Geomaple Geotechnics Inc.

GEOTECHNICAL INVESTIGATION REPORT
PROPOSED RESIDENTIAL DEVELOPMENT
161 HEATHWOOD HEIGHTS DRIVE
AURORA, ONTARIO
L4G 4X2

Prepared for:

Mr. Kamran Rzayev
161 Heathwood Heights Drive
Aurora, Ontario
L4G 4X2

Prepared by:

Geomaple Geotechnics Inc.
60 Green Lane, Unit 12A
Thornhill, Ontario
L3T 7P5

Date: March 7, 2025

Project No.: 2024-10-150

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1 INTRODUCTION

Geomaple Geotechnics Inc. (Geomaple) was retained by Mr. Kamran Rzayev (the Client) to conduct a geotechnical investigation for the proposed residential development at 161 Heathwood Heights Drive, Aurora, Ontario.

This report presents the results of the geotechnical investigation conducted at the subject site to determine the prevailing subsurface soil and groundwater conditions, and based on this information, provides geotechnical engineering recommendations for the design of building foundations, basement floor, excavation, backfill, site servicing, pavement, seismic site classifications and shoring design.

Geomaple was also retained to carry out a hydrogeological study at the site, the result of which is reported under a separate cover.

2 SITE AND PROJECT DESCRIPTION

The site is located at the southeast quadrant of the intersection of Bathurst Street and St. John's Sideroad, in the Town of Aurora, Ontario. The general location of the site is shown in Figure 1 in Appendix A.

The site currently features a single storey detached dwelling slated for demolition. The proposed development plan involves subdividing the property into five individual lots, with each lot designated for the construction of a two-storey detached dwelling.

The proposed site plan, prepared by Arcica Inc. dated January 31, 2025, was provided by the client.

3 PROCEDURE

The field investigation of the site was conducted on November 21, 2024, which consisted of drilling and sampling of six (6) boreholes at the site, five (5) boreholes to a depth of about 5 m and one (1) deep borehole to a depth of 12.2 m.

The approximate borehole locations are shown in Figure 2 in Appendix A. The results of the boreholes are recorded in detail on the Borehole Logs in Appendix B.

The borehole surface elevations noted on the enclosed Borehole Logs are taken from the Survey drawing provided by the client. The borehole surface elevations are provided only for relating borehole soil stratigraphy and should not be used or relied on for other purposes.

The boring was drilled by a specialist drilling subcontractor using a track-mounted drill rig power auger and was sampled with conventional 25 mm diameter split barrel samplers when the Standard Penetration Test (SPT) was carried out (ASTM D1586). The boreholes were equipped with a 50 mm diameter well for groundwater level monitoring. The fieldwork (drilling, sampling, and testing) was observed and recorded by a member of our engineering staff, who logged the boring and examined the samples as they were obtained.

All samples obtained during the investigation were sealed into clean plastic bags and transported to our office for detailed inspection and testing. The samples were examined (tactile) in detail by our staff and classified according to visual and index properties.

The geotechnical laboratory testing consisted of water content determination as well as Sieve and Hydrometer Analysis on selected soil samples. The laboratory test results of individual samples are plotted on the Borehole Logs at respective sampling depths, and presented in Appendix C.

Monitoring wells consisting of 50 mm diameter PVC tubing were installed in the boreholes for groundwater level monitoring. The results are summarized in Section 4.2 of this report.

4 SUBSURFACE CONDITIONS

It should be noted that soil and groundwater conditions are confirmed at the borehole locations only and may vary at other locations. The stratigraphic boundaries as shown on the Borehole Logs represent an inferred transition between various strata, rather than a precise plane of geologic change.

4.1 Stratigraphy

The borehole results are summarized below and recorded on the accompanying Borehole Logs. This summary is intended to correlate this data to assist in the interpretation of the subsurface conditions at the site.

In summary, below the surficial layer of topsoil, the boreholes encountered undisturbed native glacial till deposit extending to the full depth of investigation.

4.1.1 Glacial Till

Below the topsoil, a layer of undisturbed native glacial till deposit was encountered extending to the full depth of investigation in all boreholes. The composition of the till varied from sandy silt to silty sand at the top, to clayey silt to silty clay at the middle, and to silty sand at the lower portion of the glacial deposit.

The samples obtained from the till layer loose to very dense for the silty sand to sandy silt layers, and soft to very stiff for the clayey silt to silty clay layer representing Standard Penetration Test results (‘N’ Values) of 2 to 92 blows per 300 mm of penetration and 50 blows per 75 to 100 mm of penetration.

It should be noted that the glacial till the deposit is likely to contain larger particles (cobbles and boulders) that are not specifically identified in the borehole. The size and distribution of such obstructions cannot be predicted with borings, because the borehole sampler size is insufficient to secure representative samples for particles of this size.

4.2 Groundwater

Stabilized groundwater levels were measured on March 07, 2024, in the monitoring wells installed in the boreholes. The following table summarizes the results of groundwater level measurement:

Borehole No.	Borehole Surface Elevation (m)	Stabilized Groundwater Level On November 29, 2024	
		Depth (m)	Elevation (m)
BH1	305.6	Dry	Dry
BH2	306.2	Dry	Dry
BH3	308.5	Dry	Dry
BH4	305.0	Dry	Dry
BH5	305.9	6.6	299.3
BH6	308.8	Dry	Dry

The stabilized groundwater level at the site was at about Elev. 299.3 m. It should be noted that the groundwater levels may fluctuate seasonally depending on the amount of precipitation and surface runoff. Wet soils may be encountered to about 0.6 m above the groundwater level in the cohesive deposits.

5 DISCUSSION AND RECOMMENDATIONS

The following discussion and recommendations are based on the factual data obtained from this investigation and are intended for use by the owner and the design engineer. The contractors bidding or providing services on this project should review the factual data and determine their own conclusions regarding construction methods and scheduling.

This report is provided based on these terms of reference and the assumption that the design features relevant to the geotechnical analyses will follow applicable codes, standards, and guidelines of practice. The pertinent sections of the Ontario Building Code may require additional considerations above and beyond the recommendations provided in this report. Suppose there are any changes to the site development features, or there is any additional information relevant to the interpretations made of the subsurface information concerning the geotechnical analyses or other recommendations. In that case, Geomaple should be retained to review the implications of these changes for the contents of this report.

5.1 Foundations

Based on the borehole data the site is underlain by glacial till deposit varying in composition from silty sand to silty clay. The upper portion of the till deposit comprising sandy silt to silty sand matrix was generally loose extending to about 1.2 to 2.0 m depth below grade. Below it, a layer of firm to stiff cohesive till was encountered comprising a clayey silt to silty clay matrix, extending to a depth of 2.8 to 3.5 m below grade. The cohesive till was not encountered in BH5. Underlying the upper till in BH5 and the middle cohesive layer in other boreholes, a layer of compact to very dense silty sand till was encountered, extending to the full depth of investigation.

The upper sandy silt to silty sand, and the middle cohesive till layers are not suitable to support the proposed house foundation. The foundations should be supported on the underlying compact to very dense silty sand till layer.

The table below provides the highest founding elevation and the associated soil bearing capacity values for each lot, based the borehole data. These values may be used for the design of conventional spread footing foundations (subjected to vertical and concentric loads) bearing on undisturbed native soil deposits at the founding levels indicated in the table.

Lot No.	Highest Founding Elevation (m)	Founding Soil	Soil Bearing Capacity (kPa)	
			Serviceability Limit States (SLS)	Ultimate Limit States (ULS)
Lot 1	304.4	Clayey silt to silty clay till	50	75
	302.1	Silty sand till	200	300
Lot 2	305.0	Clayey silt to silty clay till	50	75
	303.5	Silty sand till	200	300
Lot 3	304.5	Clayey silt to silty clay till	50	75
	303.7	Silty sand till	200	300
Lot 4	304.5	Clayey silt to silty clay till	50	75
	303.9	Silty sand till	200	300
Lot 5	307.0	Clayey silt to silty clay till	50	75
	305.9	Silty sand till	200	300

All foundations must be designed to bear at least a minimum of 0.3 m into the undisturbed native soil strata. The foundation level noted above accounts for this 0.3 m embedment. All exterior foundations and foundations in unheated areas should be provided with a minimum of 1.2 m of earth cover for frost protection or alternative equivalent insulation.

The minimum width of the continuous strip footings must be 600 mm, and the minimum size of isolated footings must be 1000 mm x 1000 mm regardless of loading considerations, in conjunction with the above recommended geotechnical resistance. The geotechnical resistance(s) as recommended allow for up to 25 mm of total settlement. This settlement will occur as the load is applied and is linear elastic and nonrecoverable. Differential settlement is a function of spacing, loading and foundation size.

If footings must step from one level to another, the slope between the two bearing surfaces must not be steeper than 10 horizontals to 7 verticals. Specific consideration must be given to the excavation procedures during the setting out of footings at different levels, either to stipulated neat cut excavations or to allow for sufficient separation to provide for forming. Regardless, the deepest foundations must be cast first so that there is no chance of soil disturbance under footings already cast.

5.1.1 Placement of Footings

It is recommended that all excavated footing bases must be evaluated by Geomaple to ensure that the founding soils exposed at the excavation base are consistent with the design bearing pressure intended by the geotechnical engineer.

Prior to pouring foundation concrete, the foundation subgrade should be cleaned of all deleterious materials such as topsoil, fill, wet, softened, disturbed, or caved materials, as well as any standing water. If construction proceeds during freezing weather conditions, adequate temporary frost protection for the foundation subgrade and concrete must be provided.

It is noted that the native soils tend to weather rapidly and deteriorate on exposure to the atmosphere or surface water. Hence, foundation bases which remain open for an extended period should be protected by a skim coat of lean concrete.

5.2 Floor Slabs

Based on the borehole data, the basement slab subgrade is expected to be the upper sandy silt to silty sand or the middle cohesive till deposit. The slab subgrade should be assessed by a Geomaple, and any disturbed/soft/lose/wet subgrade areas should be sub-excavated and backfilled with clean approved earth fill compacted to a minimum of 98 percent Standard Proctor Maximum Dry Density (SPMDD).

The following modulus of subgrade reaction may be used for the slab design.

Upper sandy silt to silty sand till	15,000 kPa/m
Middle clayey silt to silty clay till	10,000 kPa/m

The basement floor slab must be provided with a capillary moisture barrier and drainage layer. This is provided by placing the slab on a minimum 200 mm layer of 19 mm clear stone (OPSS 1004) with positive drainage and compacted by vibration to a dense state.

Regardless of the approach to slab construction, the floor slabs that are to have bonded floor finishes (such as tiles with adhesives) should be provided with a capillary moisture and vapour barrier. The floor manufacturers have specific requirements for moisture and vapour barriers; therefore, the floor designer/architect must ensure that a provision of appropriate moisture and vapour barrier conforming to specific floor finish product requirements is incorporated in the project specifications. Adequate testing must be carried out to ensure acceptable levels of moisture and relative humidity in the concrete slab before the installation of floor finish(es). Studies indicate that a provision of a 200 mm thick 19 mm clear stone base (OPSS 1004) under the slab helps provide a good capillary moisture break provided the granular base is positively drained. However, this provision does not replace the floor manufacturers’ specific requirement(s) for a moisture and vapour barrier.

5.3 Drainage

Based on the results of groundwater level monitoring, the stabilized groundwater level at the site is at about Elev. 299.3 m, which would be considerably below the finished floor of the proposed houses.

To assist in maintaining a dry basement from seepage, it is recommended that exterior grades around the building be sloped away at a 2 percent gradient or more, for a distance of at least 1.2 m, and a foundation drainage system be installed around the perimeter footings.

The perimeter drains should outlet to a suitable discharge point under gravity flow or connected to a sump pit(s) located in the lowest level of the basement; and the water be pumped up to a suitable discharge point. The size of the sump should be adequate to accommodate anticipated water seepage.

A duplex pumping arrangement (main pump with a provision of a backup pump) on emergency backup power is recommended. The pumps should have sufficient capacity to accommodate the anticipated maximum peak water flow. It is common to provide a storm sump with a nominal 200 litres/minute pumping capacity using an industrial pump to remove water from the system as and when needed. The sub-drain installation and outlet must conform to the plumbing code requirements.

5.4 Excavation and Groundwater Control

The borehole data indicate that the site is underlain by native till deposit which would be encountered in the excavations. Excavations must be carried out following the Occupational Health and Safety Act and Regulations for Construction Projects. The following table categorizes the site soils based on these regulations.

Soil Layer	Soil Type	
	Above Groundwater	Below Groundwater
Upper silty sand to sandy silt till	Soil Type3	Soil Type 4
Middle clayey silt to silty clay till	Soil Type 3	Soil Type 3
Lower silty sand till	Soil Type 2	Soil Type 2

Where workmen must enter excavations, the trench walls should be suitably sloped and/or braced per the Occupational Health and Safety Act and Regulations for Construction Projects. The regulation stipulates the steepest slopes of excavation by soil type, as follows:

Soil Type	Base of Slope	Maximum Slope Inclination
Type 1	within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
Type 2	within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
Type 3	from bottom of trench	1 horizontal to 1 vertical
Type 4	from bottom of trench	3 horizontal to 1 vertical

Minimum support system requirements for steeper excavations are stipulated in the Occupational Health and Safety Act and Regulations for Construction Projects, and include provisions for timbering, shoring and moveable trench boxes.

As previously noted, glacial till deposits may contain larger particles (cobbles and boulders) that are not specifically identified in the boreholes. The size and distribution of such obstructions cannot be predicted with borings, because the borehole sampler size is insufficient to secure representative samples for particles of this size. Provision should be made in the excavation contract to allocate risks associated with the time spent and equipment utilized to remove or penetrate such obstructions when encountered.

The glacial till deposit is expected to have a relatively low permeability and should not yield significant free-flowing groundwater seepage, especially in the short term. However, perched groundwater may be present within cohesionless sand/silt lenses/seams generally found within the glacial till deposits. This perched groundwater seepage should diminish slowly and can be controlled by continuous pumping from a series of strategically designed sump and pump arrangements at the base of the excavation.

5.5 Earth Pressure Design Parameters

Walls or bracings subject to unbalanced earth pressures must be designed to resist a pressure that can be calculated based on the following equation:

$$\mathbf{P = K [\gamma (h-h_w) + \gamma' h_w + q] + \gamma_w h_w}$$

where:

P = the horizontal pressure at depth, h (m)
K = the earth pressure coefficient,
h_w = the depth below the groundwater level (m),
γ = the bulk unit weight of soil, (kN/m^3)
γ' = the submerged unit weight of the exterior soil, (9.81 kN/m^3)
q = the complete surcharge loading (kPa)

Where the wall backfill can be drained effectively to eliminate hydrostatic pressures on the wall, this equation can be simplified to:

$$\mathbf{P = K\,[\gamma h + q]}$$

This equation assumes that free-draining granular backfill is used and positive drainage is provided to ensure that there is no hydrostatic pressure acting in conjunction with the earth pressure.

Resistance to sliding of earth retaining structures is developed by friction between the base of the footing and the soil. This friction (R) depends on the normal load on the soil contact (N) and the frictional resistance of the soil (tan φ) expressed as: $R = N \tan \varphi$. The factored resistance at ULS is 0.8R.

Passive earth pressure resistance is generally not considered a resisting force against sliding for conventional retaining structure design since a structure must deflect significantly to develop the full passive resistance.

The appropriate values for use in the design of structures subject to unbalanced earth pressures at this site are tabulated as follows:

Parameter	Definition	Units
φ	internal angle of friction	degrees
γ	bulk unit weight of soil	kN/m^3
K_a	active earth pressure coefficient (Rankin)	dimensionless
K_o	at-rest earth pressure coefficient (Rankin)	dimensionless
K_p	passive earth pressure coefficient (Rankin)	dimensionless

Stratum/Parameter	φ	γ	K_a	K_o	K_p
Upper silty sand to sandy silt till	30	19	0.33	0.50	3.00
Middle clayey silt to silty clay till	28	19	0.36	0.53	2.77
Lower silty sand till	32	20	0.31	0.47	3.25
Granular backfill	32	20	0.31	0.47	3.25

The values of the earth pressure coefficients noted above are for the horizontal retained grade. The earth pressure coefficients for an inclined grade will vary based on the inclination of the retained ground surface.

5.6 Backfill

The upper and lower non-cohesive till soils encountered on the site may be reused as backfill provided they do not contain excessive amounts of organics and/or deleterious materials. Selection and sorting of backfill materials should be conducted under the supervision of a geotechnical engineer. Soils containing excessive amounts of organics may be stockpiled and reused for landscaping purposes.

The native soil is considered suitable for backfill provided these soils are within 3 percent of the optimum moisture content. It should be noted that native soils below the groundwater table are too wet to compact effectively. Soils with 3 percent or higher in-situ moisture content than their optimum moisture content could be put aside to dry or be tilled to reduce the moisture content so they can be effectively compacted. Alternatively, materials of higher moisture content could be wasted, and replaced with imported materials which can be readily compacted.

In settlement sensitive areas such as beneath floor slab, the backfill should consist of clean earth and should be placed in lifts of 150 mm thickness or less, and heavily compacted to a minimum of 98 percent SPMDD at a water content close to optimum.

It should be noted that the glacial till soils encountered on the site are not free draining and will be difficult to handle and compact should they become wetter because of inclement weather or seepage. Therefore, it can be expected that earthworks will be difficult during the wet seasons of the year (i.e., spring and fall).

5.7 Pipe Bedding

The undisturbed native soils and the earth fill materials compacted to 98 percent SPMDD will be suitable for support of buried services on conventional well-graded granular base material. It is recommended that the utility subgrade be inspected by Geomaple during construction. If disturbance of the trench base has occurred, such as due to groundwater seepage, or construction traffic, the disturbed soils should be sub-excavated and replaced with suitably compacted granular fill.

Granular bedding materials should consist of a well graded, free-draining soil, such as OPSS Granular “A” or 19 mm Crusher Run Limestone or its equivalent as per the pertinent City/Region specifications. The granular bedding materials should be placed in 150 mm thick lifts and compacted to a minimum of 95 percent SPMDD or vibrated/tempted to a dense state in case of clear stone bedding. A clear stone type bedding may be considered if approved by the City/Region, however, on a silt/sand subgrade it must be utilized only in conjunction with a suitable geotextile filter (Terrafix 270R or equivalent). Without proper filtering, there may be entry of fines from the subgrade soils into the bedding. This loss of ground could result in loss of support to the pipes and possible future settlements. A geotextile is not required if subgrade consists of cohesive clayey soils.

6 LIMITATIONS AND USE OF REPORT

It must be recognized that there are special risks whenever engineering or related disciplines are applied to identify subsurface conditions. A comprehensive sampling and testing programme implemented in strict accordance with the most stringent level of care may fail to detect certain conditions. Geomaple has assumed for the purposes of providing advice, that the conditions that exist between sampling points are similar to those found at the sample locations. The conditions that Geomaple has interpreted to exist between sampling points can differ from those that exist. It must also be recognized that the passage of time, natural occurrences, and direct or indirect human intervention at or near the site have the potential to alter subsurface conditions.

The discussion and recommendations provided here are based on the factual data obtained from the investigation and are intended for use by the owner and its retained designers in the design phase of the project. Since the project is still in the design stage, all aspects of the project relative to the subsurface conditions cannot be anticipated. Geomaple should review the design drawings and specifications before the construction of this work. If there are changes to the project scope and development features, the interpretations made of the subsurface information, the geotechnical design parameters and comments relating to constructability issues and quality control may not be relevant to the revised project scope. Geomaple should be retained to review the implications of these changes with respect to the contents of this report.

The investigation at this site was conceived and executed to provide information for the geotechnical design. It may not be possible to drill a sufficient number of boreholes, or samples and report them in a way that would provide all the subsurface information that could influence construction costs, techniques, equipment, and scheduling. Contractors bidding on or undertaking work on this project should therefore, in this light, be directed to decide on their own investigations, as well as their own interpretations of the factual investigation results. They should be cognizant of the risks implicit in subsurface investigation activities so that they may draw their own conclusions as to how the subsurface conditions may affect them.

This report was prepared for the express use of Mr. Kamran Rzayev and his retained design consultants. It is not for use by others. This report is copyright of Geomaple Geotechnics Inc., and no part of this report may be reproduced by any means, in any form, without the prior written permission of Geomaple Geotechnics Inc. and Mr. Kamran Rzayev, who are the authorized users.

It is recognized that the regulatory agencies in their capacities as the planning and building authorities under Provincial statutes, will make use of and rely upon this report, cognizant of the limitations thereof, both expressed and implied.

7 CLOSURE

We trust the foregoing information is sufficient for your present requirements. If you have any questions, or if we can be of further assistance, please do not hesitate to contact us.

Yours truly,

Geomaple Geotechnics Inc.

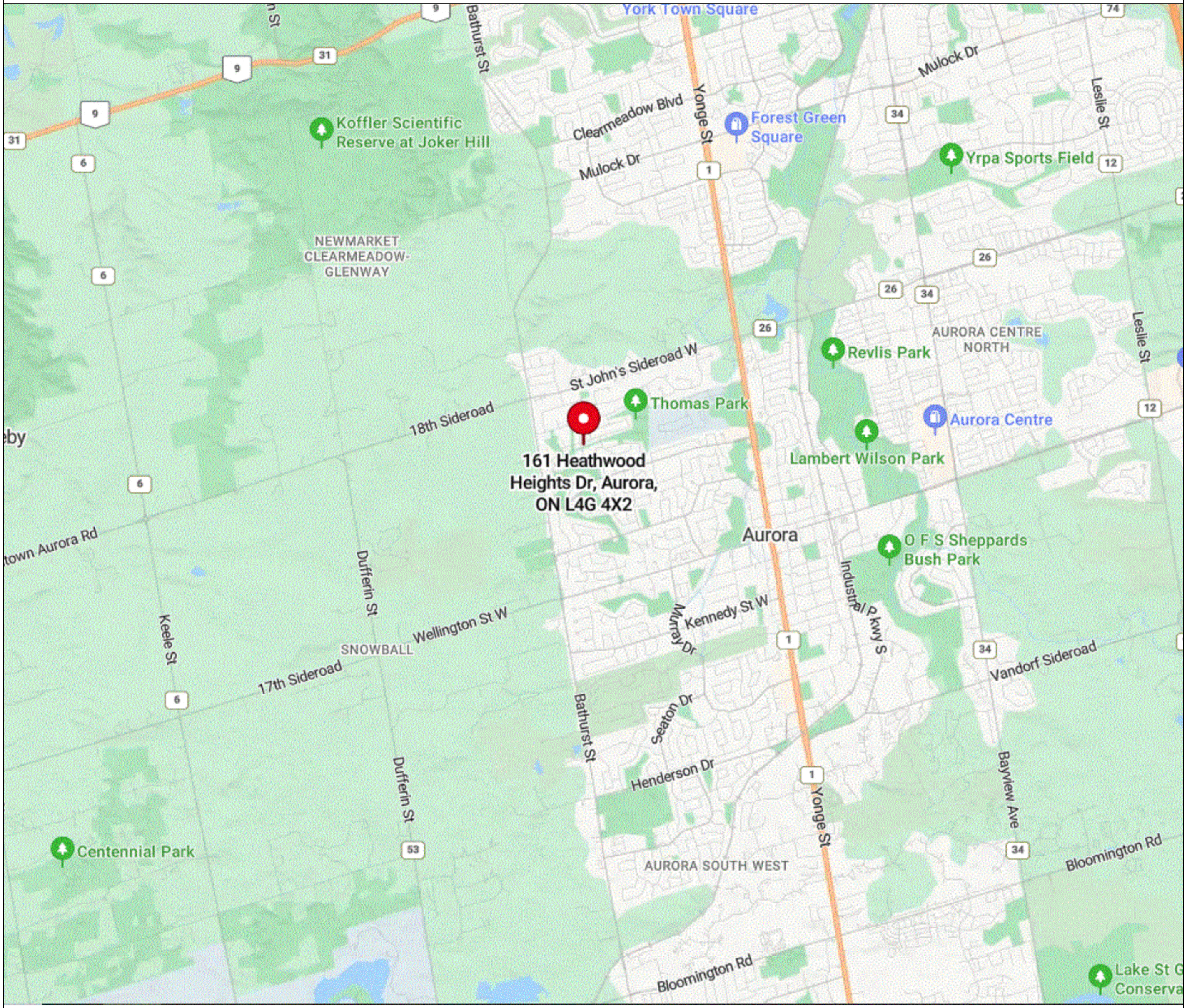
LICENSED PROFESSIONAL ENGINEER
03/12/2025
N. HATAMI
100198435
PROVINCE OF ONTARIO

Navid Hatami, M.Eng, P.Eng
Geotechnical Engineer

APPENDICES

APPENDIX A

FIGURES



Geomaple Geotechnics Inc.

60 Green Lane, Unit 12A
Thornhill, Ontario
L3T 7P5

Phone: (416) 444 1200
Fax: (416) 444 1200

No.	Revision	Date

161 Heathwood Heights Drive,
Aurora, Ontario

Site Location Plan

Project No.:	2024-10-150
Date:	March 2025
Drawn by:	EL
Checked by:	NH

Figure 1

Scale:	NA

LOT #1

Zoning Data Matrix	Proposed
R3	
Lot Frontage	17.95 m
Lot Area	6436.2 s.f. - 597.94 m2
Lot Coverage	1950.0 s.f. -181.16 m2 (30.30%)
Height	10 m

LOT #2

Zoning Data Matrix	Proposed
R3	
Lot Frontage	15 m
Lot Area	5356.2 s.f. - 497.61 m2
Lot Coverage	1950.0 s.f. - 181.16 m2 (36.41%)
Height	10 m

LOT #3

Zoning Data Matrix	Proposed
R3	
Lot Frontage	15 m
Lot Area	5281.1 s.f. - 490.63 m2
Lot Coverage	1950.0 s.f. -181.16 m2 (36.92%)
Height	10 m

LOT #4

Zoning Data Matrix	Proposed
R3	
Lot Frontage	15 m
Lot Area	5206.1 s.f. - 483.66 m2
Lot Coverage	1950.0 s.f. -181.16 m2 (37.46%)
Height	10 m

LOT #5

Zoning Data Matrix	Proposed
R3	
Lot Frontage	15 m
Lot Area	5279.5 s.f. - 490.48 m2
Lot Coverage	1950.0 s.f. -181.16 m2 (36.94%)
Height	10 m

1. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE LATEST VERSION OF THE OBC
2. VERIFY ALL DIMENSION BEFORE CONSTRUCTION.
3. DO NOT SCALE DRAWINGS.
4. ALL DIMENSIONS AND INFORMATION SHALL BE CHECKED AND VERIFIED ON THE JOB AND ANY VARIANCES OR DISCREPANCIES MUST BE REPORTED TO THE ARCHITECT BY PHONE AND SUBSEQUENT WRITTEN CONFIRMATION PRIOR TO COMMENCEMENT OF THE WORK.
5. USE ONLY LATEST VERSION OF DRAWINGS
6. ALL STRUCTURAL DESIGN MUST BE REVIEWED AND APPROVED BY CERTIFIED STRUCTURAL ENGINEER PRIOR TO CONSTRUCTION

ALI SHAKERI-NEZHAD
LICENCE
9786

revisions:
SEP 20, 2024- SITE PLAN1
JAN 31, 2025- SITE PLAN2

project:
161 HEATHWOOD HEIGHT DRIVE

drawing:
SITE PLAN

scale:
1/16" = 1'-0"

page:
A1d

ALI SHAKERI
416-821.3960

ARCICA INC.
326 SHEPPARD AVENUE EAST, SUITE 200
TORONTO, ONTARIO, CANADA, M2N 3B4
WWW.ARCICA.COM

Geomaple Geotechnics Inc.

Geomaple Geotechnics Inc.

60 Green Lane, Unit 12A
Thornhill, Ontario
L3T 7P5

Phone: (416) 444 1200
Fax: (416) 444 1200

Legend:

BH1 **Borehole Location**

No.	Description	Date

Project

161 Heathwood Heights Drive,
Aurora, Ontario

Borehole Location Plan

Project Number	2024-10-150
Date	March 2025
Drawn By	EL
Checked By	NH

Figure 2

Scale	As Shown

APPENDIX B

BOREHOLE LOGS

Geomaple Geotechnics Inc.

RECORD OF BOREHOLE 1

PAGE 1 OF 1

PROJECT: 161 Heathwood Heights Drive
LOCATION: Aurora, ON
PROJECT NO: 2024-10-147

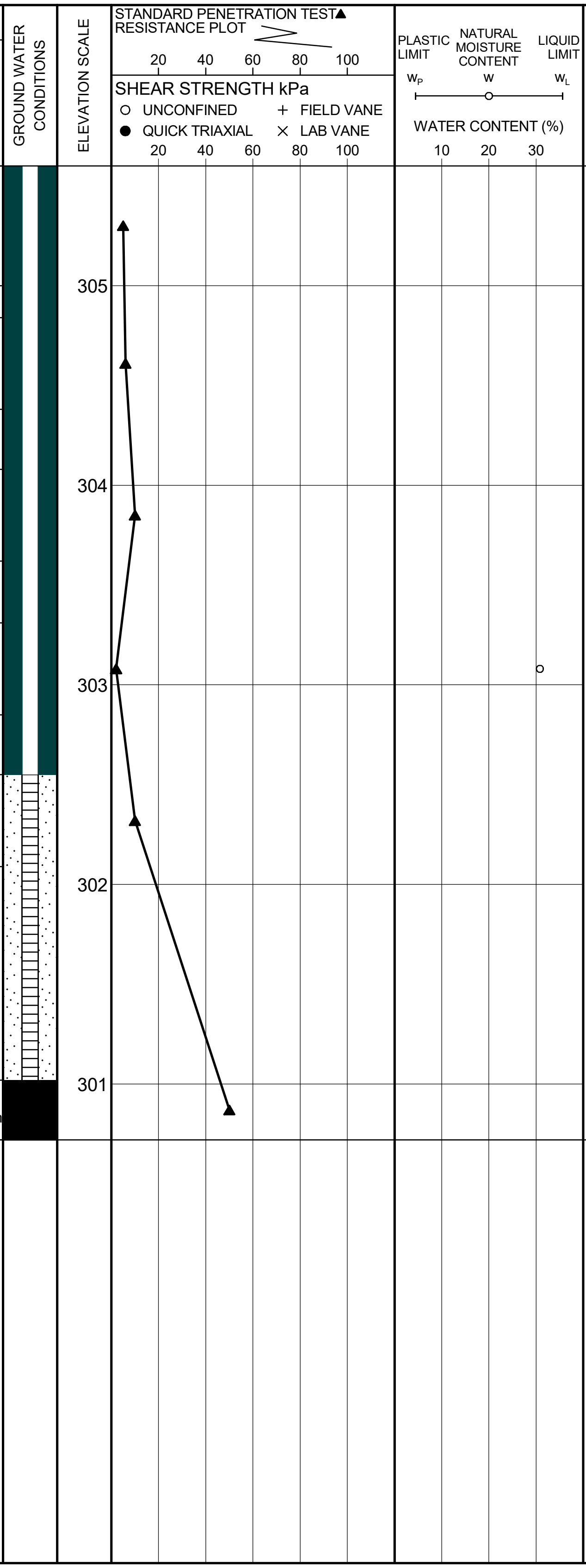
CLIENT: Kamran Rzayev
DRILLING DATE: 2024-11-21

SOIL PROFILE		SAMPLES			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GR	SA	SI	CL
305.6								
0.0	**TOPSOIL** 50 mm							
305.5 / 0.1	**SANDY SILT TO SILTY SAND TILL** trace to some clay, trace gravel, loose, brown, moist.	1	SS	5				
		2	SS	6				
304.4 / 1.2	**CLAYEY SILT TO SILTY CLAY TILL** trace to some sand, trace gravel, soft to stiff, brown, moist.	3	SS	10				
		4	SS	2	0	4	45	51
		5	SS	10				
302.1 / 3.5	**SILTY SAND TILL** trace to some clay, trace gravel, very dense, brown, moist.	6	SS	50/ 150mm				
300.7 / 4.9	**END OF BOREHOLE**							

The borehole was open and dry upon completion of drilling.

WATER LEVELS

Date	Depth (m)
2024-11-29	Dry



UNIT WEIGHT γ kN/m³

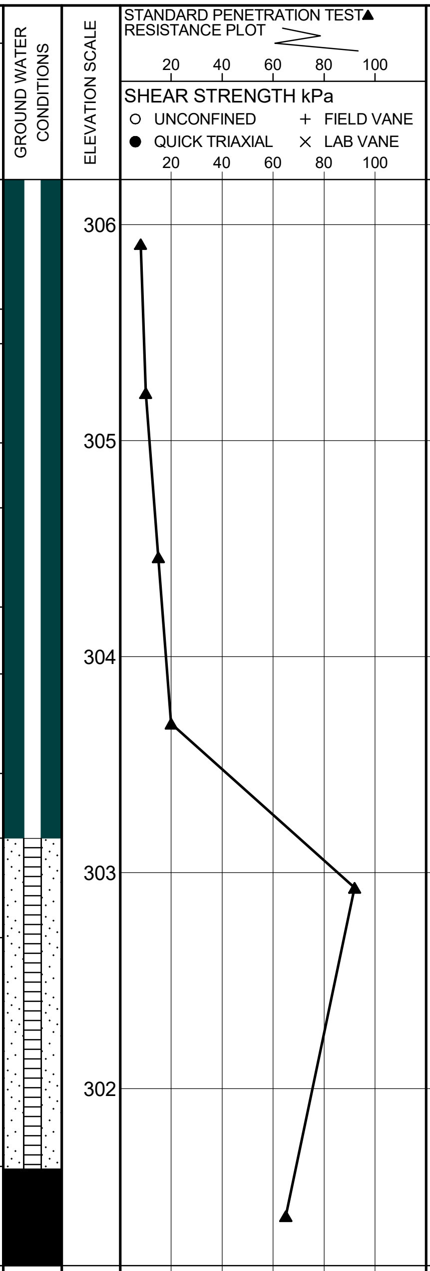
$+^3, \times^3$: Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE 2

PROJECT: 161 Heathwood Heights Drive
CLIENT: Kamran Rzayev
LOCATION: Aurora, ON
DRILLING DATE: 2024-11-21
PROJECT NO: 2024-10-147

SOIL PROFILE		SAMPLES			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GR	SA	SI	CL
306.2 0.0	**TOPSOIL** 50 mm							
306.1 0.1	**SANDY SILT TO SILTY SAND TILL** trace to some clay, trace gravel, loose, brown, moist.	1	SS	8				
		2	SS	10				
305.0 1.2	**CLAYEY SILT TO SILTY CLAY TILL** trace to some sand, trace gravel, very stiff, brown, moist.	3	SS	15				
		4	SS	20				
303.5 2.8	**SILTY SAND TILL** trace to some clay, trace gravel, very dense, brown, moist.	5	SS	92	1	48	34	17
		6	SS	65				
301.2 5.0	**END OF BOREHOLE**							



PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L

WATER CONTENT (%) 10 20 30

UNIT WEIGHT γ kN/m^3

The borehole was open and dry upon completion of drilling.

WATER LEVELS

Date	Depth (m)
2024-11-29	Dry

+^{3}, ×^{3}: Numbers refer to Sensitivity ○$^{3\%}$ STRAIN AT FAILURE

Geomaple Geotechnics Inc.

RECORD OF BOREHOLE 3

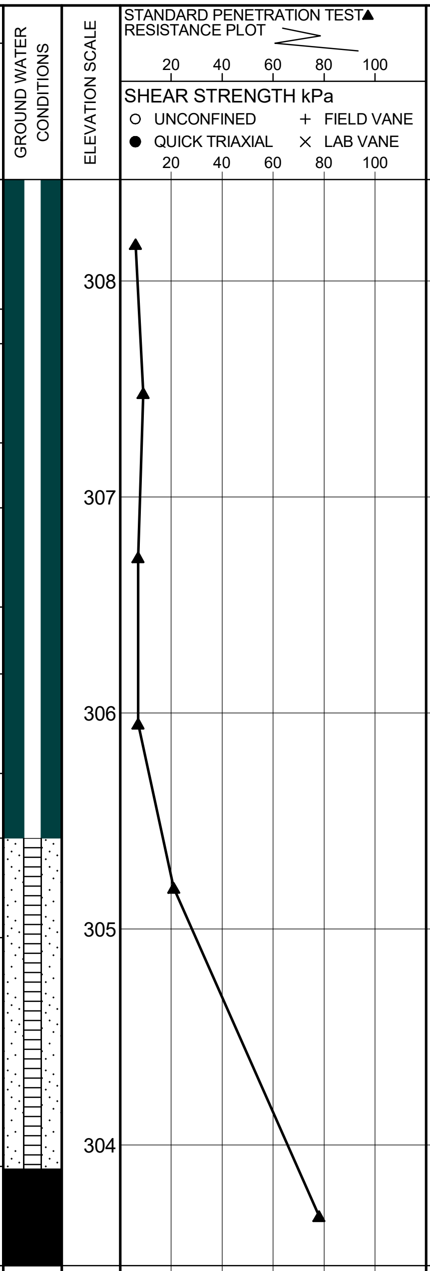
PROJECT: 161 Heathwood Heights Drive
LOCATION: Aurora, ON
PROJECT NO: 2024-10-147
CLIENT: Kamran Rzayev
DRILLING DATE: 2024-11-21

ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	NATURAL MOISTURE CONTENT W (%)	GR	SA	SI	CL
308.5									
0.0	**TOPSOIL** 50 mm								
308.4 0.1	**SANDY SILT TO SILTY SAND TILL** trace to some clay, trace gravel, loose, brown, moist.	1	SS	6					
		2	SS	9	10	1	50	33	16
		3	SS	7					
306.5 2.0	**CLAYEY SILT TO SILTY CLAY TILL** trace to some sand, trace gravel, firm, brown, moist.	4	SS	7					
305.7 2.8	**SILTY SAND TILL** trace to some clay, trace gravel, compact to very dense, brown, moist.	5	SS	21					
		6	SS	78					
303.4 5.0	**END OF BOREHOLE**								

The borehole was open and dry upon completion of drilling.

WATER LEVELS

Date	Depth (m)
2024-11-29	Dry



PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L; WATER CONTENT (%) 10 20 30

UNIT WEIGHT γ kN/m³

REMARKS & GRAIN SIZE DISTRIBUTION (%)

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

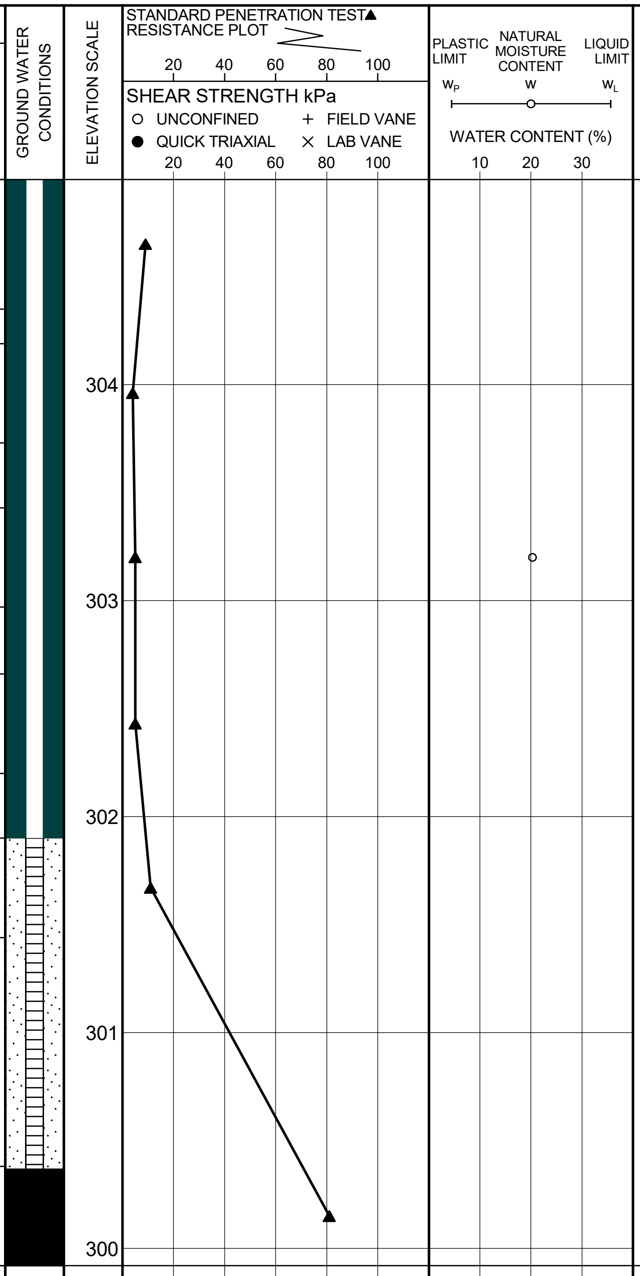
Geomaple Geotechnics Inc.

RECORD OF BOREHOLE 4

PAGE 1 OF 1

PROJECT: 161 Heathwood Heights Drive
LOCATION: Aurora, ON
PROJECT NO: 2024-10-147
CLIENT: Kamran Rzayev
DRILLING DATE: 2024-11-21

ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GR	SA	SI	CL
305.0								
304.9 0.0	**TOPSOIL** 50 mm							
0.1	**SANDY SILT TO SILTY SAND TILL** trace to some clay, trace gravel, loose, brown, moist.	1	SS	9				
		2	SS	4				
		3	SS	5	0	31	56	13
303.0 2.0	**CLAYEY SILT TO SILTY CLAY TILL** trace to some sand, trace gravel, firm, brown, moist.	4	SS	5				
302.2 2.8	**SILTY SAND TILL** trace to some clay, trace gravel, compact to very dense, brown, moist.	5	SS	11				
		6	SS	81				
299.9 5.0	**END OF BOREHOLE**							



UNIT WEIGHT γ kN/m³

REMARKS & GRAIN SIZE DISTRIBUTION (%)

The borehole was open and dry upon completion of drilling.

WATER LEVELS

Date	Depth (m)
2024-11-29	Dry

+ 3, × 3: Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

ONTARIO MOT 2024-10-150 HEATHWOOD HEIGHT DRIVE.GPJ ONTARIO MOT.GDT 3-6-25

Geomaple Geotechnics Inc.

RECORD OF BOREHOLE 5

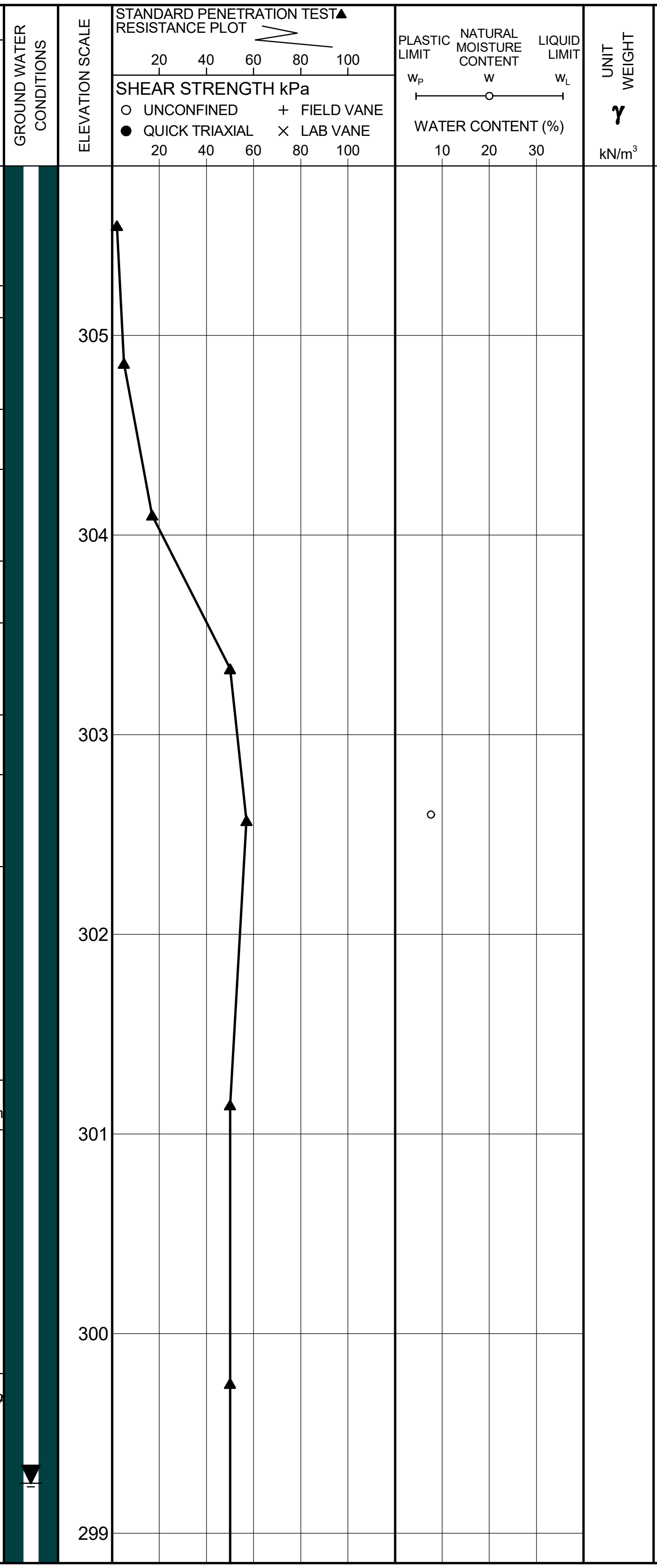
PAGE 1 OF 2

PROJECT: 161 Heathwood Heights Drive **CLIENT:** Kamran Rzayev

LOCATION: Aurora, ON **DRILLING DATE:** 2024-11-21

PROJECT NO: 2024-10-147

SOIL PROFILE		SAMPLES			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GR	SA	SI	CL
305.9								
305.8 0.0 0.1	**TOPSOIL** 50 mm **SADY SILT TO SILTY SAND TILL** trace to some clay, trace gravel, very loose to compact, brown, moist.	1	SS	2				
		2	SS	5				
		3	SS	17				
303.9 2.0	**SILTY SAND TILL** trace to some clay, trace gravel, very dense, brown, moist.	4	SS	50				
		5	SS	57	4	53	28	15
		6	SS	50/ 100mm				
		7	SS	50/ 100mm				



Continued Next Page

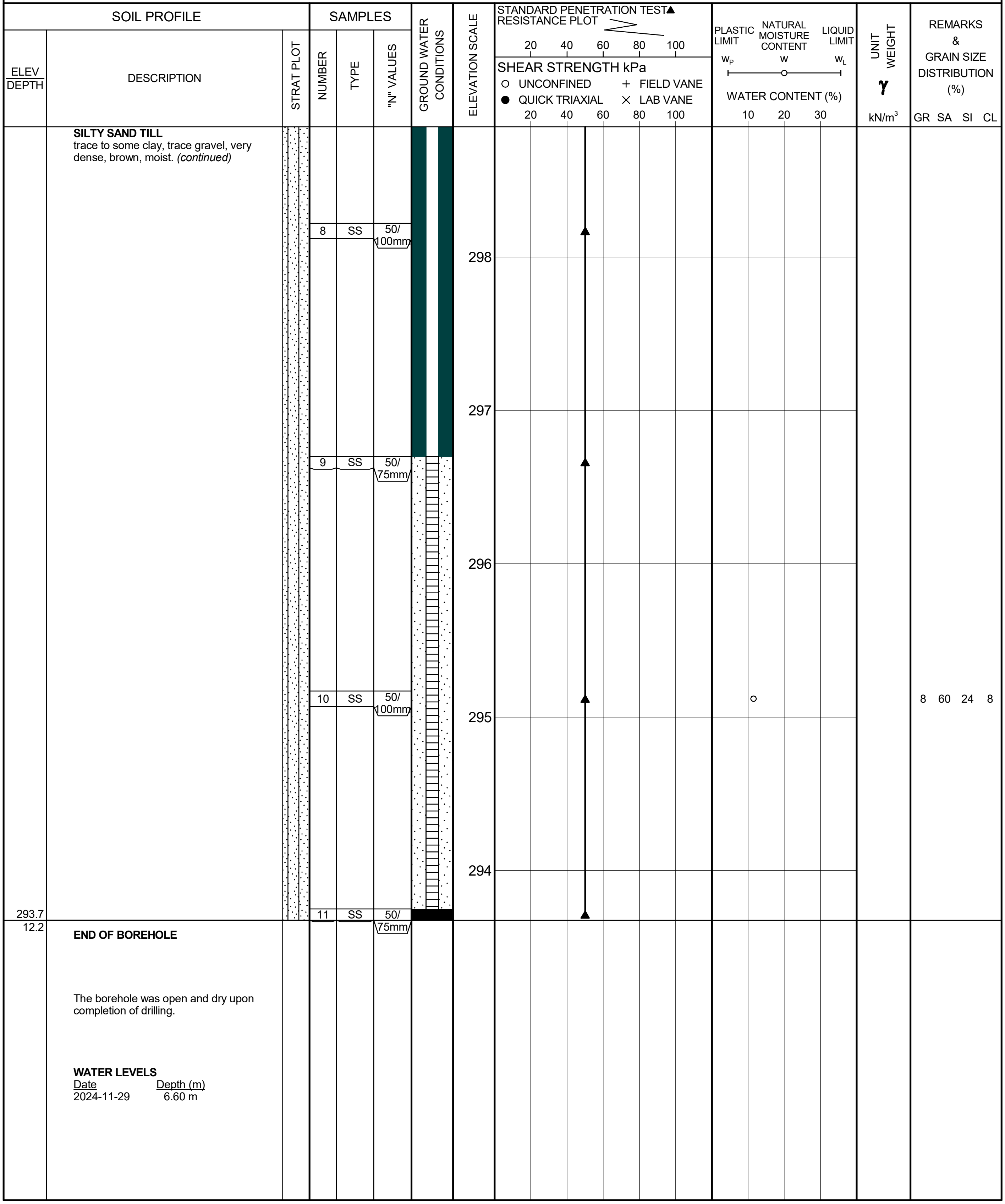
+³, ×³: Numbers refer to Sensitivity ○3% STRAIN AT FAILURE

Geomaple Geotechnics Inc.

RECORD OF BOREHOLE 5

PAGE 2 OF 2

PROJECT: 161 Heathwood Heights Drive
LOCATION: Aurora, ON
PROJECT NO: 2024-10-147
CLIENT: Kamran Rzayev
DRILLING DATE: 2024-11-21



ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GR	SA	SI	CL
	SILTY SAND TILL trace to some clay, trace gravel, very dense, brown, moist. *(continued)*	8	SS	50/ 100mm				
		9	SS	50/ 75mm				
		10	SS	50/ 100mm	8	60	24	8
293.7 12.2		11	SS	50/ 75mm				

END OF BOREHOLE

The borehole was open and dry upon completion of drilling.

WATER LEVELS

Date	Depth (m)
2024-11-29	6.60 m

+³, ×³: Numbers refer to Sensitivity

○³% STRAIN AT FAILURE

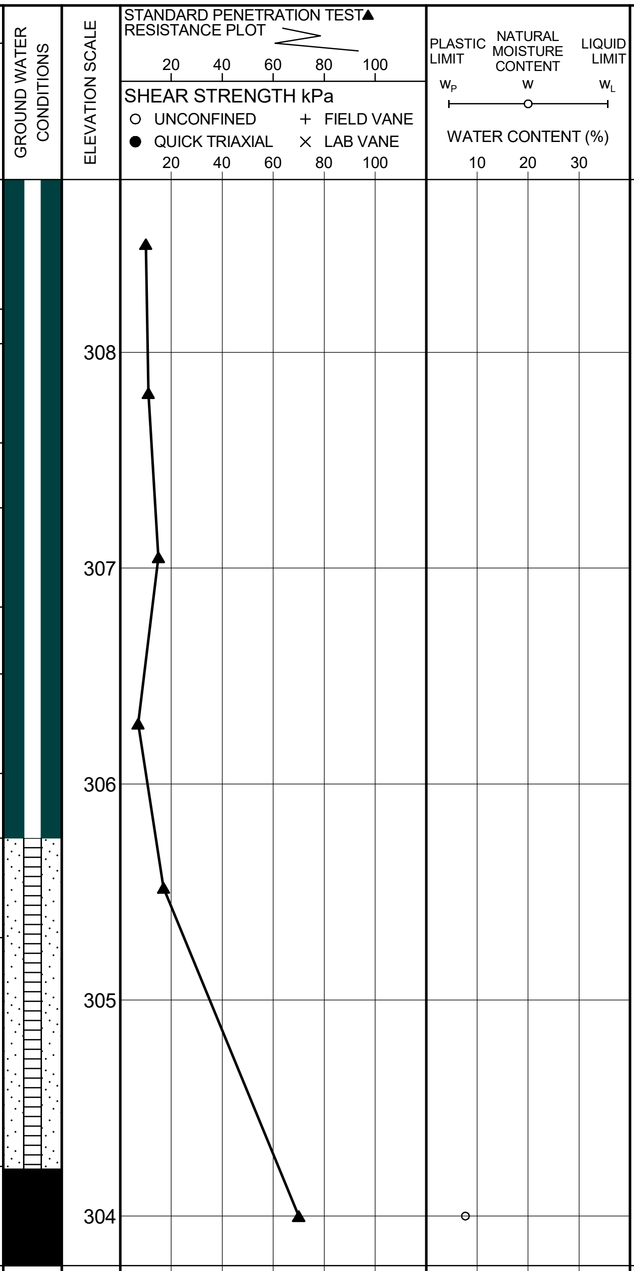
Geomaple Geotechnics Inc.

RECORD OF BOREHOLE 6

PAGE 1 OF 1

PROJECT: 161 Heathwood Heights Drive
LOCATION: Aurora, ON
PROJECT NO: 2024-10-147
CLIENT: Kamran Rzayev
DRILLING DATE: 2024-11-21

SOIL PROFILE		SAMPLES			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GR	SA	SI	CL
308.8 0.0	**TOPSOIL** 50 mm							
308.7 0.1	**SANDY SILT TO SILTY SAND TILL** trace to some clay, trace gravel, compact, brown, moist.	1	SS	10				
		2	SS	11				
307.6 1.2	**CLAYEY SILT TO SILTY CLAY TILL** trace to some sand, trace gravel, firm to stiff, brown, moist.	3	SS	15				
		4	SS	7				
306.1 2.8	**SILTY SAND TILL** trace to some clay, trace gravel, compact to very dense, brown, moist.	5	SS	17				
		6	SS	70	4	55	30	11
303.8 5.0	**END OF BOREHOLE**							



The borehole was open and dry upon completion of drilling.

WATER LEVELS

Date	Depth (m)
2024-11-29	Dry

+3, ×3: Numbers refer to Sensitivity

○3% STRAIN AT FAILURE

APPENDIX C

GEOTECHNICAL LABORATORY TEST RESULTS

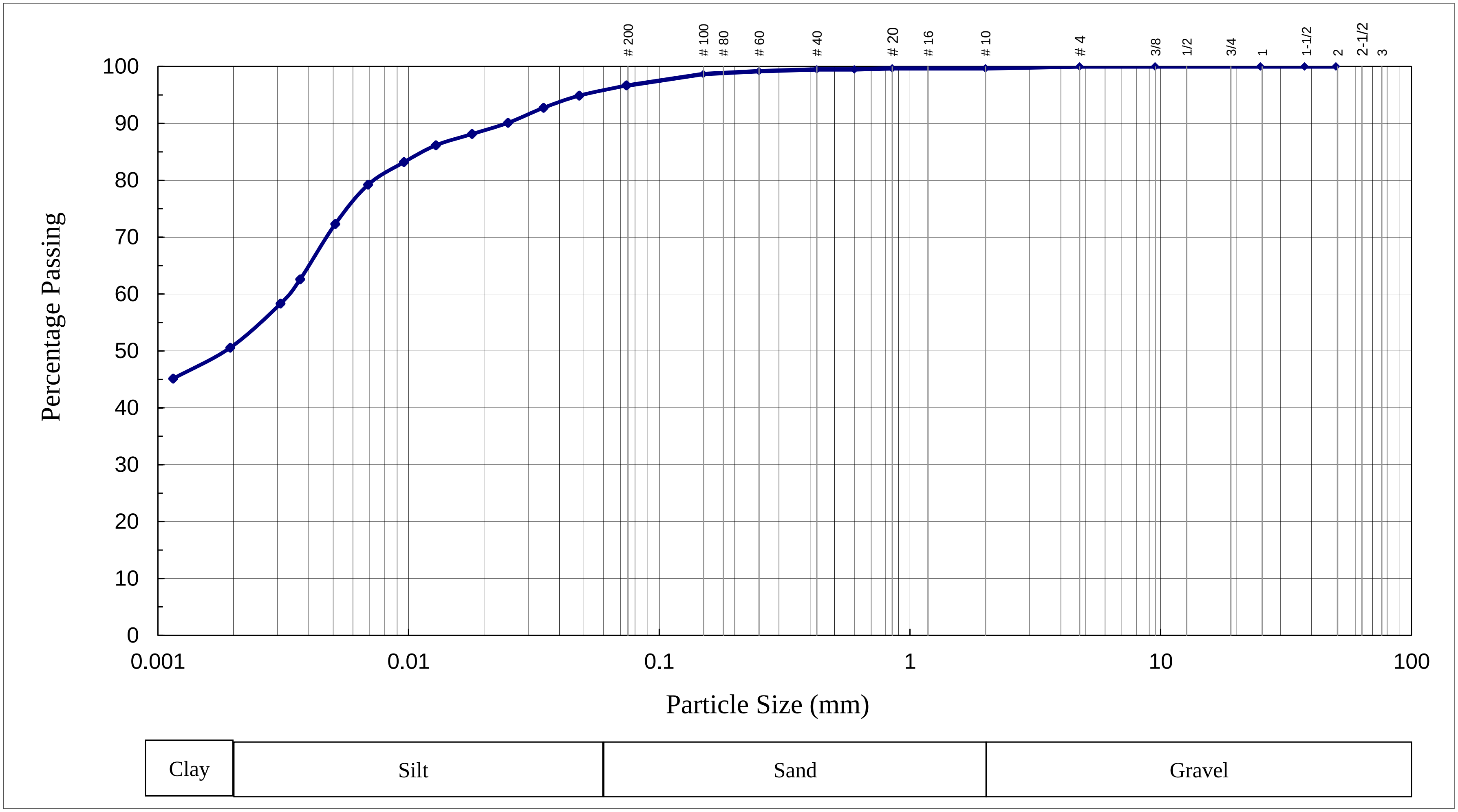
GMGFR-006-R0

Sieve & Hydrometer Analysis

Geomaple Geotechnics Inc.

Lab#: 100633

Project Name:	161 Heathwood Heights Drive			**Project No:**	2024-10-150
Order No:		**Test Date:**	09-Dec-24	**Client:**	Kamran Rzayev
Borehole No:	BH1	**Borehole Location:**	Figure2	**Lead Consultant:**	
Sample No:	SS4	**Sample Depth:**	2.52	**moisture content:**	30.8%



Clay:	**51**	Silt:	**45**	Sand:	**4**	Gravel:	**0**

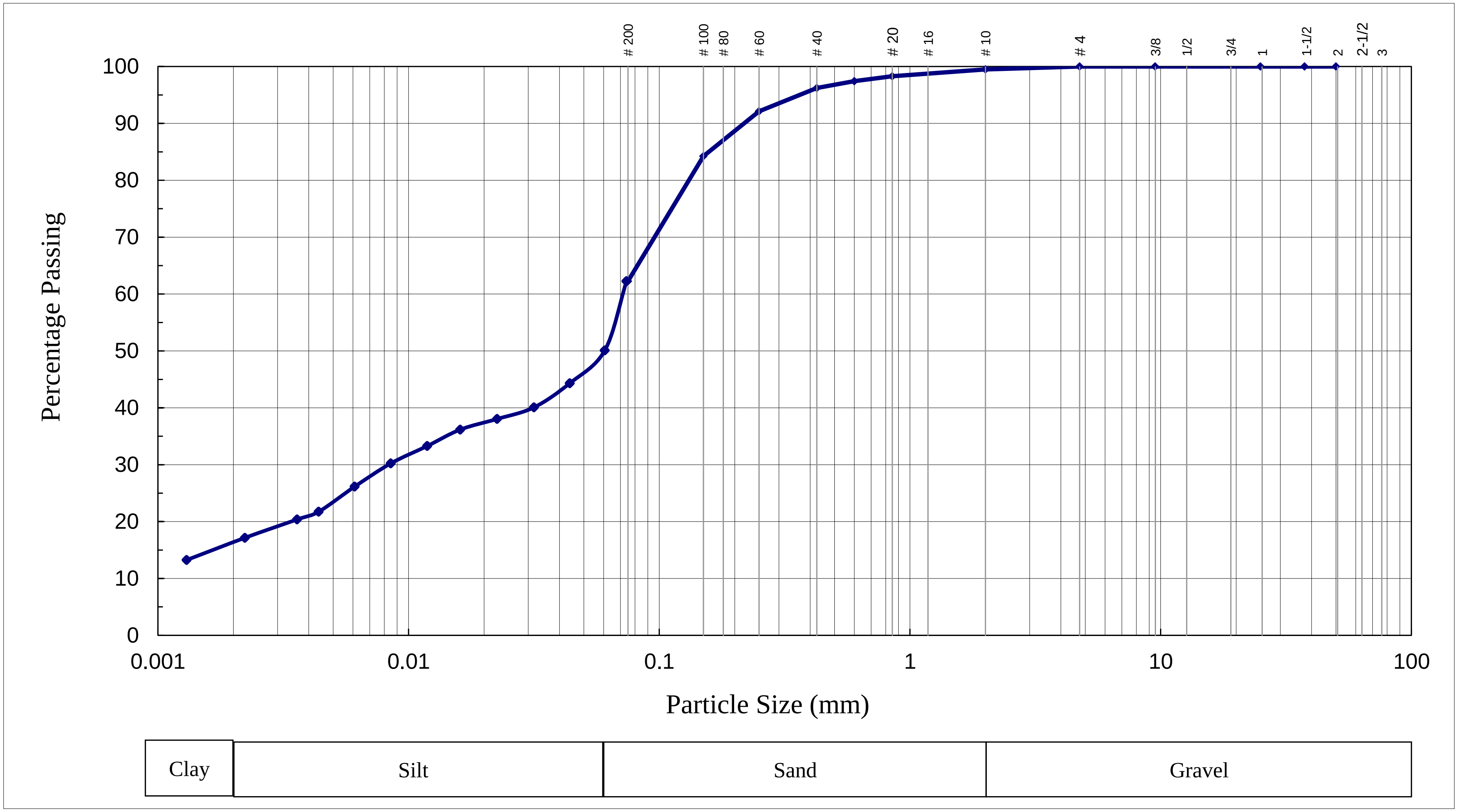
LL:		PL:		PI:	

GMGFR-006-R0

Sieve & Hydrometer Analysis

Lab#: 100635

Project Name:	**161 Heathwood Heights Drive**			**Project No:**	**2024-10-150**
Order No:		**Test Date:**	**07-Dec-24**	**Client:**	**Kamran Rzayev**
Borehole No:	**BH2**	**Borehole Location:**	**Figure2**	**Lead Consultant:**	
Sample No:	**SS3**	**Sample Depth:**	**1.75**	**moisture content:**	**9.8%**



Clay: **16**

Silt: **33**

Sand: **50**

Gravel: **1**

LL:

PL:

PI:

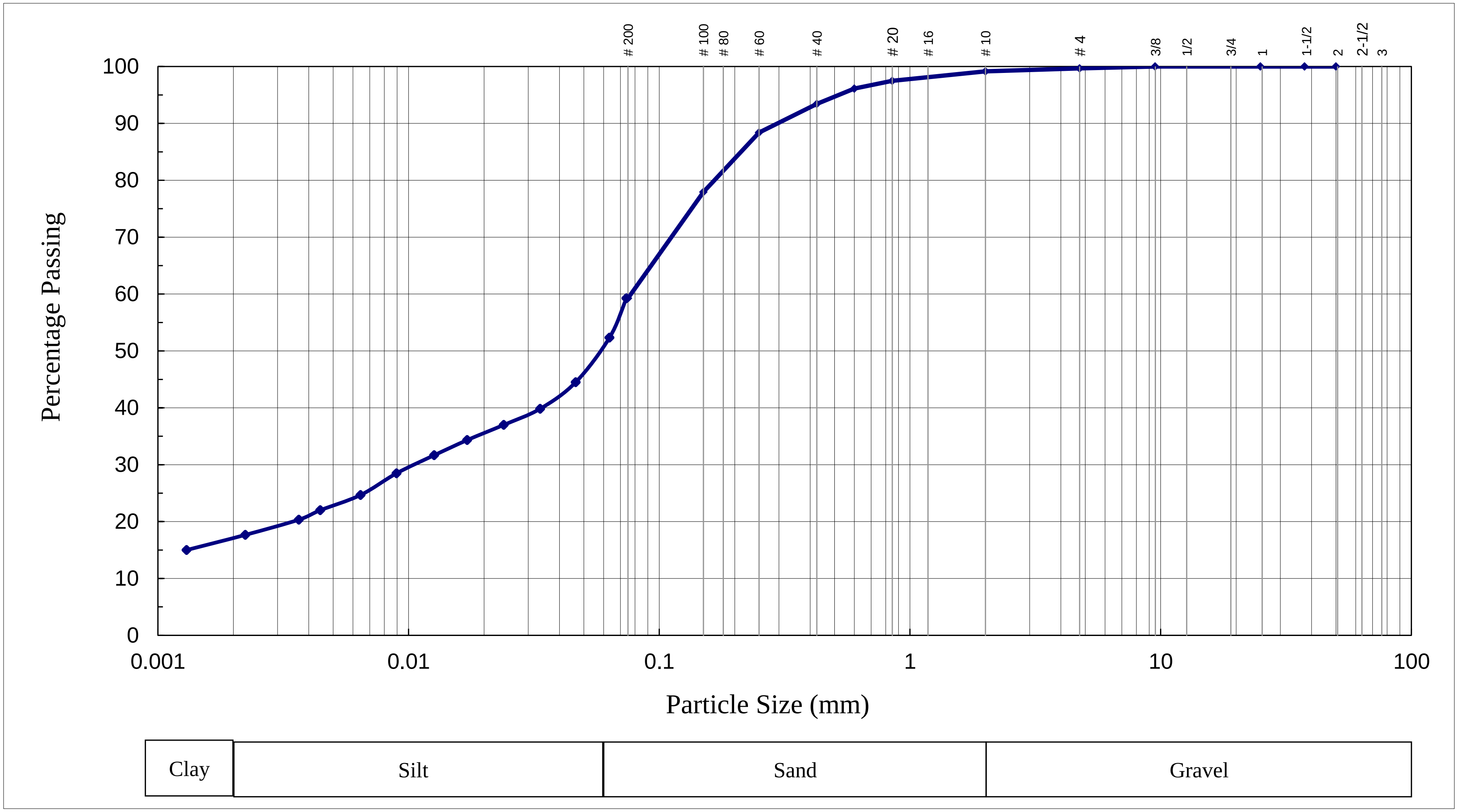
GMGFR-006-R0

Sieve & Hydrometer Analysis

Geomaple Geotechnics Inc.

Lab#: 100634

Project Name:	**161 Heathwood Heights Drive**			**Project No:**	**2024-10-150**
Order No:		**Test Date:**	**09-Dec-24**	**Client:**	**Kamran Rzayev**
Borehole No:	**BH2**	**Borehole Location:**	**Figure2**	**Lead Consultant:**	
Sample No:	**SS5**	**Sample Depth:**	**3.28**	**moisture content:**	**7.0%**



Clay: **17**

Silt: **33**

Sand: **49**

Gravel: **1**

LL:

PL:

PI:

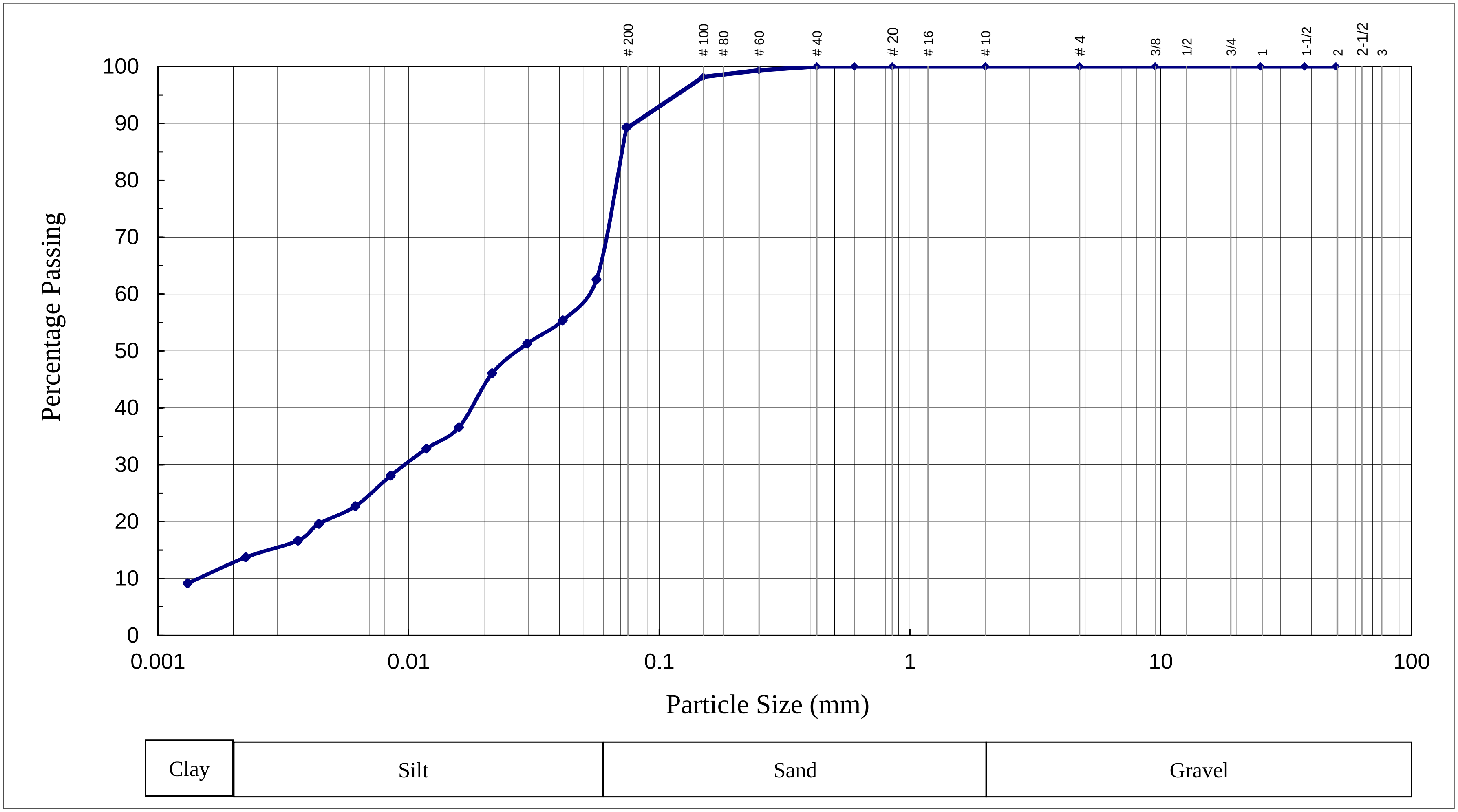
GMGFR-006-R0

Sieve & Hydrometer Analysis

Lab#: 100636

Geomaple Geotechnics Inc.

Project Name:	161 Heathwood Heights Drive			**Project No:**	2024-10-150
Order No:		**Test Date:**	07-Dec-24	**Client:**	Kamran Rzayev
Borehole No:	BH4	**Borehole Location:**	Figure2	**Lead Consultant:**	
Sample No:	SS3	**Sample Depth:**	1.75	**moisture content:**	20.3%



Clay: **13** Silt: **56** Sand: **31** Gravel: **0**

LL: PL: PI:

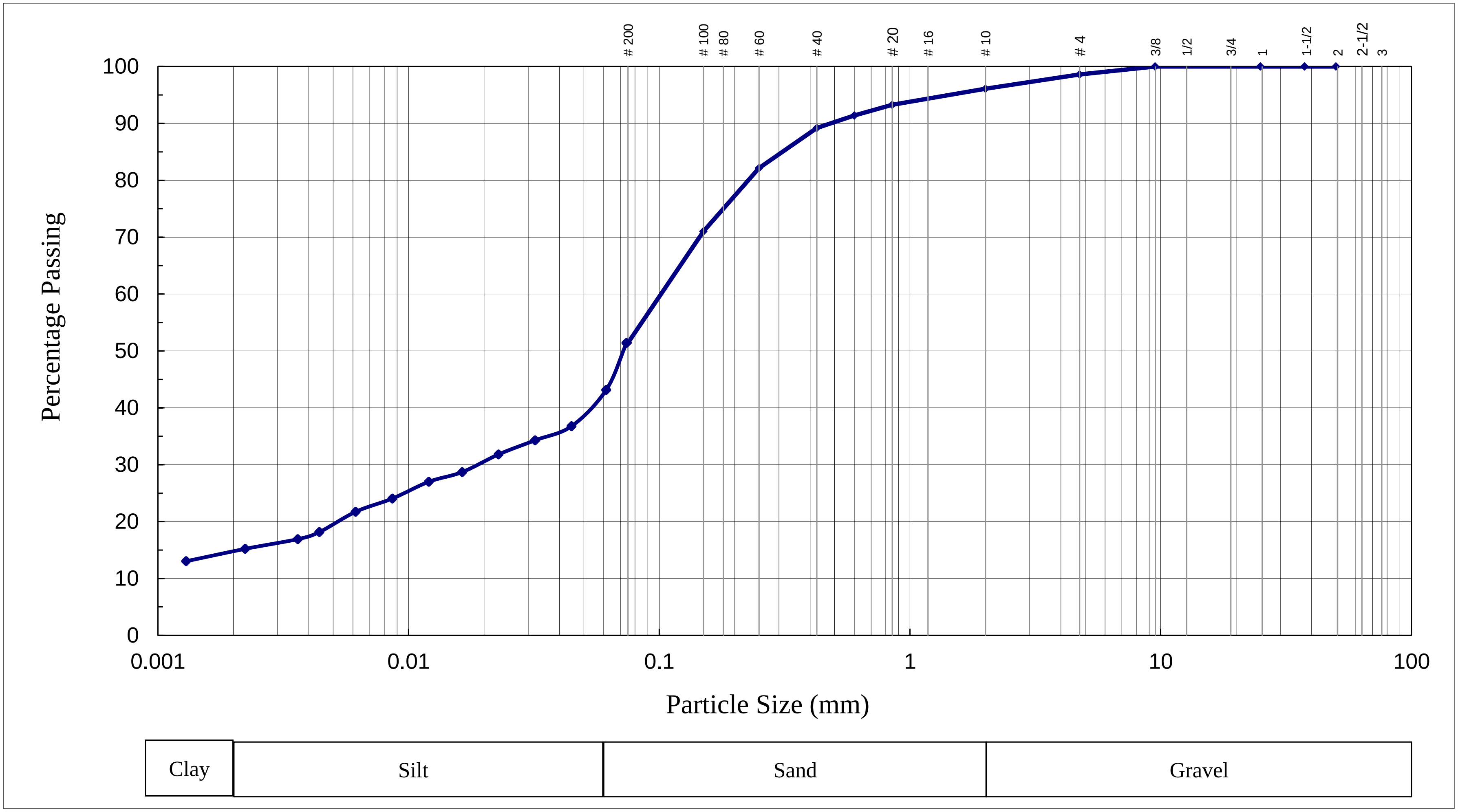
GMGFR-006-R0

Sieve & Hydrometer Analysis

Geomaple Geotechnics Inc.

Lab#: 100637

Project Name:	161 Heathwood Heights Drive			**Project No:**	2024-10-150
Order No:		**Test Date:**	07-Dec-24	**Client:**	Kamran Rzayev
Borehole No:	BH5	**Borehole Location:**	Figure2	**Lead Consultant:**	
Sample No:	SS5	**Sample Depth:**	3.25	**moisture content:**	7.6%



Clay: **15** Silt: **28** Sand: **53** Gravel: **4**

LL: PL: PI:

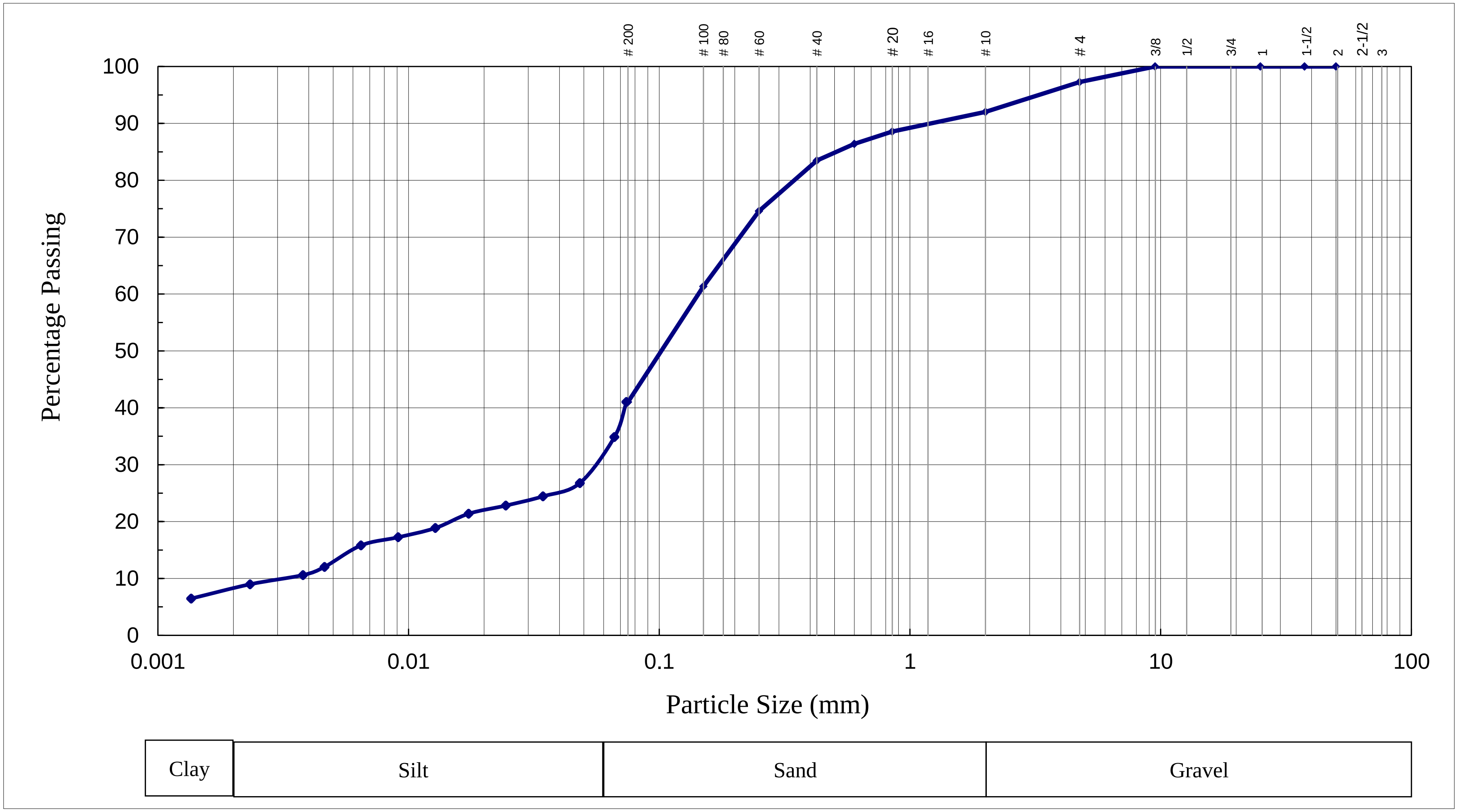
GMGFR-006-R0

Sieve & Hydrometer Analysis

Geomaple Geotechnics Inc.

Lab#: 100638

Project Name:	161 Heathwood Heights Drive			**Project No:**	2024-10-150
Order No:		**Test Date:**	06-Dec-24	**Client:**	Kamran Rzayev
Borehole No:	BH5	**Borehole Location:**	Figure2	**Lead Consultant:**	
Sample No:	SS10	**Sample Depth:**	10.73	**moisture content:**	11.5%



Clay: **8** Silt: **22** Sand: **62** Gravel: **8**

LL: PL: PI:

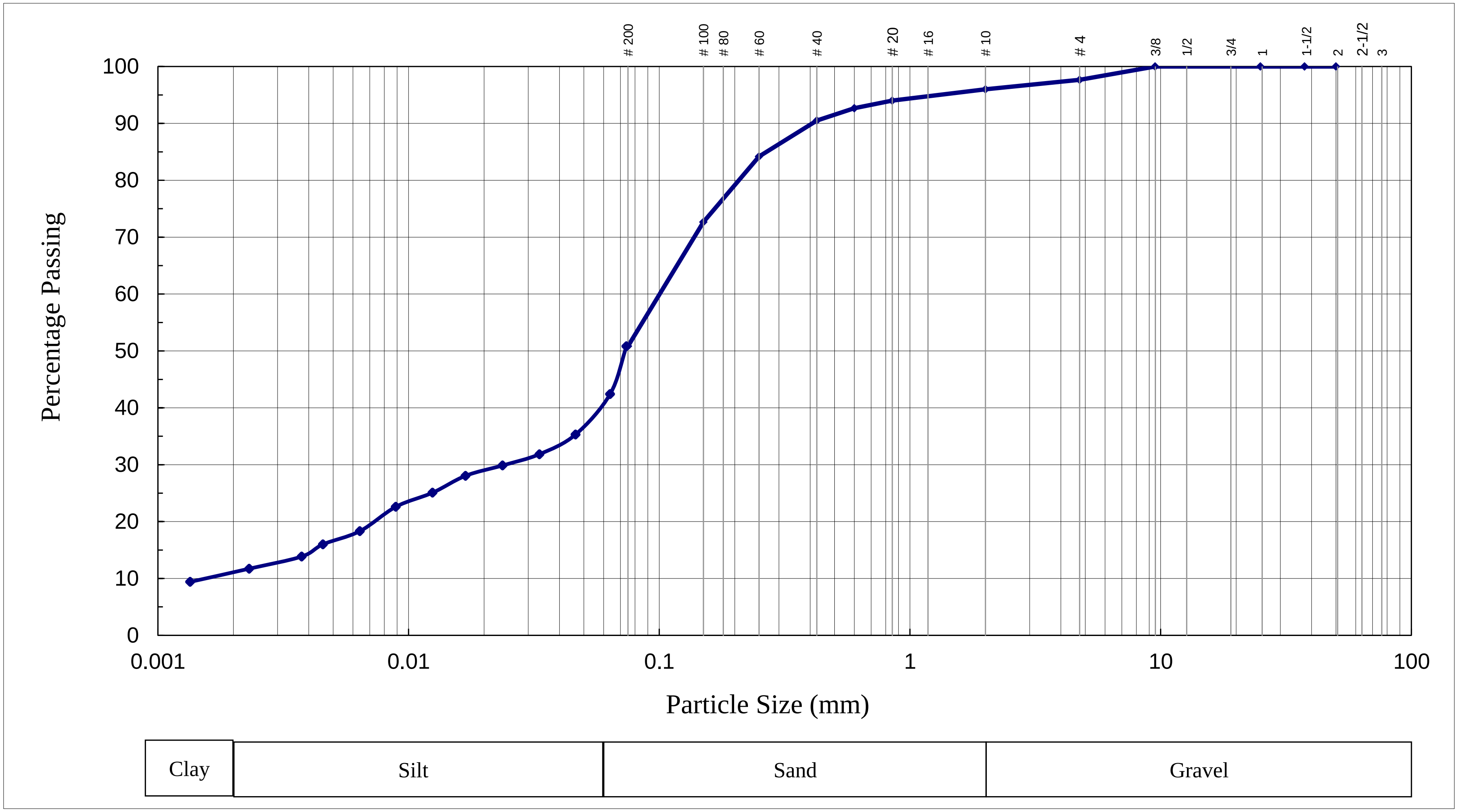
GMGFR-006-R0

Sieve & Hydrometer Analysis

Lab#: 100639

Geomaple Geotechnics Inc.

Project Name:	**161 Heathwood Heights Drive**			**Project No:**	**2024-10-150**
Order No:		**Test Date:**	**06-Dec-24**	**Client:**	**Kamran Rzayev**
Borehole No:	**BH6**	**Borehole Location:**	**Figure2**	**Lead Consultant:**	
Sample No:	**SS6**	**Sample Depth:**	**4.8**	**moisture content:**	**7.7%**



Clay: **11** Silt: **28** Sand: **57** Gravel: **4**

LL: PL: PI: