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PROJECT NO.: SM 190744-G February 21, 2020

MARZ HOMES
825 North Service Road, Suite 200
Hamilton, Ontario
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Attention: Anthony Chiarella

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
SOUTH GRIMSBY ROAD 5 – SOUTH OF CP RAIL
SMITHVILLE, ONTARIO

Dear Mr. Chiarella,

Further to your authorisation, SOIL-MAT ENGINEERS & CONSULTANTS LTD. has completed the fieldwork, laboratory testing, and report preparation in connection with the above noted project. The scope of work was completed in general accordance with our proposal P8049, dated May 7, 2019, revised October 23, 2019. Our comments and recommendations based on our findings at the sixteen [16] borehole locations are presented in the following paragraphs.

1. INTRODUCTION

We understand the project will involve the construction of a residential development consisting of single detached homes, semi-detached homes, and townhouse units. Construction will also include asphalt paved roadways and installation of associated underground municipal services, as well as the construction of a stormwater management pond. The purpose of this geotechnical investigation work was to assess the subsurface soil and groundwater conditions, and to provide our comments and recommendations with respect to the design and construction of the proposed development, from a geotechnical point of view.

This report is based on the above summarised project description, and on the assumption that the design and construction will be performed in accordance with applicable codes and standards. Any significant deviations from the proposed project design may void the recommendations given in this report. If significant changes are made to the proposed design, this office must be consulted to review the new design

with respect to the results of this investigation. It is noted that, other than the limited background testing detailed below, the information contained in this report does not reflect upon the environmental aspects of the site.

2. PROCEDURE

A total of sixteen [16] sampled boreholes were advanced at the locations illustrated in the attached Drawing No. 1, Borehole Location Plan. The boreholes were advanced using continuous flight power auger equipment on January 14 and 15, 2020 under the direction and supervision of a staff member of SOIL-MAT ENGINEERS & CONSULTANTS LTD., to termination/auger refusal on assumed bedrock at depths of between approximately 2.8 and 8.5 metres below the existing ground surface.

Upon completion of drilling, monitoring wells were installed in each of Borehole Nos. 1 and 16 to allow for the future monitoring of the static groundwater level. The monitoring wells consisted of 50-millimetre PVC pipe, screened in the lower 1.5 metres. The monitoring wells were encased in well filter sand up to approximately 0.3 metres above the screened portion, then with bentonite 'hole plug' to the surface and fitted with a protective steel 'stick up' casing. The remaining boreholes were backfilled in general accordance with Ontario Regulation 903, and the ground surface was reinstated even with the surrounding grade.

Representative samples of the subsoils were recovered from the borings at selected depth intervals using split barrel sampling equipment driven in accordance with the requirements of ASTM test specification D1586, Standard Penetration Resistance Testing. After undergoing a general field examination, the soil samples were preserved and transported to the SOIL-MAT laboratory for visual, tactile, and olfactory classifications. Routine moisture content tests were performed on all soil samples recovered from the borings.

In addition, five [5] selected samples of the subsurface soils recovered from the boreholes were submitted to AGAT Laboratories, an independent Canadian accredited analytical laboratory, for background environmental testing consisting of a standard panel of metal and inorganic parameters, as well as for petroleum hydrocarbons [PHCs] and volatile organic compounds [VOCs]. The results of this testing can be found appended to the end of this report.

The boreholes were located on site by a representative of SOIL-MAT ENGINEERS & CONSULTANTS LTD. The ground surface elevation at the borehole locations was referenced to a site-specific benchmark, described as the top of the top of manhole rim located on South Grimsby Road 5, south of the road's intersection with Northridge Drive, as shown in Drawing No. 1. This benchmark was noted to have a geodetic elevation of 192.74 on the topographic survey by Ashenhurst Nouwens Limited (File No.: 27614-TPO, dated July 6, 2007) provided to our office.

Details of the conditions encountered in the boreholes, together with the results of the field and laboratory tests, are presented in Log of Borehole Nos. 1 to 16, inclusive, following the text of this report. It is noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design and therefore should not be construed at the exact depths of geological change.

3. SITE DESCRIPTION AND SUBSURFACE CONDITIONS

The subject site is located north of the intersection of South Grimsby Road 5 and West Street (Highway 20) in Smithville, Ontario, and consists of active agricultural land. The site is bounded to the north by the CP Railway, to the east by South Grimsby Road 5, to the south by commercial and community developments as well as West Street (Highway 20), and to the west by other agricultural lands. The subject property has a gentle undulating topography with an overall relief to the south/southwest of approximately 2.9 metres, as measured across the boreholes.

The subsurface conditions encountered at the borehole locations are summarised as follows:

Topsoil

A surficial veneer of topsoil approximately 250 to 350 millimetres in thickness was encountered at all borehole locations. It is noted that the depth of topsoil may vary across the site and from the depths encountered at the borehole locations. It is also noted that the term 'topsoil' has been used from a geotechnical point of view, and does not necessarily reflect its nutrient content or ability to support plant life.

Silty Clay/Clayey Silt Fill

Silty clay/clayey silt fill was encountered beneath the topsoil at Borehole Nos. 11, 12, and 13. The fill material was brown in colour, contained trace gravel with occasional construction debris and organic inclusions, and was generally firm in consistency. The silty clay/clayey silt fill was proven to depths of 0.8 to 1.5 metres where encountered.

Silty Clay/Clayey Silt

Native silty clay/clayey silt was encountered beneath the topsoil or fill materials at all borehole locations. The cohesive soil was brown to greyish brown in colour, transitioning to grey at depths of between approximately 3 and 6 metres, contained trace to some sand and gravel, and was generally found to be firm to very stiff in consistency. The silty clay/clayey silt was proven to termination or auger refusal on assumed bedrock at depths of approximately 2.8 to 3.6 metres below the existing ground surface. It is noted that seams of sand and gravel with bedrock fragments were often encountered just above the bedrock.

Grain Size analyses were conducted on four [4] selected samples of the silty clay/clayey silt, including one [1] selected sample from the location of the proposed stormwater management pond. The results of this grain size testing can be found appended to the end of this report, and are summarized as follows:

TABLE A
GRAIN SIZE ANALYSES

Sample ID	Depth	% Clay	% Silt	% Sand	% Gravel
BH1 SS4	2.1 m	45	47	5	3
BH10 SS3	1.5 m	72	26	2	0
BH11 SS4	2.3 m	65	30	4	1
BH16 SS3	1.5 m	65	32	2	1

The field and laboratory testing demonstrate the native soils to consist of silty clay or silt and clay with trace sand and gravel. These soils would generally behave as a cohesive material with very low permeability, on the order of 10^{-7} to 10^{-8} cm/sec. These soils are considered effectively impermeable, with an estimated infiltration rate of less than 5 mm/hr.

A review of available published information [Quaternary Geology of Ontario, Southern Sheet Map 2556] indicate the subsurface soils to consist of fine-textured glaciolacustrine deposits of silt and clay with minor sand and gravel, consistent with our experience in the area, the above analyses, and our observations during drilling.

Limestone/Dolostone Bedrock

Bedrock was inferred from auger refusal, at depths of between of approximately 2.8 and 8.5 metres at the borehole locations noted below. The depth and relative elevation of the inferred bedrock surface at each borehole location is summarised in the following table.

TABLE B
ASSUMED BEDROCK DEPTHS AND ELEVATIONS

Borehole No.	Surface Elevation [m]	Assumed Bedrock Depth [m]	Assumed Bedrock Elevation [m]
1	192.69	2.8	189.90
2	192.98	4.9	188.10
3	192.87	4.4	188.50
4	193.38	5.6	187.80
5	193.55	>3.6	<189.90
6	193.44	5.4	188.00
7	193.72	>3.6	<190.10
8	193.21	5.5	187.70
9	191.88	>3.6	<188.20
10	191.87	>3.6	<188.20
11	191.63	7.6	184.00
12	191.85	>3.6	<188.20
13	191.68	8.5	183.10
14	190.52	5.9	184.60
15	190.62	>3.6	<187.00
16	190.62	6.2	184.40

Based on the bedrock elevations noted above, the bedrock appears to ‘step’ to lower elevations from north to south, ranging from elevations of approximately 189.0 metres at the north end, and as low as 183.1 metres or deeper in the south end. From a review of available published information and past experience in the area, the bedrock consists of Limestone and Dolostone of the Lockport Formation. The upper levels of the bedrock are often weathered and fractured, and are noted to be susceptible to ‘vugs’ and solution cavities; however, the bedrock would still be considered very sound in terms of excavation and foundation requirements for the proposed development. The bedrock was not cored as part of this investigation.

Groundwater Observations

Seven of the boreholes were recorded as 'wet' at depths ranging between approximately 1.8 and 7.5 metres below the existing ground surface, with the remaining boreholes recorded as dry. It is noted that insufficient time would have passed for the static groundwater level to stabilise in the open boreholes. As noted above, monitoring wells were installed at two [2] borehole locations (Borehole Nos. 1, and 16), to allow for future measurements of the static groundwater level. Additionally, data loggers were installed at the monitoring well locations to allow for measurements of the static groundwater level. The water levels in the monitoring wells were measured by the data loggers at regular intervals from January 15 to February 13, 2020. Manual measurements were taken on February 13, 2020. The water level readings in the monitoring wells, summarised as follows:

TABLE C
SUMMARY OF MONITORING WELL READINGS

	Surface Elevation (metres)	January 15 to February 13, 2020	
		Groundwater Depth (metres)	Groundwater Elevation (metres)
Borehole No. 1	192.69	1.21 to 2.32	190.37 to 191.48
Borehole No.16	190.62	1.00 to 1.20	189.42 to 189.62

	Surface Elevation (metres)	February 13, 2020	
		Groundwater Depth (metres)	Groundwater Elevation (metres)
Borehole No. 1	192.69	1.39	191.30
Borehole No. 16	190.62	1.08	189.54

Based on our experience in the area and observations during drilling, the static groundwater level is estimated at depths of approximately 1.2 to 3 metres below the existing ground surface in the area of the proposed new dwellings, with possible shallower groundwater conditions in the area of Borehole No. 16, and would be expected to fluctuate seasonally. It is noted these readings are not considered fully stabilized, given the low permeable nature of the native soils, and the data collected from the data loggers and subsequent visits, and would also be more reflective of a seasonal 'high'. It would be prudent to take additional readings once the monitoring wells have sufficiently stabilized, in order to confirm the estimated groundwater level provided in this report, as well as to observe any seasonal fluctuation. Groundwater should also be expected to be perched above the bedrock elevation.

4. EXCAVATIONS

Excavations for the installation of foundations and underground services are anticipated to extend to depths of up to approximately 2 to 4 metres below the existing grade. Excavations through the native silty clay/clayey silt soils above the groundwater level should be relatively straightforward, with the sides remaining stable for the short construction period at slopes of up to 60 degrees to the horizontal. Where wet seams are encountered, during periods of extended precipitation, or where excavations extend below the static groundwater level, the sides of excavations should be expected to 'slough in' to as flat as 3 horizontal to 1 vertical, or flatter. In the event excavations are to extend into the bedrock, excavations should be expected to slow significantly, and the use of mechanical rock splitting equipment will be required. The sides of the excavations within the competent bedrock will remain stable at near vertical inclinations. Notwithstanding the foregoing, however, all excavations must comply with the current Occupational Health and Safety Act and Regulations for Construction Projects. Excavation slopes steeper than those required in the Safety Act must be supported and a senior geotechnical engineer from this office should monitor the work.

As noted above the static groundwater level is anticipated to generally be approximately 1.2 to 3 metres below the existing ground surface, with some excavations likely extending near or below this level. The generally low permeability silty clay/clayey silt should yield a relatively low rate of groundwater infiltration such that it should be possible to adequately control groundwater infiltration for the short construction period using conventional construction dewatering techniques for excavations extending near to as much as perhaps 1 to 3 metres below the static groundwater level. Additionally, it is noted that the final grading of the site relative to the existing grade will affect the required depth of excavation below the existing grade and groundwater level, with an overall increase in the site grade being generally beneficial, tending to reduce the potential and extent of groundwater infiltration. More water should be expected when connections are made to existing services, and where excavations extend to the bedrock. Surface water should be directed away from the excavations.

The base of the excavations in the native soils encountered in the boreholes should generally remain firm and stable. As such, standard pipe bedding material as specified by the Ontario Provincial Standard Specification [OPSS] or Township of West Lincoln should be satisfactory. The bedding should be well compacted to provide sufficient support to the pipes and components (i.e. valve chambers, manholes etc.), and to minimize settlements of the roadway above the service trenches. Special attention should be paid to compaction under the pipe haunches.

Any utility poles, light poles, etc. located within 3 metres of the top of an excavation slope should be braced to ensure their stability. Likewise, temporary support might be required for other existing above and below ground structures, including existing underground services, depending on their proximity to the trench excavations.

5. BACKFILL CONSIDERATIONS

The excavated material will consist primarily of the silty clay/clayey silt soils encountered. These soils are generally considered suitable for use as engineered fill, trench backfill, etc., provided that they are free of organics or other deleterious material, and that its moisture content can be controlled to within 3 per cent of its standard Proctor optimum moisture content.

It is noted that the on-site soils encountered are not considered to be free draining and should not be used where this characteristic is necessary. It is also noted that these cohesive soils will present difficulties in achieving effective compaction where access with compaction equipment is restricted. The on-site silty clay/clayey silt soils encountered are generally considered to be near to slightly 'wet' of their standard Proctor optimum moisture content. Some moisture conditioning may be required depending upon the weather conditions at the time of construction. It is noted that these silty clay/clayey silt soils will become nearly impossible to compact when wet of optimum moisture. As such, compaction efforts would be expected to be more difficult during wet periods of the year. Any material that becomes wet to saturated should be spread out to allow to dry, or separated out from material to be used as engineered fill. These 'too wet' soils could be utilised as grading fill in non-settlement sensitive areas.

We note that where backfill material is placed near or slightly above its optimum moisture content, the potential for long term settlements due to the ingress of groundwater and collapse of the fill structure is reduced. Correspondingly, the shear strength of the 'wet' backfill material is also lowered, thereby reducing its ability to support construction traffic and therefore impacting roadway construction. If the soil is well dry of its optimum value, it will appear to be very strong when compacted, but will tend to settle with time as the moisture content in the fill increases to equilibrium condition. The native silty clay/clayey silt soils encountered may require high compaction energy to achieve acceptable densities if the moisture content is not close to its standard Proctor optimum value. It is therefore very important that the placement moisture content of the backfill soils be within 3 per cent of its standard Proctor optimum moisture content during placement and compaction to minimise long term subsidence [settlement] of the fill mass. Any imported fill required in service trenches or to raise the subgrade elevation should have its moisture content within 3 per cent of its optimum moisture content and meet the necessary environmental guidelines.

A representative of SOIL-MAT should be present on-site during the backfilling and compaction operations to confirm the uniform compaction of the backfill material to project specification requirements. Close supervision is prudent in areas that are not readily accessible to compaction equipment, for instance near the end of compaction 'runs'. All structural fill should be compacted to 100 per cent of its standard Proctor maximum dry density [SPMDD]. Backfill within service trenches, areas to be paved, etc., should be placed in loose lifts not exceeding 300 millimetres in thickness and compacted to a minimum of 95 per cent of its SPMDD, and to 100 per cent of its SPMDD in the upper 1 metre below the design subgrade level. The appropriate compaction equipment should be employed based on soil type, i.e. pad-toe for cohesive soils and smooth drum/vibratory plate for granular soils. A method should be developed to assess compaction efficiency employing the on-site compaction equipment and backfill materials during construction.

6. MANHOLES, CATCH BASINS AND THRUST BLOCKS

Properly prepared bearing surfaces for manholes, valve chambers, etc. in the native competent soils, stabilised where required, will be practically non-yielding under the anticipated loads. Proper preparation of the founding soils will tend to accentuate the protrusion of these structures above the pavement surface if compaction of the fill around these structures is not adequate, causing settlement of the surrounding paved surfaces. Conversely, the pavement surfaces may rise above the valve chambers and around manholes under frost action. To alleviate the potential for these types of differential movements, free-draining, non-frost susceptible material should be employed as backfill around the structures located within the paved roadway limits, and compacted to 100 per cent of its standard Proctor maximum dry density.

The thrust blocks in the native soils may be conservatively sized as recommended by the applicable Ontario Provincial Standard Specification conservatively using a horizontal allowable bearing pressure of up to 150 kPa [~3,000 psf]. Any backfill required behind the blocks should be a well-graded granular product and should be compacted to 100 per cent of its standard Proctor maximum dry density.

7. PAVEMENT STRUCTURE DESIGN CONSIDERATIONS

All areas to be paved must be cleared of all organic and otherwise unsuitable materials, and the exposed subgrade proof rolled with 3 to 4 passes of a loaded tandem-axle truck in the presence of a representative of SOIL-MAT ENGINEERS & CONSULTANTS LTD., immediately prior to the placement of the sub-base material. Any areas of distress revealed by this or other means should be subexcavated and replaced with suitable backfill material. Where the subgrade condition is poorer it may be necessary to implement more aggressive stabilisation methods, such as the use of coarse aggregate [50-millimetre clear stone, 'rip rap' stone, etc.] 'punched' into the soft areas. It may also be prudent to consider the provision of a heavy geofabric over the subgrade to act as a separator between the subgrade and granular base materials.

Good drainage provisions will optimise the long-term performance of the pavement structure. The subgrade must be properly crowned and shaped to promote drainage to the subdrain system. Subdrains should be installed to intercept excess subsurface water and to prevent softening of the subgrade material. Surface water should not be allowed to pond adjacent to the outer limits of the paved areas.

The most severe loading conditions on the subgrade typically occur during the course of construction, therefore precautionary measures may have to be taken to ensure that the subgrade is not unduly disturbed by construction traffic. SOIL-MAT should be given the opportunity to review the final pavement structure design and subdrain scheme prior to construction to ensure that they are consistent with the recommendations of this report.

If construction is conducted under adverse weather conditions, additional subgrade preparation may be required. During wet weather conditions, such as during the fall and spring months, it should be anticipated that additional subgrade preparation will be required, such as additional depth of Ontario Provincial Standard Specification [OPSS] Granular 'B', Type II sub-base material. It is also important that the sub-base and base granular layers of the pavement structure be placed as soon as possible after exposure, preparation and approval of the subgrade level.

The proposed pavement structure would be required to adequately support cars, trucks and intermittent delivery and garbage trucks. For this project, a recommended pavement structure would consist of 300 millimetres of OPSS Granular 'B', Type II sub-base course, 150 millimetres of OPSS Granular 'A' base course, 65 millimetres of HL8 binder course asphaltic concrete, and 40 millimetres of HL3 surface course asphaltic concrete. Notwithstanding, the pavement structure should conform to the relevant Township of West Lincoln requirements where they are to be assumed by the Township. It is our opinion that this design is suitable for use on a residential roadway section, provided that the subgrade has been prepared as specified and is good and firm before the sub-base course material is placed. If the subgrade is soft, remedial measures as discussed above may have to be implemented and/or the sub-base thickness may have to be increased. The granular sub-base and base courses and asphaltic concrete layers should be compacted to OPSS or Township of West Lincoln requirements. A program of in-place density testing must be carried out to monitor that compaction requirements are being met. We note that this pavement structure is not to be considered as a construction roadway design.

To minimise segregation of the finished asphalt mat, the asphalt temperature must be maintained uniform throughout the mat during placement and compaction. All too often, significant temperature gradients exist in the delivered and placed asphalt with the cooler portions of the mat resisting compaction and presenting a honeycomb surface. As the spreader moves forward, a responsible member of the paving crew should monitor the pavement surface, to ensure a smooth uniform surface. The contractor can mitigate the surface segregation by 'back-casting' or scattering shovels of the full mix material over the segregated areas and raking out the coarse particles during compaction operations. Of course, the above assumes that the asphalt mix is sufficiently hot to allow the 'back-casting' to be performed.

Asphalt paving of driveways should be consistent with the general recommendations provided above. Proper preparation of the subgrade soils is essential to good long-term performance of the pavement. Likewise, sufficient depth and compaction of granular base materials and adequate drainage will be important in achieving good long-term performance, i.e. preventing/limiting premature cracking, subgrade failure, rutting, etc. A recommended light duty pavement structure for residential driveways would consist of a minimum of 200 millimetres of OPSS Granular 'A' base course, compacted to 100 percent standard Proctor maximum dry density, followed by a minimum of 50 millimetres of HL3 or HL3F asphaltic concrete, compacted to a minimum of 92 per cent of their Marshall maximum relative density [MRD].

8. HOUSE AND TOWNHOUSE CONSTRUCTION

It is anticipated that the design founding level for residential dwellings and townhouse blocks will extend to depths of up to approximately 1.5 to 2.0 metres below the existing grade. The construction of foundations at or above this depth should be relatively straightforward when above the static groundwater level. The static groundwater level, as noted above, is anticipated to be at depths ranging from 1.2 to 3.0 metres below the existing grade. As such, depending on the final grading of the property, and final founding elevations of the proposed residences, it may be prudent to raise the founding level of the proposed structures, or to further investigate groundwater conditions in other areas of the site.

The native soils encountered at the borehole locations are considered capable of supporting the loads associated with typical residential dwelling and townhouse structures on conventional spread footings. This typically considers a nominal design bearing pressure of 75 kPa [~1,500 psf], however bearing pressures of up to 200 kPa [~4,000 psf] SLS and 300 kPa [~6,000 psf] ULS may be considered in the competent native silty clay/clayey silt soils. The founding surfaces must be hand cleaned of any loose or disturbed material, along with any ponded water, immediately prior to placement of foundation concrete.

In the event that site grading works result in engineered fill below founding elevations, the general recommendations presented in the Backfill Considerations above should be strictly adhered to, with compaction to 100 percent standard Proctor maximum dry density, verified by monitoring and testing by a representative of SOIL-MAT ENGINEERS present on a full time basis. If there is a short fall in the volume of fill required, then the source of imported fill should be reviewed for gradation, Proctor value, compatibility with existing fill, environmental characteristics and be approved by this office prior to use. Footings within quality engineered fill may be designed on the basis of a nominal bearing value of 100 kPa [~2,000 psf] SLS and 150 kPa [~3,000 psf] ULS.

The support conditions afforded by the native soils and/or engineered fill are generally not uniform across the building footprint, nor are the loads on the various foundation elements. As such it is recommended that consideration be given to the provision of nominal reinforcement in the footings and foundation walls to account for variable support and loading conditions. The use of nominal reinforcement is considered good construction practice as it will act to reduce the potential for cracking in the foundation walls due to minor settlements, heaving, shrinkage, etc. and will assist in resisting the pressures generated against the foundation walls by the backfill. Such nominal reinforcement is an economical approach to the reduction and prevention of costly foundation repairs after completion and later in the life of the buildings. This

reinforcement would typically consist of two continuous 15M steel bars placed in the footings [directly below the foundation wall], and similarly two steel bars placed approximately 300 millimeters from the top of the foundation walls at a minimum, depending on ground conditions exposed during construction. These reinforcement bars would be bent to reinforce all corners and under basement windows, and be provided with sufficient overlap at staggered splice locations. At 'steps' in the foundations and at window locations, the reinforcing steel should transition diagonally, rather than at 90 degrees, to maintain the continuous tensile capacity of the reinforcement. Where footings are founded on, or partially on, engineered fill the above provision for nominal reinforcement would be required.

All basement foundation walls should be suitably damp proofed, including the provision of a 'dimple board' type drainage product, and provided with a perimeter drainage tile system outlet to a gravity sewer connection or positive sump pit a minimum of 150 millimetres below the basement floor slab. The clear stone material surrounding the weeping tile should be encased with a geotextile material to prevent the migration of fines from the foundation wall backfill into the clear stone product. In the event that sump pit systems are required we would recommend that the sump pump system should be constructed with an 'oversized' reservoir and a 'back-flow' prevention valve so that the sump pump will not cycle repeatedly within short time periods.

All footings exposed to the environment must be provided with a minimum of 1.2 meters of earth or equivalent insulation to protect against frost penetration. This frost protection would also be required if construction were undertaken during the winter months. All footings must be proportioned to satisfy the requirements of the Ontario Provincial Building Code.

It is imperative that a soils engineer be retained from this office to provide geotechnical engineering services during the excavation and foundation construction phases of the project. This is to observe compliance with the design concepts and recommendations outlined in this report, and to allow changes to be made in the event that subsurface conditions differ from the conditions identified at the borehole locations.

9. STORM WATER MANAGEMENT POND CONSIDERATIONS

The stormwater management [SWM] pond is proposed for the south western portion of the site (east of the existing Greek community center). The base of the proposed pond within the native silty clay/clayey silt soils should generally remain firm and stable. However, depending on the proposed depth of the pond relative to the groundwater level the base may potentially become locally unstable as a function of the pond base elevation versus the groundwater level and prevailing weather conditions. Such instability would be exacerbated by repeated travel of heavy construction equipment. These conditions will be made worse during wet weather, and so it is recommended that site works be conducted during the dry summer months of the year, where possible. It would be reasonable to conduct the initial grading of the SWM pond to or slightly above the final base contours. These initial 'pre-grade' contours could then be maintained during construction of site grading and servicing and then the pond completed near the end of site servicing works. This would have the benefit of providing a demonstration of how the pond can be expected to perform in the long-term and allow any necessary changes to be made to the design prior to completion of construction.

Another design consideration in the long-term performance of the SWM pond will be the need to accommodate the infiltration of natural groundwater to allow the pond to provide the maximum storage volume for storm water detention. Given the observed static groundwater levels it is anticipated that groundwater movement will be infiltration into the pond as a function of the design base elevation, permanent pool elevation and seasonal fluctuation in groundwater levels. The low permeable silty clay soils will yield a relatively low rate of infiltration in the short-term, in the long-term [over yearly cycles] the groundwater must be expected to stabilise near the levels as estimated above. As such, further monitoring of the existing well at Borehole No. 16 may be warranted to further investigate the static groundwater level in the area.

Based on information available to date, it would appear that the most appropriate approach to the seepage conditions and storm water management on this site would be to provide a low permeability layer over the base of the pond to resist the infiltration of groundwater, and of sufficient weight to resist any hydrostatic uplift pressures. This could be readily accomplished through the use of a re-compacted clay liner comprised of the silty clay/clayey silt soils native to the area.

An impermeable compacted clay liner would consist of a sufficiently plastic clay soil, with a recommended minimum clay content of 20 per cent and plasticity index of 7 or more. Based on the grain size analyses presented above, the on-site silty clay soils would be considered suitable for use in the construction of a low permeable or impermeable liner at the base of the SWM pond to resist the infiltration/exfiltration of groundwater. This may be readily accomplished by working the silty clay in the base of the pond to a depth of perhaps 0.5 metres, such as with a heavy disc, to break apart any natural structure or layering. The liner material should be moisture conditioned to be within 2 per cent below to 4 per cent above optimum moisture content and compacted in place to 95 per cent of standard Proctor maximum dry density [SPMDD].

The final design interior pond slopes in the native overburden or constructed using the on-site silty clay should be at 4 horizontal to 1 vertical, or flatter, and the exterior slopes of any berms, where required, at 3 horizontal to 1 vertical, or flatter. Should steeper slopes be required it will be necessary to provide some form of stabilisation, such as with the placement of coarse 'rip-rap' stone, or proprietary product such as Turfstone or Cable-Crete. In fact, it is recommended that all interior pond slopes be provided with at least some form of vegetation or nominal stabilisation/protection to control erosion/loss of ground. It is anticipated that topsoil will be placed within the SWM pond area and 'seeded' to provide stabilisation and erosion protection.

It is also noted that appropriate care and effort will be required by the contractor around inlet and outlet structures to ensure the impermeable liner is continuous and avoid the potential of 'piping'. In this regard the clay liner should be completely constructed prior to the installation of inlet/outlet structures. If necessary a bentonite clay material could be utilised within the fill around any structures to provide a continuous impermeable seal.

10. ENVIRONMENTAL CONSIDERATIONS

As noted above, five [5] representative samples of the subsurface soils recovered from the boreholes were submitted to AGAT Laboratories, an independent Canadian accredited analytical laboratory for background analytical testing for a standard panel of metal and inorganic parameters. The purpose of this testing was to characterise the subsurface soils and provide comments with respect to the off-site disposal of surplus soil during construction. The results of this testing are presented in the attached AGAT Certificate of Analysis [20T564177].

The laboratory test results received in our Office were compared to the applicable standard from the Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*, as follows:

- **TABLE 1**: Full Depth Background Site Condition Standards for a Residential/ Parkland/ Institutional property use, [RPI], as well as for an Industrial/ Commercial/ Community [ICC] property use.
- **TABLE 2**: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for a Residential/Parkland/Institutional property use, [RPI], as well as for an Industrial/Commercial/Community [ICC] property use.
- **TABLE 3**: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for a Residential/Parkland/Institutional property use, [RPI], as well as for an Industrial/Commercial/Community [ICC] property use.

Based on SOIL-MAT's field observations and the analytical test results from AGAT, SOIL-MAT offers the following comments:

1. The sampled material was found to be within the Table 1 [ALL] Standards for the tested parameters, with the exception of Samples BH5 SS2 and BH16 SS3 which were found to exceed the standard for Electrical Conductivity [EC].
2. The sampled material was found to be within the Table 2 and 3 [RPI] Standards for the tested parameters with the exception of Sample BH16 SS3 which was found to exceed the standard for EC.
3. The sampled material was found to be within the Table 2 and 3 [ICC] Standards for the tested parameters with the exception of Sample BH16 SS3 which was found to exceed the standard for EC.
4. It is noted that the presence of elevated levels of EC is often observed in the area of municipal roadways and parking lots and is largely the result of the use of salt for winter de-icing operations. EC is essentially an aesthetic parameter that does not present a hazard to human or animal life. Rather it tends to render the soil environment un-supportive of plant growth and corrosive to buried grey or cast iron pipe;
5. The sample secured for analytical testing is believed to be representative of the soil conditions at the borehole locations only. No evidence of potential impact, i.e. staining or odours were observed during the fieldwork. If any significant changes are noted, i.e., odours, staining etc., SOIL-MAT should be contacted to reassess the environmental characteristics of the soil.

Given the above test results the following disposal options are applicable under Regulation 153/04 [amended by Regulation 511/09 effective July 1, 2011]:

- As the tested material has been shown to exceed the Table 1 [RPI/ICC] Standards in Borehole Nos. 5 and 16, surplus material may not be accepted at an off-site Table 1 property, including properties subject to a Record of Site Condition or MCPE Certificate of Authorization;
- Additional testing and/or selective sorting of surplus material depending on location may allow for portions of surplus soil to be disposed of at a Table 1 property including properties subject to a Record of Site Condition, subject to approval of the receiving property owner. Such acceptance may require additional sampling to confirm EC levels or delineation of material which exceed the Table 1 Standard.
- As the test results for the submitted samples show values of EC which exceed the Table 2 and 3 [RPI and ICC] Standards, strictly speaking the tested materials may not be accepted at an off-site RPI or ICC property in a potable or non-potable groundwater condition.
    - As the test results show only elevated levels of EC only, noted above as an essentially aesthetic parameter associated with the application of road de-icing salt, it would be reasonable to accept surplus material at an off-site RPI or ICC property under the 'beneficial use' concept. Such a use would require assessment of the receiving property and approval of the receiving property owner, and depending on the location and nature of the property consultation with the local MCPE District Engineer;
- Excavated soil may be reused as backfill on site.

11. GENERAL COMMENTS

The comments provided in this document are intended only for the guidance of the design team. The subsoil descriptions and borehole information are only intended to describe conditions at the borehole locations. Contractors placing bids or undertaking this project should carry out due diligence in order to verify the results of this investigation and to determine how the subsurface conditions will affect their operations.

We trust that this geotechnical report is sufficient for your present requirements. Should you require any additional information or clarification as to the contents of this document, please do not hesitate to contact the undersigned.

Yours very truly,
SOIL-MAT ENGINEERS & CONSULTANTS LTD.

Adam Roemmele, P. Eng.
Project Engineer

Kyle Richardson, P. Eng.
Review Engineer

Enclosures: Drawing No.1, Borehole Location Plan
Log of Borehole Log Nos. 1 to 16, inclusive
AGAT Laboratories Certificate of Analysis No. 20T564177
Drawing No. 2, Recommended Design Requirements for Basement Construction

Distribution: Marz Homes [1, plus pdf]
IBI Group [pdf only]

LEGEND

Borehole Location
BH#

Benchmark
Top of manhole lid.
TBM Geodetic elevation of 192.74 metres

NOTES

1. This drawing should be read in conjunction with Soil-Mat Engineers & Consultants Ltd. Geotechnical Report SM 190744-G.

2. Borehole locations are approximate.

SOIL-MAT

ENGINEERS & CONSULTANTS LTD.

Geotechnical Investigation
Proposed Residential Development
South Grimsby Road 5
Smithville, Ontario

Borehole Location Plan

Project No. SM 190744-G

Date: January 2020

Drawn: SW	Checked: AR

SM 190744-G Borehole Location Plan

Drawing No. 1

Log of Borehole No. 1

Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

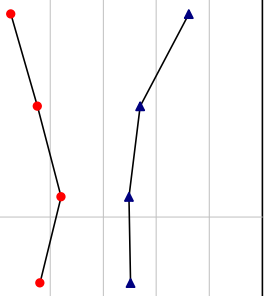
Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4774071
E: 617341

Soil-Mat

Depth (ft)	Depth (m)	Elevation (m)	Description	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		192.69	Ground Surface							
0	0	192.39	**Topsoil** Approximately 300 millimetres of topsoil.							
1			**Clayey Silt/Silty Clay** Brown, trace gravel and sand, firm to very stiff.	SS	1	1 2 3 6	5			
2	1			SS	2	4 6 9 14	15		>4.5	
3				SS	3	5 9 15 20	24		>4.5	
4	2	189.90		SS	4	5 6 10 50/3"	16		4.0	
5			End of Borehole Auger refusal on assumed bedrock							
6	3									
7										
8	4									
9										
10	5									
11										
12	6									
13										
14	7									
15										
16	8									
17										
18	9									
19										
20	10									
21										
22	11									
23										
24	12									
25										
26	13									
27										
28	14									
29										
30	15									
31										
32	16									
33										

Moisture Content w%: 10 20 30 40

Standard Penetration Test blows/300mm: 20 40 60 80



NOTES:

1. Borehole was advanced using solid stem auger equipment on January 14, 2020 to auger refusal on assumed bedrock at a depth of 2.8 metres.

2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

4. A monitoring well was installed. The following free groundwater level readings have been measured:

Feb 13, 2020: 1.39m below existing grade

Drill Method: Solid Stem Augers
Drill Date: January 14, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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130 Lancing Drive, Hamilton, ON L8W 3A1
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Datum: Geodetic
Field Logged by: SW
Checked by: AR
Sheet: 1 of 1

Log of Borehole No. 2

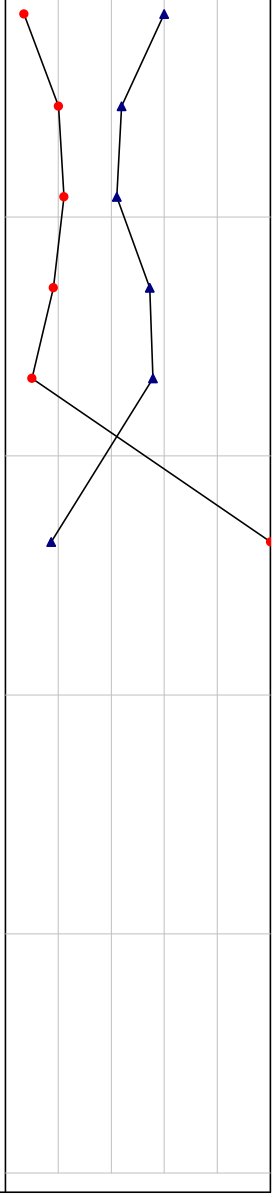
Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4774129
E: 617356

Soil-Mat

Depth (ft / m)	Elevation (m)	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	192.98	Ground Surface								
0 / 0	192.68	**Topsoil** Approximately 300 millimetres of topsoil.		SS	1	1 2 5 8	7			
3 / 1		**Clayey Silt/Silty Clay** Brown, trace gravel and sand, firm to very stiff.		SS	2	5 7 13 17	20		>4.5	
6 / 2				SS	3	5 7 15 22	22		>4.5	
9 / 3				SS	4	6 8 10 12	18		>4.5	
12 / 4				SS	5	4 4 6 9	10		2.0	
15 / 5	188.10			SS	6	9 50/6"	100			
16 / 5		End of Borehole Auger refusal on assumed bedrock								

Moisture Content w% (10 20 30 40)
Standard Penetration Test blows/300mm (20 40 60 80)



NOTES:

1. Borehole was advanced using solid stem auger equipment on January 14, 2020 to auger refusal on assumed bedrock at a depth of 4.9 metres.

2. Borehole was recorded as open and 'wet' at a depth of 4.6 metres upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: January 14, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Datum: Geodetic
Field Logged by: SW
Checked by: AR
Sheet: 1 of 1

Log of Borehole No. 3

Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4774065
E: 617432

Soil-Mat

Depth (ft)	Depth (m)	Elevation (m)	Symbol	Description	Well Data	SAMPLE Type	SAMPLE Number	SAMPLE Blow Counts	SAMPLE Blows/300mm	SAMPLE Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		192.87		Ground Surface								
0	0	192.52		**Topsoil** Approximately 350 millimetres of topsoil.		SS	1	1 2 4 7	6			
1				**Clayey Silt/Silty Clay** Brown, trace gravel and sand, firm to very stiff.		SS	2	6 8 10 15	18		>4.5	
2	1					SS	3	6 12 16 19	28		>4.5	
3						SS	4	6 9 15 21	24		>4.5	
4	2	189.40		Transition to grey in colour.		SS	5	6 9 12 14	21		3.0	
5	3	188.50		End of Borehole Auger refusal on assumed bedrock								
6	4											
7	5											
8	6											
9	7											
10	8											
11	9											
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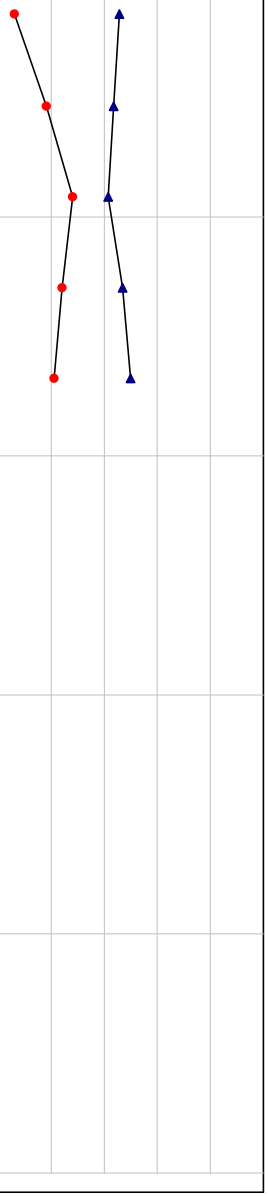
32												
33												

Moisture Content w%
10 20 30 40

Standard Penetration Test blows/300mm
20 40 60 80



NOTES:

1. Borehole was advanced using solid stem auger equipment on January 14, 2020 to auger refusal on assumed bedrock at a depth of 4.4 metres.

2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: January 14, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Datum: Geodetic
Field Logged by: SW
Checked by: AR
Sheet: 1 of 1

Log of Borehole No. 4

Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773986
E: 617420

Soil-Mat

Depth (ft / m)	Elevation (m)	Symbol	Description	Well Data	SAMPLE Type	SAMPLE Number	SAMPLE Blow Counts	SAMPLE Blows/300mm	SAMPLE Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
ft / m	193.38		Ground Surface								
0 / 0	193.08		**Topsoil** Approximately 300 millimetres of topsoil.								
1 / 0			**Clayey Silt/Silty Clay** Brown, trace gravel and sand, firm to very stiff.		SS	1	2 3 4 7	7			
3 / 1					SS	2	3 6 9 14	15		>4.5	
6 / 2					SS	3	5 10 15 19	25		>4.5	
10 / 3					SS	4	6 9 11 12	20		>4.5	
16 / 5					SS	5	5 7 9 13	16		2.0	
18 / 5	187.80		End of Borehole Auger refusal on assumed bedrock								

Moisture Content w% (10 20 30 40)

Standard Penetration Test blows/300mm (20 40 60 80)

NOTES:

1. Borehole was advanced using solid stem auger equipment on January 14, 2020 to auger refusal on assumed bedrock at a depth of 5.6 metres.

2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: January 14, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Datum: Geodetic
Field Logged by: SW
Checked by: AR
Sheet: 1 of 1

Log of Borehole No. 5

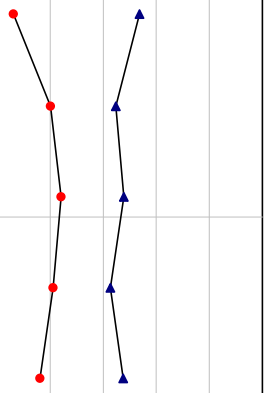
Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773930
E: 617479

Soil-Mat

Depth (ft / m)	Elevation (m)	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	193.55	Ground Surface								
0 / 0	193.25	**Topsoil** Approximately 300 millimetres of topsoil.		SS	1	0 3 3 6	6			
3 / 1		**Clayey Silt/Silty Clay** Brown, trace gravel and sand, firm to very stiff.		SS	2	5 8 12 17	20		>4.5	
6 / 2				SS	3	5 9 15 19	24		>4.5	
9 / 3				SS	4	5 9 12 16	21		>4.5	
11 / 3	189.90			SS	5	5 7 9 14	16		2.5	
12 / 4		End of Borehole NOTES: 1. Borehole was advanced using solid stem auger equipment on January 14, 2020 to termination at a depth of 3.7 metres. 2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903. 3. Soil samples will be discarded after 3 months unless otherwise directed by our client.								

Moisture Content w% (10 20 30 40)
Standard Penetration Test blows/300mm (20 40 60 80)



Drill Method: Solid Stem Augers
Drill Date: January 14, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

Soil-Mat Engineers & Consultants Ltd.
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Datum: Geodetic
Field Logged by: SW
Checked by: AR
Sheet: 1 of 1

Log of Borehole No. 6

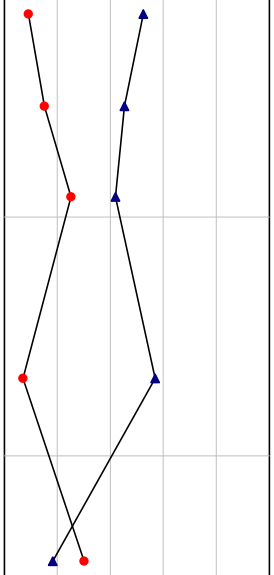
Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4774002
E: 617504

Soil-Mat

Depth (ft / m)	Elevation (m)	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	193.44	Ground Surface								
0 / 0	193.14	**Topsoil** Approximately 300 millimetres of topsoil.		SS	1	7 5 4 5	9			
3 / 1		**Clayey Silt/Silty Clay** Brown, trace gravel and sand, firm to very stiff.		SS	2	4 6 9 16	15		>4.5	
6 / 2				SS	3	5 9 16 24	25		>4.5	
10 / 3	190.40	Transition to grey colour		SS	4	2 3 4 6	7		1.5	
16 / 5				SS	5	5 14 16 19	30		1.5	
18 / 6	188.00	End of Borehole Auger refusal on assumed bedrock								

Moisture Content w% (10 20 30 40)
Standard Penetration Test blows/300mm (20 40 60 80)



NOTES:

1. Borehole was advanced using solid stem auger equipment on January 14, 2020 to auger refusal on assumed bedrock at a depth of 5.4 metres.

2. Borehole was recorded as open and 'wet' at a depth of 1.8 metres upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: January 14, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Datum: Geodetic
Field Logged by: SW
Checked by: AR
Sheet: 1 of 1

Log of Borehole No. 7

Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

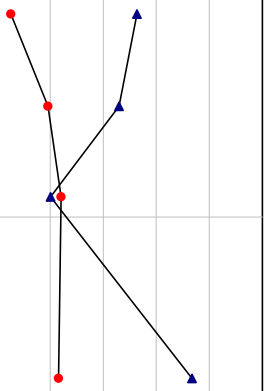
Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773923
E: 617565

Soil-Mat

Depth (ft)	Depth (m)	Elevation (m)	Description	Well Data	SAMPLE Type	SAMPLE Number	SAMPLE Blow Counts	SAMPLE Blows/300mm	SAMPLE Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		193.72	Ground Surface								
0	0	193.42	**Topsoil** Approximately 300 millimetres of topsoil.								
1–3	1		**Clayey Silt/Silty Clay** Brown, trace gravel and sand, firm to very stiff.		SS	1	2 2 3 7	5			
3–6	1–2				SS	2	5 7 12 14	19		>4.5	
6–10	2–3				SS	3	5 9 15 21	24		>4.5	
10–11	3	190.10			SS	4	6 10 12 20	22		2.5	
12–33	4–9		End of Borehole								

Moisture Content w% (10 20 30 40)

Standard Penetration Test blows/300mm (20 40 60 80)



NOTES:

1. Borehole was advanced using solid stem auger equipment on January 14, 2020 to termination at a depth of 3.6 metres.

2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: January 14, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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E: info@soil-mat.ca

Datum: Geodetic
Field Logged by: SW
Checked by: AR
Sheet: 1 of 1

Log of Borehole No. 8

Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

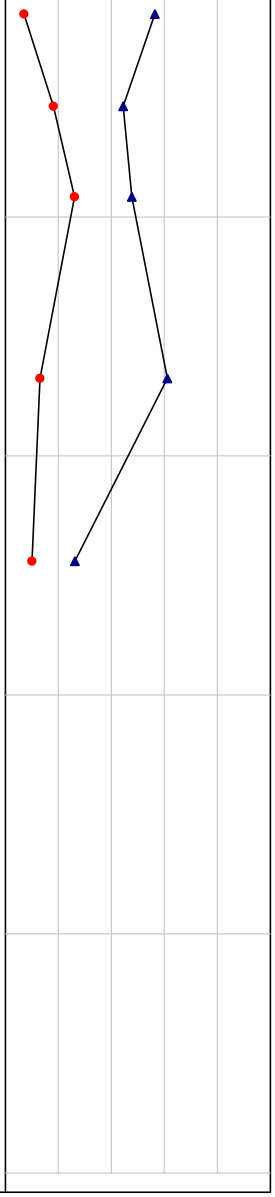
Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773895
E: 617608

Soil-Mat

Depth (ft / m)	Elevation (m)	Symbol	Description	Well Data	SAMPLE Type	SAMPLE Number	SAMPLE Blow Counts	SAMPLE Blows/300mm	SAMPLE Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
	193.21		Ground Surface								
0 / 0	192.96		**Topsoil** Approximately 250 millimetres of topsoil.		SS	1	2 3 4 5	7			
1 /			**Clayey Silt/Silty Clay** Brown, trace gravel and sand, firm to very stiff.		SS	2	4 7 11 16	18		>4.5	
2 /					SS	3	7 11 15 17	26		>4.5	
3 /					SS	4	4 5 8 9	13		>4.5	
4 /											
5 /	187.70		End of Borehole Auger refusal on assumed bedrock		SS	5	4 5 5 8	10		>4.5	
6 /											
7 /											
8 /											
9 /											

Moisture Content w% (10 20 30 40)

Standard Penetration Test blows/300mm (20 40 60 80)



NOTES:

1. Borehole was advanced using solid stem auger equipment on January 14, 2020 to auger refusal on assumed bedrock at a depth of 5.5 metres.

2. Borehole was recorded as open and 'wet' at a depth of 5.2 metres upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: January 14, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

Soil-Mat Engineers & Consultants Ltd.
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E: info@soil-mat.ca

Datum: Geodetic
Field Logged by: SW
Checked by: AR
Sheet: 1 of 1

Log of Borehole No. 9

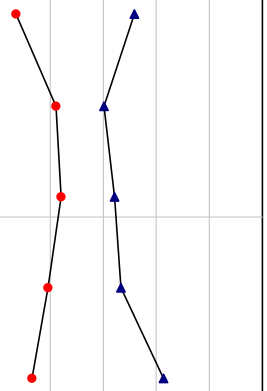
Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773839
E: 617566

Soil-Mat

Depth (ft)	Depth (m)	Elevation (m)	Description	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		191.88	Ground Surface							
0	0	191.63	**Topsoil** Approximately 250 millimetres of topsoil.							
1			**Clayey Silt/Silty Clay** Brown, trace gravel and sand, firm to very stiff.	SS	1	2 2 5 5	7			
2										
3	1			SS	2	5 9 13 19	22		>4.5	
4										
5										
6				SS	3	7 10 14 17	24		>4.5	
7	2									
8										
9				SS	4	6 8 11 16	19		3.0	
10	3									
11				SS	5	5 6 7 9	13		2.0	
12		188.20								
13	4		End of Borehole							
14			NOTES:							
15			1. Borehole was advanced using solid stem auger equipment on January 14, 2020 to termination at a depth of 3.6 metres.							
16										
17	5									
18			2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.							
19										
20	6		3. Soil samples will be discarded after 3 months unless otherwise directed by our client.							
21										
22										
23	7									
24										
25										
26	8									
27										
28										
29	9									
30										
31										
32										
33										

Moisture Content w% (10 20 30 40)
Standard Penetration Test blows/300mm (20 40 60 80)



Drill Method: Solid Stem Augers
Drill Date: January 14, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Datum: Geodetic
Field Logged by: SW
Checked by: AR
Sheet: 1 of 1

Log of Borehole No. 10

Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773766
E: 617539

Soil-Mat

Depth (ft / m)	Elevation (m)	Symbol	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	191.87		Ground Surface								
0 / 0	191.57		**Topsoil** Approximately 300 millimetres of topsoil.		SS	1	2,2,4,7	6			
3 / 1			**Clayey Silt/Silty Clay** Brown, trace gravel, firm to very stiff.		SS	2	5,9,13,19	22		>4.5	
6 / 2					SS	3	7,10,15,21	25		>4.5	
10 / 3					SS	4	3,6,9,12	15		3.75	
11 / 3	188.19		End of Borehole								

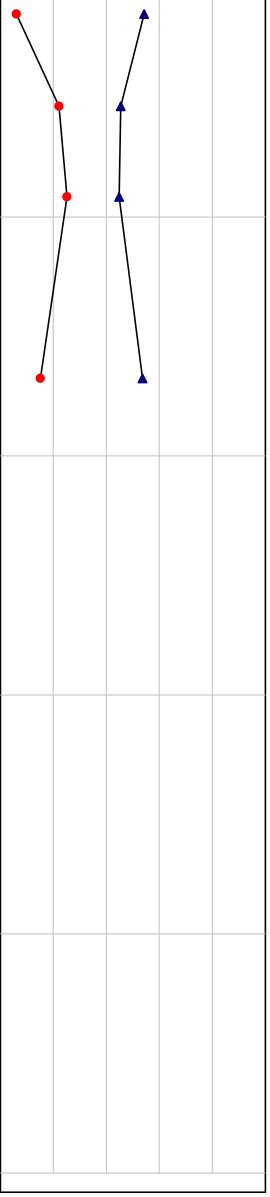
NOTES:

1. Borehole was advanced using solid stem auger equipment on January 14, 2020 to auger refusal on assumed bedrock at a depth of 3.6 metres.

2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Moisture Content w% (10 20 30 40)
Standard Penetration Test blows/300mm (20 40 60 80)



Drill Method: Solid Stem Augers
Drill Date: January 15, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Datum: Geodetic
Field Logged by: LC
Checked by: AR
Sheet: 1 of 1

Log of Borehole No. 11

Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773682
E: 617548

Soil-Mat

Depth (ft / m)	Elevation (m)	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)	Moisture Content w% (10 20 30 40) / Standard Penetration Test blows/300mm (20 40 60 80)
0 / 0	191.63	Ground Surface									
0–3 / 0–1	191.28	**Topsoil** Approximately 350 millimetres of topsoil.		SS	1	4 5 3 3	8				
3–5 / 1–1.5	190.11	**Clayey Silt/Silty Clay Fill** Brown, trace gravel, construction debris with organic inclusions, firm.		SS	2	2 5 7 12	12		>4.5		
5–15 / 1.5–4.5	187.06	**Clayey Silt/Silty Clay** Brown, trace gravel, firm to very stiff.		SS	3	7 11 18 24	29		>4.5		
				SS	4	8 10 14 18	24		>4.5		
				SS	5	5 7 10 13	17		3.5		
15 / 4.5		Transition to grey		SS	6	2 2 3 4	5		<1.0		
20–25 / 6–7.5	184.00	End of Borehole Auger refusal on assumed bedrock		SS	7	1 3 4 6	7		1.0		

NOTES:

1. Borehole was advanced using solid stem auger equipment on January 14, 2020 to auger refusal on assumed bedrock at a depth of 7.6 metres.

2. Borehole was recorded as open and 'wet' at a depth of 7.5 metres upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: January 15, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Sheet: 1 of 1

Log of Borehole No. 12

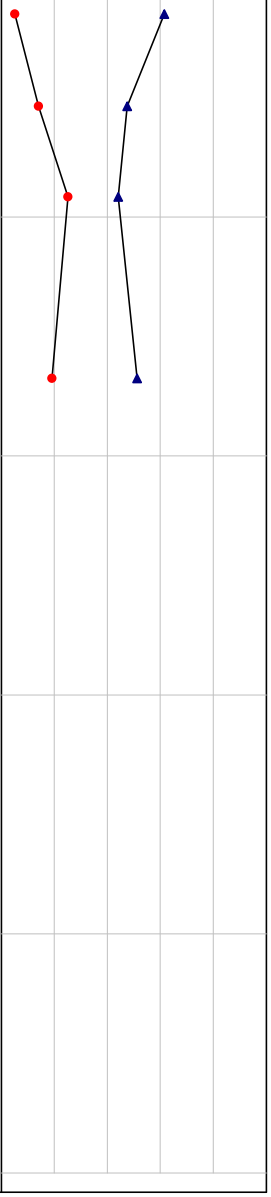
Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773604
E: 617575

Soil-Mat

Depth (ft)	Depth (m)	Elevation (m)	Description	Well Data	SAMPLE Type	SAMPLE Number	SAMPLE Blow Counts	SAMPLE Blows/300mm	SAMPLE Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0	0	191.85	Ground Surface								
0	0	191.60	**Topsoil** Approximately 250 millimetres of topsoil.		SS	1	1 2 3 5	5			
3	1	191.00	**Clayey Silt/Silty Clay Fill** Brown,trace gravel with organic inclusions, firm.		SS	2	3 6 8 11	14		>4.5	
6	2		**Clayey Silt/Silty Clay** Brown, trace gravel, stiff to very stiff.		SS	3	7 11 14 20	25		>4.5	
11	3	188.20			SS	4	4 8 11 15	19		4.5	
12	4		End of Borehole								

Moisture Content w% (10 20 30 40)
Standard Penetration Test blows/300mm (20 40 60 80)



NOTES:

1. Borehole was advanced using solid stem auger equipment on January 15, 2020 to termination at a depth of 3.6 metres.

2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: January 15, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Sheet: 1 of 1

Log of Borehole No. 13

Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773569
E: 617565

Soil-Mat

Depth (ft / m)	Elevation (m)	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
	191.68	Ground Surface								
0 / 0	191.38	**Topsoil** Approximately 300 millimetres of topsoil.								
2 / 1	190.90	**Clayey Silt/Silty Clay Fill** Brown, trace gravel with organic inclusions, firm.		SS	1	2 3 4 7	7			
				SS	2	3 7 10 14	17			
6 / 2		**Clayey Silt/Silty Clay** Brown, trace gravel, stiff to very stiff.		SS	3	6 9 16 20	25		>4.5	
		NOTES: 1. Borehole was advanced using solid stem auger equipment on January 15, 2020 to auger refusal on assumed bedrock at a depth of 8.5 metres. 2. Borehole was recorded as open and 'wet' at a depth of 5.8 metres upon completion and backfilled as per Ontario Regulation 903. 3. Soil samples will be discarded after 3 months unless otherwise directed by our client.		SS	4	4 6 9 12	15		4.5	
18 / 5	186.00	Transition to grey		SS	5	3 5 7 9	12		3.5	
22 / 6				SS	6	2 4 6 7	10		1.0	
26 / 8				SS	7	3 5 8 15	13		2.0	
28 / 9	183.10	End of Borehole Auger refusal on assumed bedrock								

Moisture Content w% (10 20 30 40)
Standard Penetration Test blows/300mm (20 40 60 80)

Drill Method: Solid Stem Augers
Drill Date: January 15, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Log of Borehole No. 14

Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

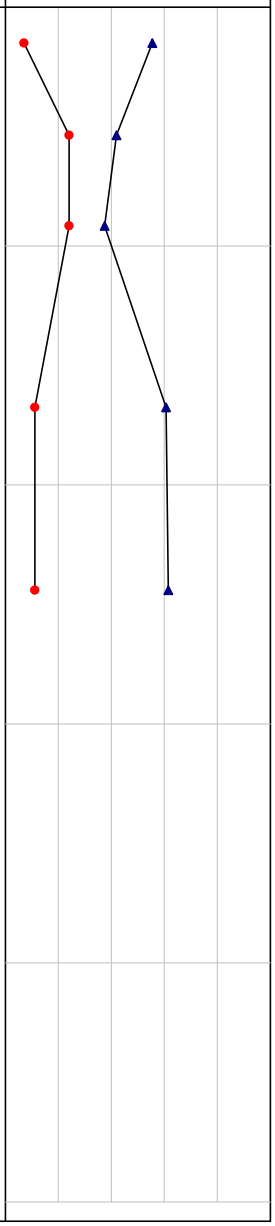
Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773759
E: 617448

Soil-Mat

Depth (ft)	Depth (m)	Elevation (m)	Description	Well Data	SAMPLE Type	SAMPLE Number	SAMPLE Blow Counts	SAMPLE Blows/300mm	SAMPLE Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		190.52	Ground Surface								
0	0	190.22	**Topsoil** Approximately 300 millimetres of topsoil.								
1–3	1		**Clayey Silt/Silty Clay** Brown, trace gravel, stiff to very stiff.		SS	1	2 2 5 7	7			
4–5					SS	2	6 10 14 18	24			
6–7	2				SS	3	5 9 15 20	24		>4.5	
8–10	3				SS	4	2 5 6 9	11		2.5	
11–13	4										
14–16	5				SS	5	2 5 6 8	11		1.5	
17–19		184.60									
20	6		End of Borehole Auger refusal on assumed bedrock								
21–33	7–9										

Moisture Content w% (10 20 30 40)

Standard Penetration Test blows/300mm (20 40 60 80)



NOTES:
1. Borehole was advanced using solid stem auger equipment on January 15, 2020 to auger refusal on assumed bedrock at a depth of 5.9 metres.

2. Borehole was recorded as open and 'wet' at a depth of 3.0 metres upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: January 15, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Checked by: AR
Sheet: 1 of 1

Log of Borehole No. 15

Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

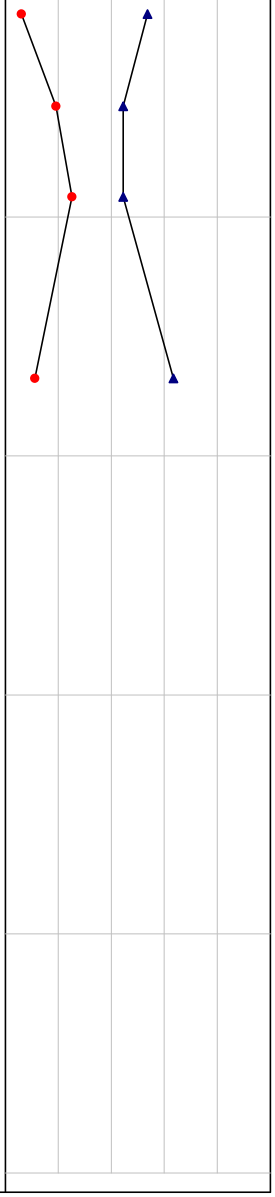
Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773829
E: 617442

Soil-Mat

Depth (ft)	Depth (m)	Elevation (m)	Description	Well Data	SAMPLE Type	SAMPLE Number	SAMPLE Blow Counts	SAMPLE Blows/300mm	SAMPLE Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		190.62	Ground Surface								
0	0	190.32	**Topsoil** Approximately 300 millimetres of topsoil.								
1			**Clayey Silt/Silty Clay** Brown, stiff to very stiff.		SS	1	2 2 4 6	6			
2											
3	1				SS	2	6 8 11 16	19		>4.5	
4											
5											
6	2				SS	3	6 11 14 16	25		>4.5	
7											
8											
9	3										
10											
11		187.00			SS	4	2 5 6 7	11		2.5	
12			End of Borehole								
13	4		NOTES:								
14											
15			1. Borehole was advanced using solid stem auger equipment on January 15, 2020 to termination at a depth of 3.7 metres.								
16											
17	5										
18			2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.								
19											
20	6		3. Soil samples will be discarded after 3 months unless otherwise directed by our client.								
21											
22											
23	7										
24											
25											
26	8										
27											
28											
29	9										
30											
31											
32											
33											

Moisture Content w%
10 20 30 40

Standard Penetration Test blows/300mm
20 40 60 80



Drill Method: Solid Stem Augers
Drill Date: January 15, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Sheet: 1 of 1

Log of Borehole No. 16

Project No: SM 190744-G
Project: Proposed Residential Development
Location: South Grimsby Road 5, Smithville
Client: Marz Homes

Project Manager: Adam Roemmele, P.Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4773817
E: 617359

Soil-Mat

Depth (ft / m)	Elevation (m)	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	190.62	Ground Surface								
0 / 0	190.32	**Topsoil** Approximately 300 millimetres of topsoil.								
1 / 0		**Clayey Silt/Silty Clay** Brown, trace gravel, stiff to very stiff.		SS	1	2 3 8 14	11			
2 / 1				SS	2	7 12 21 24	33		>4.5	
6 / 2				SS	3	7 12 16 20	28		>4.5	
11 / 3				SS	4	6 10 13 13	23		>4.5	
16 / 5				SS	5	3 6 8 12	14		3.0	
20 / 6	184.40			SS	6	50/"4	100			
		End of Borehole Spoon refusal								

Moisture Content w% (10 20 30 40)
Standard Penetration Test blows/300mm (20 40 60 80)

NOTES:

1. Borehole was advanced using solid stem auger equipment on January 15, 2020 to spoon refusal on assumed bedrock at a depth of 6.2 metres.

2. Borehole was recorded as open and 'wet' at a depth of 1.8 metres upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

4. A monitoring well was installed. The following free groundwater level readings have been measured:

Feb 13, 2020: 1.08m below existing grade

Drill Method: Solid Stem Augers
Drill Date: January 15, 2020
Hole Size: 150 millimeters
Drilling Contractor: Elite Drilling

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Sheet: 1 of 1

AGAT Laboratories

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CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT
130 LANCING DRIVE
HAMILTON, ON L8W3A1
(905) 318-7440

ATTENTION TO: Ian Shaw

PROJECT: 190744

AGAT WORK ORDER: 20T564177

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Jan 23, 2020

PAGES (INCLUDING COVER): 15

VERSION*: 1

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

NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 20T564177

PROJECT: 190744

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLING SITE:South Grimsby Road 5, Smithville

SAMPLED BY:Scott Wylie

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

DATE RECEIVED: 2020-01-15

DATE REPORTED: 2020-01-23

		SAMPLE DESCRIPTION:		BH2 SS2	BH5 SS2	BH8 SS2	BH12 SS3	BH16 SS3
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2020-01-14	2020-01-14	2020-01-14	2020-01-15	2020-01-15
Parameter	Unit	G / S	RDL	865822	865824	865828	871071	871072
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	5	5	5	5	5
Barium	µg/g	220	2	216	170	186	192	214
Beryllium	µg/g	2.5	0.5	0.8	0.9	0.9	1.0	1.1
Boron	µg/g	36	5	10	15	12	16	18
Boron (Hot Water Soluble)	µg/g	NA	0.10	<0.10	0.32	0.10	0.17	0.27
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	70	2	30	36	34	30	31
Cobalt	µg/g	21	0.5	13.9	16.1	15.9	15.1	16.1
Copper	µg/g	92	1	22	24	25	22	22
Lead	µg/g	120	1	11	14	13	13	11
Molybdenum	µg/g	2	0.5	<0.5	<0.5	<0.5	0.5	<0.5
Nickel	µg/g	82	1	30	36	34	33	33
Selenium	µg/g	1.5	0.4	0.4	<0.4	<0.4	0.6	<0.4
Silver	µg/g	0.5	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	1.3	1.1	1.1	1.0	1.1
Vanadium	µg/g	86	1	40	48	47	43	43
Zinc	µg/g	290	5	63	73	70	63	67
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.268	**0.603**	0.513	0.318	**1.92**
Sodium Adsorption Ratio	NA	2.4	NA	0.580	0.726	0.509	0.582	0.437
pH, 2:1 CaCl2 Extraction	pH Units		NA	8.00	7.92	7.89	7.92	7.78

Certified By: Vivine Basily

AGAT Laboratories

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AGAT WORK ORDER: 20T564177

PROJECT: 190744

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLING SITE:South Grimsby Road 5, Smithville

SAMPLED BY:Scott Wylie

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

DATE RECEIVED: 2020-01-15 **DATE REPORTED: 2020-01-23**

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
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.

865822-871072 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: Vivine Basily

AGAT Laboratories

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AGAT WORK ORDER: 20T564177

PROJECT: 190744

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLING SITE:South Grimsby Road 5, Smithville

SAMPLED BY:Scott Wylie

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

DATE RECEIVED: 2020-01-15 **DATE REPORTED: 2020-01-23**

		SAMPLE DESCRIPTION:		BH3 SS2	BH5 SS2	BH8 SS2	BH12 SS2	BH16 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2020-01-14	2020-01-14	2020-01-14	2020-01-15	2020-01-15
Parameter	**Unit**	**G / S**	**RDL**	**865823**	**865824**	**865828**	**871069**	**871070**
F1 (C6 to C10)	µg/g	25	5	<5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	25	5	<5	<5	<5	<5	<5
F2 (C10 to C16)	µg/g	10	10	<10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	240	50	<50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	120	50	<50	<50	<50	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g	120	50	NA	NA	NA	NA	NA
Moisture Content	%		0.1	16.8	18.6	18.0	18.5	15.4
Surrogate	**Unit**	**Acceptable Limits**						
Terphenyl	%	60-140		100	95	123	110	110

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
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.

865823-871070 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
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 without the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 20T564177

PROJECT: 190744

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLING SITE:South Grimsby Road 5, Smithville

SAMPLED BY:Scott Wylie

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2020-01-15 **DATE REPORTED: 2020-01-23**

		SAMPLE DESCRIPTION:		BH3 SS2	BH5 SS2	BH8 SS2	BH12 SS2	BH16 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2020-01-14	2020-01-14	2020-01-14	2020-01-15	2020-01-15
Parameter	Unit	G / S	RDL	865823	865824	865828	871069	871070
Dichlorodifluoromethane	µg/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Vinyl Chloride	ug/g	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bromomethane	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Trichlorofluoromethane	ug/g	0.25	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acetone	ug/g	0.5	0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methylene Chloride	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Trans- 1,2-Dichloroethylene	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methyl tert-butyl Ether	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethane	ug/g	0.05	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Methyl Ethyl Ketone	ug/g	0.5	0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Cis- 1,2-Dichloroethylene	ug/g	0.05	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chloroform	ug/g	0.05	0.04	<0.04	<0.04	<0.04	<0.04	<0.04
1,2-Dichloroethane	ug/g	0.05	0.03	<0.03	<0.03	<0.03	<0.03	<0.03
1,1,1-Trichloroethane	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Carbon Tetrachloride	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzene	ug/g	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
1,2-Dichloropropane	ug/g	0.05	0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Trichloroethylene	ug/g	0.05	0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Bromodichloromethane	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methyl Isobutyl Ketone	ug/g	0.5	0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/g	0.05	0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Toluene	ug/g	0.2	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibromochloromethane	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylene Dibromide	ug/g	0.05	0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Tetrachloroethylene	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1,1,2-Tetrachloroethane	ug/g	0.05	0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Chlorobenzene	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
m & p-Xylene	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 20T564177

PROJECT: 190744

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLING SITE:South Grimsby Road 5, Smithville

SAMPLED BY:Scott Wylie

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2020-01-15

DATE REPORTED: 2020-01-23

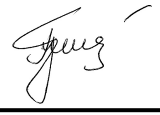
		SAMPLE DESCRIPTION:		BH3 SS2	BH5 SS2	BH8 SS2	BH12 SS2	BH16 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2020-01-14	2020-01-14	2020-01-14	2020-01-15	2020-01-15
Parameter	**Unit**	**G / S**	**RDL**	**865823**	**865824**	**865828**	**871069**	**871070**
Bromoform	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Styrene	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1,2,2-Tetrachloroethane	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
o-Xylene	ug/g		0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,3-Dichlorobenzene	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,4-Dichlorobenzene	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,2-Dichlorobenzene	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylene Mixture	ug/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,3-Dichloropropene (Cis + Trans)	µg/g	0.05	0.04	<0.04	<0.04	<0.04	<0.04	<0.04
n-Hexane	µg/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Surrogate	**Unit**	**Acceptable Limits**						
Toluene-d8	% Recovery	50-140		123	84	120	107	106
4-Bromofluorobenzene	% Recovery	50-140		90	90	90	102	100

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
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.

865823-871070 The sample was analyzed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 20T564177

PROJECT: 190744

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CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
865824	BH5 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	0.57	0.603
871072	BH16 SS3	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	0.57	1.92

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Quality Assurance

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 20T564177

PROJECT: 190744

ATTENTION TO: Ian Shaw

SAMPLING SITE:South Grimsby Road 5, Smithville

SAMPLED BY:Scott Wylie

Soil Analysis

RPT Date: Jan 23, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	865815		<0.8	<0.8	NA	< 0.8	128%	70%	130%	100%	80%	120%	88%	70%	130%
Arsenic	865815		3	3	NA	< 1	117%	70%	130%	103%	80%	120%	105%	70%	130%
Barium	865815		24	24	1.2%	< 2	113%	70%	130%	95%	80%	120%	97%	70%	130%
Beryllium	865815		<0.5	<0.5	NA	< 0.5	94%	70%	130%	111%	80%	120%	97%	70%	130%
Boron	865815		5	6	NA	< 5	96%	70%	130%	96%	80%	120%	87%	70%	130%
Boron (Hot Water Soluble)	865611		0.19	0.18	NA	< 0.10	98%	60%	140%	95%	70%	130%	91%	60%	140%
Cadmium	865815		<0.5	<0.5	NA	< 0.5	92%	70%	130%	99%	80%	120%	97%	70%	130%
Chromium	865815		9	9	NA	< 2	101%	70%	130%	100%	80%	120%	101%	70%	130%
Cobalt	865815		4.1	4.1	0.6%	< 0.5	97%	70%	130%	99%	80%	120%	97%	70%	130%
Copper	865815		14	14	3.5%	< 1	91%	70%	130%	105%	80%	120%	96%	70%	130%
Lead	865815		10	10	1.8%	< 1	104%	70%	130%	97%	80%	120%	91%	70%	130%
Molybdenum	865815		<0.5	<0.5	NA	< 0.5	93%	70%	130%	92%	80%	120%	93%	70%	130%
Nickel	865815		8	8	0.5%	< 1	97%	70%	130%	100%	80%	120%	96%	70%	130%
Selenium	865815		<0.4	<0.4	NA	< 0.4	122%	70%	130%	95%	80%	120%	98%	70%	130%
Silver	865815		<0.2	<0.2	NA	< 0.2	101%	70%	130%	100%	80%	120%	90%	70%	130%
Thallium	865815		<0.4	<0.4	NA	< 0.4	112%	70%	130%	98%	80%	120%	93%	70%	130%
Uranium	865815		<0.5	<0.5	NA	< 0.5	114%	70%	130%	96%	80%	120%	99%	70%	130%
Vanadium	865815		17	17	0.7%	< 1	102%	70%	130%	96%	80%	120%	95%	70%	130%
Zinc	865815		49	49	0.4%	< 5	101%	70%	130%	102%	80%	120%	105%	70%	130%
Chromium VI	865822	865822	< 0.2	< 0.2	0.0%	< 0.2	91%	80%	120%	91%	70%	130%	81%	70%	130%
Cyanide	865822	865822	<0.040	<0.040	NA	< 0.040	107%	70%	130%	106%	80%	120%	106%	70%	130%
Mercury	865815		<0.10	<0.10	NA	< 0.10	114%	70%	130%	100%	80%	120%	97%	70%	130%
Electrical Conductivity	862611		0.216	0.224	3.7%	< 0.005	100%	90%	110%						
Sodium Adsorption Ratio	862611		0.495	0.509	2.9%	NA									
pH, 2:1 CaCl2 Extraction	868510		8.22	8.18	0.5%	NA	100%	80%	120%						

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Certified By: Nivine Basily

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Quality Assurance

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 20T564177

PROJECT: 190744

ATTENTION TO: Ian Shaw

SAMPLING SITE:South Grimsby Road 5, Smithville

SAMPLED BY:Scott Wylie

Trace Organics Analysis

RPT Date: Jan 23, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - VOCs (Soil)															
Dichlorodifluoromethane	863284		< 0.05	< 0.05	NA	< 0.05	96%	50%	140%	94%	50%	140%	95%	50%	140%
Vinyl Chloride	863284		< 0.02	< 0.02	NA	< 0.02	101%	50%	140%	92%	50%	140%	84%	50%	140%
Bromomethane	863284		< 0.05	< 0.05	NA	< 0.05	96%	50%	140%	102%	50%	140%	91%	50%	140%
Trichlorofluoromethane	863284		< 0.05	< 0.05	NA	< 0.05	95%	50%	140%	104%	50%	140%	105%	50%	140%
Acetone	863284		< 0.50	< 0.50	NA	< 0.50	102%	50%	140%	100%	50%	140%	87%	50%	140%
1,1-Dichloroethylene	863284		< 0.05	< 0.05	NA	< 0.05	104%	50%	140%	106%	60%	130%	104%	50%	140%
Methylene Chloride	863284		< 0.05	< 0.05	NA	< 0.05	104%	50%	140%	109%	60%	130%	113%	50%	140%
Trans- 1,2-Dichloroethylene	863284		< 0.05	< 0.05	NA	< 0.05	102%	50%	140%	102%	60%	130%	103%	50%	140%
Methyl tert-butyl Ether	863284		< 0.05	< 0.05	NA	< 0.05	116%	50%	140%	107%	60%	130%	109%	50%	140%
1,1-Dichloroethane	863284		< 0.02	< 0.02	NA	< 0.02	104%	50%	140%	111%	60%	130%	113%	50%	140%
Methyl Ethyl Ketone	863284		< 0.50	< 0.50	NA	< 0.50	99%	50%	140%	100%	50%	140%	97%	50%	140%
Cis- 1,2-Dichloroethylene	863284		< 0.02	< 0.02	NA	< 0.02	103%	50%	140%	107%	60%	130%	120%	50%	140%
Chloroform	863284		< 0.04	< 0.04	NA	< 0.04	115%	50%	140%	115%	60%	130%	114%	50%	140%
1,2-Dichloroethane	863284		< 0.03	< 0.03	NA	< 0.03	108%	50%	140%	120%	60%	130%	102%	50%	140%
1,1,1-Trichloroethane	863284		< 0.05	< 0.05	NA	< 0.05	114%	50%	140%	119%	60%	130%	110%	50%	140%
Carbon Tetrachloride	863284		< 0.05	< 0.05	NA	< 0.05	102%	50%	140%	102%	60%	130%	94%	50%	140%
Benzene	863284		< 0.02	< 0.02	NA	< 0.02	113%	50%	140%	110%	60%	130%	106%	50%	140%
1,2-Dichloropropane	863284		< 0.03	< 0.03	NA	< 0.03	89%	50%	140%	109%	60%	130%	118%	50%	140%
Trichloroethylene	863284		< 0.03	< 0.03	NA	< 0.03	101%	50%	140%	99%	60%	130%	106%	50%	140%
Bromodichloromethane	863284		< 0.05	< 0.05	NA	< 0.05	89%	50%	140%	102%	60%	130%	109%	50%	140%
Methyl Isobutyl Ketone	863284		< 0.50	< 0.50	NA	< 0.50	80%	50%	140%	118%	50%	140%	85%	50%	140%
1,1,2-Trichloroethane	863284		< 0.04	< 0.04	NA	< 0.04	99%	50%	140%	107%	60%	130%	96%	50%	140%
Toluene	863284		< 0.05	< 0.05	NA	< 0.05	119%	50%	140%	117%	60%	130%	119%	50%	140%
Dibromochloromethane	863284		< 0.05	< 0.05	NA	< 0.05	75%	50%	140%	81%	60%	130%	74%	50%	140%
Ethylene Dibromide	863284		< 0.04	< 0.04	NA	< 0.04	93%	50%	140%	100%	60%	130%	113%	50%	140%
Tetrachloroethylene	863284		< 0.05	< 0.05	NA	< 0.05	104%	50%	140%	103%	60%	130%	101%	50%	140%
1,1,1,2-Tetrachloroethane	863284		< 0.04	< 0.04	NA	< 0.04	70%	50%	140%	74%	60%	130%	74%	50%	140%
Chlorobenzene	863284		< 0.05	< 0.05	NA	< 0.05	94%	50%	140%	95%	60%	130%	108%	50%	140%
Ethylbenzene	863284		< 0.05	< 0.05	NA	< 0.05	97%	50%	140%	98%	60%	130%	107%	50%	140%
m & p-Xylene	863284		< 0.05	< 0.05	NA	< 0.05	101%	50%	140%	101%	60%	130%	110%	50%	140%
Bromoform	863284		< 0.05	< 0.05	NA	< 0.05	107%	50%	140%	106%	60%	130%	104%	50%	140%
Styrene	863284		< 0.05	< 0.05	NA	< 0.05	87%	50%	140%	87%	60%	130%	102%	50%	140%
1,1,2,2-Tetrachloroethane	863284		< 0.05	< 0.05	NA	< 0.05	89%	50%	140%	93%	60%	130%	113%	50%	140%
o-Xylene	863284		< 0.05	< 0.05	NA	< 0.05	98%	50%	140%	98%	60%	130%	113%	50%	140%
1,3-Dichlorobenzene	863284		< 0.05	< 0.05	NA	< 0.05	94%	50%	140%	92%	60%	130%	108%	50%	140%
1,4-Dichlorobenzene	863284		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	89%	60%	130%	105%	50%	140%
1,2-Dichlorobenzene	863284		< 0.05	< 0.05	NA	< 0.05	88%	50%	140%	88%	60%	130%	107%	50%	140%
1,3-Dichloropropene (Cis + Trans)	863284		< 0.04	< 0.04	NA	< 0.04	87%	50%	140%	97%	60%	130%	98%	50%	140%
n-Hexane	863284		< 0.05	< 0.05	NA	< 0.05	103%	50%	140%	106%	60%	130%	102%	50%	140%

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Quality Assurance

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 20T564177

PROJECT: 190744

ATTENTION TO: Ian Shaw

SAMPLING SITE:South Grimsby Road 5, Smithville

SAMPLED BY:Scott Wylie

Trace Organics Analysis (Continued)

RPT Date: Jan 23, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)															
F1 (C6 to C10)	867013		< 5	< 5	NA	< 5	97%	60%	130%	98%	85%	115%	74%	70%	130%
F2 (C10 to C16)	864633		< 10	< 10	NA	< 10	119%	60%	130%	80%	80%	120%	85%	70%	130%
F3 (C16 to C34)	864633		< 50	< 50	NA	< 50	104%	60%	130%	81%	80%	120%	98%	70%	130%
F4 (C34 to C50)	864633		< 50	< 50	NA	< 50	96%	60%	130%	116%	80%	120%	103%	70%	130%

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:

AGAT Laboratories

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Method Summary

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 20T564177

PROJECT: 190744

ATTENTION TO: Ian Shaw

SAMPLING SITE:South Grimsby Road 5, Smithville

SAMPLED BY:Scott Wylie

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
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	EPA SW 846 6010C; 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 VI	INOR-93-6068	SW 846 Method 3060A; Method 7196A	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 20T564177

PROJECT: 190744

ATTENTION TO: Ian Shaw

SAMPLING SITE:South Grimsby Road 5, Smithville

SAMPLED BY:Scott Wylie

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method, SW846 5035	P&T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method, SW846 5035	P&T GC/FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	CCME Tier 1 Method	GC/FID
Dichlorodifluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Vinyl Chloride	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Bromomethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Acetone	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Trans- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Cis- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Chloroform	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Benzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Toluene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Bromoform	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Styrene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Xylene Mixture	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,3-Dichloropropene (Cis + Trans)	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
n-Hexane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS

AGAT Laboratories

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MISSISSAUGA, ONTARIO
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TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 20T564177

PROJECT: 190744

ATTENTION TO: Ian Shaw

SAMPLING SITE:South Grimsby Road 5, Smithville

SAMPLED BY:Scott Wylie

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
4-Bromofluorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS

AGAT Laboratories
5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
www.agatlabs.com webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Laboratory Use Only
Work Order #: 20T564177
Cooler Quantity: 1 cm
Arrival Temperatures: 6.8 | 7.8 | 7.2 / 5.5 | 4.8 | 5.2
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: Ice

Report Information:
Company: Soil-Mat
Contact: Ian Shaw
Address: 130 Lancing Drive, Hamilton, ON
Phone: 905-318-7440 Fax:
Reports to be sent to:
1. Email: aroemmele@soilmat.ca
2. Email: swylie@soilmat.ca

Project Information:
Project: 190744
Site Location: South Grimsby Road 5, Smithville
Sampled By: Scott Wylie
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:

Regulatory Requirements:
☐ No Regulatory Requirement
(Please check all applicable boxes)

☑ Regulation 153/04
Table ____ (Indicate One)
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture (Check One)
☐ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region ____ (Indicate One)

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other ____ (Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:
Regular TAT ☑ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day
OR Date Required (Rush Surcharges May Apply): 5 DAY
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Sample Matrix Legend
B Biota
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	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr6+ ☐ EC ☐ FOC ☐ NO_3/NO_2 ☐ Total N ☐ Hg ☐ pH ☐ SAR	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2	Volatiles: ☑ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use	Corrosivity Package
BH2 SS2	Jan 14/20	PM	1	Soil		☑															
BH3 SS2	Jan 14/20	AM	2	Soil								☑	☑								
BH5 SS5	Jan 14/20	PM	3	Soil		☑						☑	☑								
BH8 SS2	Jan 14/20	AM	3	Soil		☑						☑	☑								

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Ross Mackie	Jan 15/20	1:00	John Chypyha	Jan 15	1:00
Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
			John Chypyha	Jan 15	4:00

Page 1 of 1
N°:

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AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

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: SOIL-MAT
Contact: Scott
Address: 130 Lancing Dr. Hamilton
Phone: Fax:
Reports to be sent to:
1. Email: SWylie@soilmat.ca.
2. Email: ARoemmele@soilmat.ca

Project Information:

Project: 190744
Site Location: South Grimsby Road 5
Sampled By: Lianne Crawford
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:

Regulatory Requirements:

☐ No Regulatory Requirement
(Please check all applicable boxes)

☒ Regulation 153/04
Table 1 *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☐ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region *Indicate One*
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
Indicate One

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Laboratory Use Only

Work Order #:
Cooler Quantity: 1 3m
Arrival Temperatures: 7.8 | 7.6 | 7.4 / 6.4 | 6.4 | 6.4
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: Ice

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

Sample Matrix Legend

B	Biota
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	O. Reg 153: Metals and Inorganics	O. Reg 153: All Metals ☐ 153 Metals (excl. Hydrides)	O. Reg 153: Hydride Metals ☐ 153 Metals (Incl. Hydrides)	O. Reg 153: ORPs: ☐ B-HWS ☐ Cl ☐ CN	O. Reg 153: ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg	O. Reg 153: ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN	☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use						Potentially Hazardous or High Concentration (Y/N)
BH12-SS2	Jan15	am.	2	S														X	X												
BH16-SS2	Jan15	pm	2	S														X	X												
BH12-SS3	Jan15	am	1	S				X																							
BH16-SS3	Jan15	pm	1	S				X																							

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Ross	Jan17/20	1135			
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
			John Chypyha	Jan17	11:40
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
			John Chypyha	Jan17	4:10

Page 1 of 1
N°: T098332

Document ID: DIV-78-1511 016

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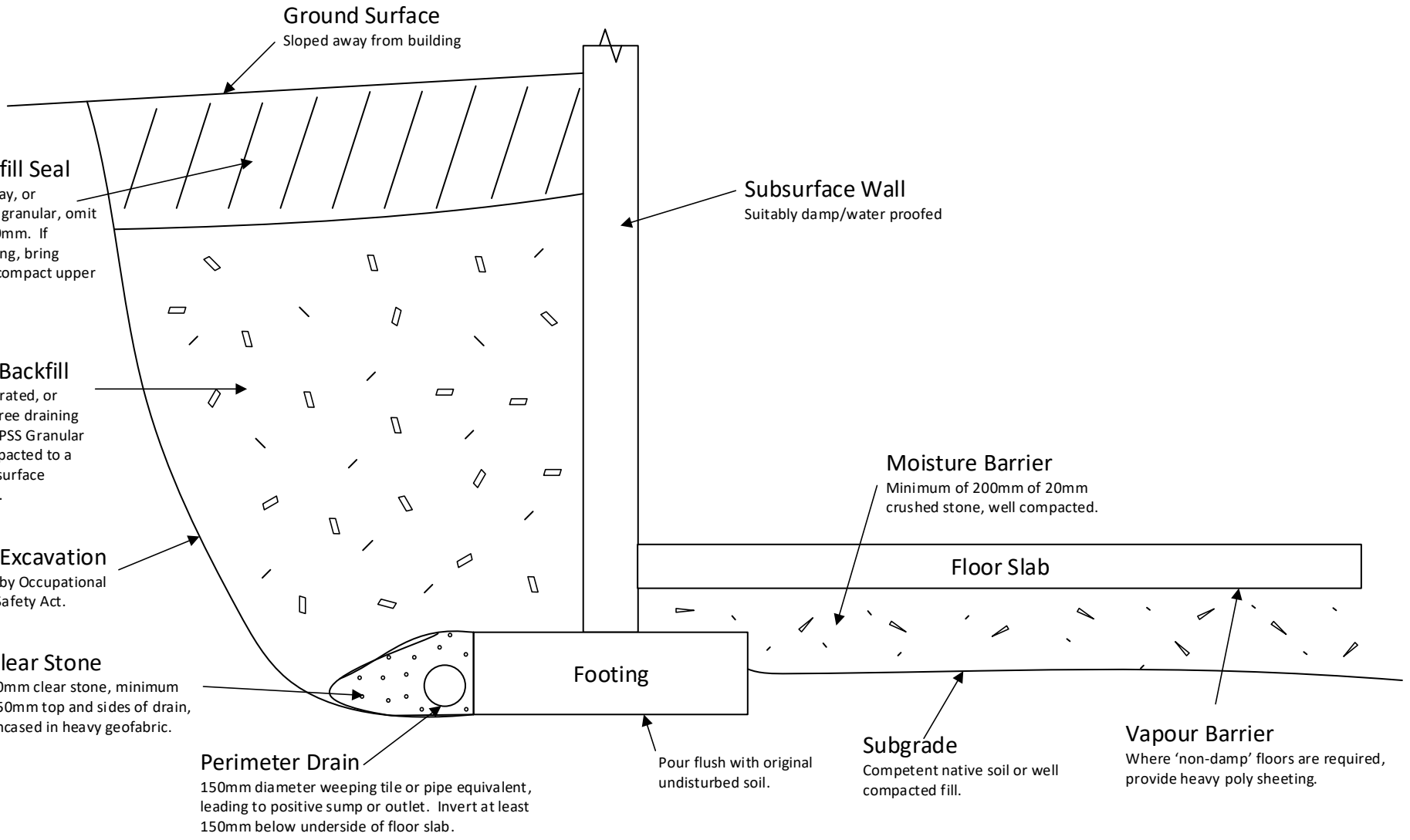
Date Issued: March 22, 2019



NOT TO SCALE

Soil-Mat

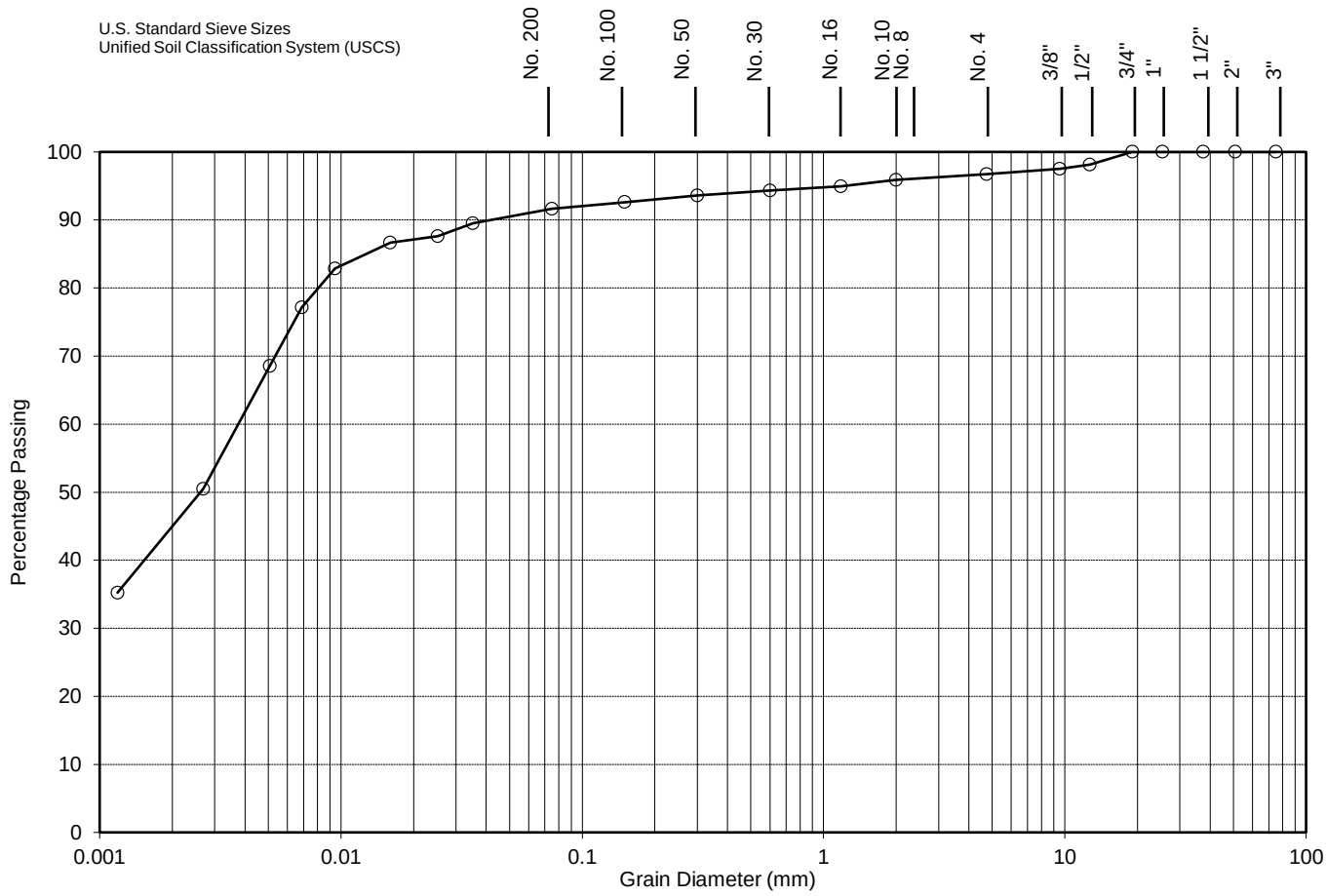
Soil-Mat Engineers & Consultants Ltd.

Project No.:	SM 190744-G
Date:	February, 2020

Typical Design Requirements
Drainage and Backfill for Basement Walls

Drawing No. 2

Mechanical & Hydrometer Analyses



CLAY	SILT	FINE	MEDIUM	COARSE	FINE	COARSE
		SAND			GRAVEL	

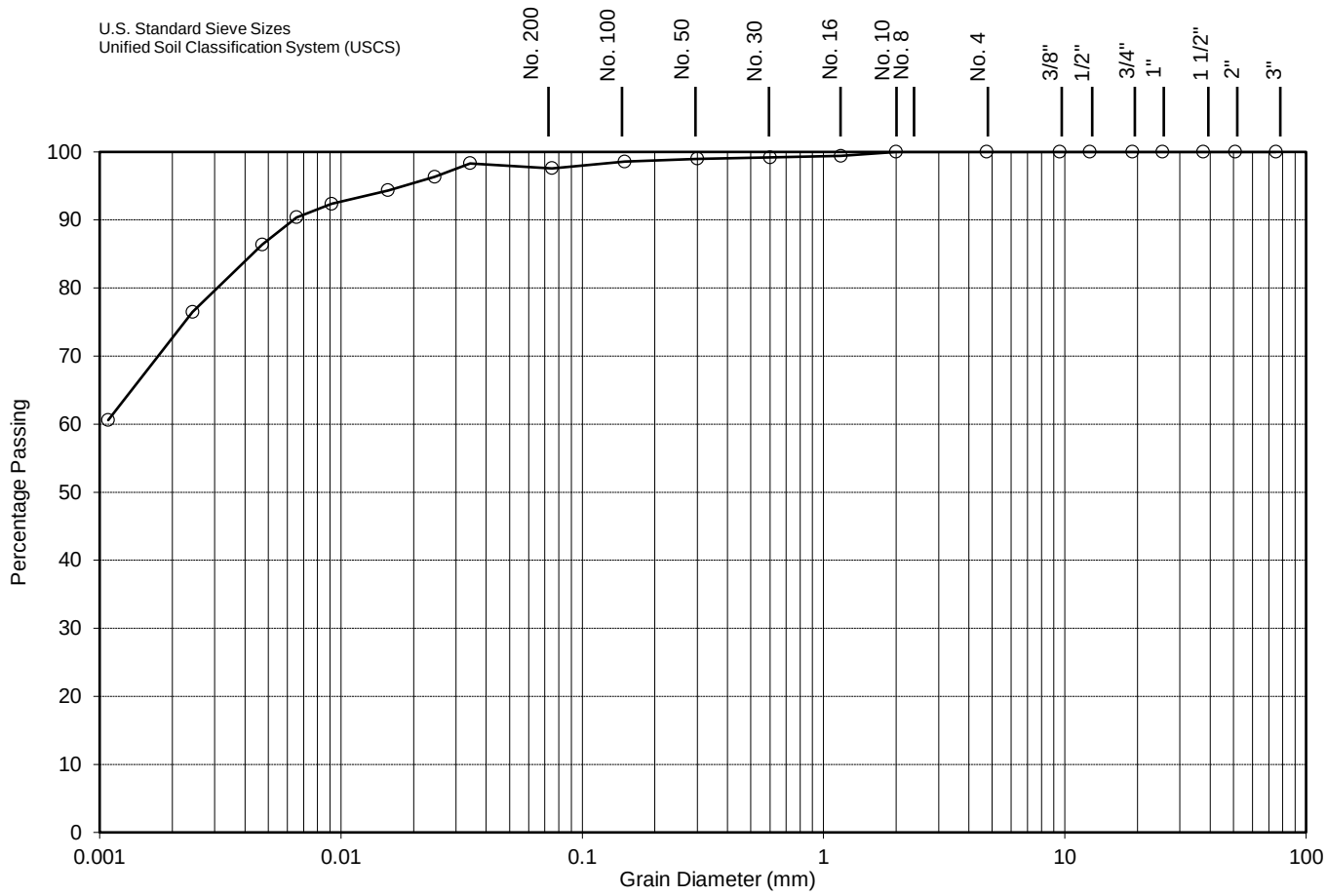
Lab No.:	**028-20**	Notes: Depth 7.5'			
Sample No.:	4				
Borehole No.:	1				
CLAY [%]:	**45**	Soil Description:	**Brown Clay and Silt w/ traces of Sand and Gravel**		
SILT [%]:	**47**		**C.L. - Inorganic clays of low to medium plasticity, silty clays**		
SAND [%]:	**5**		**to M.L. - Inorganic silts, clayey silts with slight plasticity**		
GRAVEL [%]:	**3**	Estimated Infiltration Rate [mil/hr] :	**< 10**	Estimated Permeability, k [cm/s]	**10^{-7}**
D_{10} (Effective Diam. in mm):	**0.0005**	Coefficient of Uniformity C_U:	**7.6**	Coefficient of Curvature C_C:	**0.5**

SOIL-MAT ENGINEERS & CONSULTANTS LTD.

S. Grimsby Rd 5, Smithville, Ontario

January 2020	**Grain Size Analysis No. 1**	**Project No.: SM 190744-T**

Mechanical & Hydrometer Analyses



CLAY	SILT	FINE	MEDIUM	COARSE	FINE	COARSE
		SAND			GRAVEL	

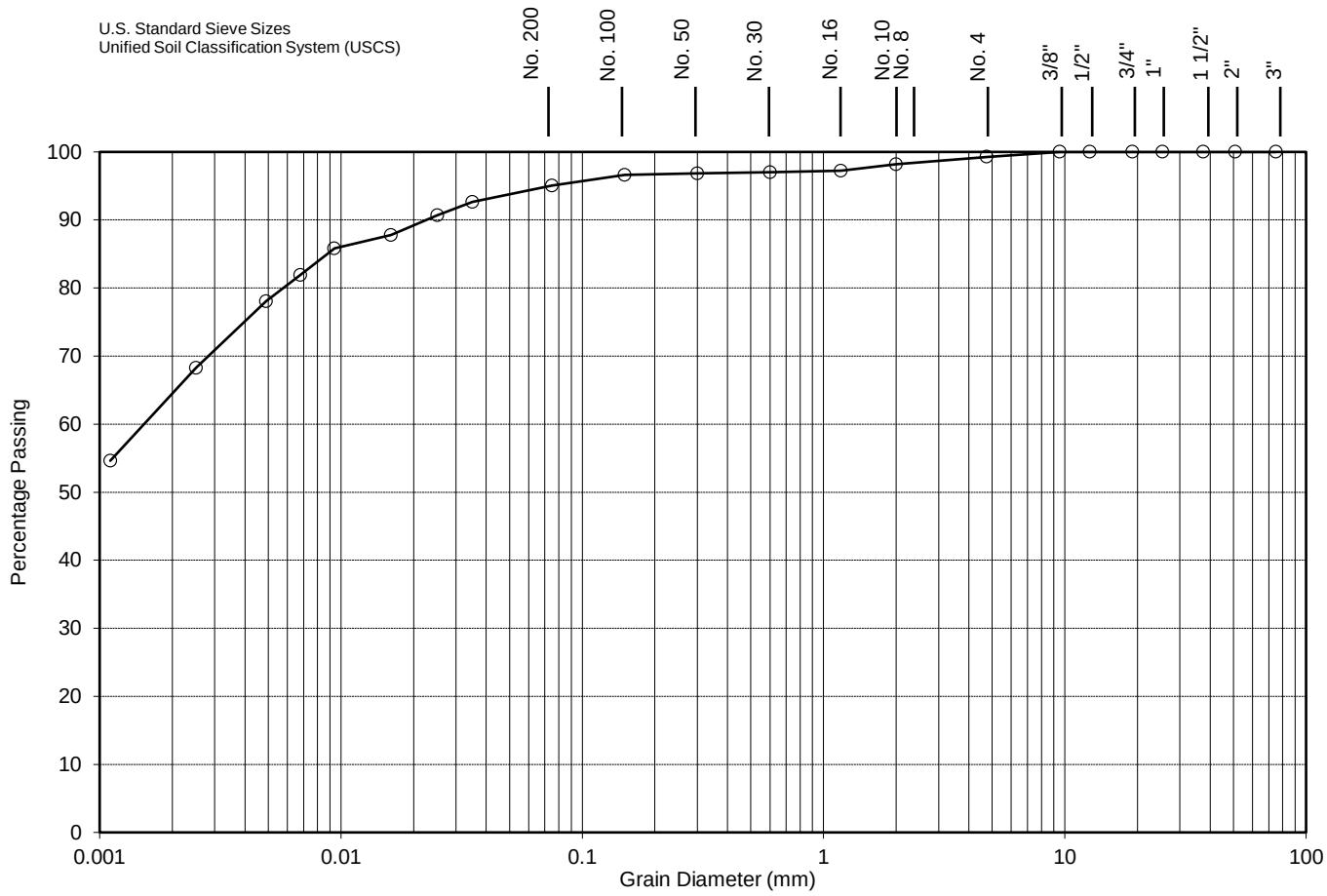
Lab No.:	**030-20**	Notes: Depth 5'	
Sample No.:	3		
Borehole No.:	10		
CLAY [%]:	**72**	Soil Description: **Brown Silty Clay w/ traces of Sand**	
SILT [%]:	**26**	**C.L. - Inorganic clays of low to medium plasticity, silty clays**	
SAND [%]:	**2**		
GRAVEL [%]:	**0**	Estimated Infiltration Rate [mil/hr] : **< 10**	Estimated Permeability, k [cm/s] **10^{-8}**
D_{10} (Effective Diam. in mm):	**0.0002**	Coefficient of Uniformity C_U: **6.0**	Coefficient of Curvature C_C: **1.0**

SOIL-MAT ENGINEERS & CONSULTANTS LTD.

S. Grimsby Rd 5, Smithville, Ontario

January 2020	**Grain Size Analysis No. 3**	**Project No.: SM 190744-T**

Mechanical & Hydrometer Analyses



CLAY	SILT	FINE	MEDIUM	COARSE	FINE	COARSE
		SAND			GRAVEL	

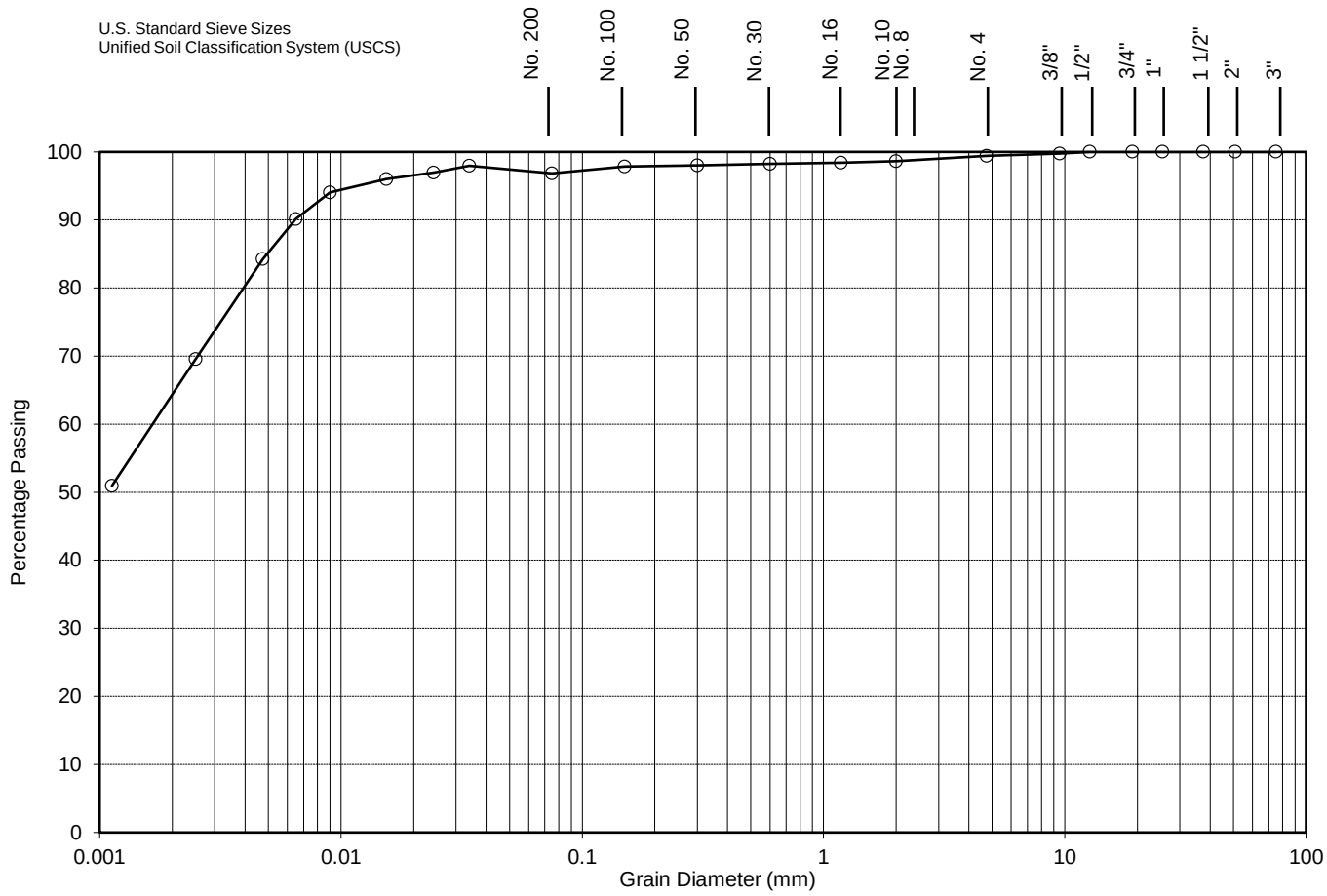
Lab No.:	**031-20**	Notes: Depth 7.5'			
Sample No.:	4				
Borehole No.:	11				
CLAY [%]:	**65**	Soil Description:	**Brown Silty Clay w/ traces of Sand and Gravel**		
SILT [%]:	**30**		**C.L. - Inorganic clays of low to medium plasticity, silty clays**		
SAND [%]:	**4**				
GRAVEL [%]:	**1**	Estimated Infiltration Rate [mil/hr] :	**< 10**	Estimated Permeability, k [cm/s]	**10^{-8}**
D_{10} (Effective Diam. in mm):	**0.0002**	Coefficient of Uniformity C_U:	**7.5**	Coefficient of Curvature C_C:	**0.8**

SOIL-MAT ENGINEERS & CONSULTANTS LTD.

S. Grimsby Rd 5, Smithville, Ontario

January 2020	**Grain Size Analysis No. 4**	**Project No.: SM 190744-T**

Mechanical & Hydrometer Analyses



CLAY	SILT	FINE	MEDIUM	COARSE	FINE	COARSE
		SAND			GRAVEL	

Lab No.:	**029-20**	Notes: Depth 5'			
Sample No.:	3				
Borehole No.:	16				
CLAY [%]:	**65**	Soil Description:	**Brown Silty Clay w/ traces of Sand and Gravel**		
SILT [%]:	**32**		**C.L. - Inorganic clays of low to medium plasticity, silty clays**		
SAND [%]:	**2**				
GRAVEL [%]:	**1**	Estimated Infiltration Rate [mil/hr] :	**< 10**	Estimated Permeability, k [cm/s]	**10^{-8}**
D_{10} (Effective Diam. in mm):	**0.0002**	Coefficient of Uniformity C_U:	**8.5**	Coefficient of Curvature C_C:	**1.9**

SOIL-MAT ENGINEERS & CONSULTANTS LTD.

S. Grimsby Rd 5, Smithville, Ontario

January 2020	**Grain Size Analysis No. 2**	**Project No.: SM 190744-T**