to silty sand. The granular deposits extended to depths between 5.6 and 9.0 m below existing grade at Boreholes 1 to 3 and 5 to 8 while Borehole 4 was terminated within sand and gravel deposit at a depth of 9.6 m below existing grade. The sand and gravel deposits typically contained trace to some silt and occasional to frequent cobbles and boulders. A layer of sandy silt till was sandwiched between the sand and gravel layers at Borehole 3.

Four (4) grain size distribution analyses were conducted on representative samples of the granular deposits collected from Boreholes 1, 3, 4 and 6 and the results are graphically presented on Enclosures 9 to 12.

Standard Penetration testing within the granular deposits yielded "N"-values between 15 and greater than 100 blows per 300 mm, indicating a compact to very dense compactness condition. Natural moisture contents were measured between 4 and 10%, indicating a generally damp moisture condition.
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5.6 Sandy Silt Till

The granular deposits at Boreholes 1 and 2 were underlain by brown sandy silt till with trace to some clay and gravel and occasional cobbles which extended to at least the borehole termination depths of 9.6 m below existing grade. A layer of sandy silt till was also sandwiched between the sand and gravel layers at Borehole 3. One (1) grain size distribution analysis was conducted on a representative sample of the sandy silt till deposit and the results are graphically presented on Enclosure 13.

Standard Penetration testing within the sandy silt till deposit yielded "N"-values between 6 and 60 blows per 300 mm, indicating a variable loose to very dense compactness condition. Natural moisture contents were measured between 11 and 15%, indicating a moist to wet moisture condition.

5.7 Lower Sand and Silt

The sand and gravel at Borehole 7 was underlain by brown sand and silt which extended to at least the borehole termination depth of 9.6 m below existing grade.

Standard Penetration testing within the lower sand and silt deposit yielded "N"-values between 10 and 24 blows per 300 mm, indicating a compact compactness conditions. Natural moisture contents were measured between 10 and 18%, indicating damp to saturated moisture conditions.

5.8 Dolostone Bedrock

Cream/buff dolostone bedrock was contacted beneath the above described deposits at four (4) of the eight (8) borehole locations. Borehole 3 was advanced into the bedrock by the 108 mm inner diameter hollow stem drilling augers. Coring of the bedrock was not included in the scope of the geotechnical investigation.

The following table provides the approximate bedrock contact depth, bedrock contact elevation, and the thickness of bedrock penetrated by the drilling augers at each applicable borehole location.

Borehole Location	Bedrock Contact Depth (mbeg)	Bedrock Contact Elevation (m)	Thickness of Bedrock Penetrated (m)
BH 3	9.0±	322.0±	0.75±
BH 5	8.2±	327.0±	-
BH 6	9.0±	323.0±	-
BH 8	6.4±	325.8±	-

Note: mbeg = metres below existing grade

The bedrock is reported to be light coloured, fine to medium crystalline, sucrosic dolomite containing small bioherm reefs of the Guelph Formation of Middle Silurian Age according to the Geological Survey of Canada, Map 1263A entitled “Geology, Toronto-Windsor Area” dated 1969 (geology compiled by B.V. Sanford).

5.9 Groundwater Condition

50 mm diameter monitoring wells with 3 m long well screens were installed to depths between 6.4 and 9.75 m below existing grades at Boreholes 1, 3, 5, 6 and 8 to potentially enable long term monitoring of groundwater depths/elevations. The following table provides the water levels measured on August 6, 2021.

Borehole Location	Ground Surface Elevation (m)	Water Depth (m)	Water Elevation (m)
BH 1	336.87	7.55	329.32
BH 3	331.03	9.21	321.82
BH 5	335.27	dry at 8.23 m	below 327.04
BH 6	331.95	dry at 8.99 m	below 322.96
BH 8	332.20	dry at 6.40 m	below 325.80

The water table was measured at a depth of 8.23 m below existing grade at Borehole 2 at withdrawal of the drilling augers.

It should be cautioned that the groundwater table will fluctuate in response to major weather events. Seasonal fluctuations of the groundwater table are to be expected.

6.0 DISCUSSION AND RECOMMENDATIONS

It is understood that seven (7) current properties comprise the 57± acre site, 40± acres of which are potentially developable (no development is assumed allowable in the 17± acres of Significant Natural Area located in the eastern portion of the site). No specific development concept plans or sketch(es) exist at this time. However, Fusion Homes forwarded the City of Guelph's Secondary Plan showing land use and height restrictions for potential future development of the overall area. The Secondary Plan designates the land use as residential and mixed-use corridor with maximum building heights between 6 and 10 storeys. It is understood that future development would be municipally serviced.

6.1 Site Grading and Engineered Fill Construction

Site grading operations involving "cut and fill" procedures are anticipated for the future development of the site. It is recommended to construct engineered fill in areas to be raised in order to suitably support future roadways, infrastructure servicing and lightly loaded building structure areas.

Unsuitable topsoil fill or mixed topsoil fill materials were encountered at Boreholes 1, 2 and 5 which extended to depths between 2.9 and 3.8 m below existing grade. Engineered fill is considered to be a viable cost-effective method to improve/remedy the current non-suitable supporting conditions by removal of the poor supporting organic soil and constructing engineered fill in order to properly support future roadways, infrastructure servicing and lightly loaded building structure areas. The removed organic soils are not suitable to be re-purposed as material to construct engineered fill.

Surficial native topsoil was encountered at five (5) of the eight (8) borehole locations and varied in thickness between 50 and 300 mm. It should be noted that the thickness of this layer could vary drastically across the site from those reported at the borehole locations. It is noted that surficial topsoil stripping operations should be conducted when the ground is not wet and will support large scale construction equipment. Over-stripping can result when the ground conditions are wet and unstable.

Inorganic onsite native soil deposits from potential "cut" areas may potentially be reused to construct engineered fill capable of supporting future roadways, infrastructure servicing and lightly loaded building structures. The natural moisture content of the "cut" soils to be used as engineered fill should be within 3% below their optimum moisture contents to achieve the specified degree of compaction.

Any shortfall of fill material required for the balance of site grading operations is recommended to be comprised of imported inorganic granular-based soil ideally containing less than 25% silt sized particles (75 micron) and less than 5% clay sized particles (2 micron). It is recommended that any proposed borrow source materials be tested prior to importing, in order to ensure that the environmental quality

of the fill meets all environmental approval criteria and to ensure that the natural moisture content of the fill is suitable for compaction.

It is recommended that engineered fill construction be conducted during the summer and early fall months when drier warmer weather conditions typically exist as some of the onsite soils are sensitive to moisture and will become difficult to handle and compact to the specified degree of compaction when wet.

The onsite finer grained deposits are frost-susceptible. Constructing engineered fill and backfilling service trenches using finer grained soils during the winter months is not advisable, unless suitable weather conditions prevail, the soils are at suitable moisture content, and strict procedures are followed and monitored on a full-time basis by the geotechnical engineer.

The onsite finer grained soils are susceptible to softening and deformation when exposed to excessive moisture and construction traffic. As a result, it is imperative that the grading/filling operations are planned and maintained to direct surface water run-off to low points and then be positively drained by suitable means. During periods of wet weather, construction traffic should be directed along the designated construction routes so as not to disturb and rut the exposed subgrade soil. Temporary construction roads consisting of clear crushed material (such as crushed stone or recycled concrete) may be required during poor weather conditions such as wet Spring or Fall.

Engineered fill should be constructed in accordance with the following procedures in order to support roadway pavement, infrastructure servicing, and building structure areas.

1. All existing fill, topsoil, organic and deleterious materials should be stripped from roadway pavement, infrastructure servicing, and building structure areas. These removed materials may be considered for reuse as surface grade materials such as berms. Removed organic soils may be considered for reuse as topsoil in landscaped areas, however, it is recommended that these soils be tested for such purposes prior to reuse;

2. The exposed inorganic subgrade surface is to be thoroughly recompacted by large heavy compaction equipment (10 tonne compactor is recommended) and inspected by qualified geotechnical personnel. Any loose or soft areas identified should be excavated to the level of competent soil. It may be necessary to statically roll the approved subgrade soils and place an initial 500 mm thick lift of coarse sand and gravel fill to stabilize the subgrade and suitably support additional engineered fill;

3. The required grades can then be achieved by placing approved inorganic onsite fill in maximum 200 to 300 mm thick loose lifts which are to be thoroughly compacted to at least 98% Standard Proctor maximum dry density (SPMDD). The moisture content of the fill materials should be within 3% below their optimum moisture contents in order to achieve the specified degree of compaction. Moisture adjustment to the fill soil can be expected in order to achieve the 98% SPMDD specification;

4. Engineered fill used to support future roadway, infrastructure servicing and building structures must be placed such that the fill pad extends horizontally outwards at least a distance equal to the depth of fill to be placed on the suitably prepared and approved subgrade;

5. Overly wet and organic materials should be placed in non-structural areas and outside of storm water management feature areas where compaction to 90% SPMDD is normally adequate. Alternatively, wet inorganic soils can be mixed with drier soils to produce a suitable moisture content to allow appropriate compaction to occur if conditions dictate;

6. All 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.

It is strongly recommended that the vertical and horizontal limits of all monitored and approved engineered fill be properly surveyed and documented on a lot-by-lot basis. This information can form part of a permanent record for the final user of each specific property.

Vibration could be generated from various construction equipment (compactors and rollers) during construction 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 10 to 20 mm/s PPV, depending on 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. It is also recommended that a pre-construction condition survey be conducted to document the condition of the existing structures within the possible zone of influence.

6.2 Underground Site Servicing

It is anticipated that municipal watermain and sewer servicing will generally be in the range of 2 to 4 m below final design grades.

6.2.1 Excavation Conditions

Trenching can be carried out using conventional open cut procedures. The excavations will generally intersect native and/or re-compacted fill soils. Bedrock may also be encountered during excavation. The native and re-compacted fill soil and underlying bedrock will generally provide suitable subgrade support to sewer and watermain serving. Any loose, unstable and/or organic soils encountered at the pipe invert should be sub-excavated and replaced with well compacted Granular "A" which should be placed in 150 mm thick layers and compacted to at least 95% Standard Proctor Maximum Dry Density (SPMDD). The support of pipes in these areas can also be achieved with non-shrinkable fill, if poor soil is encountered at the subgrade level and fully removed.

Excavation side slopes should comply with the current “Regulations for Construction Projects Under The Ontario Occupational Health and Safety Act”. The native or re-compacted fill soils can be generally classified as Type 3 soils. Excavation in the Type 3 soils should be cut to side slopes of 1H : 1V throughout. The excavation side slopes should be suitably protected from erosion processes. Should unstable and/or wet conditions be encountered, side slopes are to be flattened to a stable configuration. The geotechnical engineer should be retained to examine and inspect cut slopes to ensure construction safety.

Trench excavation into the bedrock may occur during the construction works. For practical considerations, the bedrock surface can be defined as being that elevation which cannot be excavated using a mid-sized tracked excavator operating at its full capacity. It is the opinion of CVD that although larger more powerful equipment may be capable of ripping the bedrock, where encountered, bedrock removal may require the additional use of mechanical means such as hoe-ram or drilling and splitting tools. Ground vibrations due to blasting will pose significant concerns to abutting properties and features and may not prove viable/practical.

Cut slopes made in the overburden soils shall confirm to O. Reg 213 as described in the previous paragraphs. There is no reference to the inclination/configuration of side slopes that can be cut in sound and stable rock, except a reference is made on “Support Systems” in Section 234 (2) (d) “Subsection (1) does not apply with respect to an excavation, that is cut in sound and stable rock”. CVD refers to OPSD 802.013 which states that a vertical slope can be made in sound rock in an unsupported trench excavation which is over 1.2 m above the trench bottom. The upper zones of the fractured rock

are expected to be similar to Type 1 soil.

The geotechnical engineer should be retained to examine and inspect cut slopes (both soil and bedrock) to ensure construction safety.

It may be necessary to provide support for nearby services if they are located within the applicable influence zone measured from the vertical. For soils and sound/stable bedrock, respective values of 45^0 and 30^0 measured from the vertical can be used.

The use of trench liner box or timber lagging can be considered to support the trench side walls and adjacent foundations, structures or utilities.

6.2.2 Pipe Bedding

As noted in Section 6.2.1, any unsuitable soils exposed at the pipe subgrade should be sub-excavated and replaced with imported Granular "A", placed in thin layers and compacted to at least 95% SPMDD, or can be removed and supported on non-shrinkable fill.

The bedding requirements for the services should be in accordance with Ontario Provincial Standard Drawings OPSD - 802 for flexible and rigid pipes. The bedding shall be a Class "B" and consist of at least 150 mm thick Granular "A" compacted to at least 95% SPMDD. Granular "A" should be used to backfill around the pipe to at least 150 mm above the top of the pipe.

Particular attention should be given to ensure material placed beneath the haunches of the pipe is adequately compacted. Recycled asphalt will not be allowed to be used in Granular “A” bedding material.

6.2.3 Trench Backfill

Excavated inorganic materials are considered suitable for reuse as trench backfill. If necessary, potential mixing of drier and wetter excavated soils in proper ratios can be done to produce a suitable mixture near the materials optimum moisture content in order to achieve the required compaction specification. Conversely, judicious addition of water may be required if the soils are significantly drier than their optimum moisture content in order to facilitate suitable compaction.

The backfill should be placed in thin layers, 300 mm thick (or less dependant on the demonstrated success of compaction based on in-situ density test results) and compacted to no less than 95% SPMDD.

Other types of materials such as organic soils, overly wet soils, boulders and frozen materials (if work is carried out in the winter months) should not be used for backfilling.

Backfilling operations should follow closely after excavation so that only a minimal length of trench slope is exposed at any one time so as to minimize potential problems. This will potentially minimize over-wetting of the subgrade material. Particular attention should be given to make sure frozen material is not used as backfill should construction extend into the winter season.

It has been our experience that excavated cohesive soils should be broken into smaller pieces (less than 150 mm diameter) before returning into the trench as backfill. This will eliminate "wedging" problems and reduce long term settlement. Particular attention must be made to backfilling the laterals where the trenches are narrow and against the manholes and catch-basins. Thinner lifts and additional compaction must be applied.

Frequent inspection by experienced geotechnical personnel should be carried out to examine and approve backfill material, to carefully inspect placement, and to verify that the specified degree of compaction has been obtained by in situ density testing.

6.2.4 Groundwater Control

No major problems due to groundwater are expected within the anticipated servicing excavations. Perched water and surface runoff may be controlled by filtered sump pits and pumping when and where necessary.

It should be noted that the groundwater table can be expected to fluctuate seasonally and with major weather events.

6.3 Pavement Design and Construction

The earth subgrade soil is anticipated to vary between sandy silt and sand and gravel. The following flexible roadway pavement structure is recommended based on the results of the gradational analyses, assumed CBR values, groundwater table, frost susceptibility of subgrade soils.

The designation of future roadways is unknown at this time. The following pavement component thicknesses are considered suitable and comply with the City of Guelph Standard Drawing SD-49.

Pavement Component	Component Thickness
HL3 Surface Asphaltic Concrete HL8 Binder Asphaltic Concrete	45 mm 90 mm
Granular "A" Base Course	175 mm
Granular "B" Type II Sub-base Course	450 mm
Pavement Thickness	760 mm
Granular Base Equivalency (GBE)	745 mm

Note: GBE denotes Granular Base Equivalency which is calculated using factors of 2 for asphaltic concrete, 1 for Granular "A" base and 0.67 for Granular "B" sub-base

The asphaltic concrete should consist of two (2) layers of 45 mm thick HL8 and one (1) top layer of 45 mm thick HL3.

The pavement design considers that road 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 may be required.

The subgrade should be prepared in accordance with the recommendations provided in Section 6.1 and Section 6.2.3 prior to placement of the granular base layers.

The base and sub-base materials should be produced in accordance with the current OPSS specifications, and placed and uniformly compacted to at least 100% SPMDD. The asphaltic concrete should be placed and compacted in accordance with OPSS MUNI 310 and to a minimum of 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.

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 so as 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.

Longitudinal sub-drains with positive drainage outlets are recommended to be installed at the subgrade level along the edges of the roadway construction to enhance the performance of the pavement. Systematic drainage of the granular base materials will promote the longevity of the pavement structure.

6.4 Hydraulic Conductivity and Infiltration Rates

Grain size distribution analyses were conducted on samples of the native granular, sand and silt till, and silt deposits. The results are graphically presented on Enclosures 9 to 14.

Based on our past experience and the results of grain size analyses, the coefficient of permeability and infiltration rate of the encountered inorganic native soil deposits are estimated and provided in the following table:

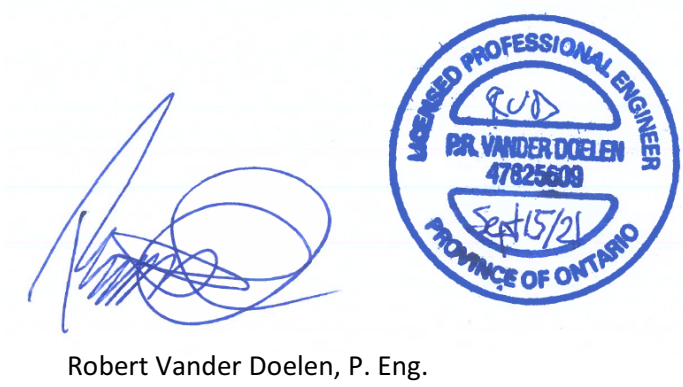
MATERIAL	PERMEABILITY (K) (cm/sec)	INFILTRATION RATE (mm/hr)
Sandy Silt to Sand and Silt	5×10^{-6} to 1×10^{-5}	5 to 10
Silt, some clay, trace sand	2×10^{-6}	2
Silty Sand to Sand and Gravel	1×10^{-4} to 1×10^{-2}	30 to 150
Sandy Silt Till	1×10^{-6} to 5×10^{-6}	1 to 5

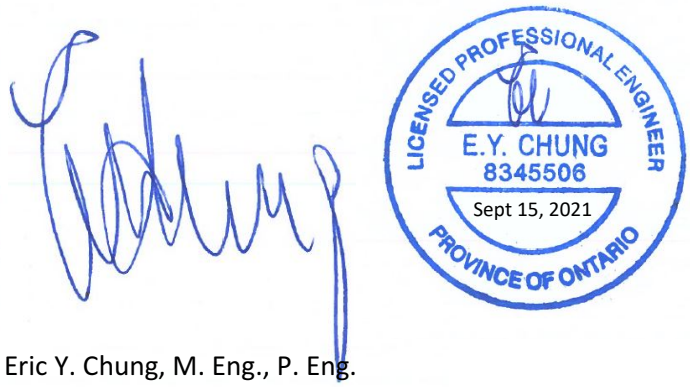
7.0 CLOSURE

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.





Robert Vander Doelen, P. Eng.
Senior Engineer

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

APPENDIX “A”

Limitations of Report

APPENDIX "A"

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.

ENCLOSURES

FILE No: G21257

BOREHOLE No. 1

Client: **Fusion Homes**

Project: **Future Development of Block Plan 3**

Location: **Stone Road East and Victoria Road South, Guelph, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Jul 23 - 21** TO **Jul 23 - 21**

SOIL LITHOLOGY

Ground Elevation: **336.87 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)
	loose to very loose dark brown topsoil FILL damp to moist	0.5
		1.0
		1.5
		2.0
	---- occ. to frequent cobbles	2.5
333.97		3.0
2.90	compact brown SAND AND GRAVEL trace to some silt occ. cobbles damp	3.5
		4.0
		4.5
		5.0
331.57		5.5
5.30	compact brown Fine to Medium SAND trace gravel and silt damp	6.0
		6.5
329.87		7.0
7.00	very dense brown SANDY SILT TILL trace to some clay and gravel occ. cobbles occ. sand and gravel seams/pockets moist with saturated pockets	7.5
		8.0
		8.5
		9.0
327.27		9.5
9.60	End of Borehole	

SYMBOL

SAMPLE ID	TYPE	N-VALUE
1	SS	28
2	SS	6
3	SS	4
4	SS	8
5	SS	28
6	SS	17
7	SS	15
8	SS	52
9	SS	60

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

- above ground protective casing set in concrete
- bentonite seal/PVC riser
- 3 m long, 50 mm diameter PVC well screen with sandpack
- water level at 7.55 m bgs on August 6, 2021

PROJECT MANAGER: **RVD**

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FILE No: G21257

BOREHOLE No. 2

Client: **Fusion Homes**

Project: **Future Development of Block Plan 3**

Location: **Stone Road East and Victoria Road South, Guelph, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Jul 22 - 21** TO **Jul 22 - 21**

SOIL LITHOLOGY

Ground Elevation: **332.27 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL
	very loose to compact dark brown topsoil FILL trace to some gravel damp to moist	0.5 1.0 1.5 2.0 2.5 3.0	
328.67 3.60	compact dark to orangy brown SAND AND SILT trace gravel and clay moist	3.5 4.0	
327.97 4.30	compact orangy brown to brown SILTY SAND damp	4.5 5.0	
326.97 5.30	compact brown Fine to Medium SAND trace gravel and silt damp	5.5 6.0	
325.87 6.40	compact brown SANDY SILT TILL trace to some clay and gravel occ. cobbles and silt seams/pockets moist to wet	6.5 7.0 7.5 8.0 8.5 9.0	
322.67 9.60	End of Borehole	9.5	

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	9
2	SS	3
3	SS	16
4	SS	13
5	SS	10
6		14
7	SS	19
8	SS	23
9	SS	21
10	SS	15

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

water level at 8.23 m bgs at withdrawal of drilling augers

PROJECT MANAGER: **RVD**

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Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

Enclosure No.: 3
Sheet 1 of 1

FILE No: G21257

BOREHOLE No. 3

Client: **Fusion Homes**

Project: **Future Development of Block Plan 3**

Location: **Stone Road East and Victoria Road South, Guelph, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **108 mm I.D.**
Date: **Jul 21 - 21** TO **Jul 21 - 21**

Ground Elevation: **331.03 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE
	50mm TOPSOIL ---- loose orangy brown to brown SAND AND SILT	0.5	1	SS	8
330.38 0.65	compact to dense brown SAND AND GRAVEL trace silt, occ. cobbles damp ------- some silt to silty	1.0	2	SS	26
		1.5	3	SS	32
328.83 2.20	loose to compact brown SANDY SILT TILL trace to some clay and gravel moist to wet	2.0 2.5	4	SS	6
		3.0	5	SS	14
327.03 4.00	dense to very dense brown SAND AND GRAVEL trace silt occ. to frequent cobbles occ. boulders damp ---- occ. silty seams/pockets	3.5 4.0	6		49
		4.5	7	SS	86
		5.0 5.5 6.0	8	SS	50/ 75mm
		6.5 7.0 7.5	9	SS	50/ 125mm
		8.0 8.5			
322.03 9.00	Carbonate BEDROCK	9.0	10	SS	50/ 125mm
321.28 9.75	Auger Refusal in Bedrock	9.5			

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

- above ground protective casing set in concrete
- bentonite seal/PVC riser
- 3 m long, 50 mm diameter PVC well screen with sandpack
- water level at 9.21 m bgs on August 6, 2021

PROJECT MANAGER: **RVD**

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Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G21257

BOREHOLE No. 4

Client: **Fusion Homes**

Project: **Future Development of Block Plan 3**

Location: **Stone Road East and Victoria Road South, Guelph, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Jul 23 - 21** TO **Jul 23 - 21**

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	WELL DATA	DEPTH (m)	REMARKS
	Ground Elevation: **335.60 m**								
335.30	300mm TOPSOIL								
0.30	compact dark brown SANDY SILT trace clay damp	0.5		1	SS	17		0.5	
334.60		1.0		2	SS	34		1.0	
1.00	dense to very dense brown SAND AND GRAVEL trace to some silt occ. to frequent cobbles occ. boulders damp	1.5		3	SS	49		1.5	
		2.0						2.0	
		2.5		4	SS	41		2.5	
		3.0						3.0	
		3.5		5	SS	43		3.5	dry cave-in at 3.35 m bgs at withdrawal of drilling augers
		4.0						4.0	
		4.5						4.5	
		5.0		6	SS	50		5.0	
		5.5						5.5	
	---- occ. silty layers	6.0						6.0	
		6.5		7	SS	35		6.5	
		7.0						7.0	
		7.5						7.5	
		8.0		8	SS	51		8.0	
		8.5						8.5	
	---- occ. till seams/lenses	9.0						9.0	
		9.5		9	SS	55		9.5	
326.00									
9.60	End of Borehole								

PROJECT MANAGER: **RVD**

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FILE No: G21257

BOREHOLE No. 5

Client: **Fusion Homes**

Project: **Future Development of Block Plan 3**

Location: **Stone Road East and Victoria Road South, Guelph, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Jul 22 - 21** TO **Jul 22 - 21**

Ground Elevation: **335.27 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	REMARKS
	compact dark brown silty sand and gravel FILL some asphalt and slag-like inclusions damp	0.5	1	SS	26	above ground protective casing set in concrete
333.97		1.0	2	SS	24	
1.30	loose to compact dark brown topsoil and sandy silt FILL some gravel moist	1.5	3	SS	18	
	------- cobbly	2.0	4	SS	7	bentonite seal/PVC riser
		2.5	5	SS	6	
331.47		3.0				
3.80	compact brown SAND AND GRAVEL trace to some silt occ. to frequent cobbles damp ---- very dense	3.5	6		20	
		4.0	7	SS	15	
		4.5				
		5.0				
		5.5				
		6.0	8	SS	50/ 100mm	3 m long, 50 mm diameter PVC well screen with sandpack
		6.5				
		7.0				
		7.5	9	SS	50/ 100mm	
327.04		8.0				
8.23	Auger Refusal on Bedrock	8.5				well is dry on August 6, 2021
		9.0				
		9.5				

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

PROJECT MANAGER: **RVD**

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FILE No: G21257

BOREHOLE No. 6

Client: **Fusion Homes**

Project: **Future Development of Block Plan 3**

Location: **Stone Road East and Victoria Road South, Guelph, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **108 mm I.D.**
Date: **Jul 21 - 21** TO **Jul 21 - 21**

SOIL LITHOLOGY

Ground Elevation: **331.95 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)
331.77	175mm TOPSOIL	
0.18	very loose dark to orangy brown SAND AND SILT damp	
331.15		
0.80	compact to dense brown SAND AND GRAVEL trace to some silt occ. to frequent cobbles damp ---- occ. sand and till layers ---- some silty layers	
322.96		
8.99	Auger refusal on Bedrock	

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	3
2	SS	16
3	SS	40
4	SS	33
5	SS	21
6	SS	31
7	SS	50/ 75mm
8	SS	35

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

- above ground protective casing set in concrete
- bentonite seal/PVC riser
- 3 m long, 50 mm diameter PVC well screen with sandpack
- well is dry on August 6, 2021

PROJECT MANAGER: **RVD**

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FILE No: G21257

BOREHOLE No. 7

Client: **Fusion Homes**

Project: **Future Development of Block Plan 3**

Location: **Stone Road East and Victoria Road South, Guelph, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **108 mm I.D.**
Date: **Jul 21 - 21** TO **Jul 21 - 21**

SOIL LITHOLOGY

SAMPLE

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	WELL DATA	DEPTH (m)	REMARKS
332.07	175mm TOPSOIL								
0.18	loose to compact dark to orangy brown Silty SAND AND GRAVEL	0.5		1	SS	6		0.5	
331.15	damp	1.0		2	SS	25		1.0	
1.10	compact to dense brown SAND AND GRAVEL trace to some silt occ. cobbles damp	1.5		3	SS	49		1.5	
		2.0						2.0	
		2.5		4	SS	34		2.5	
		3.0						3.0	
		3.5		5	SS	23		3.5	
		4.0						4.0	
		4.5						4.5	
		5.0		6	SS	26		5.0	
326.65		5.5						5.5	
5.60	compact brown SAND AND SILT damp to moist	6.0						6.0	
		6.5		7	SS	24		6.5	
		7.0						7.0	
		7.5						7.5	
		8.0		8	SS	10		8.0	
		8.5						8.5	
	---- wet to saturated	9.0						9.0	
		9.5		9	SS	17		9.5	
322.65									
9.60	End of Borehole								borehole is dry and open at withdrawal of drilling augers

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FILE No: G21257

BOREHOLE No. 8

Client: **Fusion Homes**

Project: **Future Development of Block Plan 3**

Location: **Stone Road East and Victoria Road South, Guelph, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Jul 22 - 21** TO **Jul 22 - 21**

SOIL LITHOLOGY

Ground Elevation: **332.20 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE
331.95	250mm TOPSOIL				
0.25	loose to compact dark to orangy brown SAND AND SILT trace clay damp	0.5	1	SS	5
		1.0	2	SS	10
330.80					
1.40	compact brown SANDY SILT to SILT trace to some sand moist ---- occ. sand and till layers	1.5	3	SS	12
		2.0			
		2.5	4	SS	14
		3.0			
		3.5	5	SS	19
328.10		4.0			
4.10	dense brown SILT trace to some clay trace sand moist	4.5			
		5.0	6	SS	33
326.80					
5.40	very dense brown SAND AND GRAVEL trace to some silt damp	5.5			
		6.0	7	SS	50/ 125mm
325.80					
6.40	Auger refusal on Bedrock	6.5			
		7.0			
		7.5			
		8.0			
		8.5			
		9.0			
		9.5			

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)	REMARKS
0.5	above ground protective casing set in concrete
1.5	bentonite seal/PVC riser
4.5	3 m long, 50 mm diameter PVC well screen with sandpack
6.5	well is dry on August 6, 2021

PROJECT MANAGER: **RVD**

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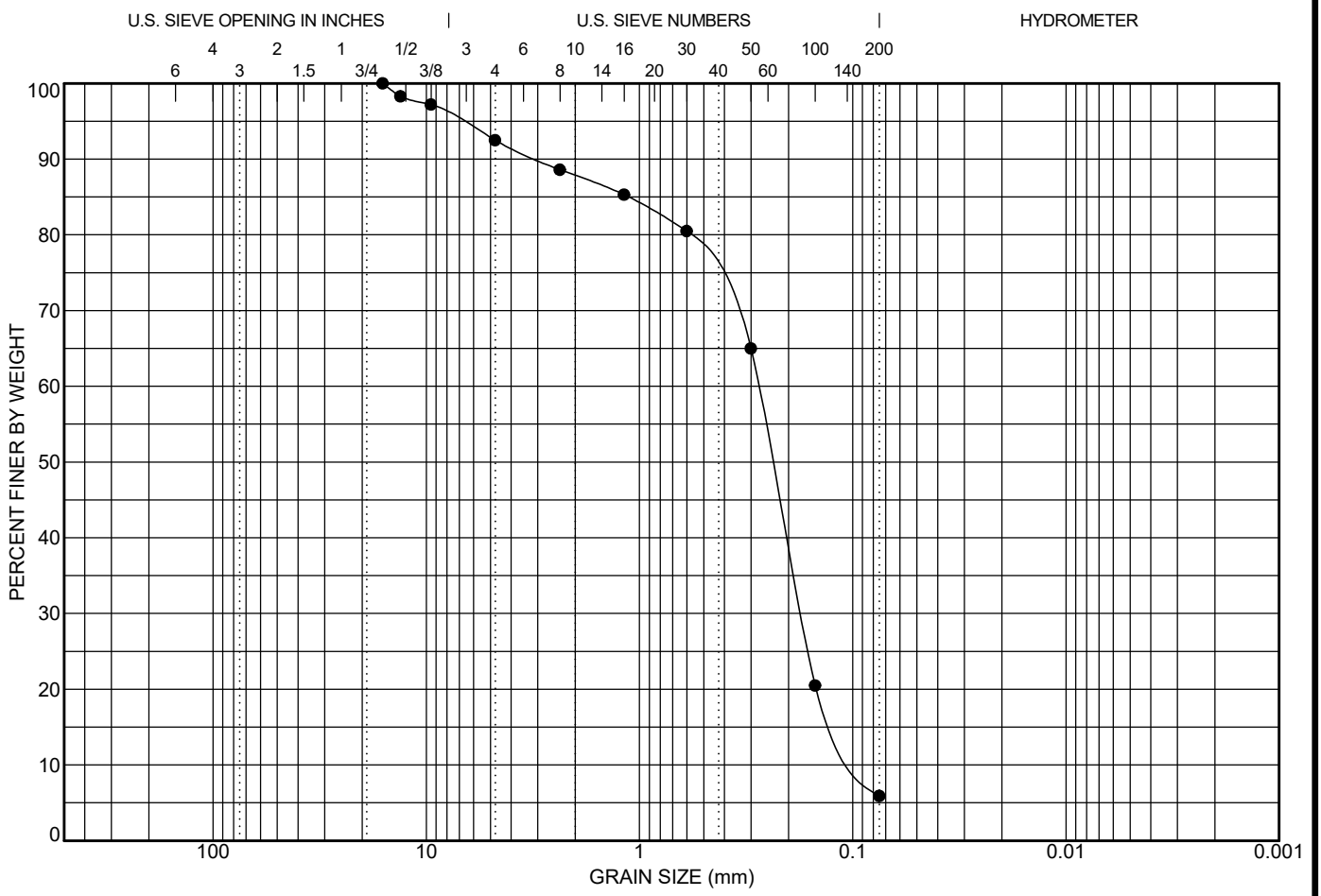

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.20	3.05	16	0.278	0.174	0.091	7.5	86.6	5.9	

Date: Aug. 25 - 2021
Client: Fusion Homes
Contractor:
Source:
Sampled From: BH 1, 6.1 to 6.55 m depth
Sample No.: 7
Date Sampled: Jul. 23 - 2021
Sampled By: DO
Lab No.: 0913
Date Tested: Aug. 02 - 2021
Type of Material: Sand, trace gravel and silt

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

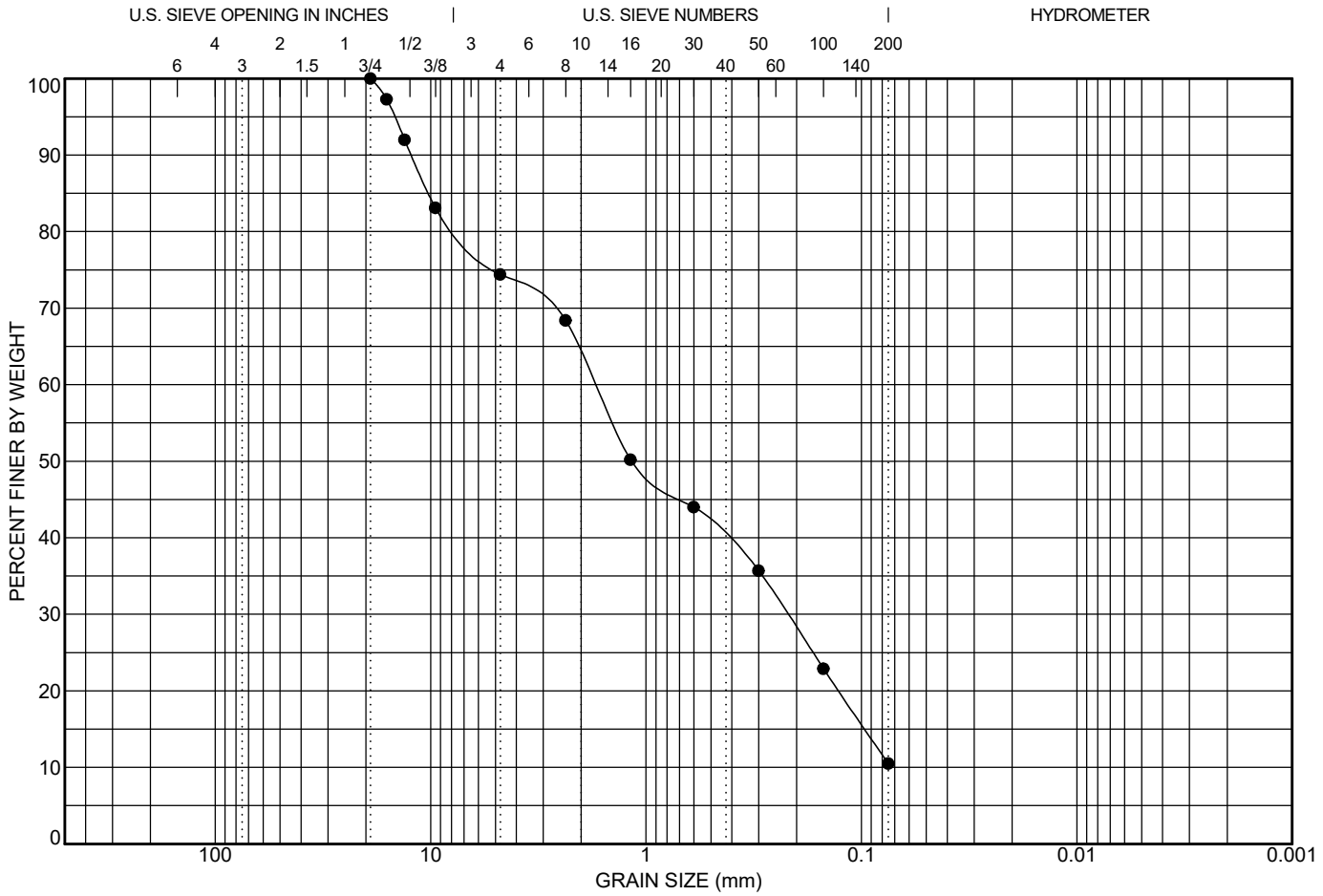
GRAIN SIZE DISTRIBUTION

Project: Future Development of Block Plan 3

Location: Stone Road East and Victoria Road South, Guelph, Ontario

File No.: G21257

Enclosure No.: 9



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.39	23.50	19	1.714	0.22		25.6	63.9	10.5	

Date: Aug. 25 - 2021
Client: Fusion Homes
Contractor:
Source:
Sampled From: BH 3, 9.15 to 9.6 m depth
Sample No.: 9
Date Sampled: Jul. 21 - 2021
Sampled By: DO
Lab No.: 0914
Date Tested: Aug. 02 - 2021
Type of Material: Gravelly Sand, some silt

Sieve Size (mm)	Percent Passing	No Specifications

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Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

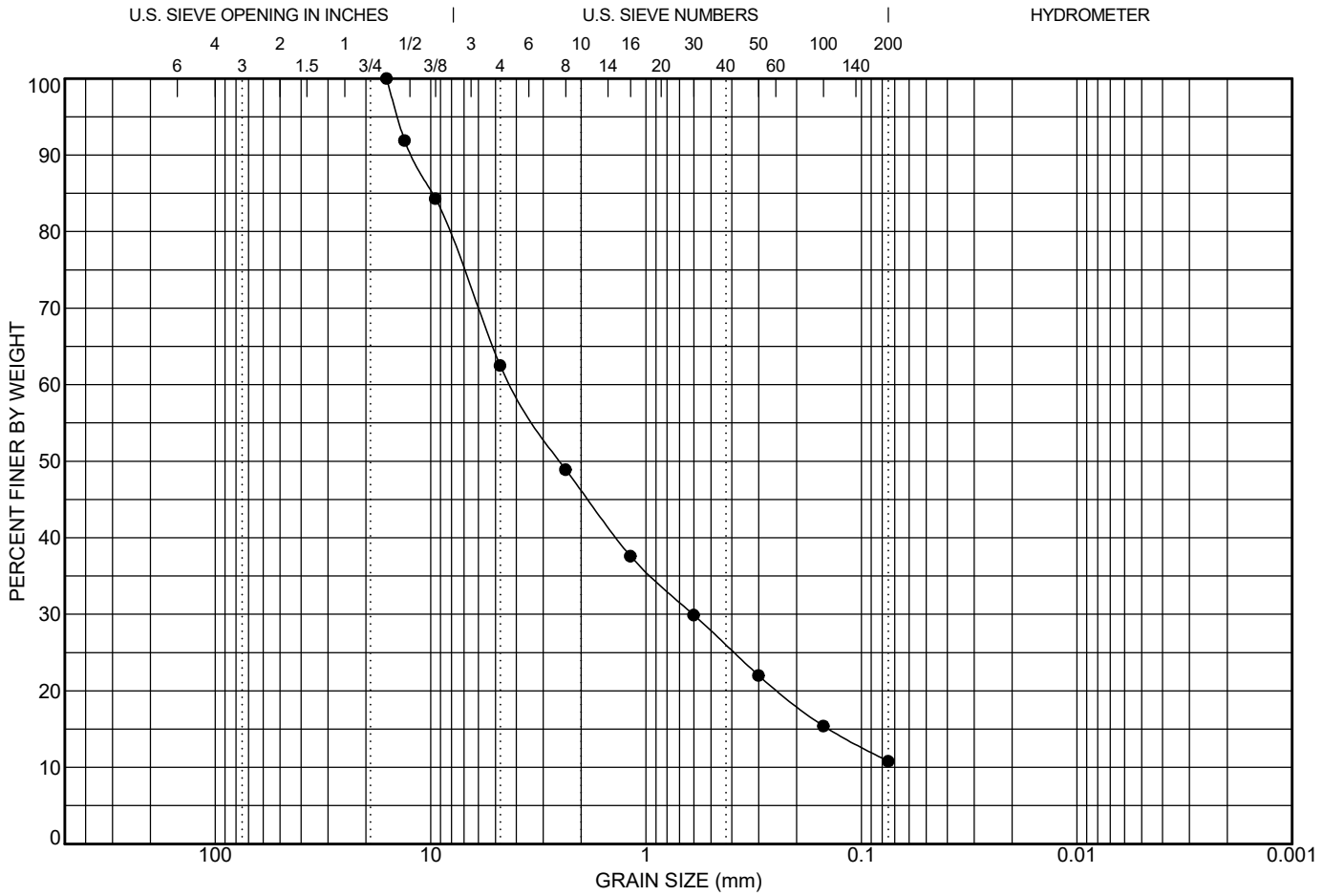
GRAIN SIZE DISTRIBUTION

Project: Future Development of Block Plan 3

Location: Stone Road East and Victoria Road South, Guelph, Ontario

File No.: G21257

Enclosure No.: 10



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.32	62.83	16	4.177	0.605		37.5	51.7	10.8	

Date: Aug. 25 - 2021
Client: Fusion Homes
Contractor:
Source:
Sampled From: BH 4, 4.55 to 5.0 m depth
Sample No.: 6
Date Sampled: Jul. 23 - 2021
Sampled By: DO
Lab No.: 0915
Date Tested: Aug. 02 - 2021
Type of Material: Sand and Gravel, some silt

Sieve Size (mm)	Percent Passing	No Specifications

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ENGINEERING LTD.
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Fax: 519-742-7739
e-mail: info@cvdengineering.com

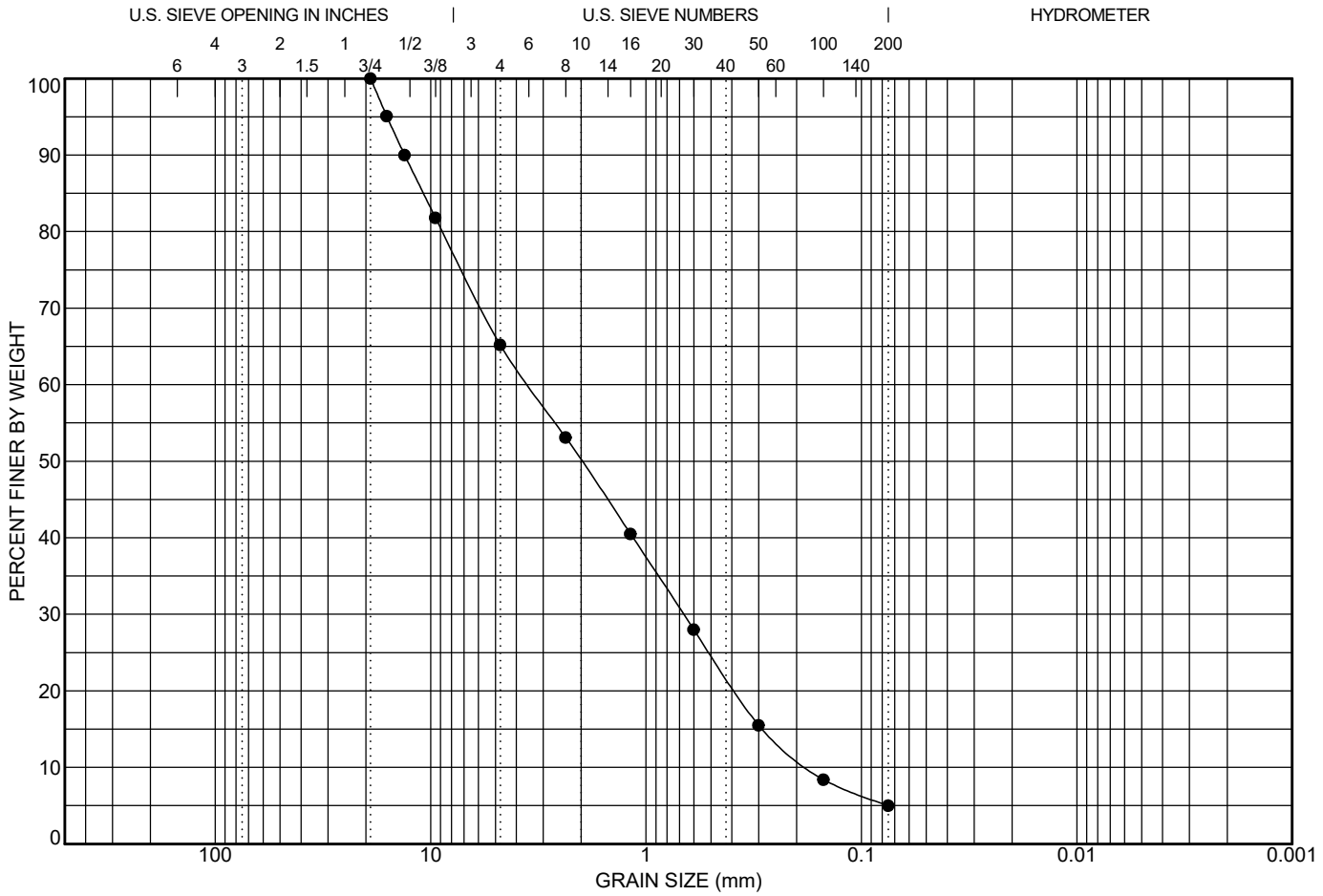
GRAIN SIZE DISTRIBUTION

Project: Future Development of Block Plan 3

Location: Stone Road East and Victoria Road South, Guelph, Ontario

File No.: G21257

Enclosure No.: 11



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.72	20.05	19	3.517	0.669	0.175	34.8	60.2	5.0	

Date: Aug. 25 - 2021
Client: Fusion Homes
Contractor:
Source:
Sampled From: BH 6, 4.55 to 5.0 m depth
Sample No.: 6
Date Sampled: Jul. 21 - 2021
Sampled By: DO
Lab No.: 0916
Date Tested: Aug. 02 - 2021
Type of Material: Sand and Gravel, trace silt

Sieve Size (mm)	Percent Passing	No Specifications

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

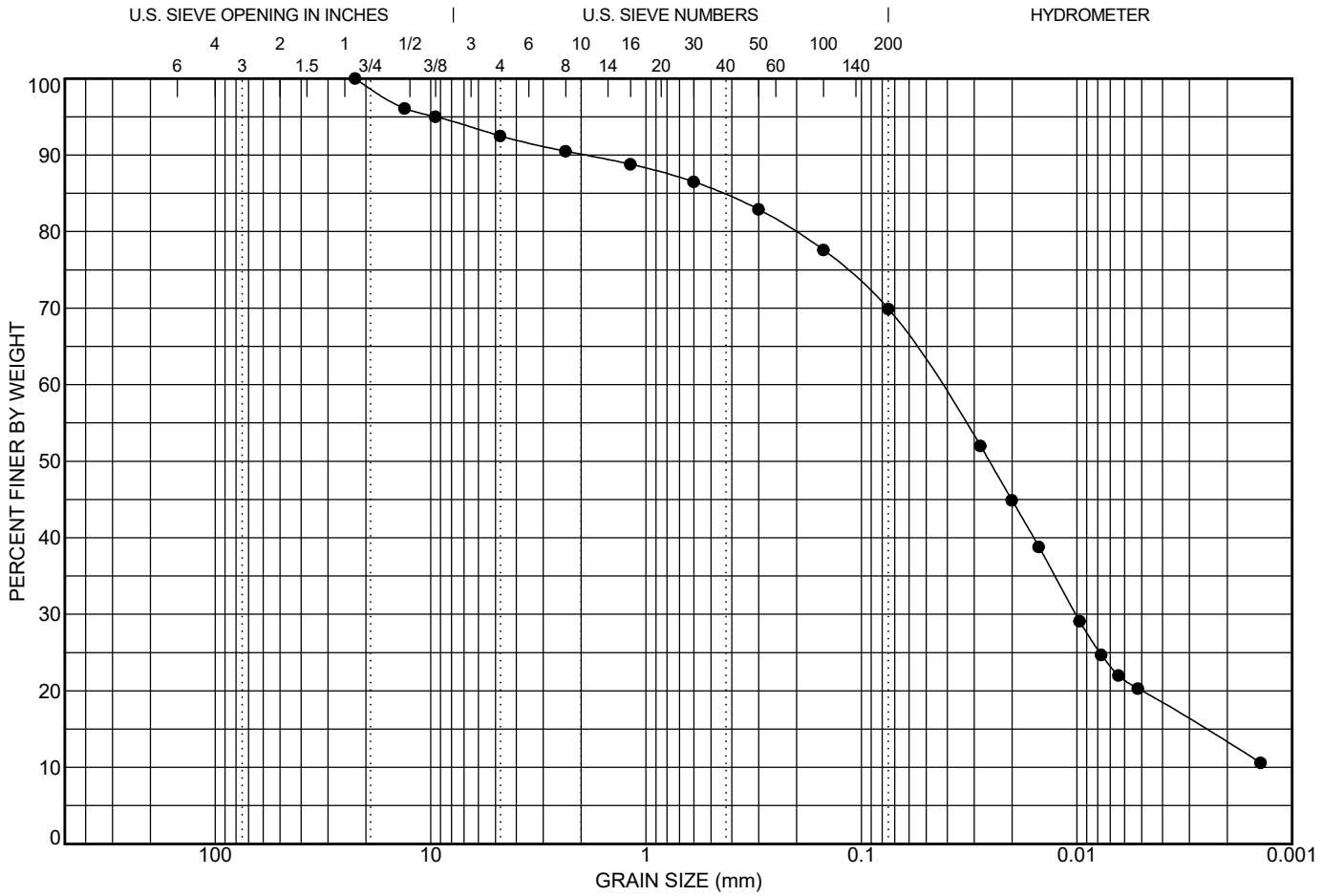
GRAIN SIZE DISTRIBUTION

Project: Future Development of Block Plan 3

Location: Stone Road East and Victoria Road South, Guelph, Ontario

File No.: G21257

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
					22.4	0.043	0.01		7.5	22.6	69.9	

Date: Aug. 25 - 2021
Client: Fusion Homes
Contractor:
Source:
Sampled From: BH 3, 2.25 to 2.7 m depth
Sample No.: 4
Date Sampled: Jul. 21 - 2021
Sampled By: DO
Lab No.: 0917
Date Tested: Aug. 02 - 2021
Type of Material: Sandy Silt Till, some clay, trace gravel

Sieve Size (mm)	Percent Passing	No Specifications

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

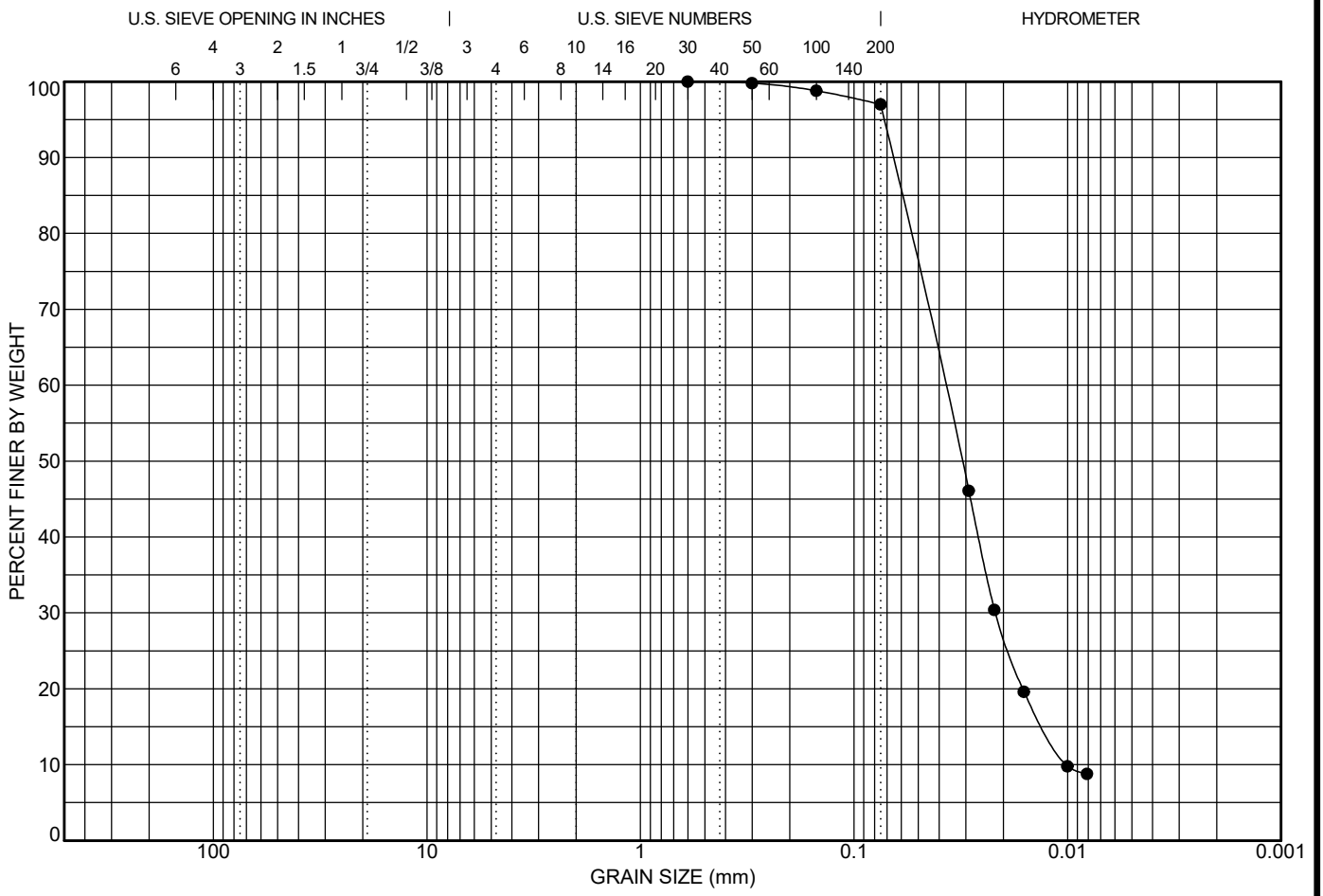
GRAIN SIZE DISTRIBUTION

Project: Future Development of Block Plan 3

Location: Stone Road East and Victoria Road South, Guelph, Ontario

File No.: G21257

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
			1.25	3.72	0.6	0.038	0.022	0.01	0.0	3.0	97.0	

Date: Aug. 25 - 2021
Client: Fusion Homes
Contractor:
Source:
Sampled From: BH 8, 4.55 to 5.0 m depth
Sample No.: 6
Date Sampled: Jul. 22 - 2021
Sampled By: DO
Lab No.: 0918
Date Tested: Aug. 02 - 2021
Type of Material: Silt, trace sand and clay

Sieve Size (mm)	Percent Passing	No Specifications

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GRAIN SIZE DISTRIBUTION

Project: Future Development of Block Plan 3

Location: Stone Road East and Victoria Road South, Guelph, Ontario

File No.: G21257

Enclosure No.: 14

KEY PLAN **SOURCE:** Google Earth

LEGEND

Borehole Location

Borehole and Monitoring Well Location

Borehole locations surveyed by CVD Engineering Ltd. using Leica iCON GPS 70T.

BOREHOLE LOCATION PLAN

Future Development of Block Plan 3

Stone Road East and Victoria Road South
Guelph, Ontario

CHUNG & VANDER DOELEN ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1 / 519-742-8979

Drawn By: YC	Date: July, 2021	File No.: G21257
Checked By: RVD	Scale: N.T.S.	Drawing No.: 1