



Appendix A – Geotechnical Review



Quality Engineering | Valued Relationships

Burns Maendel Consulting Engineers Ltd.

**Norwood Colony, RM of St. Andrews, MB
Geotechnical Investigation Report**

Prepared for:

Kyla Bietrich, E.I.T.

Burns Maendel Consulting Engineers Ltd.

903 Rosser Avenue, Brandon, MB

R7A 0L3

Project Number: 0105-098-00

Date: May 12, 2025



Quality Engineering | Valued Relationships

May 12, 2025

Our File No. 0105-098-00

Kyla Bietrich, E.I.T.
Burns Maendel Consulting Engineers Ltd.
903 Rosser Avenue, Brandon, MB
R7A 0L3

**RE: Norwood Colony, RM of St. Andrews, MB
Geotechnical Investigation Report**

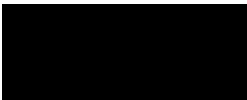
TREK Geotechnical Inc. is pleased to submit our final report for the above noted project.

Please contact the undersigned should you have any questions.

Sincerely,

TREK Geotechnical Inc.

Per:



Ryan Belbas, M.Sc., P.Eng.
Senior Geotechnical Engineer

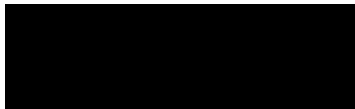
Encl.

Revision History

Revision No.	Author	Issue Date	Description
0	TR	April 14, 2025	Final Report
1	TR	May 12, 2025	Final Report - Revised

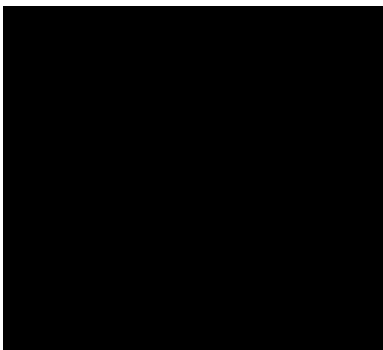
Authorization Signatures

Prepared By:

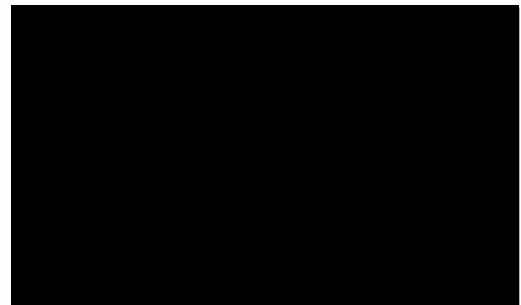


Tyson Roeland, E.I.
Geotechnical Engineering Intern

Reviewed By:



Reza Jamshidi Chenari, Ph.D., P.Eng.
Senior Geotechnical Engineering



Ryan Belbas, M.Sc., P.Eng.
Senior Geotechnical Engineer

Table of Contents

Letter of Transmittal

Revision History and Authorization Signatures

1.0	Introduction	4
2.0	Background and Site Conditions	4
3.0	Field Program	4
3.1	Sub-surface Investigation	4
3.2	Soil Stratigraphy	5
3.3	Power Auger Refusal	6
3.4	Groundwater and Sloughing Conditions	6
4.0	Site Development	8
5.0	Foundation Recommendations	8
5.1	Limit States Design	8
5.2	Shallow Foundations	10
5.3	Cast-in-Place End Bearing Piles	12
5.4	Pile Caps and Grade Beams	14
5.5	Adfreezing Effects	14
5.6	Foundation Concrete	15
5.7	Foundation Inspection Requirements	15
6.0	Concrete Slabs	16
6.1	Grade Supported Concrete Slabs	16
6.2	Structural Floor Slabs	17
7.0	Lateral Earth Pressure	17
8.0	Pavement Recommendations	18
9.0	Suitability For Use as Clay Liner	20
10.0	Seismic Classification	21
11.0	Site Drainage	21
12.0	Temporary Excavations	21
13.0	Closure	21

Figure

Test Hole Logs

Appendices

List of Tables

Table 1	Power Auger Refusal Summary	6
Table 2	Groundwater and Sloughing Conditions Summary.....	7
Table 3	Ultimate Geotechnical Resistance Factors for Deep and Shallow Foundations	10
Table 4	Recommended Values for Lateral Sub-grade Reaction Modulus (K_s).....	13
Table 5	Lateral Earth Pressure Coefficients for Wall Design	17
Table 6	Pavement Sections for Roads and Parking Areas.....	19
Table 7	Soil Permeability Properties	20

List of Figures

Figure 1	Test Hole Location Plan
Figure 2	Groundwater Elevation vs Time

List of Appendices

Appendix A	Laboratory Testing Results
------------	----------------------------

1.0 Introduction

This report summarizes the results of the geotechnical investigation completed by TREK Geotechnical Inc. (TREK) for the proposed Norwood Colony New Development located at SE 19-16-4E in the RM of St. Andrews, MB. The proposed colony is located approximately 30 km northwest of Selkirk MB.

The terms of reference for the investigation are included in our proposal to Burns Maendel Consulting Engineers Ltd. (BMCE) dated March 6, 2024. The scope of work includes a sub-surface investigation, laboratory testing, and provision of geotechnical recommendations for suitable foundation alternatives, concrete slabs, below grade walls, lagoon liners, and pavements. Recommendations for temporary excavations, shoring, backfilling and compaction, seismic site classification, quality control materials testing, and inspection services during construction are also included.

2.0 Background and Site Conditions

TREK understands the development will include residential, industrial, and agricultural structures, as well as a school and gymnasium, playground, greenhouses, lagoon, parking areas, and access roads. Foundation loads for the new buildings are unknown, however approximate building footprints and locations were provided.

The existing site consists of relatively flat-lying agricultural fields with some areas of trees and brush. At the time of the investigation, the site was snow covered.

3.0 Field Program

3.1 Sub-surface Investigation

A sub-surface investigation was completed on January 20th to 24th, 2025 under the supervision of TREK personnel to determine the soil stratigraphy and groundwater conditions at the site. A total of twenty-six (26) test holes were drilled (TH25-01 to 26) across the site, including:

- five test holes drilled to within the proposed lagoon area (TH25-22 to 26) for evaluation of the clay as a lagoon liner.
- seven test holes within access roads and parking areas (TH25-01 to 03, 08, 09, 11, and 18) for evaluation of pavement requirements; and
- fourteen test holes near the proposed buildings (TH25-04 to 07, 10, 12 to 17, and 19 to 21) for evaluation of foundations, concrete slabs, and retaining walls.

The test hole locations are shown on Figure 01 (attached). The test holes were drilled by Paddock Drilling Ltd. using a Mobile B-57 track-mounted drill rig equipped with 125 mm diameter solid stem augers and a Canterra CT250 truck-mounted geotechnical drill rig equipped with 125 mm diameter solid stem augers. The test holes were drilled at locations proposed and approved by BMCE.

Three 25 mm diameter PVC standpipes fitted with Casagrande tips were installed in three test holes (TH25-06, 12, and 23) to monitor groundwater levels. Standpipe test holes were backfilled with a sand

filter then bentonite to surface. Test holes located near the proposed lagoon were backfilled exclusively with bentonite, and the remainder of test holes were backfilled using auger cuttings and bentonite chips to surface.

Sub-surface soils observed during drilling were visually classified based on the Unified Soil Classification System (USCS). Samples retrieved during drilling include disturbed (auger cutting and split spoon) samples. Standard Penetration Tests were performed at depths where split spoon samples were obtained. Undrained shear strength testing was performed in the field on the grab samples (i.e. auger cuttings / disturbed samples) using Torvane and/or Pocket Penetrometer testing devices, and the results are provided on the test hole logs.

All samples retrieved during drilling were transported to TREK's material testing laboratory in Winnipeg, Manitoba. Laboratory testing consisted of moisture content determination on all samples, and standard proctor and flexible wall permeability testing on bulk clay samples obtained from the lagoon area. Atterberg limits and grain-size analysis was performed on select samples. Laboratory test results are included in Appendix A.

The test hole locations were recorded using a handheld GPS. Test hole geodetic elevations were surveyed by BMCE and provided for inclusion in the test hole logs. Test hole logs are attached describing the soil units encountered and other pertinent information such as groundwater and sloughing conditions, UTM coordinates, and a summary of the laboratory testing results for each test hole.

3.2 Soil Stratigraphy

A brief description of the soil units encountered during drilling is provided below. All interpretations of soil stratigraphy for the purposes of design should refer to the detailed information provided on the attached test hole logs.

In general, the soil stratigraphy in the test hole locations consists of varying layers of sands, clay with silt till, and silt till. Layers of silty clay were also encountered in some test holes near and at the surface above the tills and sands.

Layers of sands were encountered in some test holes, typically between till layers but occasionally at surface level. The sand typically contains trace to some clay, trace to some silt, and trace to some gravel. The sand is light brown, moist, compact becoming very dense with depth, and well graded containing fine-grained sand to medium grained gravel.

Silty clay was encountered in test holes TH25-22, 23, and 25 near the lagoon area and in test holes TH25-01 to 05, 10 and 18 at the colony area at the surface. The clay is silty, containing trace gravel, trace silt inclusions, is brown, frozen to approximately 1.5 m below ground, moist and stiff when thawed, and of high plasticity.

Clay with silt till was typically found at or near surface in test holes extending to depths up to 6.1 m below ground surface. The till contains some sand and trace gravel. It is brown, moist, stiff to very stiff, and of intermediate plasticity.

Silt till was encountered in most test holes, typically below the clay with silt till up to the maximum explored depths. The silt till is clayey, sandy containing trace gravel, is light brown, moist, compact, becoming very dense with depth, and of low plasticity.

3.3 Power Auger Refusal

Power auger refusal (PAR) was encountered in fifteen test holes at varying depths. Power auger refusal is suspected to have typically occurred on cobbles and boulders within stiff clay till or dense to very dense silt till. A summary of refusal depths is provided in Table 1 below.

Table 1. Power Auger Refusal Summary

Test Hole ID	Refusal Depth Below Grade (m)	Geodetic Elevation of Refusal (m)
TH25-04	5.0	259.5
TH25-05	3.3	262.0
TH25-06	5.5	259.1
TH25-08	8.4	255.8
TH25-10	7.0	256.7
TH25-11	4.9	257.9
TH25-12	6.1	255.1
TH25-13	5.8	255.5
TH25-14	5.5	256.8
TH25-15	7.6	255.1
TH25-16	4.7	258.3
TH25-17	4.3	258.7
TH25-20	6.4	257.2
TH25-21	5.8	256.9
TH25-26	4.0	254.4

3.4 Groundwater and Sloughing Conditions

Seepage and/or sloughing was observed in several test holes during drilling from within the till or underlying sand deposits. Table 2 provides a summary of these observed conditions, including the depths seepage and sloughing were observed, as well as the open test hole depths and water levels immediately after drilling.

Table 2. Groundwater and Sloughing Conditions Summary

Test Hole ID	Depth Seepage Observed (m)	Depth Sloughing Observed (m)	Final Test Hole Depth (m)	Open Test Hole Depth at the End of Drilling (m)	Depth to Water Level at the End of Drilling (m)
TH25-08	6.1	6.1	8.4	6.1	5.9
TH25-10	6.1	6.1	7.5	6.2	6.1
TH25-12	3.8	3.8	6.5	5.8	5.5
TH25-13	3.6	3.6	5.8	5.0	4.7
TH25-14	4.9	4.9	5.5	5.3	4.7
TH25-16	4.1	4.1	4.7	4.1	Dry
TH25-20	4.9	4.9	6.4	6.2	5.5
TH25-22	2.4	2.4	6.5	4.3	2.4
TH25-23	4.3	N/A	6.1	6.1	5.8
TH25-24	5.5	N/A	6.1	6.1	5.5

The water levels in two of the standpipe piezometers (SP25-06 and 12) were measured approximately one month after drilling with a water level meter. Water levels were measured at depths of 4.9 and 3.4 m below grade in SP25-06 and 12, respectively. A water level logger (Solinst Levelogger) was installed in SP25-23 for continuous monitoring of the piezometer between January 24 and February 28, 2025. During this period the water level in SP25-23 fluctuated between approximately elevation 256.9 and 257.8 m. Figure 02 provides a plot of groundwater elevation versus date for the piezometers.

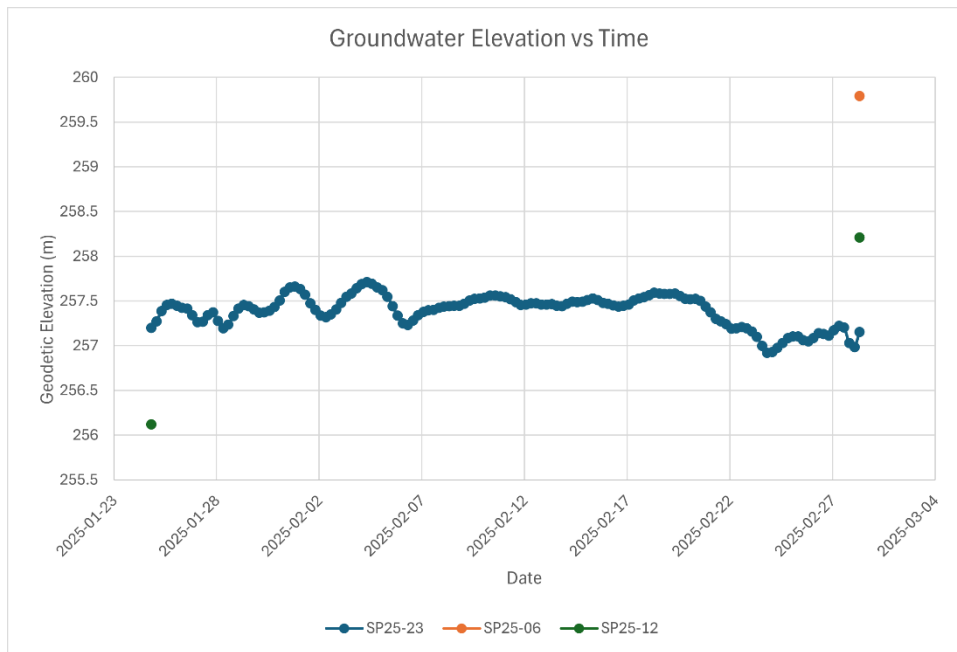


Figure 2. Groundwater Elevation vs Time

Groundwater observations made during drilling are considered short term and should not be considered reflective of (static) groundwater levels at the site, which would require monitoring over an extended period of time to determine. It is important to recognize that groundwater conditions may vary seasonally, annually, or as a result of construction activities.

4.0 Site Development

Site development is anticipated to require levelling of the ground surface to achieve design grades. Ground levelling is expected to consist of cut and fill methods. In areas where fill is required to raise grades, organics (topsoil, peat), silt, and any other deleterious materials should be stripped such that the sub-grade consists of clay, sand or till. The fill may also consist of the local clay or till materials; Grain-size analysis of the local sand shows it may also be acceptable as a fill material. Sand, clay, and till fill should be placed in lifts no greater than 150 mm and compacted to at least 95% of the Standard Proctor Maximum Dry Density (SPMDD). At this level of compaction, settlement is expected to range from 1 to 2% of the fill thickness.

5.0 Foundation Recommendations

TREK understands that shallows foundations (footings, thickened-edge slabs, mats) and cast-in-place concrete (CIPC) end bearing piles are the preferred foundation alternatives for the site. Based on the soil and ground water conditions encountered, these foundation alternatives are suitable for the proposed new development. Recommendations for these pile types according to the current Manitoba Building Code (MBC 2024), which is based on the National Building Code of Canada (NBCC, 2020), are provided in the following sections.

5.1 Limit States Design

The foundation recommendations provided in this report are based on limit state design. The National Building Code of Canada (NBCC, 2020), the Canadian Highway Bridge Design Code (CHBDC, 2019), and the American Association of State Highway and Transportation Officials (AASHTO, 2024) require the use of limit state design that utilize load and resistance factor design (LRFD) methodology. CHBDC (2019) also incorporates a consequence factor for geotechnical systems while NBCC (2020) does not.

Table 1 of this report summarizes the recommended ULS geotechnical resistance factors that can be used for the design of foundations based on the degree of understanding (low, typical and high) of the site subsurface conditions and models used to predict geotechnical resistance. Depending on the relevant Code, resistance factors may depend upon the degree of understanding and verification testing completed during construction.

The following definitions from the 5th Ed. of the Canadian Foundation Engineering Manual (CFEM, 2023) are provided with additional notes to assist the reader with the limit state design terminology used in the building foundation recommendations.

Limit states: conditions beyond which a geotechnical system or component ceases to meet the criteria for which it was designed. The main ones are:

Serviceability limit states (SLS) – states corresponding to behaviour of the ground that causes unacceptable serviceability performance conditions, such as deformations, that restrict the intended use of the supported structure and (or) geotechnical system. Recommendations in this report are provided for evaluating the SLS that are developed based on limiting settlement to 25 mm or less. If a more stringent settlement tolerance is required, detailed settlement analysis should be conducted to refine the estimated settlement and/or adjust our recommendations.

Ultimate limit states (ULS) – states corresponding to a loss of stability of the geotechnical system and (or) failure of the supported structure.

Load factor – factor used to modify (usually increase) the characteristic load acting on and from a structure, for the limit state being considered.

Geotechnical resistance factor (ϕ)– multiplicative value that accounts for uncertainty in the geotechnical resistance to produce an acceptable and reliable geotechnical system.

Ultimate geotechnical resistance factor – resistance factor to be used at the ULS.

Characteristic (Nominal) geotechnical parameter – an appropriately conservative estimate of the mean value of a geotechnical parameter for individual strata within the zones of influence of applied loads.

Consequence factor (Y) - multiplicative factor applied to ultimate and serviceability geotechnical resistances, which accounts for consequences of exceeding the limit state under consideration.

Geotechnical resistance – load that the ground can support at a limit state. Different resistances can be defined, including:

Characteristic (nominal) ultimate geotechnical resistance – maximum load that the ground can support at the ULS, estimated using characteristic (nominal) geotechnical parameters.

Factored ultimate (ULS) geotechnical resistance – product of the consequence factor, the ultimate geotechnical resistance factor, and the characteristic (nominal) ultimate geotechnical resistance.

Table 3. Ultimate Geotechnical Resistance Factors for Deep and Shallow Foundations

Deep Foundations	Resistance Factors (ϕ) ^(Note 1)
Limit State: Test Method / Model	Degree of Understanding
	Typical
Compression: Static Analysis	0.4
Compression: Dynamic Testing (i.e. PDA testing with CAPWAP) ^(Note 2)	0.5
Uplift Resistance – Static Analysis	0.3
Shallow Foundations	Resistance Factors (ϕ) ^(Note 1)
Limit State: Test Method / Model	Degree of Understanding
	Typical
Bearing: Analysis	0.5
Sliding	0.8

1. Based on a consequence factor of 1.0
2. TREK should be contacted to determine the number of tests required for use of the associated resistance factor.

5.2 Shallow Foundations

Footings and thickened-edge slabs bearing on undisturbed, dense to very dense sand, stiff to very stiff clay till, or dense to very dense silt till can be designed using a SLS bearing resistance of 240 kPa and a factored ULS bearing resistance of 360 kPa. For thickened-edge slabs, the bearing resistances should only be applied to the base of the thickened-edges. Mats bearing on undisturbed, dense to very dense sand, stiff to very stiff clay till, or dense to very dense silt till can be designed using an SLS bearing resistance of 120 kPa and a factored ULS bearing resistance of 180 kPa. The SLS values are based on a limiting settlement to 25 mm or less and the ULS values were determined using a resistance factor of 0.5.

Shallow foundations are subject to vertical movements associated with moisture and volume changes of the underlying soils. Although difficult to predict, these movements could be in the order of 25 mm or more. Shallow foundations in unheated areas will be subject to further movements due to freeze/thaw of the bearing soils. It may be desirable to provide control joints in the slabs to reduce random cracking and isolation joints to separate the foundations from other structural elements and accommodate these movements. If these movements are considered unacceptable, a piled foundation will be required to support the proposed buildings. It should be understood that seasonal movements are independent of displacement required to mobilize bearing capacity.

Insulation Recommendations

The foundation soils at the site are frost susceptible, which refers to the propensity of the soil to grow ice lenses and heave during freezing. Methods to reduce frost-related movements include placement of the footings and thickened edges below the depth of frost penetration (2.4 m below final grade) or incorporating insulation such as Styrofoam Highload into the foundation design to provide frost protection to an equivalent depth of 2.4 m.

The following recommendations apply to footings, thickened-edge slabs, and mats supporting structures that will be heated year-round:

1. Rigid extruded polystyrene insulation (e.g. Styrofoam Highload™) should be placed at a minimum depth of 0.4 m and extended 1.2 m horizontally in all directions from the building foundation according to manufacturers specifications.
2. Insulation should be a minimum of 50 mm thick. Joints between insulation layers should be staggered.
3. For heated structures, insulation should be fastened to exterior walls up from the horizontal insulation to a level coincident with the insulation of the interior wall.
4. Insulation should be sloped away from the structure to promote runoff.

Additional Design Recommendations:

1. Footings and thickened edges should have a minimum width of 0.75 m. However, minimum footing and thickened edge widths should be verified with the applicable building code (e.g. Manitoba Building Code, NBCC).
2. Shallow foundations should be designed to resist all design loads (overturning, sliding, vertical) and forces induced from seasonal movements (swelling, shrinkage, freeze, thaw). Resistance to overturning and uplift forces due to lateral and/or eccentric loads will be provided from the weight of the backfill and structural dead loads.
3. Where a footing and pier are present, the weight of the backfill above the footing should be included in the structural loading).

Construction Recommendations:

1. All fill, organics, silts, and any other deleterious material should be completely removed such that the bearing surface consists of undisturbed, dense to very dense sand, stiff to very stiff clay till, or dense to very dense silt till.
2. Excavations for shallow foundations should be completed by an excavator equipped with a smooth-bladed bucket operating from the edge of the excavation.
3. The sand and till are expected to be sensitive to disturbance during construction. The contractor should work carefully to prevent disturbance of the bearing surface at all times.
4. Mechanical compaction may be required for sand bearing surfaces if they become disturbed due to excavation and other construction activities.

5. The bearing surfaces should be protected from mechanical disturbance, freezing, drying, and inundation with water at all times. If any of these conditions occur, additional preparation work (e.g., compaction, excavation) will be required as recommended by TREK.
6. It is important that footings are not installed on a frozen bearing surface during construction. Measures to prevent freezing of the foundation soils could include construction of the footings during the summer and fall seasons when frost is not present at or below the footing depth, or heating and hoarding the site in late fall or early winter before frost has penetrated to the foundation level.
7. After preparation, the bearing surface should be assessed and documented by TREK prior to erection of concrete forms and placement of steel reinforcement and concrete to verify the adequacy of the bearing surface and proper installation of the shallow foundations.
8. Concrete must be placed under dry conditions. If groundwater is encountered, it should be controlled and removed from the bearing surfaces.

5.3 Cast-in-Place End Bearing Piles

Cast-in-place concrete piles with straight shafts end bearing on very dense silt till with mechanically cleaned bases can be designed using a SLS end bearing resistance of 480 kPa and a factored geotechnical ULS end bearing resistance of 580 kPa. A geotechnical resistance factor of 0.4 has been used to obtain the factored geotechnical ULS end bearing resistance. Settlement of the piles under service loads is expected to be 25 mm or less. Elastic shortening of the pile should be added to the tip displacement to calculate the pile head settlement.

Additional Design Recommendations

1. Piles should have a minimum shaft diameter of 450 mm and a spacing of 2.5 pile diameters measured center to center. Where the spacing cannot be achieved, TREK should be contacted for additional input and assess the potential for group effects.
2. If large cobbles and/or boulders are encountered in the pile borings, the shaft diameter may need to be increased to 610 mm, or more, to facilitate removal of the cobbles and boulders.
3. A factored ULS uplift resistance of 15.0 kPa (resistance factor of 0.3 applied) can be used for design. Uplift resistance within the upper 2 m of the pile below ground level should be ignored to account for the potential for soil shrinkage away from the pile.
4. Piles require steel reinforcement designed by a structural engineer for the anticipated axial (compression and tension), lateral and bending loads induced from the structure as well as forces induced from seasonal movements (i.e. shrinkage/swelling and frost-related movements) of the bearing soils.

Pile Installation Recommendations

1. The foundation contractor must expect to encounter wet sand layers, cobbles and boulders within the till. Churn drilling (locally referred to as chopping) of boulders may be necessary to advance the borings in the till or using a larger auger (e.g. ≥ 610 mm diameter) to help with removal of boulders. The pile bases are to be mechanically cleaned with double start augers, clean out buckets, or other

- tools as required to remove the auger cuttings off the bottom of the pile hole to the satisfaction of the geotechnical engineer.
2. Temporary steel casings (sleeves) should be available and used if sloughing of the pile hole occurs and/or to control groundwater seepage, if encountered. Care should be taken in removing sleeves to prevent sloughing (necking) of the shaft walls and a reduction in the cross-sectional area of the pile.
 3. Concrete should be placed in one continuous operation immediately after completion of drilling the pile hole to avoid potential construction problems such as sloughing or caving of the pile hole and groundwater seepage. Concrete placed by free-fall methods should be poured under dry conditions. If groundwater is encountered, it should be controlled or removed. If water cannot be controlled or removed, the concrete should be placed using tremie methods.
 4. Concrete placed by free-fall methods should be directed through the middle of the pile shaft and steel reinforcing cage to prevent striking of the drilled shaft walls to protect against soil contamination of the concrete.
 5. The installation of all piles should be observed and documented by TREK Geotechnical personnel to confirm the piles are installed on very dense silt till according to the geotechnical recommendations and to confirm that soil conditions are consistent with these recommendations.

Lateral Pile Capacity

For preliminary design of pile foundations, the soil response (sub-grade reaction) to lateral loads can be modeled in a simplified manner that assumes the soil around a pile can be simulated by a series of horizontal springs for preliminary design of pile foundations. The soil behaviour can be estimated using an equivalent spring constant referred to as the lateral sub-grade reaction modulus (K_s). The majority of lateral resistance will typically be offered by the upper 5 to 10 m of soil, depending on the relative stiffness of the pile and soil units. Estimated values of the lateral sub-grade reaction modulus can be calculated based on the values provided in Table 4 below.

Table 4. Recommended Values for Lateral Sub-grade Reaction Modulus (K_s)

Approximate Pile Depth Below Existing Site Grade (m)	Soil Type	K_s (kPa/m) ¹
0 to 3.0	Mixed Soils	2,000/d
3.0 to 8.5	Clay or Silt Till	4,400/d

Note 1: d = pile diameter.

It should be understood that using the lateral sub-grade reaction modulus assumes a linear response to lateral loading and therefore is only appropriate under the following conditions:

- maximum pile deflections are small (less than 1% of the pile diameter),
- loading is static (not cyclic), and
- pile material behaves linear elastically (does not reach yield conditions).

If one or more of these conditions are not met, a more rigorous analysis that includes non-linear behavior of the piles and surrounding soil is required (e.g. p-y curve method). In this regard, a lateral pile analysis that incorporates the material and section properties of the piles, lateral pile deflection

criteria, and a more realistic elastic-plastic model of the soil response to loading should be carried out to confirm the lateral load capacity of the piles.

5.4 Pile Caps and Grade Beams

A minimum void of 150 mm should be provided underneath all pile caps and grade beams to accommodate volumetric changes in the underlying sub-grade soils (i.e. swelling, shrinkage, and thermal expansion and contraction in unheated areas). Void forms should be used under pile caps and grade beams and should be capable of deforming a minimum of 150 mm without transferring excessive stress to the structure.

Excavations for pile caps and grade beams should be backfilled with granular sub-base material that is compacted to 90 to 92 percent of the Standard Proctor Maximum Dry Density (SPMDD). Crushed limestone material consistent with MTI Standard Construction Specification No.901(1) Material Specification for Aggregate – Granular Coarse are recommended for the granular sub-base material.

5.5 Adfreezing Effects

Concrete piles, pile caps, grade beams, and below grade walls subjected to freezing conditions should be designed to resist adfreeze and uplift forces related to frost acting along the vertical face of the member within the depth of frost penetration (2.4 m). In this regard concrete members may be subject to an adfreeze bond stress of 65 kPa for concrete members within the depth of frost penetration. Adfreeze forces will be resisted by structural dead loads and uplift resistance provided by the length of the pile below the depth of frost penetration. The following design recommendations apply to piles subject to adfreeze forces:

1. A load factor (α) of 1.2 may be used in the calculation of adfreezing forces.
2. The geotechnical resistance for this ULS condition can be calculated using a factored ULS uplift resistance of 40 kPa applied to the pile shaft. A resistance factor of 0.8 was used to calculate the factored ULS uplift resistance.
3. Resistance to adfreezing within the depth of frost penetration should be neglected.
4. Unfactored structural dead loads should be added to the resistance.
5. The calculated geotechnical resistance plus the structural dead loads must be greater than the factored adfreezing forces.
6. Piles subject to adfreezing forces should be installed to a minimum depth of 8.0 m below final site grade or as calculated by the method above, whichever is greater.
7. Piles require steel reinforcement designed by a structural engineer for the anticipated adfreeze forces.
8. Measures such as flat lying rigid polystyrene insulation could be considered to reduce frost penetration depths and thereby adfreezing and uplift forces.
9. A greased, polyethylene wrapped Sonotube could also be placed around the upper 2.4 m of CIPC friction pile shafts to act as a bond breaker and provide additional protection against frost heave.
10. The calculated geotechnical and structural resistances must be greater than the factored ad-freezing force.

5.6 Foundation Concrete

Two samples (G29 and G142) were submitted to ALS Environmental for sulfate testing. Testing of both samples showed a total sulfate ion content of <0.05% indicating a negligible water-soluble content. In this regard, the degree of exposure for concrete subjected to sulphate attack is considered negligible according to Table 3, CSA A23.1-19 (Concrete Materials and Methods of Concrete Construction). Accordingly, high sulphate-resistant cement (HS or HSb) is not required, and Type GU is suitable for use. Concrete that may be exposed to freezing and thawing should be adequately air entrained to improve freeze-thaw durability in accordance with Table 4, CSA A23.1-19.

It should be noted, however, that the RM of St. Andrews is known to have soils with high sulphate content, so it would be prudent to use sulphate sulphate-resistant cement. In this case, all concrete in contact with the native soil should be made with high sulphate-resistant cement (HS or HSb). Furthermore, the concrete should have a minimum specified 56-day compressive strength of 32 MPa and have a maximum water to cement ratio of 0.45 in accordance with Table 2, CSA A23.1-19 for concrete with severe sulphate exposure (S2).

5.7 Foundation Inspection Requirements

In accordance with Section 4.2.2.3 *Field Review* of the NBCC (2020), the designer or other suitably qualified person shall carry out a field review on:

- a) continuous basis during:
 - i. the construction of all deep foundation units with all pertinent information recorded for each *foundation unit*,
 - ii. during the installation and removal of retaining structures and related backfilling operations,
 - iii. during the placement of engineered fills that are to be used to support the *foundation units*, and
- b) as-required, unless otherwise directed by the *authority having jurisdiction*,
 - i. in the construction of all *shallow foundation units*, and
 - ii. in excavating, dewatering and other related works.

In accordance with Engineers and Geoscientists of Manitoba, a Professional Engineer or delegated staff responsible to them must perform site reviews for the work presented in the documents they've sealed.

For conformance with the NBCC and EGM requirements, TREK should be retained on a full-time basis to observe and document the installation of all pile foundations, shoring or engineered fills supporting the structure, and on an as-required basis for other components such as sub-grade inspections and compaction testing. TREK is familiar with the geotechnical conditions present and the underlying design assumptions of our foundation recommendations. TREK is therefore solely qualified to evaluate any design modifications deemed to be necessary should altered sub-surface conditions be encountered.

6.0 Concrete Slabs

6.1 Grade Supported Concrete Slabs

If some movement can be tolerated, grade-supported concrete floor slabs can be used. Vertical deformation of grade-supported slabs should be expected due to volumetric changes in the underlying sub-grade soils (i.e., swelling and shrinkage). Although difficult to predict, movements on the order of 25 to 50 mm or more should be expected. Slabs in unheated areas or near the perimeter of the structures will be subject to additional movements from freeze/thaw of the sub-grade soils. The movements will be differential and are not expected to be uniform across the floor slab. A major factor impacting the magnitude of floor slab movements, which should be expected, are the climatic effects during construction which might impact changes in the sub-soil moisture conditions. For these reasons, it is not possible to assess the amount of soil movement which will occur with any degree of accuracy. If these movements cannot be tolerated, a structural floor slab will be required.

Additional Recommendations:

1. All fill, silt, organics, and any other deleterious material should be removed such that the sub-grade consists of undisturbed, compact to dense silt till, compact to dense sand, or stiff to very stiff clay till.
2. Excavation should be completed with an excavator equipped with a smooth bucket and operating from the edge of the excavation in order to minimize disturbance to the exposed sub-grade at all times.
3. The sand and till are expected to be sensitive to disturbance during construction. The contractor should work carefully to prevent disturbance of the bearing surface at all times.
4. Mechanical compaction may be required for sand bearing surfaces if they become disturbed due to excavation and other construction activities.
5. After excavation, the sub-grade should be inspected by TREK prior to placement of new fill and granular base materials to identify soft areas, silt, or organics. Soft and silt areas should be repaired as per recommendations provided by TREK. This may consist of excavating an additional 150 to 300 mm of granular sub-base and placing a non-woven geotextile on the sub-grade and backfilling with the 50 mm down granular sub-base material. The additional sub-base material should be placed in lifts no greater than 150 mm and compacted to a minimum of 98% of the SPMDD. Organics should be removed in their entirety.
6. The sub-grade should be protected from freezing, drying, inundation or disturbance. If any of these conditions occur, the sub-grade should be scarified, moisture conditioned as appropriate, and re-compacted to a minimum of 95% of the SPMDD.
7. In heated areas, the floor slab should be placed on a 150 mm thick layer of GSB-C crushed granular sub-base underlying a 150 mm thick base consisting of GBC-I or GBC-II crushed granular base course. In unheated areas (e.g. exterior slabs) the thickness of the sub-base should be increased to 250 mm. The crushed granular material should be placed in lifts no greater than 150 mm and compacted to 98% of the SPMDD.

8. The granular base and subbase materials should consist of a well graded, durable crushed limestone in accordance with MTI Standard Construction Specification No.901(1) Material Specification for Aggregate – Granular Course.
9. Floor slabs should be designed to resist all structural loads and to minimize slab cracking associated with movements as a result of swelling, shrinkage, and thermal expansion and contraction of the sub-grade soils.
10. To accommodate slab movements, it may be desirable to provide control joints to reduce random cracking and isolation joints to separate the slab from other structure elements. Allowances should be made to accommodate vertical movements of light-weight structures (e.g., partitions) bearing on the slab.
11. A filter-protected drainage system (weeping tile) should be installed around the perimeter of all grade-supported slabs and connected to a collection pit complete with a sump pump.

6.2 Structural Floor Slabs

In areas where movement of floor slabs is not tolerable, a structural floor slab should be used. A minimum void of 150 mm beneath structural floor slabs is recommended to accommodate volumetric changes in the underlying sub-grade soils. The void can consist of a compressible layer (e.g., void form) to permit sub-grade soil movements without engaging the floor slab, or alternatively, a crawl space. Void forms should be selected such that they can deform a minimum of 150 mm without transferring excessive stresses to the structure. A vapour barrier should be placed between the floor slab and the void form (if present).

7.0 Lateral Earth Pressure

The magnitude of lateral earth pressures from retained soil against buried walls will depend on the backfill material type, method of placing and compacting the backfill, and the magnitude of rotation of the walls. Table 5 below provides K_o values for calculation of lateral earth pressures developed from granular backfill acting on buried walls that are not free to rotate. Cohesive soils (e.g. existing on-site clay) are not recommended for use as backfill material against buried walls as these soils could generate excessive lateral earth pressures from swelling.

Table 5. Lateral Earth Pressure Coefficients for Wall Design

Design Parameter	Granular Backfill	Existing On-Site Soils
Active Earth Pressure Coefficient (K_a)	0.3	0.3
Passive Earth Pressure Coefficient (K_p)	3.0	3.5
At-Rest Earth Pressure Coefficient (K_o)	0.5	0.4
Estimated Bulk Unit Weight, γ	20 kN/m ³	21 kN/m ³
Estimated Effective Unit Weight, γ'	10 kN/m ³	11 kN/m ³

Note 1: Y = magnitude of lateral wall movement, H = wall height.

Where backfill drainage is expected, such as a sub-drainage system at the base of the abutment to prevent the build-up of hydrostatic pressures, the total lateral earth pressure force is the area of the

triangular pressure distribution acting on a below grade wall which can be derived based on the following equation:

$$P = K\gamma D$$

Where,

P = lateral earth pressure at depth D (kPa)

K = earth pressure coefficient (unitless)

γ = bulk unit weight of retained soil = 20 kN/m³

D = depth below finished grade to where earth pressure is being calculated (m)

If drainage is not expected the following equation should be used:

$$P = K \gamma' D + \gamma_w D$$

Where,

P = lateral earth pressure at depth D (kPa)

K = earth pressure coefficient (unitless)

γ' = effective unit weight of retained soil = 10.2 kN/m³

D = depth below finished grade to where earth pressure is being calculated (m)

γ_w = unit weight of water (9.81 kN/m³)

The effect of any surcharge loads (e.g. construction equipment) must be added to the pressure acting on the walls in addition to the calculated earth pressures. The pressure diagram for surcharge loads is uniform (rectangular) with the wall pressure equivalent to the surcharge pressure multiplied by the appropriate earth pressure coefficient as defined above.

Backfill should not be placed and compacted until the walls can support lateral earth pressures. Over-compaction of the backfill soils adjacent to buried walls may result in earth pressures that are considerably higher than those predicted in design. Compaction of the granular fills within about 1.5 m of the vertical walls should be conducted with a light hand operated vibrating plate compactor and the number of compaction passes should be limited to achieve a maximum of 92% of Standard Proctor Maximum Dry Density (SPMDD). Compensation for any settlement can be made in the final grading by placing additional fill adjacent to the structure.

8.0 Pavement Recommendations

Recommended asphalt and granular pavement sections for parking areas and areas subject to heavier vehicular loads are provided in Table 6. Granular materials that are consistent with MTI Standard Construction Specification No.901(1) Material Specification for Aggregate – Granular Coarse are recommended for the base and sub-base layers.

Table 6. Pavement Sections for Roads and Parking Areas

Material	Asphalt Layer Thickness		Granular Layer Thickness		Compaction/Installation Requirements
	Car Parking Areas	Heavy Vehicular Loads	Car Parking Areas	Heavy Vehicular Loads	
Asphalt	100 mm	100 mm	NA	NA	Mix design and compaction by others
MTI GBC-I or GBC-II Granular Base	100 mm	100 mm	150 mm	150 mm	100% of the SPMDD
MTI GSB-C Granular Sub-Base	250 mm	350 mm	250 mm	350 mm	98% of the SPMDD
Non-Woven Geotextile (Geotex 801 or equivalent)	Required	Required	Required	Required	Install as per manufacturer's recommendations

Additional Recommendations:

1. All fill, silt, organics, and any other deleterious material should be stripped such that the sub-grade consists of compact to dense silt till, compact to dense sand, or stiff to very stiff clay till.
2. Excavation should be completed with an excavator equipped with a smooth-bladed bucket and operating from the edge of the excavation in order to minimize disturbance to the exposed sub-grade.
3. The sand and till are expected to be sensitive to disturbance during construction. The contractor should work carefully to prevent disturbance of the bearing surface at all times.
4. Mechanical compaction may be required for sand bearing surfaces if they become disturbed due to excavation and other construction activities.
5. After excavation, the sub-grade should be inspected by TREK personnel. The sub-grade should be proof-rolled with a fully loaded tandem axle truck to detect silt or soft areas and organics. Silt or soft areas should be repaired as per directions provided by TREK. This will likely consist of excavating an additional 150 to 300 mm, placing a non-woven geotextile on the sub-grade, and backfilling with a 37.5 mm down crushed granular fill. The granular fill should be placed in lifts no greater than 150 mm and compacted to a minimum of 95% of the SPMDD. Organics should be removed in their entirety.
6. The sub-grade should be protected from freezing, drying, inundation with water or disturbance at all times. If any of these conditions occur the sub-grade should be scarified, moisture conditioned as appropriate, and re-compacted to a minimum of 95% of the SPMDD.
7. A non-woven geotextile should be placed in accordance with the manufacturer's recommendations on the prepared sub-grade prior to placement of granular fill.

8. The granular sub-base and base materials should be placed in lifts not exceeding 150 mm and compacted as per the recommendations in Table 6.

9.0 Suitability For Use as Clay Liner

The province of Manitoba requires that soil liners have a minimum hydraulic conductivity of 1×10^{-7} cm/s. To assess the in-situ permeability of a soil liner, flexible wall permeability, Atterberg limits, and grain size analysis testing was conducted on a bulk sample of native silty clay obtained from test holes (TH25-22, 23, and 25) within the extents of the proposed lagoon compacted to 96.5% of the SPMDD. Table 7 summarizes the results of the testing.

Table 7. Soil Permeability Properties

Test Hole and Sample Number	Soil Description	Sample Depth Below Grade (m)	In-situ Hydraulic Conductivity (cm/s)	Atterberg Limits			Grain Size Distribution (%)		
				PL ¹	LL ¹	PI ¹	Clay	Silt	Sand
TH25-22, 23 BLK170+BLK179	Silty Clay	0.5 to 1.5	8.23×10^{-9}	21	69	48	64.2	22.4	12.0

Note 1. PL- Plastic Limit, LL – Liquid Limit, PI- Plasticity Index

The compacted silty clay sample exceeded the provincial hydraulic conductivity requirements for use as a soil liner with a measured hydraulic conductivity of 8.23×10^{-9} cm/s indicating that this material will be suitable for use in a compacted liner. The permeability test results are representative of compacted silty clay properties at specific points and do not necessarily apply to the final properties of the silty clay following bulk excavation, placement, and compaction. Variations in the silty clay composition, moisture content, and compacted density can alter hydraulic conductivity properties and further testing may be required by regulatory authorities to confirm the hydraulic conductivity of the silty clay.

The lagoon is anticipated to be constructed using cut and fill methods. However, sufficient volumes of silty clay may not present within the proposed lagoon area and additional liner material may need to be obtained from other areas of the site or imported from an off-site borrow source.

Additional sampling and Standard Proctor and permeability testing will be required to verify the level of compaction required to achieve a hydraulic conductivity of 1×10^{-7} cm/s or less. Organics and sands must be removed from the subgrade prior to placement of the liner soils. This may however not be practical, and a synthetic liner may be preferred. In this regard, the in-situ soils at the site are sufficient for a synthetic liner sub-grade.

Preparation of a synthetic liner sub-grade should consist of removal of topsoil, silt, organics, and any other deleterious materials such that the sub-grade consists of sand, silty clay, or till. Berms can be constructed of silty clay, till, or suitable imported fill in lifts of 150 mm compacted to 95% of the SPMDD.

10.0 Seismic Classification

The site classification for seismic site response was determined based on Section 4.1.8 *Earthquake Load and Effects* of NBCC (2020). Site Class D applies to this site based on the average standard penetration resistance measured within the site. The seismic site classification could possibly be improved by undertaking a geophysical site survey to measure shear wave velocities in the upper 30 m of the soil profile.

11.0 Site Drainage

Drainage adjacent to structures and exterior slabs should promote runoff away from the structures and slabs. A minimum gradient of about 2% should be used for both landscaped and paved areas and maintained throughout the life of the structures. The water discharge from roof leaders and run-off from exposed slabs should be directed away from the structures.

12.0 Temporary Excavations

Excavations must be carried out in compliance with the appropriate regulations under the Manitoba Workplace Safety and Health Act. Any open-cut excavation greater than 3 m deep must be designed and sealed by a professional engineer. If space is limited or the stability of adjacent structures may be endangered by an excavation, a shoring system may be required to prevent damage to, or movement of, any part of adjacent structures, and the creation of a hazard to workers and the public.

Excavation stability is the responsibility of the Contractor for the duration of construction. Excavations should be monitored regularly and flattened as necessary to maintain stability recognizing that excavation stability is time and weather dependent. Excavated slopes should be covered with polyethylene sheets to prevent wetting and drying.

Stockpiles of excavated material and heavy equipment should be kept away from the edge of any excavation by a distance equal to or greater than the depth of excavation. Dewatering measures should be completed as necessary to maintain a dry excavation and permit proper completion of the work. If seepage is encountered, it should be collected and pumped out of the excavation. If saturated silts or sands are encountered, shoring or slope flattening may be required. To prevent wet silts and sands from entering the excavation, gravel buttressing could be used in conjunction with sump pits for dewatering. Surface water should be diverted away from the excavation and the excavation should be backfilled as soon as possible following construction.

13.0 Closure

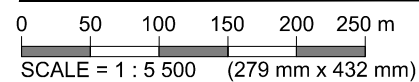
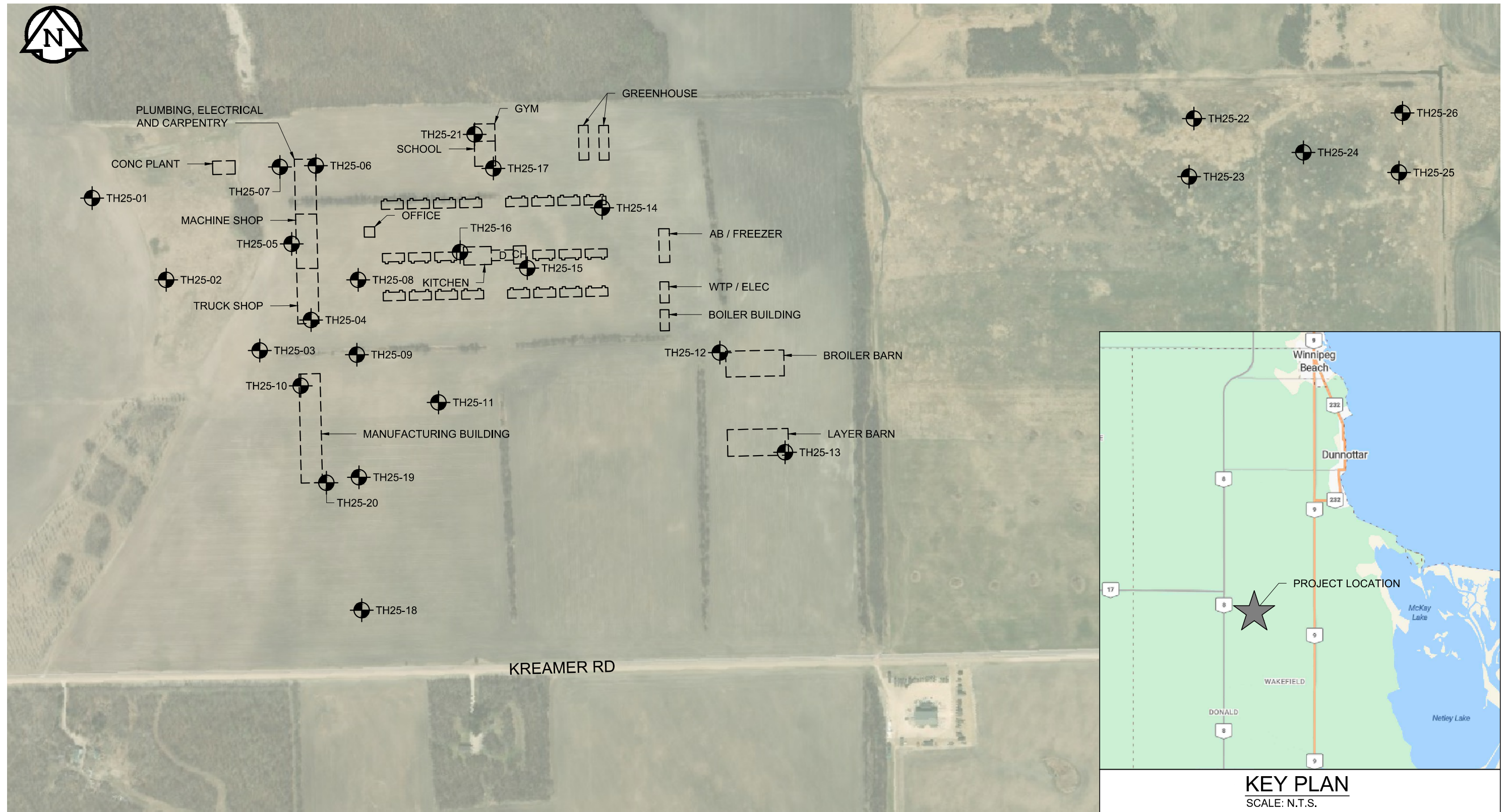
The geotechnical information provided in this report is in accordance with current engineering principles and practices (Standard of Practice). The findings of this report were based on information provided (field investigation and laboratory testing). Soil conditions are natural deposits that can be highly variable across a site. If sub-surface conditions are different than the conditions previously encountered on-site or those presented here, we should be notified to adjust our findings if necessary.

All information provided in this report is subject to our standard terms and conditions for engineering services, a copy of which is provided to each of our clients with the original scope of work or standard engineering services agreement. If these conditions are not attached, and you are not already in possession of such terms and conditions, contact our office and you will be promptly provided with a copy.

This report has been prepared by TREK Geotechnical Inc. (the Consultant) for the exclusive use of Burns Maendel Consulting Engineers Ltd. (the Client) and their agents for the work product presented in the report. Any findings or recommendations provided in this report are not to be used or relied upon by any third parties, except as agreed to in writing by the Client and Consultant prior to use.

Figures

Z:\Projects\0105 Burns Maendel Consulting Ltd\0105 098 00 Rock Lake Colony\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\Fig 2025-02-25 Norwood Colony 0_A 0105-098-00.dwg, 2025-05-12 4:32:36 PM



LEGEND: TEST HOLE (TREK, 2025)

- NOTES:**
1. AERIAL IMAGERY FROM BING MAPS.
 2. TEST HOLE LOCATIONS WERE RECORDED USING A HANDHELD GPS UNIT.
 3. TEST HOLE ELEVATIONS ARE TO BE SURVEYED BY THE CLIENT AT A LATER DATE.
 4. BUILDING LOCATIONS PROVIDED BY BURNS MAENDEL CONSULTING ENGINEERS LTD., DRAWING C1.2 DATED JUNE 27, 2024.

Figure 01
Test Hole Location Plan

Test Hole Logs



Sub-Surface Log

Test Hole TH25-02

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. Project Number: 0105-098-00
 Project Name: Norwood Colony Location: UTM 14U: 5582572 m N, 639709 m E
 Contractor: Paddock Drilling Ltd. Ground Elevation: 265.56 m (geodetic)
 Method: 125 mm solid stem auger B-57 track mounted rig Date Drilled: 20 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16	17	
265.4	0.0		ORGANIC CLAY (TOPSOIL) - trace sand, trace silt, brown, frozen, moist, firm when thawed, intermediate plasticity	<input checked="" type="checkbox"/>	G06				
265.0	0.5		SAND - trace silt, light brown, moist, loose to compact, poorly graded, fine grained	<input checked="" type="checkbox"/>	G07				
263.9	1.0		CLAY - silty, trace sand - light brown - frozen to 1.6 m, moist, firm when thawed - high plasticity	<input checked="" type="checkbox"/>	G08				<input checked="" type="checkbox"/>
262.1	3.5		CLAY WITH SILT (TILL) - some sand, trace gravel (<25 mm diam.) - brown - moist, stiff to very stiff - intermediate plasticity	<input checked="" type="checkbox"/>	G09				<input checked="" type="checkbox"/>
				<input checked="" type="checkbox"/>	G10				<input checked="" type="checkbox"/>
				<input checked="" type="checkbox"/>	SS11	14			

END OF TEST HOLE AT 3.5 m IN CLAY WITH SILT (TILL)

- Notes:
- Seepage and sloughing not observed.
 - Test hole open and dry to 3.1 m immediately after drilling.
 - Test hole backfilled with auger cuttings and bentonite chips to surface.

SUB-SURFACE LOG LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK.GDT 12/5/25

Logged By: Tyson Roeland Reviewed By: Ryan Belbas Project Engineer: Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-03

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582470 m N, 639844 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 265.16 m (geodetic)
Method: 125 mm solid stem auger B-57 track mounted rig **Date Drilled:** 20 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16	17	
							Particle Size (%)		Test Type △ Torvane △ ⊕ Pocket Pen. ⊕ ⊠ Qu ⊠ ○ Field Vane ○
264.9	0.0		ORGANIC CLAY (TOPSOIL) - sandy, trace silt, brown, frozen, moist, firm when thawed		G12				
	0.5		CLAY - silty, trace sand - light brown - frozen to 1.5 m, moist, firm when thawed - high plasticity		G13				
263.6	1.5		CLAY WITH SILT (TILL) - some sand, trace gravel (<25 mm diam.) - brown - moist, stiff to very stiff - intermediate plasticity		G14				
	2.0				G15				
262.9	2.5		SILT (TILL) - trace to some clay, trace gravel (<25 mm diam.) - brown - dry to moist, very dense - low plasticity		G16				
	3.0				SS17	119			
261.6	3.5		END OF TEST HOLE AT 3.5 m IN SILT (TILL)						

Notes:
 1. Seepage and sloughing not observed.
 2. Test hole open and dry to 3.1 m immediately after drilling.
 3. Test hole backfilled with bentonite and auger cuttings to surface.

SUB-SURFACE LOG LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK.GDT 12/5/25

Logged By: Tyson Roeland **Reviewed By:** Ryan Belbas **Project Engineer:** Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-04

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. Project Number: 0105-098-00
 Project Name: Norwood Colony Location: UTM 14U: 5582514 m N, 639918 m E
 Contractor: Paddock Drilling Ltd. Ground Elevation: 264.55 m (geodetic)
 Method: 125 mm solid stem auger B-57 track mounted rig Date Drilled: 20 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16	17	
264.4	0.0		ORGANIC CLAY (TOPSOIL) - silty, trace to some sand, dark brown, frozen, moist, firm when thawed	G18					
263.5	0.5		CLAY - silty, trace sand - light brown - frozen, moist, firm when thawed - high plasticity	G19					
	1.0		SILT (TILL) - clayey, some sand, trace gravel (<25 mm diam.) - brown - moist, compact - low plasticity	G20					
	1.5			SS21	28				
	2.0								
	2.5			G22					
	3.0								
	3.5			SS23	16				
	4.0								
	4.5			G24					
259.5	5.0		END OF TEST HOLE AT 5.0 m IN SILT (TILL)						

END OF TEST HOLE AT 5.0 m IN SILT (TILL)

Notes:

1. Power auger refusal at 5.0 m depth.
2. Seepage and sloughing not observed.
3. Test hole open and dry to 4.9 m immediately after drilling.
4. Test hole backfilled with auger cuttings and bentonite chips to surface.

Logged By: Tyson Roeland Reviewed By: Ryan Belbas Project Engineer: Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-08

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582572 m N, 639986 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 264.20 m (geodetic)
Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 **Date Drilled:** 21 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)										
							16	17											
							Particle Size (%)		Test Type										
							0	20	<input checked="" type="checkbox"/> Torvane <input type="checkbox"/> <input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> <input type="checkbox"/> Qu <input checked="" type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>										
							0	20	0										
							PL	MC	LL										
							0	20	40	60	80	100	0	50	100	150	200	250	
262.8	-0.5		CLAY WITH SILT (TILL) - some sand, trace gravel (<25 mm diam.) - brown - frozen, moist, stiff when thawed - intermediate plasticity	G46															
	-1.0			G47															
	-1.5		SILT (TILL) - clayey, sandy, trace gravel (<25 mm diam.) - light brown - moist, compact - low plasticity	G48															
	-2.0			SS49	21														
	-2.5			G50															
	-3.0		- loose below 3.1 m																
	-3.5			SS51	10														
	-4.0			G52															
	-4.5																		
	-5.0			SS53	14														
	-5.5																		
258.1	-6.0		SAND AND GRAVEL - light brown, moist, dense, poorly graded, fine grained sand to coarse grained gravel	G54															
257.5	-6.5		SILT (TILL) - clayey, sandy, trace gravel - light brown - moist, dense - low plasticity	SS55	54														
	-7.0			G56															
	-7.5																		
	-8.0			SS57	37														

END OF TEST HOLE AT 8.4 m IN SILT (TILL)
 Notes:
 1. Power auger refusal at 8.4 m depth.
 2. Seepage and sloughing observed below 6.1 m depth.
 3. Test hole open to 6.1 m immediately after drilling.
 4. Water level at 5.9 m immediately after drilling.
 5. Test hole backfilled with and auger cuttings and bentonite chips to surface.

Logged By: Tyson Roeland **Reviewed By:** Ryan Belbas **Project Engineer:** Reza Jamshidi Chenari

SUB-SURFACE LOG LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK.GDT 12/5/25



Sub-Surface Log

Test Hole TH25-09

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582464 m N, 639984 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 263.73 m (geodetic)
Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 **Date Drilled:** 21 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16	17	
							Particle Size (%)		Test Type △ Torvane △ ⊠ Pocket Pen. ⊠ ⊠ Qu ⊠ ○ Field Vane ○
							0	20	
							0	20	
							0	20	
							0	20	
263.73	0.0		CLAY WITH SILT (TILL) - sandy, trace gravel (<25 mm diam.) - brown - frozen, moist, stiff when thawed - intermediate plasticity		G58				
263.2	0.5				G59				
262.2	1.0				G60				
	1.5		SILT (TILL) - clayey, some sand, trace gravel (<25 mm diam.) - light brown - moist, compact - low plasticity		SS61	13			
	2.0				G62				
	2.5				SS63	16			
260.2	3.0		END OF TEST HOLE AT 3.1 m IN SILT (TILL)						
	3.5								

Notes:
 1. Seepage and sloughing not observed.
 2. Test hole open and dry to 3.1 m immediately after drilling.
 3. Test hole backfilled with auger cuttings and bentonite chips to surface.

SUB-SURFACE LOG LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK.GDT 12/5/25

Logged By: Tyson Roeland **Reviewed By:** Ryan Belbas **Project Engineer:** Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-10

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. Project Number: 0105-098-00
 Project Name: Norwood Colony Location: UTM 14U: 5582419 m N, 639903 m E
 Contractor: Paddock Drilling Ltd. Ground Elevation: 264.18 m (geodetic)
 Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 Date Drilled: 21 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16	17	
263.6	-0.5		CLAY - sandy, some silt - brown - frozen, moist, firm when thawed - intermediate plasticity		G64				
262.7	-1.0		CLAY - silty, trace sand - brown - frozen, moist, firm when thawed - high plasticity		G65				
262.7	-1.5		CLAY - silty, trace sand - brown - frozen, moist, firm when thawed - high plasticity		G66				
261.7	-2.0		CLAY WITH SILT (TILL) - some sand, trace gravel (<25 mm diam.) - brown - moist, stiff - intermediate plasticity		G67				
261.7	-2.5		SILT (TILL) - some clay to clayey, some sand, trace gravel (<25 mm diam.) - light brown - moist, compact - low plasticity		G68				
	-3.0				SS69	24			
	-4.0				G70				
	-4.5		- loose below 4.6 m		SS71	8			
258.7	-5.5		SAND - gravelly, trace silt - light brown - moist, dense - poorly graded, fine grained sand to medium grained gravel		G72				
	-6.0				SS73	42			
	-7.0		- very dense below 7.0 m		SS74	52			

END OF TEST HOLE AT 7.5 m IN SAND

Notes:

1. Power auger refusal at 7.0 m depth.
2. Seepage and sloughing observed below 6.1 m depth.
3. Test hole open to 6.2 m depth immediately after drilling.
4. Water level at 6.1 m depth immediately after drilling.
5. Test hole backfilled with auger cuttings and bentonite chips to surface.

Logged By: Tyson Roeland Reviewed By: Ryan Belbas Project Engineer: Reza Jamshidi Chenari

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582467 m N, 640508 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 261.62 m (geodetic)
Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 **Date Drilled:** 23 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)
Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders
Backfill Legend: Bentonite Cement Drill Cuttings Filter Pack Sand Grout Slough

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)						
								16	17	18	19	20	21	Test Type					
								Particle Size (%)											
								0	20	40	60	80	100						
								PL MC LL											
								0	20	40	60	80	100	0	50	100	150	200	250
260.4	-0.5			CLAY WITH SILT (TILL) - some sand, trace gravel (<25 mm diam.) - brown - frozen, moist, stiff to very stiff when thawed - intermediate plasticity	G83														
260.1	-1.0			SILT (TILL) - clayey, some sand, trace to some gravel (<25 mm diam.) - brown, moist, compact to dense, low plasticity	G84														
	-1.5			SAND - silty, trace gravel - light brown - moist, very dense - poorly graded, fine to coarse grained sand	G85														
	-2.0				SS86	56													
	-2.5				G87														
	-3.0				SS88	100													
257.7	-3.5				G89														
	-4.0			SILT (TILL) - sandy, some clay, trace to some gravel (<25 mm diam.) - light brown - moist, very dense - low to no plasticity															
	-4.5				SS90	79													
	-5.0				G91														
	-5.5																		
255.1	-6.0				SS92	47 / 229mm													

END OF TEST HOLE AT 6.5 m IN SILT (TILL)

- Notes:
- Power auger refusal at 6.1 m depth.
 - Seepage and sloughing observed below 3.8 m depth.
 - Test hole open 5.8 m depth immediately after drilling.
 - Water level at 5.5 m depth immediately after drilling.
 - 25 mm diameter stanpipe piezometer SP25-12 fitted with a Casagrande tip installed to 6.1 m depth with silica sand from 5.2 to 6.1 m and bentonite to ground surface.
 - Water level in standpipe measured at 3.4 m below ground on February 28, 2025.

SUB-SURFACE LOG LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK.GDT 12/5/25



Sub-Surface Log

Test Hole TH25-13

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582323 m N, 640602 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 261.31 m (geodetic)
Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 **Date Drilled:** 23 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16	17	
							Particle Size (%) 0 20 40 60 80 100 PL MC LL 0 20 40 60 80 100		Test Type <input type="checkbox"/> Torvane <input type="checkbox"/> <input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Qu <input checked="" type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>
			SAND - silty, some clay, trace gravel (<25 mm diam.) - light brown - moist, very dense - well graded, fine to coarse grained sand	<input checked="" type="checkbox"/>	G93				
	-0.5			<input checked="" type="checkbox"/>	G94				
	-1.0			<input checked="" type="checkbox"/>	G95				
	-1.5			<input type="checkbox"/>	SS96	81			
	-2.0			<input checked="" type="checkbox"/>	G97				
	-2.5			<input type="checkbox"/>	SS98	75			
	-3.0		- gravelly, trace cobbles below 3.1 m depth	<input checked="" type="checkbox"/>	G99				
	-3.5			<input checked="" type="checkbox"/>	G99				
	-4.0			<input checked="" type="checkbox"/>	G99				
	-4.5			<input type="checkbox"/>	SS100	67 / 229mm			
	-5.0			<input checked="" type="checkbox"/>	G101				
	-5.5			<input checked="" type="checkbox"/>	G101				

END OF TEST HOLE AT 5.8 m IN SAND

Notes:

1. Power auger refusal at 5.8 m depth.
2. Seepage and sloughing observed below 3.6 m depth.
3. Test hole open to 5.0 m immediately after drilling.
4. Water level at 4.7 m immediately after drilling.
5. Test hole backfilled with auger cuttings and bentonite chips to surface.

Logged By: Tyson Roeland **Reviewed By:** Ryan Belbas **Project Engineer:** Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-14

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582676 m N, 640338 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 262.29 m (geodetic)
Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 **Date Drilled:** 23 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16	17	
261.8	0.5		SAND - some silt, some clay, trace gravel (<25 mm diam.), light brown, frozen, moist, compact when thawed, poorly graded, fine to coarse grained	G102					
	1.0		CLAY WITH SILT (TILL) - some sand, some gravel (<25 mm diam.) - brown - frozen to 1.6 m, moist, very stiff when thawed - intermediate plasticity	G103					
	1.5			G104					△
260.3	2.0		SAND - some silt, some gravel (<25 mm diam.), trace clay - light brown - moist, very dense - poorly graded, fine grained sand to medium grained gravel	SS105	31				+
	2.5			G106					
	3.0			SS107	81				
	3.5			G108					
	4.0			SS109	89				
	4.5			G110					
256.8	5.0								

END OF TEST HOLE AT 5.5 m IN SAND
Notes:
 1. Power auger refusal at 5.5 m depth.
 2. Seepage and sloughing observed below 4.9 m.
 3. Test hole open to 5.3 m immediately after drilling.
 4. Water level at 4.7 m immediately after drilling.
 5. Test hole backfilled with auger cuttings and bentonite chips to surface.

SUB-SURFACE LOG LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK.GDT 12/5/25

Logged By: Tyson Roeland **Reviewed By:** Ryan Belbas **Project Engineer:** Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-15

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. Project Number: 0105-098-00
 Project Name: Norwood Colony Location: UTM 14U: 5582589 m N, 640230 m E
 Contractor: Paddock Drilling Ltd. Ground Elevation: 262.71 m (geodetic)
 Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 Date Drilled: 23 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)	
							16	17		
							Particle Size (%)		Test Type	
							0	20	<input checked="" type="checkbox"/> Torvane <input type="checkbox"/> <input checked="" type="checkbox"/> Pocket Pen. <input type="checkbox"/> <input checked="" type="checkbox"/> Qu <input type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>	
							0	20	50	
261.8	-0.5		SAND - silty, some clay, trace gravel (<25 mm diam.) - light brown - frozen, moist, compact when thawed - well graded, fine to coarse grained sand	G111						
260.3	-1.0		CLAY WITH SILT (TILL) - some sand, trace gravel (<25 mm diam.) - brown - frozen to 1.6 m, moist, stiff to very stiff when thawed - intermediate plasticity	G112						
	-1.5			G113						
	-2.0			SS114		19				
	-2.5		SAND - some silt, trace clay, trace gravel (<25 mm diam.) - light brown - moist, dense to very dense - poorly graded, fine to medium grained	G115						
	-3.0			SS116		52				
	-3.5			G117						
	-4.0									
	-4.5									
	-5.0			SS118		44				
	-5.5			G119						
	-6.0									
	-6.5			SS120		45				
	-7.0									
	-7.5			G121						

END OF TEST HOLE AT 7.6 m IN SAND
 Notes:
 1. Power auger refusal at 7.6 m depth.
 2. Seepage and sloughing observed below 6.1 m.
 3. Test hole open to 6.2 m immediately after drilling.
 4. Water level at 5.5 m immediately after drilling.
 5. Test hole backfilled with auger cuttings and bentonite chips to surface.

Logged By: Tyson Roeland Reviewed By: Ryan Belbas Project Engineer: Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-16

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. Project Number: 0105-098-00
 Project Name: Norwood Colony Location: UTM 14U: 5582612 m N, 640133 m E
 Contractor: Paddock Drilling Ltd. Ground Elevation: 262.98 m (geodetic)
 Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 Date Drilled: 23 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)
							16	17	18	19	20	
							Particle Size (%)					
							0 20 40 60 80 100					
							PL MC LL					
							0 20 40 60 80 100					
							0 50 100 150 200 250					
							Test Type					
							<input checked="" type="checkbox"/> Torvane <input type="checkbox"/> <input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> Qu <input checked="" type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>					
261.3	-0.5		CLAY WITH SILT (TILL) - sandy, trace gravel (<25 mm diam.) - brown - frozen to 1.5 m, moist, stiff to very stiff when thawed - intermediate plasticity		G122							
	-1.0				G123							
	-1.5				G124							
	-2.0		SILT (TILL) - clayey, sandy, some gravel (<25 mm diam.) - brown - moist, loose to compact - low plasticity	<input checked="" type="checkbox"/> Split Spoon	SS125	21						
	-2.5				G126							
	-3.0			<input checked="" type="checkbox"/> Split Spoon	SS127	7						
	-3.5				G128							
	-4.0											
	-4.5											

END OF TEST HOLE AT 4.7 m IN SILT (TILL)

Notes:

1. Power auger refusal at 4.7 m depth.
2. Seepage and sloughing observed below 4.1 m depth.
3. Test hole open and dry to 4.1 m depth.
4. Test hole backfilled with auger cuttings and bentonite chips to surface.

Logged By: Tyson Roeland Reviewed By: Ryan Belbas Project Engineer: Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-17

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582733 m N, 640181 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 263.06 m (geodetic)
Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 **Date Drilled:** 23 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16	17	
							Particle Size (%)		Test Type Δ Torvane Δ ⊕ Pocket Pen. ⊕ ⊠ Qu ⊠ ○ Field Vane ○
							0	20	
							PL	MC	
							0	20	
							LL	100	
							0	20	
258.7	0.0		SAND - some gravel, trace silt - light brown - moist, dense - poorly graded, fine to coarse grained sand	<input checked="" type="checkbox"/>	G130				
	0.5			<input checked="" type="checkbox"/>	G131				
	1.0			<input checked="" type="checkbox"/>	G132				
	1.5		- very dense below 1.5 m depth	<input type="checkbox"/>	SS133	54			
	2.0			<input checked="" type="checkbox"/>	G134				
	2.5			<input type="checkbox"/>	SS135	35 / 76mm			
	3.0			<input checked="" type="checkbox"/>	G136				
	3.5			<input type="checkbox"/>	SS137	27 / 76mm			
	4.0			<input checked="" type="checkbox"/>	G137				

END OF TEST HOLE AT 4.3 m IN SAND

Notes:

1. Power auger refusal at 4.3 m depth.
2. Seepage and sloughing not observed.
3. Test hole open and dry to 4.3 m immediately after drilling.
4. Test hole backfilled with auger cuttings and bentonite chips to surface.

Logged By: Tyson Roeland **Reviewed By:** Ryan Belbas **Project Engineer:** Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-18

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582095 m N, 639991 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 262.99 m (geodetic)
Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 **Date Drilled:** 23 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)								
							16	17	18	19	20	21	Test Type							
							Particle Size (%)					<input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> Qu <input checked="" type="checkbox"/> <input type="checkbox"/> Torvane <input type="checkbox"/> Field Vane								
							0 20 40 60 80 100 PL MC LL 0 20 40 60 80 100					0 50 100 150 200 250								
262.7	0.0		CLAY - silty, trace sand, dark brown, frozen, moist, firm when thawed		G138															
	0.5		CLAY WITH SILT (TILL) - sandy, trace gravel (<25 mm diam.) - brown - frozen to 1.5 m, moist, stiff to very stiff when thawed - intermediate plasticity		G139															
	1.0				G140															
	1.5				SS141	24														
	2.0				G142															
	2.5				SS143	17														
	3.0																			
	3.5																			

END OF TEST HOLE AT 3.1 m IN CLAY WITH SILT (TILL)
 Notes:
 1. Seepage and sloughing not observed.
 2. Test hole open and dry to 3.1 m immediately after drilling.
 3. Test hole backfilled with auger cuttings and bentonite chips to surface.

Logged By: Tyson Roeland **Reviewed By:** Ryan Belbas **Project Engineer:** Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-19

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582287 m N, 639987 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 263.38 m (geodetic)
Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 **Date Drilled:** 24 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16	17	
							Particle Size (%)		Test Type △ Torvane △ ⊕ Pocket Pen. ⊕ ⊠ Qu ⊠ ○ Field Vane ○
							0	20	
259.9	3.5		CLAY WITH SILT (TILL) - sandy, trace gravel (<25 mm diam.) - brown - frozen to 1.1 m, moist, stiff to very stiff when thawed - intermediate plasticity	<input checked="" type="checkbox"/>	G144				
	0.5			<input checked="" type="checkbox"/>	G145				
	1.0			<input checked="" type="checkbox"/>	G146				△
	1.5			<input checked="" type="checkbox"/>	G148				⊕
	2.0			<input checked="" type="checkbox"/>	SS147	19			△
	2.5			<input checked="" type="checkbox"/>	G148				⊕
	3.0			<input checked="" type="checkbox"/>	SS149	10			⊕
	3.5		END OF TEST HOLE AT 3.1 m IN CLAY WITH SILT (TILL)						

Notes:
 1. Seepage and sloughing not observed.
 2. Test hole open and dry to 3.1 m immediately after drilling.
 3. Test hole backfilled with auger cuttings and bentonite chips to surface.

SUB-SURFACE LOG LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK.GDT 12/5/25

Logged By: Tyson Roeland **Reviewed By:** Ryan Belbas **Project Engineer:** Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-20

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. Project Number: 0105-098-00
 Project Name: Norwood Colony Location: UTM 14U: 5582279 m N, 639940 m E
 Contractor: Paddock Drilling Ltd. Ground Elevation: 263.57 m (geodetic)
 Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 Date Drilled: 24 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16	17	
							Particle Size (%)		Test Type <input checked="" type="checkbox"/> Torvane <input type="checkbox"/> <input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Qu <input checked="" type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>
							0	100	
263.1	0.5		SAND - some silt, trace gravel (<25 mm diam.) - light brown, moist, loose to compact	<input checked="" type="checkbox"/>	G150				
	1.0		SILT (TILL) - sandy, some clay, trace gravel (<25 mm diam.) - brown - frozen to 1.5 m, moist, compact when thawed - low plasticity	<input checked="" type="checkbox"/>	G151				
	1.5			<input checked="" type="checkbox"/>	G152				
	2.0			<input checked="" type="checkbox"/>	SS153	22			
	2.5			<input checked="" type="checkbox"/>	G154				
	3.0			<input checked="" type="checkbox"/>	G154				
	3.5			<input checked="" type="checkbox"/>	SS155	20			
259.9	4.0		SAND - trace clay, trace silt, trace gravel (<25 mm diam.) - light brown - moist, compact - poorly graded, fine grained	<input checked="" type="checkbox"/>	G156				
	4.5			<input checked="" type="checkbox"/>	G156				
	5.0			<input checked="" type="checkbox"/>	SS157	19			
	5.5			<input checked="" type="checkbox"/>	G158				
	6.0			<input checked="" type="checkbox"/>	G158				

END OF TEST HOLE AT 6.4 m IN SAND

Notes:

1. Power auger refusal at 6.4 m depth.
2. Seepage and sloughing observed below 4.9 m depth.
3. Test hole open to 6.2 m immediately after drilling.
4. Water level at 5.5 m immediately after drilling.
5. Test hole backfilled with auger cuttings and bentonite chips to surface.

Logged By: Tyson Roeland Reviewed By: Ryan Belbas Project Engineer: Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-22

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. Project Number: 0105-098-00
 Project Name: Norwood Colony Location: UTM 14U: 5582805 m N, 641192 m E
 Contractor: Paddock Drilling Ltd. Ground Elevation: 258.94 m (geodetic)
 Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 Date Drilled: 24 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16	17	
257.7	0.0 - 1.0		CLAY - silty - dark brown to black - frozen, moist, stiff when thawed - high plasticity	G169	BLK170				
254.2	1.0 - 4.5		CLAY WITH SILT (TILL) - some sand, trace gravel (<25 mm diam.) - brown - moist, firm to stiff - intermediate plasticity	G171	SS172	10			
	2.4 - 2.5			G173					
	3.5 - 3.6			SS174		6			
	4.0 - 4.1			G175					
254.2	4.5 - 6.5		SAND AND GRAVEL - trace clay, trace silt - light brown - moist, compact - poorly graded, fine grained sand to medium grained gravel	SS176		15			
	6.0 - 6.1			SS177		15			

END OF TEST HOLE AT 6.5 m IN SAND AND GRAVEL
 Notes:
 1. Seepage and sloughing observed below 2.4 m depth.
 2. Test hole open to 4.3 m immediately after drilling.
 3. Water level at 2.4 m immediately after drilling.
 4. Test hole backfilled with auger cuttings and bentonite chips to surface.

SUB-SURFACE LOG LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK.GDT 12/5/25

Logged By: Tyson Roeland Reviewed By: Ryan Belbas Project Engineer: Reza Jamshidi Chenari

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582756 m N, 641175 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 259.03 m (geodetic)
Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 **Date Drilled:** 24 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)
Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders
Backfill Legend: Bentonite Cement Drill Cuttings Filter Pack Sand Grout Slough

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)									
								16	17	18	19	20	21	Test Type					
								Particle Size (%)											
								0	20	40	60	80	100						
								0	20	40	60	80	100	0	50	100	150	200	250
254.8	0.0			CLAY - silty, trace gravel, trace silt inclusions (<10 mm diam.) - brown - frozen to 1.5 m, moist, stiff when thawed - high plasticity	G178														
	0.5																		
	1.0																		
	1.5																		
	2.0																		
	2.5																		
	3.0																		
	3.5																		
	4.0																		
254.8	4.3			CLAY WITH SILT (TILL) - sandy, trace gravel (<25 mm diam.) - brown - moist, stiff - intermediate plasticity	G182														
	4.5																		
	5.0																		
	5.5																		
252.9	6.0																		

END OF TEST HOLE AT 6.1 m IN CLAY WITH SILT (TILL)
 Notes:
 1. Seepage observed below 4.3 m depth, sloughing not observed.
 2. Test hole open to 6.1 m immediately after drilling.
 3. Water level at 5.8 m immediately after drilling.
 4. 25 mm diameter stanpipe piezometer fitted with a casagrande tip installed to 6.1 m depth and backfilled with silica sand from 5.2 to 6.1 m and bentonite to ground surface.
 5. Solinst Levellogger SN 2136489 installed at 5.8 m depth in standpipe.
 6. Water level in standpipe measured at 1.8 m below ground on February 28, 2025.



Sub-Surface Log

Test Hole TH25-24

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. Project Number: 0105-098-00
 Project Name: Norwood Colony Location: UTM 14U: 5582756 m N, 641350 m E
 Contractor: Paddock Drilling Ltd. Ground Elevation: 258.70 m (geodetic)
 Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 Date Drilled: 24 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)								
							16	17	18	19	20	21	Test Type							
							Particle Size (%)													
							0	20	40	60	80	100								
							PL MC LL													
							0	20	40	60	80	100	0	50	100	150	200	250		
258.9	0.5		CLAY WITH SILT (TILL) - sandy, trace gravel (<25 mm diam.) - brown - frozen to 1.2 m, moist, stiff to very stiff when thawed - intermediate plasticity	<input checked="" type="checkbox"/>	G185															
	1.0			<input checked="" type="checkbox"/>	G186															
	1.5			<input checked="" type="checkbox"/>	G187															
	2.0			<input checked="" type="checkbox"/>	SS188	16														
	2.5		- firm below 2.1 m	<input checked="" type="checkbox"/>	G189															
	3.0			<input checked="" type="checkbox"/>	SS190	7														
	3.5			<input checked="" type="checkbox"/>	G191															
	4.0			<input checked="" type="checkbox"/>	SS192	4														
	4.5			<input checked="" type="checkbox"/>	G193															
	5.0			<input checked="" type="checkbox"/>	SS194	12														
	5.5																			
	6.0		SILT (TILL) - clayey, some sand, trace gravel (<25 mm diam.) - light brown - moist, compact - low plasticity	<input checked="" type="checkbox"/>	G193															
	6.5			<input checked="" type="checkbox"/>	SS194	12														

END OF TEST HOLE AT 6.5 m IN SILT (TILL)
 Notes:
 1. Seepage observed at 5.5 m depth, sloughing not observed.
 2. Test hole open to 6.1 m immediately after drilling.
 3. Water level at 5.5 m immediately after drilling.
 4. Test hole backfilled with auger cuttings and bentonite chips to surface.

SUB-SURFACE LOG LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK.GDT 12/5/25



Sub-Surface Log

Test Hole TH25-25

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582727 m N, 641488 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 258.48 m (geodetic)
Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 **Date Drilled:** 24 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)					
							16	17						
							Particle Size (%)		Test Type <input checked="" type="checkbox"/> Torvane <input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> Qu <input checked="" type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>					
							0	20						
							0	20						
							0	20	0	50	100	150	200	250
								PL	MC	LL				
								0	20	40	60	80	100	
256.5	0.5		CLAY - silty, trace gravel, trace silt inclusions - brown - frozen to 1.5 m, moist, firm when thawed - high plasticity	G195										
	1.0			BLK196										
	2.0		CLAY WITH SILT (TILL) - some sand, trace gravel (<25 mm diam.) - light brown - moist, firm to stiff - intermediate plasticity	G197										
	3.0													
	3.5			SS198		4								
	4.0													
	4.5			G199										
253.8	4.5		SILT (TILL) - clayey, sandy, trace gravel (<25 mm diam.) - light brown - moist, compact - low plasticity	SS200		11								
	5.0													
	5.5													
252.4	6.0			G201										

END OF TEST HOLE AT 6.1 m IN SILT (TILL)

Notes:

- Seepage and sloughing not observed.
- Test hole open and dry to 5.5 m immediately after drilling.
- Test hole backfilled with auger cuttings and bentonite chips to surface.

Logged By: Tyson Roeland **Reviewed By:** Ryan Belbas **Project Engineer:** Reza Jamshidi Chenari



Sub-Surface Log

Test Hole TH25-26

1 of 1

Client: Burns Maendel Consulting Engineers Ltd. **Project Number:** 0105-098-00
Project Name: Norwood Colony **Location:** UTM 14U: 5582813 m N, 641493 m E
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 258.32 m (geodetic)
Method: 125 mm Diameter Solid Stem Auger, Canterra CT250 **Date Drilled:** 24 January 2025

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)							
							16	17	18	19	20	21	Test Type						
							Particle Size (%)												
							0	20	40	60	80	100							
							PL MC LL												
							0	20	40	60	80	100	0	50	100	150	200	250	
257.1	-0.5		SILT - clayey, some sand - light brown - moist, loose to compact - low plasticity		G202														
	-1.0				G203														
257.1	-1.5		CLAY WITH SILT (TILL) - some sand, trace gravel (<25 mm diam.) - brown - moist, stiff - intermediate plasticity		G204														
	-2.0				SS205	13													
	-2.5				G206														
	-3.0				SS207	13													
	-3.5		- gravelly below 3.1 m		G208														

END OF TEST HOLE AT 4.0 m IN CLAY WITH SILT (TILL)

Notes:

1. Power auger refusal at 4.0 m depth.
2. Seepage and sloughing not observed.
3. Test hole open and dry to 3.8 m immediately after drilling.
4. Test hole backfilled with auger cuttings and bentonite chips to surface.

Logged By: Tyson Roeland **Reviewed By:** Ryan Belbas **Project Engineer:** Reza Jamshidi Chenari

Appendix A
Laboratory Testing



MEMORANDUM

Date	February 18, 2025
To	Tyson Roeland, TREK Geotechnical
From	Angela Fidler-Kliewer, TREK Geotechnical
Project No.	0105-098-00
Project	Rock Lake Colony
Subject	Laboratory Testing Results – Lab Req. R25-030

Distribution	Reza Jamshidi Chenari
---------------------	-----------------------

Attached are the laboratory testing results for the above noted project. This report contains moisture content determinations, Atterberg limits, particle size analysis (Hydrometer method), and Standard Proctor.

One sample TH25-22, Bulk170 (Permeability testing) will be reported upon completion.

Two samples (TH25-05 (G29) and TH25-18 (G142)) were sent to ALS for sulphates and will be reported upon completion.

Regards,

Angela Fidler-Kliewer, C.Tech.

Review Control:

<i>Prepared By: DS</i>	<i>Reviewed By: AFK</i>	<i>Checked By: NJF</i>
------------------------	-------------------------	------------------------



LABORATORY REQUISITION

CLIENT: Burns Maendel Consulting Engineers Ltd.

PROJECT NO: 0105-098-00

PROJECT NAME: Rock Lake Colony

FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS	ALS <i>Tolif surface</i>	Soil Description/Comments
TH25-01	G01	0.5 - 1.0		XXXX								
TH25-01	G02	2.0 - 2.5		XXXX								
TH25-01	G03	4.0 - 4.5		XXXX								
TH25-01	SS04	5.0 - 6.5		XXXX								
TH25-01	G05	8.0 - 8.5		XXXX								
TH25-02	G06	0.0 - 0.5		XXXX								
TH25-02	G07	1.0 - 1.5		XXXX								
TH25-02	G08	3.0 - 3.5		XXXX								
TH25-02	G09	6.0 - 6.5		XXXX	XX	XX						Clay fill
TH25-02	G10	8.0 - 8.5		XXXX								
TH25-02	SS11	10.0 - 11.5		XXXX								
TH25-03	G12	0.5 - 1.0		XXXX								
TH25-03	G13	2.5 - 3.0		XXXX								
TH25-03	G14	4.5 - 5.0		XXXX								
TH25-03	G15	5.5 - 6.0		XXXX								
TH25-03	G16	8.0 - 8.5		XXXX								
TH25-03	SS17	10.0 - 11.5		XXXX								
TH25-04	G18	0.0 - 0.5		XXXX								
TH25-04	G19	2.0 - 2.5		XXXX								
TH25-04	G20	4.0 - 4.5		XXXX								
TH25-04	SS21	5.0 - 6.5		XXXX								
TH25-04	G22	8.0 - 8.5		XXXX								
TH25-04	SS23	10.0 - 11.5		XXXX								
TH25-04	G24	13.5 - 14.0		XXXX								
TH25-05	G25	0.5 - 1.0		XXXX								
TH25-05	G26	2.5 - 3.0		XXXX								
TH25-05	G27	4.5 - 5.0		XXXX								
TH25-05	G28	6.0 - 6.5		XXXX								
TH25-05	G29	7.5 - 8.0		XXXX								
TH25-05	SS30	10.0 - 10.8		XXXX						X		Clay fill
TH25-06	G31	0.0 - 0.5		XXXX								
TH25-06	G32	1.5 - 2.0		XXXX								
TH25-06	G33	3.5 - 4.0		XXXX								
TH25-06	SS34	5.0 - 6.5		XXXX								
TH25-06	G35	8.0 - 8.5		XXXX								

REQUESTED BY: Tyson Roeland REPORT TO: TR RSC
 REQUISITION DATE: Feb 4/25 DATE REQUIRED: Feb 17/24
 COMMENTS: _____

REQUISITION NO. R25-030

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK GEOTECHNICAL.GDT 1/2/25



LABORATORY REQUISITION

CLIENT Burns Maendel Consulting Engineers Ltd.
PROJECT NAME Rock Lake Colony

PROJECT NO: 0105-098-00
FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS	Soil Description/Comments					
TH25-06	SS36	10.0 - 11.5		X												
TH25-06	G37	13.5 - 14.0		X												
TH25-06	SS38	15.0 - 15.5		X												
TH25-06	SS39	18.0 - 18.5		X												
TH25-07	G40	0.0 - 0.5		X												
TH25-07	G41	2.0 - 2.5		X												
TH25-07	G42	4.5 - 5.0		X												
TH25-07	SS43	5.0 - 6.5		X												
TH25-07	G44	8.0 - 8.5		X												
TH25-07	SS45	10.0 - 11.5		X												
TH25-08	G46	1.0 - 1.5		X												
TH25-08	G47	3.0 - 3.5		X												
TH25-08	G48	4.5 - 5.0		X												
TH25-08	SS49	5.0 - 6.5		X												
TH25-08	G50	8.0 - 8.5		X		X	X									soil fill
TH25-08	SS51	10.0 - 11.5		X												
TH25-08	G52	13.0 - 13.5		X												
TH25-08	G53	15.0 - 16.5		X												
TH25-08	G54	19.0 - 19.5		X												
TH25-08	SS55	20.0 - 21.5		X												
TH25-08	G56	23.0 - 23.5		X												
TH25-08	SS57	25.0 - 26.5		X												
TH25-09	G58	0.0 - 0.5		X												
TH25-09	G59	2.5 - 3.0		X												
TH25-09	G60	4.5 - 5.0		X												
TH25-09	SS61	5.0 - 6.5		X												
TH25-09	G62	8.0 - 8.5		X												
TH25-09	SS63	10.0 - 11.5		X												
TH25-10	G64	0.0 - 0.5		X												
TH25-10	G65	2.0 - 2.5		X												
TH25-10	G66	4.0 - 4.5		X												
TH25-10	G67	5.5 - 6.0		X												
TH25-10	G68	8.0 - 8.5		X												
TH25-10	SS69	10.0 - 11.5		X												
TH25-10	G70	13.0 - 13.5		X												

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK GEOTECHNICAL.GDT 1/2/25

REQUESTED BY: Tyson Roeland **REPORT TO:** _____
REQUISITION DATE: _____ **DATE REQUIRED:** _____
COMMENTS: _____

REQUISITION NO. _____
 PAGE 2 OF 6



LABORATORY REQUISITION

CLIENT Burns Maendel Consulting Engineers Ltd.

PROJECT NO: 0105-098-00

PROJECT NAME Rock Lake Colony

FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS				Soil Description/Comments
TH25-10	SS71	15.0 - 16.5		X										
TH25-10	G72	18.0 - 18.5		X										
TH25-10	SS73	20.0 - 21.5		X										
TH25-10	SS74	23.0 - 24.5		X										
TH25-11	G75	0.5 - 1.0		X										
TH25-11	G76	3.0 - 3.5		X										
TH25-11	G77	4.5 - 5.0		X										
TH25-11	SS78	5.0 - 6.3		X										
TH25-11	G79	8.0 - 8.5		X		X								Clay fill
TH25-11	SS80	10.0 - 11.5		X										
TH25-11	G81	13.5 - 14.0		X										
TH25-11	SS82	15.0 - 16.0		X										
TH25-12	G83	0.0 - 0.5		X										
TH25-12	G84	2.0 - 2.5		X										
TH25-12	G85	4.0 - 4.5		X										
TH25-12	SS86	5.0 - 6.5		X										
TH25-12	G87	8.0 - 8.5		X										
TH25-12	SS88	10.0 - 11.5		X										
TH25-12	G89	12.5 - 13.0		X										
TH25-12	SS90	15.0 - 16.5		X										
TH25-12	G91	18.0 - 18.5		X										
TH25-12	SS92	20.0 - 21.3		X										
TH25-13	G93	0.0 - 0.5		X										
TH25-13	G94	2.0 - 2.5		X										
TH25-13	G95	4.0 - 4.5		X										
TH25-13	SS96	5.0 - 6.5		X										
TH25-13	G97	8.0 - 8.5		X										
TH25-13	SS98	10.0 - 10.5		X										
TH25-13	G99	12.0 - 12.5		X										
TH25-13	SS100	15.0 - 16.3		X										
TH25-13	G101	18.0 - 18.5		X										
TH25-14	G102	0.5 - 1.0		X										
TH25-14	G103	3.0 - 3.5		X										
TH25-14	G104	4.5 - 5.0		X										
TH25-14	SS105	5.0 - 6.5		X										

REQUESTED BY: Tyson Roeland REPORT TO: _____
 REQUISITION DATE: _____ DATE REQUIRED: _____
 COMMENTS: _____

REQUISITION NO. _____

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR_0105-098-00.GPJ TREK GEOTECHNICAL.GDT 1/2/25



LABORATORY REQUISITION

CLIENT Burns Maendel Consulting Engineers Ltd.
 PROJECT NAME Rock Lake Colony

PROJECT NO: 0105-098-00
 FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS	ALS	Soil Description/Comments
TH25-14	G106	8.0 - 8.5		X								
TH25-14	SS107	10.0 - 11.0		X								
TH25-14	G108	13.0 - 13.5		X								
TH25-14	SS109	15.0 - 16.5		X								
TH25-14	G110	17.5 - 18.0		X								
TH25-15	G111	0.5 - 1.0		X								
TH25-15	G112	3.0 - 3.5		X								
TH25-15	G113	4.0 - 4.5		X								
TH25-15	SS114	5.0 - 6.5		X								
TH25-15	G115	8.0 - 8.5		X								
TH25-15	SS116	10.0 - 11.5		X								
TH25-15	G117	13.0 - 13.5		X								
TH25-15	SS118	15.0 - 16.5		X								
TH25-15	G119	18.0 - 18.5		X								
TH25-15	SS120	20.0 - 21.5		X								
TH25-15	G121	23.0 - 23.5		X								
TH25-16	G122	0.5 - 1.0		X								
TH25-16	G123	2.5 - 3.0		X								
TH25-16	G124	4.5 - 5.0		X								
TH25-16	SS125	5.0 - 6.5		X								
TH25-16	G126	7.0 - 7.5		X								
TH25-16	SS127	10.0 - 11.5		X								
TH25-16	G128	13.0 - 13.5		X								
TH25-17	G130	0.0 - 0.5		X								
TH25-17	G131	2.0 - 2.5		X								
TH25-17	G132	4.0 - 4.5		X								
TH25-17	SS133	5.0 - 6.5		X								
TH25-17	G134	8.0 - 8.5		X								
TH25-17	SS135	10.0 - 10.3		X								
TH25-17	G136	13.5 - 14.0		X								
TH25-17	SS137	14.0 - 14.3		X								
TH25-18	G138	0.0 - 0.5		X								
TH25-18	G139	2.0 - 2.5		X								
TH25-18	G140	4.0 - 4.5		X								
TH25-18	SS141	5.0 - 6.5		X								

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK GEOTECHNICAL.GDT 1/2/25

REQUESTED BY: Tyson Roeland REPORT TO: _____
 REQUISITION DATE: _____ DATE REQUIRED: _____
 COMMENTS: _____

REQUISITION NO. _____
 PAGE 4 OF 6



LABORATORY REQUISITION

CLIENT: Burns Maendel Consulting Engineers Ltd.
 PROJECT NAME: Rock Lake Colony

PROJECT NO: 0105-098-00
 FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS	Soil Description/Comments
TH25-18	G142	8.0 - 8.5		X							Clay fill
TH25-18	SS143	10.0 - 11.5		X							
TH25-19	G144	0.0 - 0.5		X							
TH25-19	G145	2.0 - 2.5		X							
TH25-19	G146	4.0 - 4.5		X							
TH25-19	SS147	5.0 - 6.5		X							
TH25-19	G148	8.0 - 8.5		X							
TH25-19	SS149	10.0 - 11.5		X							
TH25-20	G150	0.0 - 0.5		X							
TH25-20	G151	2.0 - 2.5		X							
TH25-20	G152	4.0 - 4.5		X							
TH25-20	SS153	5.0 - 6.5		X							
TH25-20	G154	8.0 - 8.5		X		X					Clay fill
TH25-20	SS155	10.0 - 11.5		X							
TH25-20	G156	12.5 - 13.0		X							
TH25-20	SS157	15.0 - 16.5		X							
TH25-20	G158	18.0 - 18.5		X							
TH25-21	G159	0.0 - 0.5		X							
TH25-21	G160	2.5 - 3.0		X							
TH25-21	G161	4.5 - 5.0		X							
TH25-21	SS162	5.0 - 6.5		X							
TH25-21	G163	8.0 - 8.5		X							
TH25-21	SS164	10.0 - 11.0		X							
TH25-21	G165	13.0 - 13.5		X							
TH25-21	SS166	15.0 - 16.5		X							
TH25-21	G167	17.0 - 17.5		X							
TH25-21	SS168	19.0 - 20.0		X							
TH25-22	G169	0.0 - 0.5		X							
TH25-22	BLK170	0.5 - 4.0		X							Combine w BLK 171
TH25-22	G171	4.5 - 5.0		X							
TH25-22	SS172	5.0 - 6.5		X							
TH25-22	G173	8.0 - 8.5		X							
TH25-22	SS174	10.0 - 11.5		X							
TH25-22	G175	13.0 - 13.5		X							
TH25-22	SS176	15.0 - 16.5		X							

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK GEOTECHNICAL_GDT 1/2/25

REQUESTED BY: Tyson Roeland REPORT TO: _____
 REQUISITION DATE: _____ DATE REQUIRED: _____
 COMMENTS: _____

REQUISITION NO. _____
 PAGE 5 OF 6



LABORATORY REQUISITION

CLIENT Burns Maendel Consulting Engineers Ltd.
 PROJECT NAME Rock Lake Colony

PROJECT NO: 0105-098-00
 FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS	Soil Description/Comments
TH25-22	SS177	20.0 - 21.5		X							
TH25-23	G178	0.0 - 0.5		X							
TH25-23	BLK179	0.5 - 5.0		X							
TH25-23	G180	6.0 - 6.5		X							COMBINE WITH BLK170 TO DO PROCTOR AND PERM
TH25-23	G181	8.5 - 9.0		X							
TH25-23	G182	13.0 - 13.5		X							
TH25-23	SS183	15.0 - 16.5		X							
TH25-23	G184	19.0 - 19.5		X							
TH25-24	G185	0.0 - 0.5		X							
TH25-24	G186	2.0 - 2.5		X							
TH25-24	G187	4.0 - 4.5		X							
TH25-24	SS188	5.0 - 6.5		X							
TH25-24	G189	8.0 - 8.5		X							
TH25-24	SS190	10.0 - 11.5		X							
TH25-24	G191	13.0 - 13.5		X							
TH25-24	SS192	15.0 - 16.5		X							
TH25-24	G193	19.0 - 19.5		X							
TH25-24	SS194	20.0 - 21.5		X							
TH25-25	G195	0.0 - 0.5		X							
TH25-25	BLK196	0.5 - 5.0		X							
TH25-25	G197	7.5 - 8.0		X							
TH25-25	SS198	10.0 - 11.5		X							
TH25-25	G199	13.0 - 13.5		X							
TH25-25	SS200	15.0 - 16.5		X							
TH25-25	G201	19.0 - 19.5		X							
TH25-26	G202	0.0 - 0.5		X							
TH25-26	G203	2.0 - 2.5		X							
TH25-26	G204	4.0 - 4.5		X							
TH25-26	SS205	5.0 - 6.5		X							
TH25-26	G206	8.0 - 8.5		X							
TH25-26	SS207	10.0 - 11.5		X							
TH25-26	G208	12.5 - 13.0		X							

Flexible Perm

COMBINE WITH BLK170 TO DO PROCTOR AND PERM

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK GEOTECHNICAL.GDT 1/2/25

REQUESTED BY: Tyson Roeland REPORT TO: _____
 REQUISITION DATE: _____ DATE REQUIRED: _____
 COMMENTS: _____

REQUISITION NO. _____
 PAGE 6 OF 6



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Moisture Content Report ASTM D2216-98

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date February 05, 2025
Technician K. Desikan

Test Hole	TH25-01	TH25-01	TH25-01	TH25-01	TH25-01	TH25-02
Depth (m)	0.2 - 0.3	0.6 - 0.8	1.2 - 1.4	1.5 - 2.0	2.4 - 2.6	0.0 - 0.2
Sample #	G01	G02	G03	SS04	G05	G06
Tare ID	M13	D20	H1	Z30	P14	F96
Mass of tare	7.0	8.7	9.7	8.8	8.5	8.5
Mass wet + tare	203.2	218.4	204.9	128.8	226.8	203.0
Mass dry + tare	160.5	180.5	158.2	106.1	166.3	174.9
Mass water	42.7	37.9	46.7	22.7	60.5	28.1
Mass dry soil	153.5	171.8	148.5	97.3	157.8	166.4
Moisture %	27.8%	22.1%	31.4%	23.3%	38.3%	16.9%

Test Hole	TH25-02	TH25-02	TH25-02	TH25-02	TH25-02	TH25-03
Depth (m)	0.3 - 0.5	0.9 - 1.1	1.8 - 2.0	2.4 - 2.6	3.0 - 3.5	0.2 - 0.3
Sample #	G07	G08	G09	G10	SS11	G12
Tare ID	I72	P29	F79	F58	QW15	J94
Mass of tare	6.9	8.5	9.4	8.8	7.3	6.9
Mass wet + tare	206.6	202.1	405.8	206.5	208.6	200.8
Mass dry + tare	185.5	148.1	352.4	184.6	184.2	172.9
Mass water	21.1	54.0	53.4	21.9	24.4	27.9
Mass dry soil	178.6	139.6	343.0	175.8	176.9	166.0
Moisture %	11.8%	38.7%	15.6%	12.5%	13.8%	16.8%

Test Hole	TH25-03	TH25-03	TH25-03	TH25-03	TH25-03	TH25-04
Depth (m)	0.8 - 0.9	1.4 - 1.5	1.7 - 1.8	2.4 - 2.6	3.0 - 3.5	0.0 - 0.2
Sample #	G13	G14	G15	G16	SS17	G18
Tare ID	F26	D24	M63	K9	D227	Z05
Mass of tare	8.5	8.8	7.1	8.7	6.7	8.5
Mass wet + tare	205.8	216.1	204.2	204.0	200.4	162.1
Mass dry + tare	156.6	166.3	180.2	189.2	187.0	128.2
Mass water	49.2	49.8	24.0	14.8	13.4	33.9
Mass dry soil	148.1	157.5	173.1	180.5	180.3	119.7
Moisture %	33.2%	31.6%	13.9%	8.2%	7.4%	28.3%



www.trekgeotechnical.ca
1712 St. James Street
Winnipeg, MB R3H 0L3
Tel: 204.975.9433 Fax: 204.975.9435

Moisture Content Report ASTM D2216-98

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date Febuary 05, 2025
Technician K. Desikan

Test Hole	TH25-04	TH25-04	TH25-04	TH25-04	TH25-04	TH25-04
Depth (m)	0.6 - 0.8	1.2 - 1.4	1.5 - 2.0	2.4 - 2.6	3.0 - 3.5	4.1 - 4.3
Sample #	G19	G20	SS21	G22	SS28	G24
Tare ID	Z93	F147	K29	E29	E35	E12
Mass of tare	8.5	8.5	8.4	8.8	8.6	8.7
Mass wet + tare	208.6	200.3	206.7	200.7	205.5	208.3
Mass dry + tare	169.7	180.7	189.8	179.7	184.5	184.9
Mass water	38.9	19.6	16.9	21.0	21.0	23.4
Mass dry soil	161.2	172.2	181.4	170.9	175.9	176.2
Moisture %	24.1%	11.4%	9.3%	12.3%	11.9%	13.3%

Test Hole	TH25-05	TH25-05	TH25-05	TH25-05	TH25-05	TH25-05
Depth (m)	0.2 - 0.3	0.8 - 0.9	1.4 - 1.5	1.8 - 2.0	2.3 - 2.4	3.0 - 3.3
Sample #	G25	G26	G27	G28	G29	SS30
Tare ID	Z57	D9	E87	M85	W13	E60
Mass of tare	8.6	9.2	6.9	7.1	6.8	6.9
Mass wet + tare	200.7	201.5	201.5	201.7	204.0	202.9
Mass dry + tare	191.5	162.0	174.2	158.8	178.9	184.3
Mass water	9.2	39.5	27.3	42.9	25.1	18.6
Mass dry soil	182.9	152.8	167.3	151.7	172.1	177.4
Moisture %	5.0%	25.9%	16.3%	28.3%	14.6%	10.5%

Test Hole	TH25-06	TH25-06	TH25-06	TH25-06	TH25-06	TH25-06
Depth (m)	0.0 - 0.2	0.5 - 0.6	1.1 - 1.2	1.5 - 2.0	2.4 - 2.6	3.0 - 3.5
Sample #	G31	G32	G33	SS34	G35	SS36
Tare ID	M35	Z95	N93	AB46	Z08	J82
Mass of tare	7.0	8.7	8.5	6.7	8.5	7.1
Mass wet + tare	202.8	202.0	202.5	203.3	201.2	201.2
Mass dry + tare	166.5	187.2	178.9	184.7	184.8	186.9
Mass water	36.3	14.8	23.6	18.6	16.4	14.3
Mass dry soil	159.5	178.5	170.4	178.0	176.3	179.8
Moisture %	22.8%	8.3%	13.8%	10.4%	9.3%	8.0%



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

**Moisture Content Report
 ASTM D2216-98**

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date February 05, 2025
Technician K. Desikan

Test Hole	TH25-06	TH25-06	TH25-06	TH25-07	TH25-07	TH25-07
Depth (m)	4.1 - 4.3	4.6 - 4.7	5.5 - 5.6	0.0 - 0.2	0.6 - 0.8	1.4 - 1.5
Sample #	G37	SS38	SS39	G40	G41	G42
Tare ID	M30	E21	E85	ZED1	B18	E89
Mass of tare	6.8	6.9	8.9	6.9	6.9	7.0
Mass wet + tare	207.9	202.9	206.8	203.0	204.8	201.3
Mass dry + tare	193.9	189.2	192.0	171.4	178.5	181.0
Mass water	14.0	13.7	14.8	31.6	26.3	20.3
Mass dry soil	187.1	182.3	183.1	164.5	171.6	174.0
Moisture %	7.5%	7.5%	8.1%	19.2%	15.3%	11.7%

Test Hole	TH25-07	TH25-07	TH25-07	TH25-08	TH25-08	TH25-08
Depth (m)	1.5 - 2.0	2.4 - 2.6	3.0 - 3.5	0.3 - 0.5	0.9 - 1.1	1.4 - 1.5
Sample #	SS43	G44	SS45	G46	G47	G48
Tare ID	F6	QW3	M46	F37	D30	P28
Mass of tare	6.9	6.9	6.8	8.6	8.9	8.6
Mass wet + tare	206.4	202.0	201.7	241.0	227.8	201.6
Mass dry + tare	186.0	183.4	186.0	207.9	208.7	189.0
Mass water	20.4	18.6	15.7	33.1	19.1	12.6
Mass dry soil	179.1	176.5	179.2	199.3	199.8	180.4
Moisture %	11.4%	10.5%	8.8%	16.6%	9.6%	7.0%

Test Hole	TH25-08	TH25-08	TH25-08	TH25-08	TH25-08	TH25-08
Depth (m)	1.5 - 2.0	2.4 - 2.6	3.0 - 3.5	4.0 - 4.1	4.6 - 5.0	5.8 - 5.9
Sample #	SS49	G50	SS51	G52	SS53	G54
Tare ID	E59	P12	AC35	F71	F130	W63
Mass of tare	8.7	8.7	6.9	8.7	8.8	8.8
Mass wet + tare	273.9	227.3	228.4	265.3	250.9	257.5
Mass dry + tare	244.8	203.4	202.1	233.4	224.7	221.7
Mass water	29.1	23.9	26.3	31.9	26.2	35.8
Mass dry soil	236.1	194.7	195.2	224.7	215.9	212.9
Moisture %	12.3%	12.3%	13.5%	14.2%	12.1%	16.8%



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

**Moisture Content Report
 ASTM D2216-98**

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date Febuary 05, 2025
Technician K. Desikan

Test Hole	TH25-08	TH25-08	TH25-08	TH25-09	TH25-09	TH25-09
Depth (m)	6.1 - 6.6	7.0 - 1.1	7.6 - 8.1	0.0 - 0.2	0.8 - 0.9	1.4 - 1.5
Sample #	SS55	G56	SS57	G58	G59	G60
Tare ID	M97	E08	Z82	QT88	QT5	ZD20
Mass of tare	7.0	6.6	8.4	8.3	8.4	8.3
Mass wet + tare	246.2	287.1	315.1	211.0	204.5	212.7
Mass dry + tare	217.3	251.7	291.6	183.5	186.1	187.7
Mass water	28.9	35.4	23.5	27.5	18.4	25.0
Mass dry soil	210.3	245.1	283.2	175.2	177.7	179.4
Moisture %	13.7%	14.4%	8.3%	15.7%	10.4%	13.9%

Test Hole	TH25-09	TH25-09	TH25-09	TH25-10	TH25-10	TH25-10
Depth (m)	1.5 - 2.0	2.4 - 2.6	3.0 - 3.5	0.0 - 0.2	0.6 - 0.8	1.2 - 1.4
Sample #	SS61	G62	SS63	G64	G65	G66
Tare ID	E81	QT10	Z67	B4	QW20	AA06
Mass of tare	7.0	8.4	8.8	6.7	6.8	6.9
Mass wet + tare	211.0	210.3	206.6	249.4	208.8	222.3
Mass dry + tare	185.6	191.8	182.6	211.2	163.4	163.7
Mass water	25.4	18.5	24.0	38.2	45.4	58.6
Mass dry soil	178.6	183.4	173.8	204.5	156.6	156.8
Moisture %	14.2%	10.1%	13.8%	18.7%	29.0%	37.4%

Test Hole	TH25-10	TH25-10	TH25-10	TH25-10	TH25-10	TH25-10
Depth (m)	1.7 - 1.8	2.4 - 2.6	3.0 - 3.5	4.0 - 4.1	4.6 - 5.0	5.5 - 5.6
Sample #	G67	G68	SS69	G70	SS71	G72
Tare ID	M70	H2	Z118	W88	M88	E83
Mass of tare	7.0	8.5	8.6	8.6	7.0	7.1
Mass wet + tare	260.0	265.1	234.5	255.8	229.7	256.4
Mass dry + tare	215.2	238.6	200.4	213.3	192.8	242.5
Mass water	44.8	26.5	34.1	42.5	36.9	13.9
Mass dry soil	208.2	230.1	191.8	204.7	185.8	235.4
Moisture %	21.5%	11.5%	17.8%	20.8%	19.9%	5.9%



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Moisture Content Report ASTM D2216-98

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date February 05, 2025
Technician K. Desikan

Test Hole	TH25-10	TH25-10	TH25-11	TH25-11	TH25-11	TH25-11
Depth (m)	6.1 - 6.6	7.0 - 7.5	0.2 - 0.3	0.9 - 1.1	1.4 - 1.5	1.5 - 1.9
Sample #	SS73	SS74	G75	G76	G77	SS78
Tare ID	RR-2	N59	W36	N58	F43	E117
Mass of tare	6.8	8.5	8.6	8.6	8.5	8.6
Mass wet + tare	227.4	243.5	238.6	260.9	242.5	237.9
Mass dry + tare	213.4	218.4	198.6	228.8	215.9	216.8
Mass water	14.0	25.1	40.0	32.1	26.6	21.1
Mass dry soil	206.6	209.9	190.0	220.2	207.4	208.2
Moisture %	6.8%	12.0%	21.1%	14.6%	12.8%	10.1%

Test Hole	TH25-11	TH25-11	TH25-11	TH25-11	TH25-12	TH25-12
Depth (m)	2.4 - 2.6	3.0 - 3.5	4.1 - 4.3	4.6 - 4.9	0.0 - 0.2	0.6 - 0.8
Sample #	G79	SS80	G81	SS82	G83	G84
Tare ID	H50	Z127	W95	H74	D32	E11
Mass of tare	8.8	8.8	9.0	9.0	8.6	7.1
Mass wet + tare	427.8	264.3	251.5	226.2	228.2	240.1
Mass dry + tare	370.6	229.9	218.9	216.9	191.8	203.8
Mass water	57.2	34.4	32.6	9.3	36.4	36.3
Mass dry soil	361.8	221.1	209.9	207.9	183.2	196.7
Moisture %	15.8%	15.6%	15.5%	4.5%	19.9%	18.5%

Test Hole	TH25-12	TH25-12	TH25-12	TH25-12	TH25-12	TH25-12
Depth (m)	1.2 - 1.4	1.5 - 2.0	2.4 - 2.6	3.0 - 3.5	3.8 - 4.0	4.6 - 5.0
Sample #	G85	SS86	G87	SS88	G89	SS90
Tare ID	QW14	E14	AC33	N23	AZ8	F135
Mass of tare	7.1	7.1	6.9	8.7	8.3	9.0
Mass wet + tare	201.9	228.7	274.2	257.2	213.1	321.3
Mass dry + tare	187.2	202.2	255.7	240.5	197.3	295.6
Mass water	14.7	26.5	18.5	16.7	15.8	25.7
Mass dry soil	180.1	195.1	248.8	231.8	189.0	286.6
Moisture %	8.2%	13.6%	7.4%	7.2%	8.4%	9.0%



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Moisture Content Report ASTM D2216-98

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date Febuary 05, 2025
Technician K. Desikan

Test Hole	TH25-12	TH25-12	TH25-13	TH25-13	TH25-13	TH25-13
Depth (m)	5.5 - 5.6	6.1 - 6.5	0.0 - 0.2	0.6 - 0.8	1.2 - 1.4	1.5 - 2.0
Sample #	G91	SS92	G93	G94	G95	SS96
Tare ID	Z02	N84	A104	N71	C30	N114
Mass of tare	7.0	8.6	8.6	8.7	8.5	8.6
Mass wet + tare	223.7	209.4	253.0	223.7	233.8	234.2
Mass dry + tare	199.3	187.4	232.4	207.7	217.8	218.7
Mass water	24.4	22.0	20.6	16.0	16.0	15.5
Mass dry soil	192.3	178.8	223.8	199.0	209.3	210.1
Moisture %	12.7%	12.3%	9.2%	8.0%	7.6%	7.4%

Test Hole	TH25-13	TH25-13	TH25-13	TH25-13	TH25-13	TH25-14
Depth (m)	2.4 - 2.6	3.0 - 3.2	3.7 - 3.8	4.6 - 5.0	5.5 - 5.6	0.2 - 0.3
Sample #	G97	SS98	G99	SS100	G101	G102
Tare ID	E54	Z44	AB37	L2	M78	AB55
Mass of tare	6.9	8.8	6.9	7.0	7.2	6.4
Mass wet + tare	235.7	268.3	256.4	238.7	271.9	270.3
Mass dry + tare	221.9	251.7	239.2	220.6	242.3	245.9
Mass water	13.8	16.6	17.2	18.1	29.6	24.4
Mass dry soil	215.0	242.9	232.3	213.6	235.1	239.5
Moisture %	6.4%	6.8%	7.4%	8.5%	12.6%	10.2%

Test Hole	TH25-14	TH25-14	TH25-14	TH25-14	TH25-14	TH25-14
Depth (m)	0.9 - 1.1	1.4 - 1.5	1.5 - 2.0	2.4 - 2.6	3.0 - 3.4	4.0 - 4.1
Sample #	G103	G104	SS105	G106	SS107	G108
Tare ID	AA10	B21	I71	M06	F144	Z51
Mass of tare	6.7	6.5	6.4	6.8	8.7	8.6
Mass wet + tare	255.5	277.1	257.9	260.6	243.5	250.2
Mass dry + tare	234.4	247.5	228.5	245.0	224.4	232.0
Mass water	21.1	29.6	29.4	15.6	19.1	18.2
Mass dry soil	227.7	241.0	222.1	238.2	215.7	223.4
Moisture %	9.3%	12.3%	13.2%	6.5%	8.9%	8.1%



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

**Moisture Content Report
 ASTM D2216-98**

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date February 05, 2025
Technician K. Desikan

Test Hole	TH25-14	TH25-14	TH25-15	TH25-15	TH25-15	TH25-15
Depth (m)	4.6 - 5.0	5.3 - 5.5	0.2 - 0.3	0.9 - 1.1	1.2 - 1.4	1.5 - 2.0
Sample #	SS109	G110	G111	G112	G113	SS114
Tare ID	F21	AB13	AH18	W102	Z32	M40
Mass of tare	8.6	6.6	8.6	8.6	8.8	6.9
Mass wet + tare	253.6	264.8	202.5	208.0	200.4	204.0
Mass dry + tare	233.9	236.5	180.3	183.3	182.0	185.6
Mass water	19.7	28.3	22.2	24.7	18.4	18.4
Mass dry soil	225.3	229.9	171.7	174.7	173.2	178.7
Moisture %	8.7%	12.3%	12.9%	14.1%	10.6%	10.3%

Test Hole	TH25-15	TH25-15	TH25-15	TH25-15	TH25-15	TH25-15
Depth (m)	2.4 - 2.6	3.0 - 3.5	4.0 - 4.1	4.6 - 5.0	5.5 - 5.6	6.1 - 6.6
Sample #	G115	SS116	G117	SS118	G119	SS120
Tare ID	K27	F65	A18	E80	E4	B28
Mass of tare	8.5	8.5	8.5	6.9	8.8	6.9
Mass wet + tare	205.8	206.4	202.8	209.8	205.0	219.0
Mass dry + tare	195.1	198.0	190.6	195.2	190.8	198.5
Mass water	10.7	8.4	12.2	14.6	14.2	20.5
Mass dry soil	186.6	189.5	182.1	188.3	182.0	191.6
Moisture %	5.7%	4.4%	6.7%	7.8%	7.8%	10.7%

Test Hole	TH25-15	TH25-16	TH25-16	TH25-16	TH25-16	TH25-16
Depth (m)	7.0 - 7.2	0.2 - 0.3	0.8 - 0.9	1.4 - 1.5	1.5 - 2.0	2.1 - 2.3
Sample #	G121	G122	G123	G124	SS125	G126
Tare ID	E133	M72	M39	M48	M56	AB69
Mass of tare	8.5	7.0	6.8	6.9	6.8	6.7
Mass wet + tare	208.7	205.2	223.3	206.2	126.4	213.3
Mass dry + tare	190.6	182.2	204.4	187.5	115.2	189.6
Mass water	18.1	23.0	18.9	18.7	11.2	23.7
Mass dry soil	182.1	175.2	197.6	180.6	108.4	182.9
Moisture %	9.9%	13.1%	9.6%	10.4%	10.3%	13.0%



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Moisture Content Report ASTM D2216-98

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date Febuary 05, 2025
Technician K. Desikan

Test Hole	TH25-16	TH25-16	TH25-17	TH25-17	TH25-17	TH25-17
Depth (m)	3.0 - 3.5	4.0 - 4.1	0.0 - 0.2	0.6 - 0.8	1.2 - 1.4	1.5 - 2.0
Sample #	SS127	G128	G130	G131	G132	SS133
Tare ID	E40	D237	AA9	W70	A46	M38
Mass of tare	7.7	7.1	6.8	8.2	6.8	7.0
Mass wet + tare	215.0	213.3	205.1	220.7	204.5	222.3
Mass dry + tare	192.9	191.0	185.3	207.3	191.6	206.3
Mass water	22.1	22.3	19.8	13.4	12.9	16.0
Mass dry soil	185.2	183.9	178.5	199.1	184.8	199.3
Moisture %	11.9%	12.1%	11.1%	6.7%	7.0%	8.0%

Test Hole	TH25-17	TH25-17	TH25-17	TH25-17	TH25-18	TH25-18
Depth (m)	2.4 - 2.6	3.0 - 3.1	4.1 - 4.3	4.3 - 4.4	0.0 - 0.2	0.6 - 0.8
Sample #	G134	SS135	G136	SS137	G138	G139
Tare ID	B14	M98	B9	M59	D211	D41
Mass of tare	7.0	7.0	7.3	7.1	6.9	6.8
Mass wet + tare	205.7	186.6	201.2	235.3	205.0	200.3
Mass dry + tare	192.1	173.8	189.8	221.9	156.2	179.8
Mass water	13.6	12.8	11.4	13.4	48.8	20.5
Mass dry soil	185.1	166.8	182.5	214.8	149.3	173.0
Moisture %	7.3%	7.7%	6.2%	6.2%	32.7%	11.8%

Test Hole	TH25-18	TH25-18	TH25-18	TH25-18	TH25-19	TH25-19
Depth (m)	1.2 - 1.4	1.5 - 2.0	2.4 - 2.6	3.0 - 3.5	0.0 - 0.2	0.6 - 0.8
Sample #	G140	SS141	G142	SS143	G144	G145
Tare ID	D221	D200	D214	D203	D231	D201
Mass of tare	6.9	6.8	6.8	6.8	6.9	6.9
Mass wet + tare	226.6	203.7	205.1	205.5	203.4	218.8
Mass dry + tare	206.3	179.9	181.9	185.1	180.0	182.4
Mass water	20.3	23.8	23.2	20.4	23.4	36.4
Mass dry soil	199.4	173.1	175.1	178.3	173.1	175.5
Moisture %	10.2%	13.7%	13.2%	11.4%	13.5%	20.7%



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

**Moisture Content Report
 ASTM D2216-98**

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date February 05, 2025
Technician K. Desikan

Test Hole	TH25-19	TH25-19	TH25-19	TH25-19	TH25-20	TH25-20
Depth (m)	1.2 - 1.4	1.5 - 2.0	2.4 - 2.6	3.0 - 3.5	0.0 - 0.2	0.6 - 0.8
Sample #	G146	SS147	G148	SS149	G150	G151
Tare ID	D220	E16	D206	D202	Z41	I86
Mass of tare	6.8	6.8	6.8	6.8	8.8	9.0
Mass wet + tare	205.5	210.9	225.1	234.0	215.1	224.5
Mass dry + tare	179.9	192.3	202.3	209.7	194.8	203.8
Mass water	25.6	18.6	22.8	24.3	20.3	20.7
Mass dry soil	173.1	185.5	195.5	202.9	186.0	194.8
Moisture %	14.8%	10.0%	11.7%	12.0%	10.9%	10.6%

Test Hole	TH25-20	TH25-20	TH25-20	TH25-20	TH25-20	TH25-20
Depth (m)	1.2 - 1.4	1.5 - 2.0	2.4 - 2.6	3.0 - 3.5	3.8 - 4.0	4.6 - 5.0
Sample #	G152	SS153	G154	G155	G156	SS157
Tare ID	F104	F116	W20	C14	D217	N113
Mass of tare	8.8	8.4	8.8	8.7	6.7	8.6
Mass wet + tare	205.6	201.7	424.3	242.4	224.2	201.6
Mass dry + tare	186.8	183.6	381.0	216.3	200.4	174.8
Mass water	18.8	18.1	43.3	26.1	23.8	26.8
Mass dry soil	178.0	175.2	372.2	207.6	193.7	166.2
Moisture %	10.6%	10.3%	11.6%	12.6%	12.3%	16.1%

Test Hole	TH25-20	TH25-21	TH25-21	TH25-21	TH25-21	TH25-21
Depth (m)	5.5 - 5.6	0.0 - 0.2	0.8 - 0.9	1.4 - 1.5	1.5 - 2.0	2.4 - 2.6
Sample #	G158	G159	G160	G161	SS162	G163
Tare ID	Z134	H36	QW1	E119	M96	D39
Mass of tare	9.0	8.7	7.3	8.7	7.1	8.6
Mass wet + tare	205.1	200.6	204.7	213.9	200.8	215.7
Mass dry + tare	175.7	175.8	183.3	187.7	192.8	201.3
Mass water	29.4	24.8	21.4	26.2	8.0	14.4
Mass dry soil	166.7	167.1	176.0	179.0	185.7	192.7
Moisture %	17.6%	14.8%	12.2%	14.6%	4.3%	7.5%



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

**Moisture Content Report
 ASTM D2216-98**

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date February 05, 2025
Technician K. Desikan

Test Hole	TH25-21	TH25-21	TH25-21	TH25-21	TH25-21	TH25-22
Depth (m)	3.0 - 3.4	4.0 - 4.1	4.6 - 5.0	5.2 - 5.3	5.8 - 6.1	0.0 - 0.2
Sample #	SS164	G165	SS166	G167	SS168	G169
Tare ID	QT1	K37	M36	M93	AB58	B12
Mass of tare	8.2	8.4	7.7	7.0	7.1	6.7
Mass wet + tare	213.3	214.5	208.4	212.2	207.8	207.2
Mass dry + tare	194.4	202.4	196.5	198.5	193.5	149.4
Mass water	18.9	12.1	11.9	13.7	14.3	57.8
Mass dry soil	186.2	194.0	188.8	191.5	186.4	142.7
Moisture %	10.2%	6.2%	6.3%	7.2%	7.7%	40.5%

Test Hole	TH25-22	TH25-22	TH25-22	TH25-22	TH25-22	TH25-22
Depth (m)	1.4 - 1.5	1.5 - 2.0	2.4 - 2.6	3.0 - 3.5	4.0 - 4.1	4.6 - 5.0
Sample #	G171	SS172	SS173	SS174	G175	SS176
Tare ID	8.7	D232	D236	D210	D234	QT2
Mass of tare	6.8	6.8	6.8	6.7	6.8	8.0
Mass wet + tare	209.3	213.9	211.7	207.5	205.0	203.9
Mass dry + tare	176.6	182.3	181.9	182.2	170.3	187.9
Mass water	32.7	31.6	29.8	25.3	34.7	16.0
Mass dry soil	169.8	175.5	175.1	175.5	163.5	179.9
Moisture %	19.3%	18.0%	17.0%	14.4%	21.2%	8.9%

Test Hole	TH25-22	TH25-23	TH25-23	TH25-23	TH25-23	TH25-23
Depth (m)	6.1 - 6.6	0.0 - 0.2	1.8 - 2.0	2.6 - 2.7	4.0 - 4.1	4.6 - 5.0
Sample #	SS177	G178	G180	G181	G182	SS183
Tare ID	AA5	QT3	D218	QT69	D226	D208
Mass of tare	6.8	8.1	6.8	8.1	6.7	6.8
Mass wet + tare	226.3	223.5	202.2	208.1	214.9	214.4
Mass dry + tare	202.1	178.5	146.9	151.3	150.0	194.5
Mass water	24.2	45.0	55.3	56.8	64.9	19.9
Mass dry soil	195.3	170.4	140.1	143.2	143.3	187.7
Moisture %	12.4%	26.4%	39.5%	39.7%	45.3%	10.6%



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

**Moisture Content Report
 ASTM D2216-98**

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date Febuary 05, 2025
Technician K. Desikan

Test Hole	TH25-23	TH25-24	TH25-24	TH25-24	TH25-24	TH25-24
Depth (m)	5.8 - 5.9	0.0 - 0.2	0.6 - 0.8	1.2 - 1.4	1.5 - 2.0	2.4 - 2.6
Sample #	G184	G185	G186	G187	SS188	G189
Tare ID	D204	F79	W94	K39	E48	Z68
Mass of tare	6.7	9.2	8.6	8.5	7.0	8.5
Mass wet + tare	202.3	204.0	216.2	224.8	217.2	217.2
Mass dry + tare	169.4	149.9	182.3	187.5	197.5	185.8
Mass water	32.9	54.1	33.9	37.3	19.7	31.4
Mass dry soil	162.7	140.7	173.7	179.0	190.5	177.3
Moisture %	20.2%	38.5%	19.5%	20.8%	10.3%	17.7%

Test Hole	TH25-24	TH25-24	TH25-24	TH25-24	TH25-24	TH25-25
Depth (m)	3.0 - 3.5	4.0 - 4.1	4.6 - 5.0	5.8 - 5.9	6.1 - 6.6	0.0 - 0.2
Sample #	SS190	G191	SS192	G193	SS194	G195
Tare ID	AA7	D228	EX01	AB74	E04	QT76
Mass of tare	6.7	6.6	6.7	6.9	6.9	8.2
Mass wet + tare	204.6	200.0	202.2	220.1	220.9	207.5
Mass dry + tare	184.0	165.0	147.1	197.0	201.7	162.9
Mass water	20.6	35.0	55.1	23.1	19.2	44.6
Mass dry soil	177.3	158.4	140.4	190.1	194.8	154.7
Moisture %	11.6%	22.1%	39.2%	12.2%	9.9%	28.8%

Test Hole	TH25-25	TH25-25	TH25-25	TH25-25	TH25-25	TH25-26
Depth (m)	2.3 - 2.4	3.0 - 3.5	4.0 - 4.1	4.6 - 5.0	5.8 - 5.9	0.0 - 0.2
Sample #	G197	SS198	G199	SS200	G201	G202
Tare ID	AC08	A6	AC34	E78	W44	A100
Mass of tare	7.0	8.4	6.7	8.4	8.6	9.6
Mass wet + tare	209.5	204.1	215.8	212.3	201.1	210.9
Mass dry + tare	177.3	172.6	183.6	193.8	181.9	160.2
Mass water	32.2	31.5	32.2	18.5	19.2	50.7
Mass dry soil	170.3	164.2	176.9	185.4	173.3	150.6
Moisture %	18.9%	19.2%	18.2%	10.0%	11.1%	33.7%



www.trekgeotechnical.ca
1712 St. James Street
Winnipeg, MB R3H 0L3
Tel: 204.975.9433 Fax: 204.975.9435

Moisture Content Report ASTM D2216-98

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

Sample Date 20-Jan-25
Test Date February 05, 2025
Technician K. Desikan

Test Hole	TH25-26	TH25-26	TH25-26	TH25-26	TH25-26	TH25-26
Depth (m)	0.6 - 0.8	1.2 - 1.4	1.5 - 2.0	2.4 - 2.6	3.0 - 3.5	3.8 - 4.0
Sample #	G203	G204	SS205	G206	SS207	G208
Tare ID	F69	W76	E79	N85	N111	AB61
Mass of tare	8.6	8.6	8.6	8.4	8.9	6.9
Mass wet + tare	208.6	201.9	213.7	204.6	200.8	204.6
Mass dry + tare	174.1	166.3	188.4	166.4	173.6	172.2
Mass water	34.5	35.6	25.3	38.2	27.2	32.4
Mass dry soil	165.5	157.7	179.8	158.0	164.7	165.3
Moisture %	20.8%	22.6%	14.1%	24.2%	16.5%	19.6%



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Atterberg Limits
ASTM D4318-10e1

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

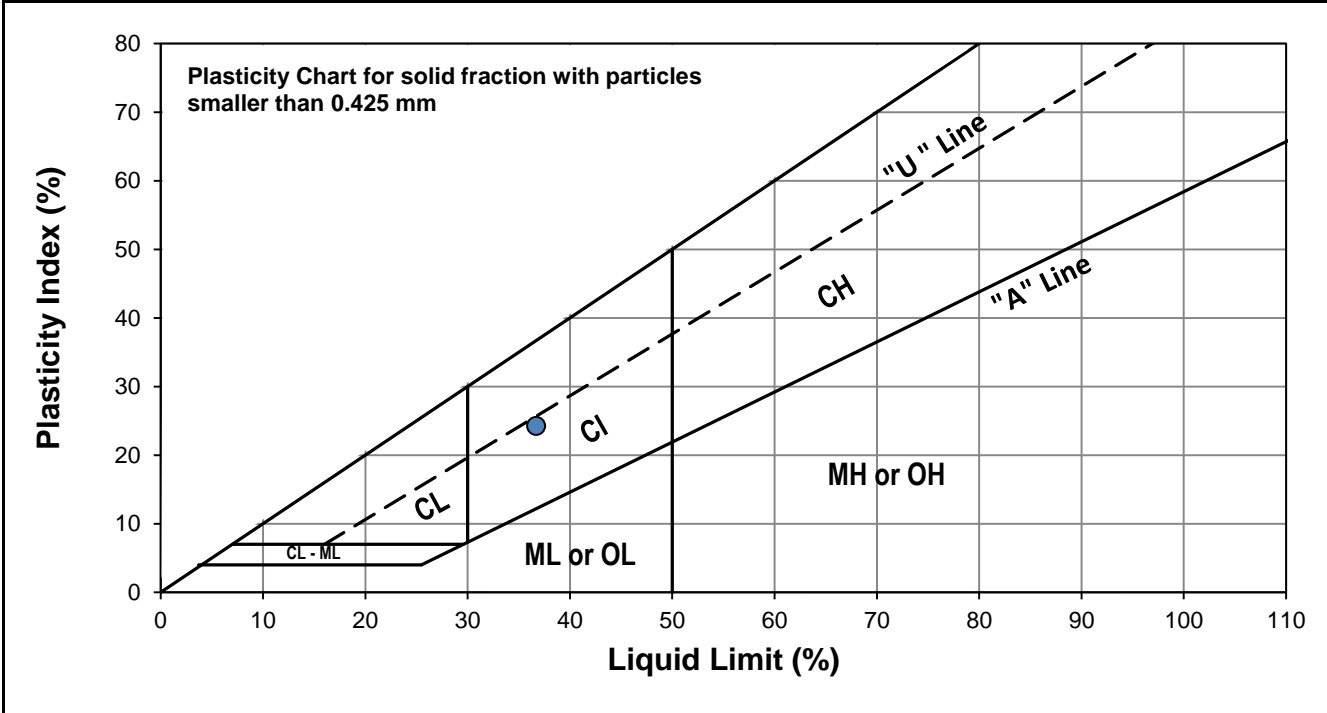


Test Hole TH25-02
Sample # G09
Depth (m) 1.8 - 2.0
Sample Date 21-Jan-25
Test Date 07-Feb-25
Technician A. Dustmamatov

Liquid Limit	37
Plastic Limit	12
Plasticity Index	24

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	15	20	31
Mass Tare (g)	13.893	14.080	13.904
Mass Wet Soil + Tare (g)	26.774	28.162	28.103
Mass Dry Soil + Tare (g)	23.182	24.329	24.348
Mass Water (g)	3.592	3.833	3.755
Mass Dry Soil (g)	9.289	10.249	10.444
Moisture Content (%)	38.669	37.399	35.954



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.962	13.984			
Mass Wet Soil + Tare (g)	25.101	26.817			
Mass Dry Soil + Tare (g)	23.863	25.401			
Mass Water (g)	1.238	1.416			
Mass Dry Soil (g)	9.901	11.417			
Moisture Content (%)	12.504	12.403			

Note: Additional information recorded/measured for this test is available upon request.



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Grain Size Analysis (Hydrometer Method)
AASHTO T 88

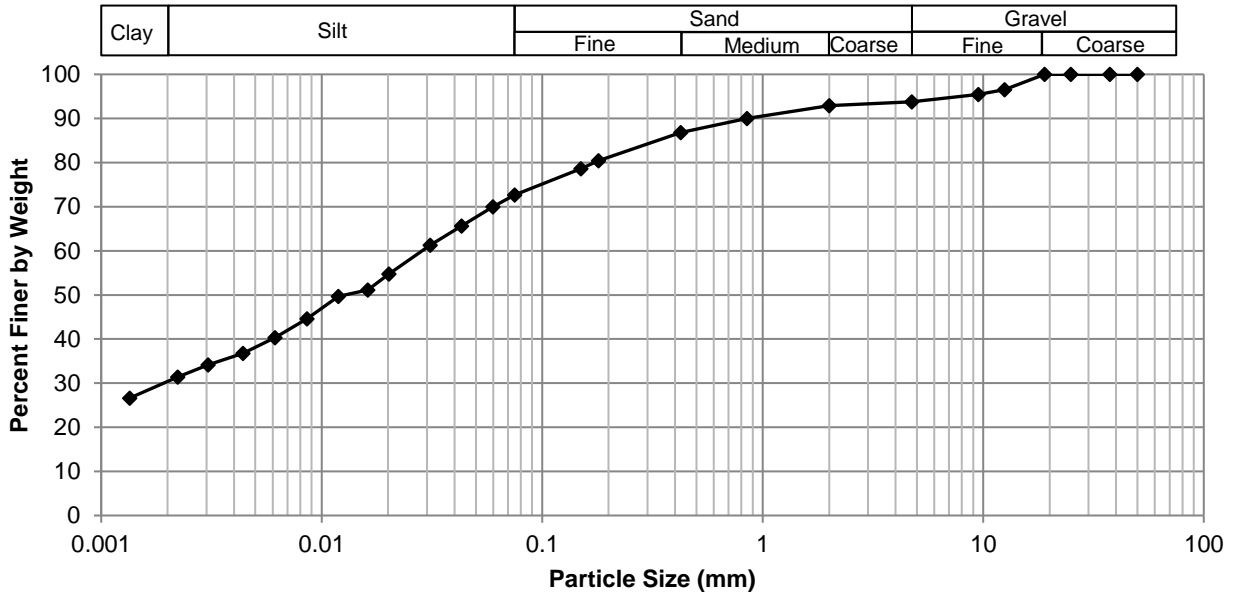
Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony



Test Hole TH25-02
Sample # G09
Depth (m) 1.8 - 2.0
Sample Date 21-Jan-25
Test Date 10-Feb-25
Technician A. Dustmamatov

Gravel	6.2%
Sand	21.1%
Silt	42.5%
Clay	30.2%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	93.78	0.0750	72.66
37.5	100.00	2.00	92.88	0.0598	69.99
25.0	100.00	0.850	90.02	0.0431	65.63
19.0	100.00	0.425	86.78	0.0311	61.27
12.5	96.54	0.180	80.44	0.0202	54.74
9.50	95.46	0.150	78.60	0.0162	51.11
4.75	93.78	0.075	72.66	0.0119	49.66
				0.0086	44.57
				0.0062	40.29
				0.0044	36.79
				0.0031	34.17
				0.0022	31.40
				0.0013	26.64



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Atterberg Limits
ASTM D4318-10e1

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

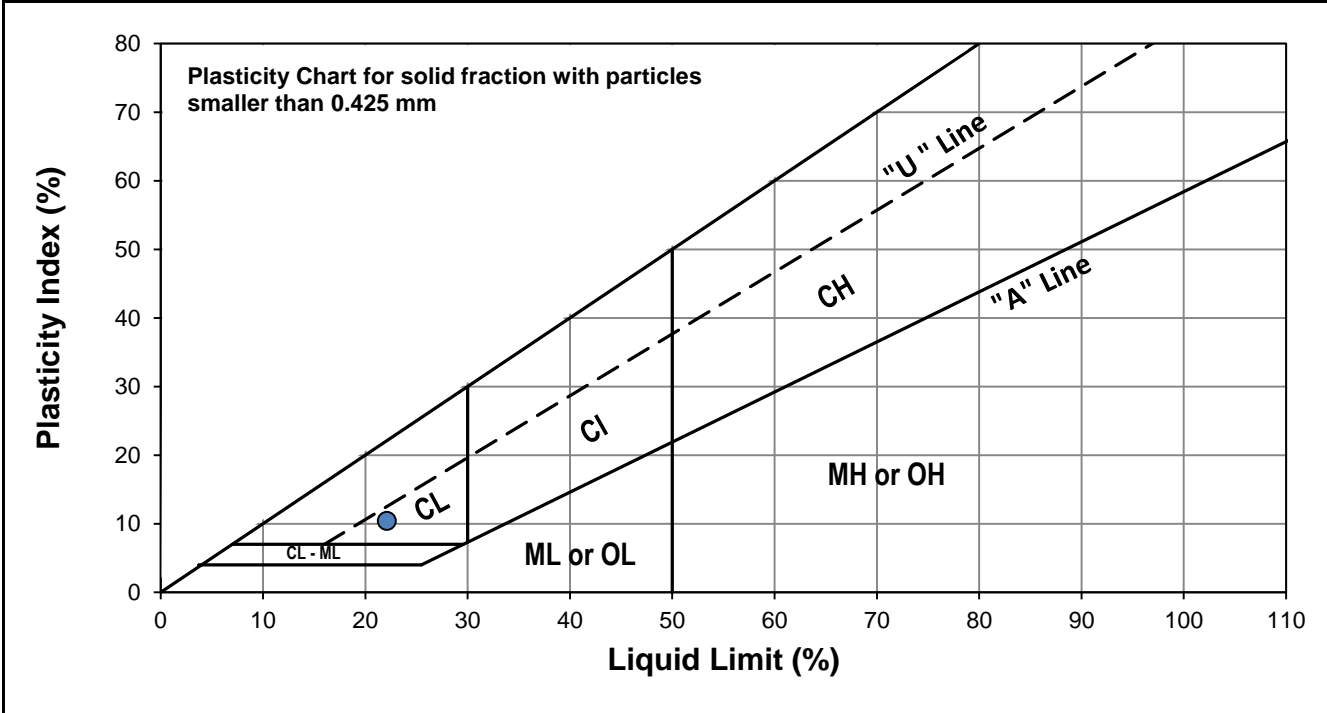


Test Hole TH25-08
Sample # G50
Depth (m) 2.4 - 2.6
Sample Date 20-Jan-25
Test Date 14-Feb-25
Technician A. Dustmamatov

Liquid Limit	22
Plastic Limit	12
Plasticity Index	10

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	15	24	32
Mass Tare (g)	14.144	14.128	14.121
Mass Wet Soil + Tare (g)	32.803	27.884	28.035
Mass Dry Soil + Tare (g)	29.280	25.392	25.562
Mass Water (g)	3.523	2.492	2.473
Mass Dry Soil (g)	15.136	11.264	11.441
Moisture Content (%)	23.276	22.124	21.615



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.824	13.990			
Mass Wet Soil + Tare (g)	23.461	24.147			
Mass Dry Soil + Tare (g)	22.443	23.089			
Mass Water (g)	1.018	1.058			
Mass Dry Soil (g)	8.619	9.099			
Moisture Content (%)	11.811	11.628			

Note: Additional information recorded/measured for this test is available upon request.



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

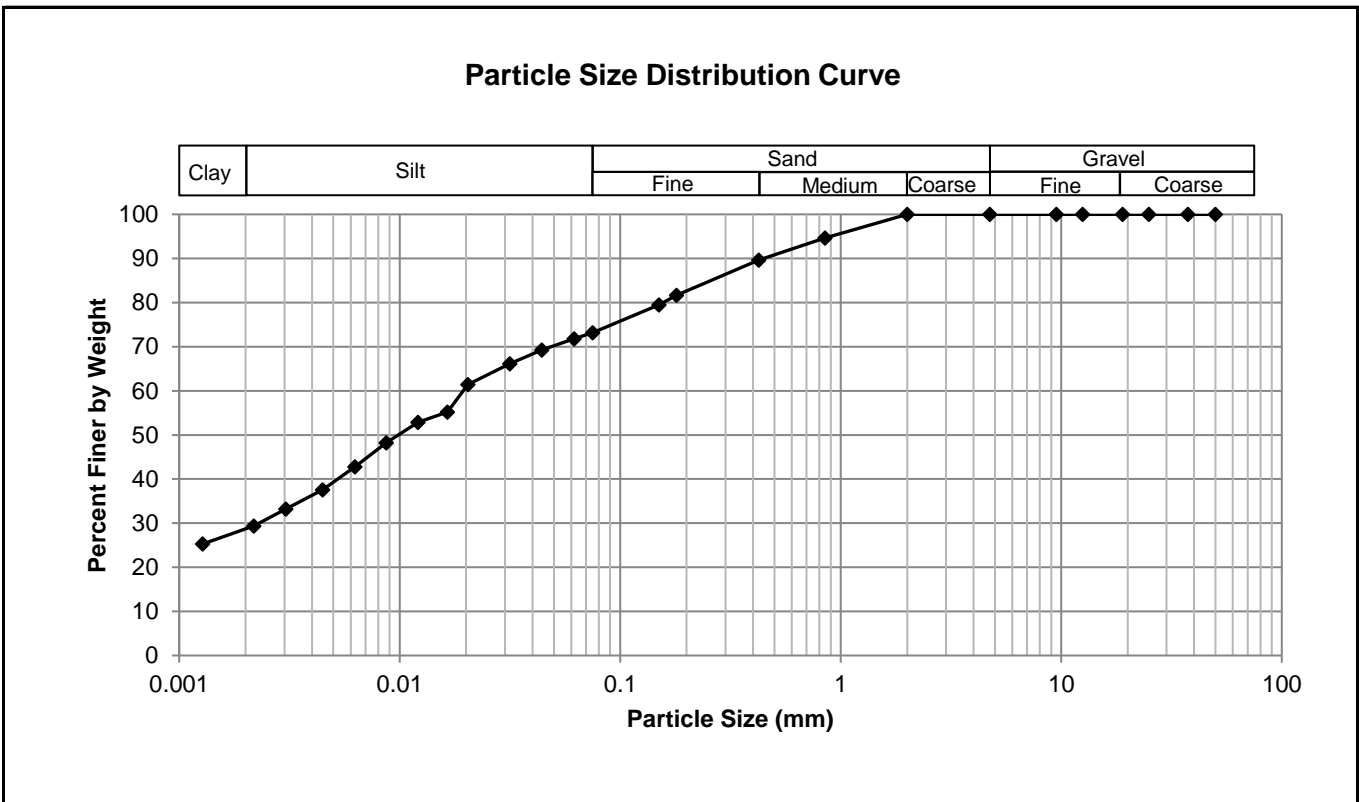
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony



Test Hole TH25-08
Sample # G50
Depth (m) 2.4 - 2.6
Sample Date 21-Jan-25
Test Date 12-Feb-25
Technician A. Dustmamatov

Gravel	0.0%
Sand	26.8%
Silt	44.6%
Clay	28.5%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	73.16
37.5	100.00	2.00	100.00	0.0618	71.77
25.0	100.00	0.850	94.68	0.0441	69.27
19.0	100.00	0.425	89.65	0.0316	66.14
12.5	100.00	0.180	81.66	0.0204	61.45
9.50	100.00	0.150	79.50	0.0165	55.20
4.75	100.00	0.075	73.16	0.0121	52.90
				0.0087	48.21
				0.0063	42.78
				0.0045	37.54
				0.0030	33.20
				0.0022	29.33
				0.0013	25.29



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Atterberg Limits
ASTM D4318-10e1

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

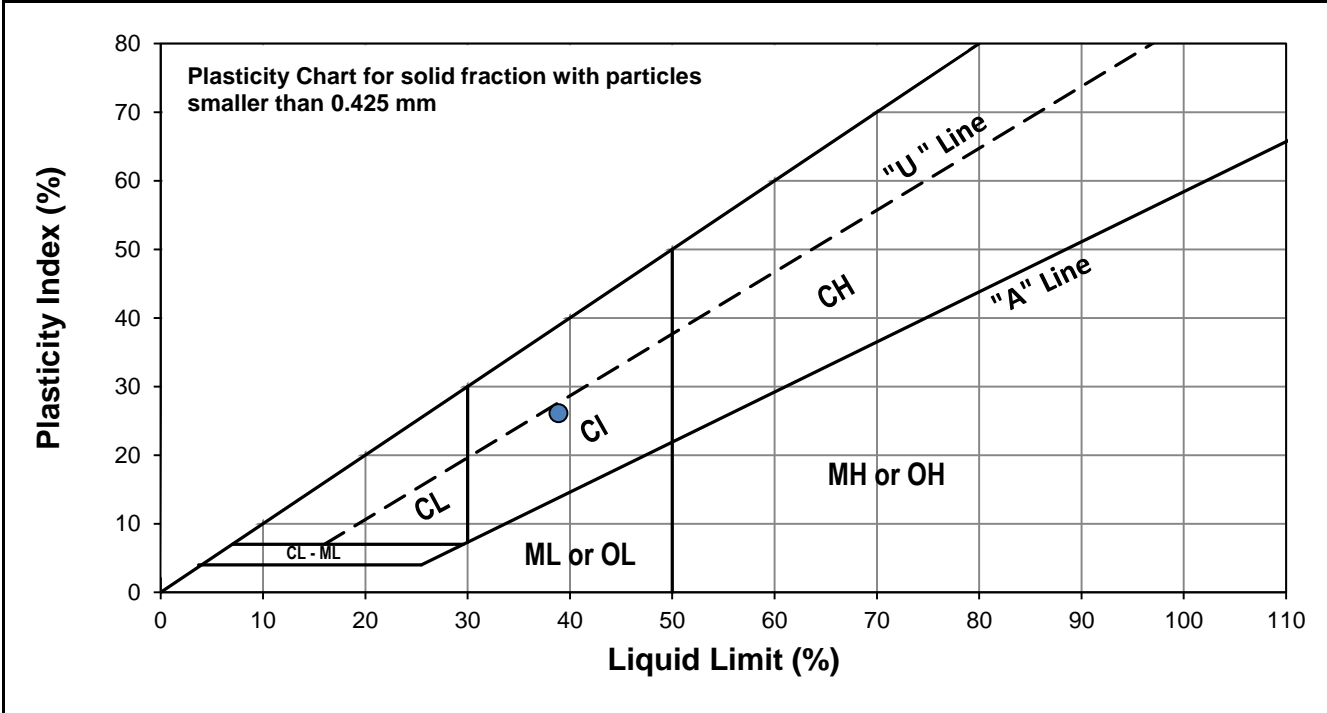


Test Hole TH25-11
Sample # G79
Depth (m) 2.4 - 2.6
Sample Date 21-Jan-25
Test Date 10-Feb-25
Technician A. Dustmamatov

Liquid Limit	39
Plastic Limit	13
Plasticity Index	26

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	17	26	33
Mass Tare (g)	14.085	14.204	13.894
Mass Wet Soil + Tare (g)	26.738	26.219	28.027
Mass Dry Soil + Tare (g)	23.093	22.874	24.147
Mass Water (g)	3.645	3.345	3.880
Mass Dry Soil (g)	9.008	8.670	10.253
Moisture Content (%)	40.464	38.581	37.843



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.959	13.983			
Mass Wet Soil + Tare (g)	23.736	23.566			
Mass Dry Soil + Tare (g)	22.601	22.505			
Mass Water (g)	1.135	1.061			
Mass Dry Soil (g)	8.642	8.522			
Moisture Content (%)	13.134	12.450			

Note: Additional information recorded/measured for this test is available upon request.



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

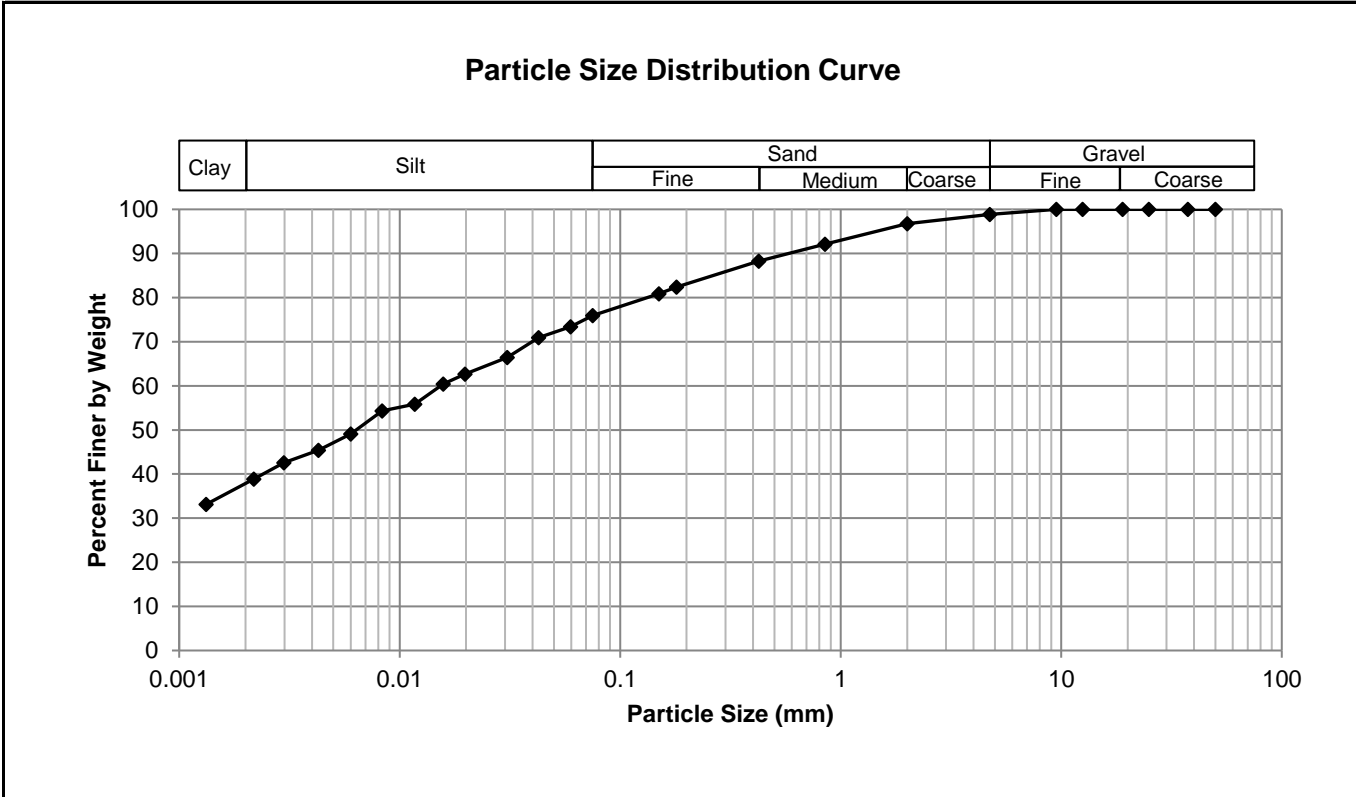
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony



Test Hole TH25-11
Sample # G79
Depth (m) 2.4 - 2.6
Sample Date 21-Jan-25
Test Date 10-Feb-25
Technician A. Dustmamatov

Gravel	1.1%
Sand	23.0%
Silt	38.2%
Clay	37.7%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	98.89	0.0750	75.91
37.5	100.00	2.00	96.72	0.0597	73.38
25.0	100.00	0.850	92.12	0.0426	70.96
19.0	100.00	0.425	88.25	0.0307	66.43
12.5	100.00	0.180	82.38	0.0197	62.65
9.50	100.00	0.150	80.87	0.0158	60.38
4.75	98.89	0.075	75.91	0.0117	55.84
				0.0083	54.33
				0.0060	49.08
				0.0043	45.39
				0.0030	42.54
				0.0022	38.85
				0.0013	33.13



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Atterberg Limits
ASTM D4318-10e1

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

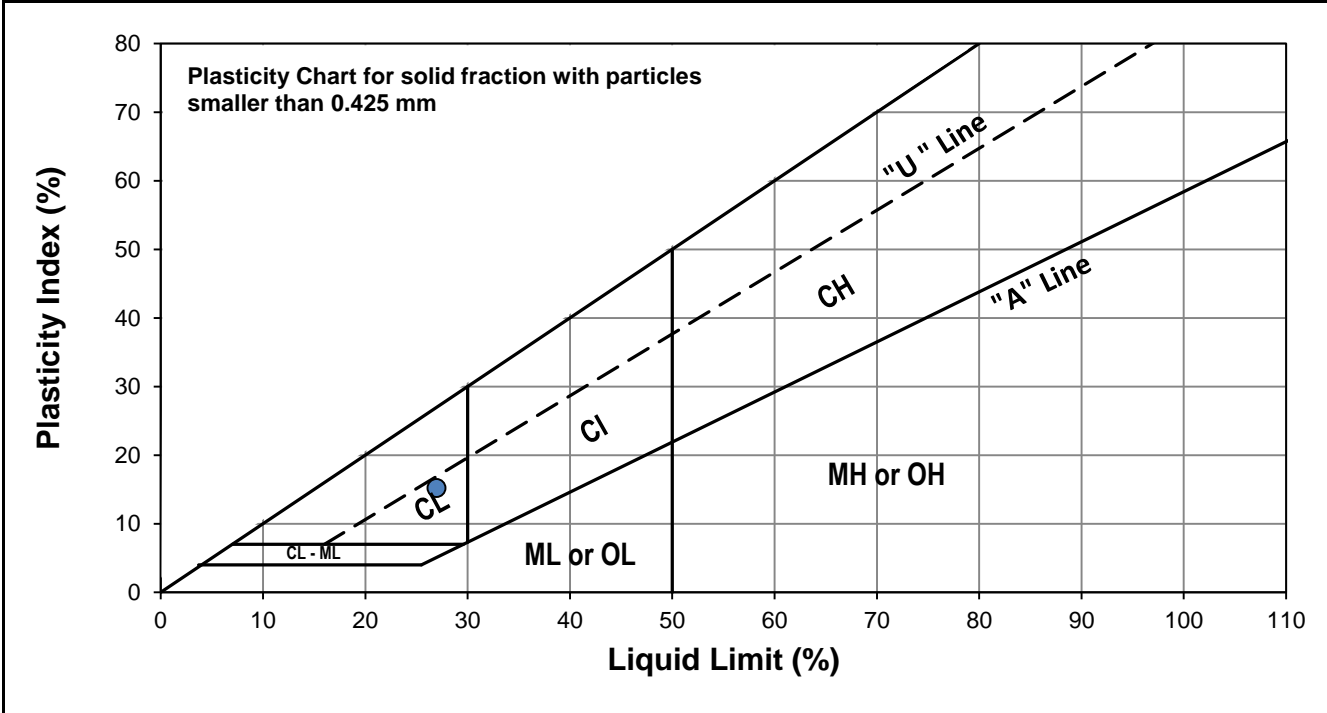


Test Hole TH25-20
Sample # G154
Depth (m) 2.4 - 2.6
Sample Date 23-Jan-25
Test Date 11-Feb-25
Technician A. Dustmamatov

Liquid Limit	27
Plastic Limit	12
Plasticity Index	15

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	17	26	34
Mass Tare (g)	14.131	14.022	13.990
Mass Wet Soil + Tare (g)	27.479	28.610	28.484
Mass Dry Soil + Tare (g)	24.575	25.520	25.464
Mass Water (g)	2.904	3.090	3.020
Mass Dry Soil (g)	10.444	11.498	11.474
Moisture Content (%)	27.805	26.874	26.320



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.944	14.001			
Mass Wet Soil + Tare (g)	23.925	23.827			
Mass Dry Soil + Tare (g)	22.877	22.789			
Mass Water (g)	1.048	1.038			
Mass Dry Soil (g)	8.933	8.788			
Moisture Content (%)	11.732	11.812			

Note: Additional information recorded/measured for this test is available upon request.



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

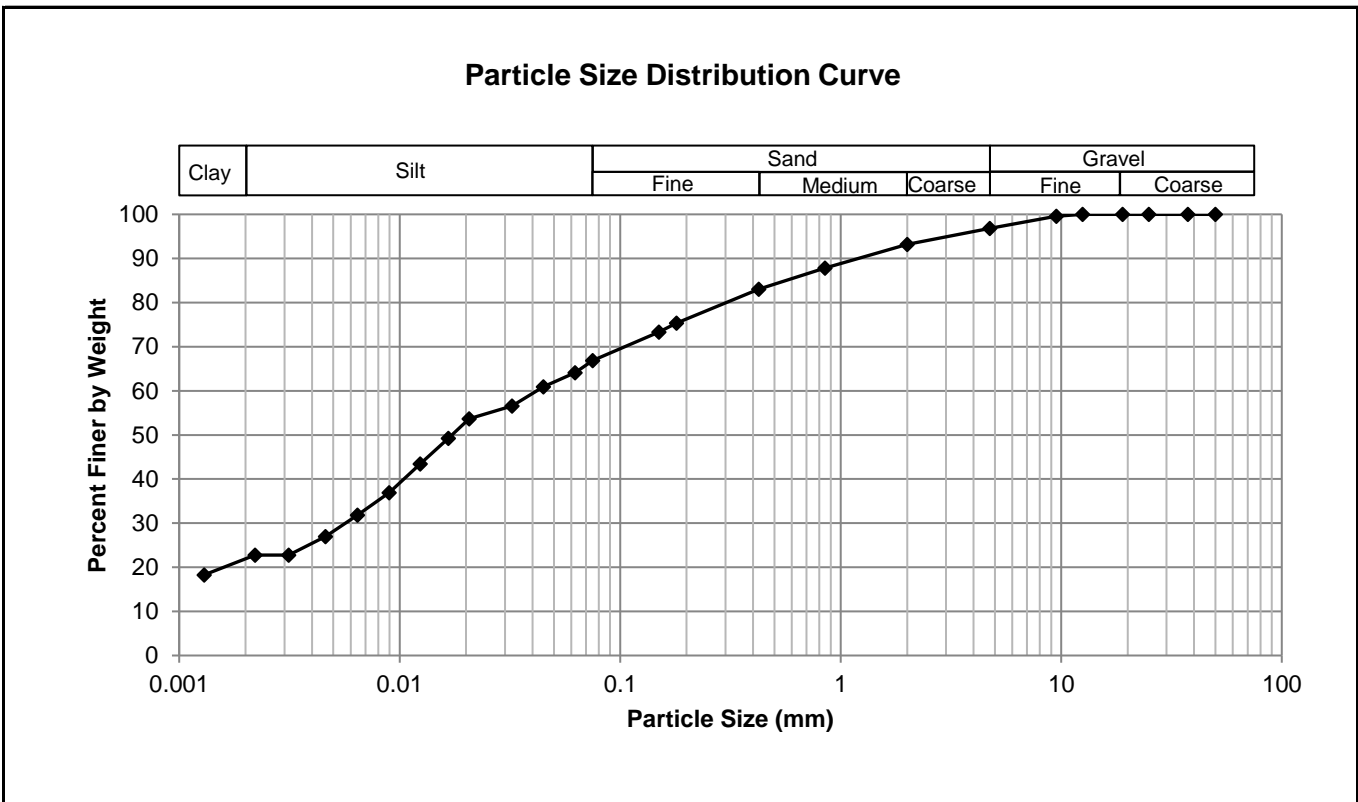
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony



Test Hole TH25-20
Sample # G154
Depth (m) 2.4 - 2.6
Sample Date 23-Jan-25
Test Date 12-Feb-25
Technician A. Dustmamatov

Gravel	3.2%
Sand	29.9%
Silt	45.2%
Clay	21.7%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	96.80	0.0750	66.90
37.5	100.00	2.00	93.23	0.0625	64.13
25.0	100.00	0.850	87.86	0.0448	60.93
19.0	100.00	0.425	83.03	0.0323	56.56
12.5	100.00	0.180	75.35	0.0207	53.64
9.50	99.55	0.150	73.32	0.0166	49.27
4.75	96.80	0.075	66.90	0.0124	43.44
				0.0090	36.92
				0.0064	31.85
				0.0046	26.95
				0.0031	22.77
				0.0022	22.78
				0.0013	18.29



www.trekgeotechnical.ca
1712 St. James Street
Winnipeg, MB R3H 0L3
Tel: 204.975.9433 Fax: 204.975.9435

Standard Proctor Compaction Test

ASTM D698-12e2

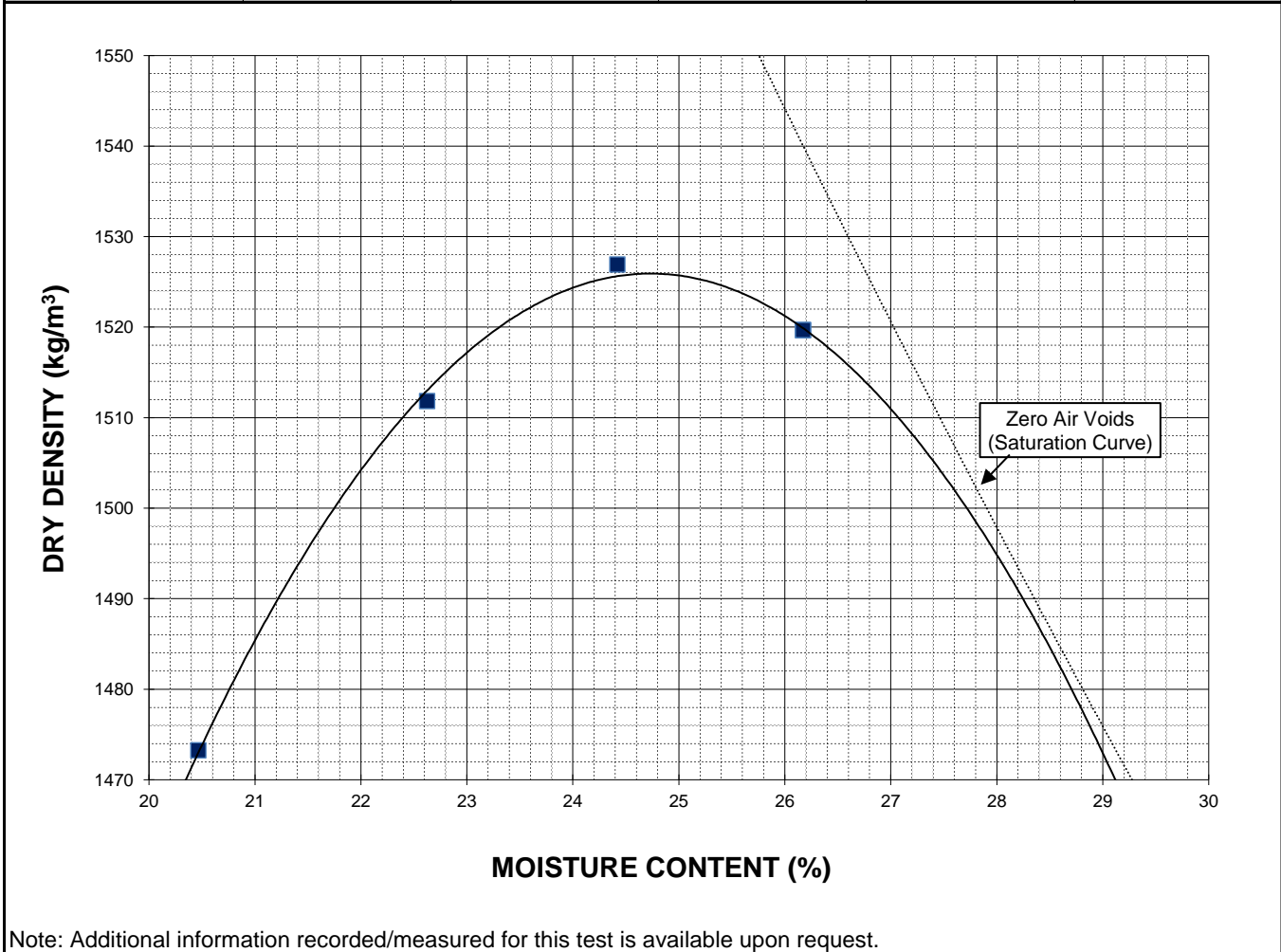
Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony



Sample # R25-030
Source BLK170 and BLK179 (combined)
Material Clay
Sample Date 20-Jan-25
Test Date 12-Feb-25
Technician AD

Maximum Dry Density (kg/m³)	1526
Optimum Moisture (%)	24.7

Trial Number	1	2	3	4	
Wet Density (kg/m³)	1775	1854	1900	1917	
Dry Density (kg/m³)	1473	1512	1527	1520	
Moisture Content (%)	20.5	22.6	24.4	26.2	





MEMORANDUM

Date	March 18, 2025
To	Tyson Roeland, TREK Geotechnical
From	Angela Fidler-Kliewer, TREK Geotechnical
Project No.	0105-098-00
Project	Rock Lake Colony
Subject	Laboratory Testing Results – Lab Req. R25-030

Distribution	Reza Jamshidi Chenari
---------------------	-----------------------

Attached are the Standard Proctor, Atterberg Limit, Grain Size Distribution (Hydrometer Method) and Hydraulic Conductivity test results for the above noted project. This report contains hydraulic conductivity test results for BLK 170 & 179 (combined) using a flexible wall permeameter following ASTM D5080-16. The sample was prepared to 95.5% of SPMDD.

The test report for the sample is attached showing the calculated hydraulic conductivity value corrected to 20°C is as follows:

Sample BLK 170 & 179 (combined) 8.23E-11 m/s (8.23 x 10⁻⁹ cm/s)

The services undertaken by TREK on this assignment constitutes testing services only and engineering evaluation or interpretation has not been undertaken but is available upon request.

If you have any questions or require additional information or clarifications, please contact Angela at 204.792.8458.

Regards,

Angela Fidler-Kliewer, C.Tech.

Review Control:

<i>Prepared By: AFK</i>	<i>Reviewed By: AFK</i>	<i>Checked By: NJF</i>
-------------------------	-------------------------	------------------------



LABORATORY REQUISITION

CLIENT: Burns Maendel Consulting Engineers Ltd.

PROJECT NO: 0105-098-00

PROJECT NAME: Rock Lake Colony

FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS	ALS <i>Tolif surface</i>	Soil Description/Comments
TH25-01	G01	0.5 - 1.0		X								
TH25-01	G02	2.0 - 2.5		X								
TH25-01	G03	4.0 - 4.5		X								
TH25-01	SS04	5.0 - 6.5		X								
TH25-01	G05	8.0 - 8.5		X								
TH25-02	G06	0.0 - 0.5		X								
TH25-02	G07	1.0 - 1.5		X								
TH25-02	G08	3.0 - 3.5		X								
TH25-02	G09	6.0 - 6.5		X		X	X					Clay fill
TH25-02	G10	8.0 - 8.5		X								
TH25-02	SS11	10.0 - 11.5		X								
TH25-03	G12	0.5 - 1.0		X								
TH25-03	G13	2.5 - 3.0		X								
TH25-03	G14	4.5 - 5.0		X								
TH25-03	G15	5.5 - 6.0		X								
TH25-03	G16	8.0 - 8.5		X								
TH25-03	SS17	10.0 - 11.5		X								
TH25-04	G18	0.0 - 0.5		X								
TH25-04	G19	2.0 - 2.5		X								
TH25-04	G20	4.0 - 4.5		X								
TH25-04	SS21	5.0 - 6.5		X								
TH25-04	G22	8.0 - 8.5		X								
TH25-04	SS23	10.0 - 11.5		X								
TH25-04	G24	13.5 - 14.0		X								
TH25-05	G25	0.5 - 1.0		X								
TH25-05	G26	2.5 - 3.0		X								
TH25-05	G27	4.5 - 5.0		X								
TH25-05	G28	6.0 - 6.5		X								
TH25-05	G29	7.5 - 8.0		X								
TH25-05	SS30	10.0 - 10.8		X						X		Clay fill
TH25-06	G31	0.0 - 0.5		X								
TH25-06	G32	1.5 - 2.0		X								
TH25-06	G33	3.5 - 4.0		X								
TH25-06	SS34	5.0 - 6.5		X								
TH25-06	G35	8.0 - 8.5		X								

REQUESTED BY: Tyson Roeland REPORT TO: TR RSC
 REQUISITION DATE: Feb 4/25 DATE REQUIRED: Feb 17/24
 COMMENTS: _____

REQUISITION NO.
R25-030

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK GEOTECHNICAL.GDT 1/2/25



LABORATORY REQUISITION

CLIENT Burns Maendel Consulting Engineers Ltd.
PROJECT NAME Rock Lake Colony

PROJECT NO: 0105-098-00
FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS	Soil Description/Comments					
TH25-06	SS36	10.0 - 11.5		X												
TH25-06	G37	13.5 - 14.0		X												
TH25-06	SS38	15.0 - 15.5		X												
TH25-06	SS39	18.0 - 18.5		X												
TH25-07	G40	0.0 - 0.5		X												
TH25-07	G41	2.0 - 2.5		X												
TH25-07	G42	4.5 - 5.0		X												
TH25-07	SS43	5.0 - 6.5		X												
TH25-07	G44	8.0 - 8.5		X												
TH25-07	SS45	10.0 - 11.5		X												
TH25-08	G46	1.0 - 1.5		X												
TH25-08	G47	3.0 - 3.5		X												
TH25-08	G48	4.5 - 5.0		X												
TH25-08	SS49	5.0 - 6.5		X												
TH25-08	G50	8.0 - 8.5		X		X	X									soft fill
TH25-08	SS51	10.0 - 11.5		X												
TH25-08	G52	13.0 - 13.5		X												
TH25-08	G53	15.0 - 16.5		X												
TH25-08	G54	19.0 - 19.5		X												
TH25-08	SS55	20.0 - 21.5		X												
TH25-08	G56	23.0 - 23.5		X												
TH25-08	SS57	25.0 - 26.5		X												
TH25-09	G58	0.0 - 0.5		X												
TH25-09	G59	2.5 - 3.0		X												
TH25-09	G60	4.5 - 5.0		X												
TH25-09	SS61	5.0 - 6.5		X												
TH25-09	G62	8.0 - 8.5		X												
TH25-09	SS63	10.0 - 11.5		X												
TH25-10	G64	0.0 - 0.5		X												
TH25-10	G65	2.0 - 2.5		X												
TH25-10	G66	4.0 - 4.5		X												
TH25-10	G67	5.5 - 6.0		X												
TH25-10	G68	8.0 - 8.5		X												
TH25-10	SS69	10.0 - 11.5		X												
TH25-10	G70	13.0 - 13.5		X												

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK GEOTECHNICAL.GDT 1/2/25

REQUESTED BY: Tyson Roeland **REPORT TO:** _____
REQUISITION DATE: _____ **DATE REQUIRED:** _____
COMMENTS: _____

REQUISITION NO. _____
 PAGE 2 OF 6



LABORATORY REQUISITION

CLIENT Burns Maendel Consulting Engineers Ltd.

PROJECT NO: 0105-098-00

PROJECT NAME Rock Lake Colony

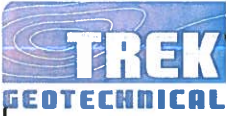
FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS				Soil Description/Comments
TH25-10	SS71	15.0 - 16.5		X										
TH25-10	G72	18.0 - 18.5		X										
TH25-10	SS73	20.0 - 21.5		X										
TH25-10	SS74	23.0 - 24.5		X										
TH25-11	G75	0.5 - 1.0		X										
TH25-11	G76	3.0 - 3.5		X										
TH25-11	G77	4.5 - 5.0		X										
TH25-11	SS78	5.0 - 6.3		X										
TH25-11	G79	8.0 - 8.5		X		X								Clay fill
TH25-11	SS80	10.0 - 11.5		X										
TH25-11	G81	13.5 - 14.0		X										
TH25-11	SS82	15.0 - 16.0		X										
TH25-12	G83	0.0 - 0.5		X										
TH25-12	G84	2.0 - 2.5		X										
TH25-12	G85	4.0 - 4.5		X										
TH25-12	SS86	5.0 - 6.5		X										
TH25-12	G87	8.0 - 8.5		X										
TH25-12	SS88	10.0 - 11.5		X										
TH25-12	G89	12.5 - 13.0		X										
TH25-12	SS90	15.0 - 16.5		X										
TH25-12	G91	18.0 - 18.5		X										
TH25-12	SS92	20.0 - 21.3		X										
TH25-13	G93	0.0 - 0.5		X										
TH25-13	G94	2.0 - 2.5		X										
TH25-13	G95	4.0 - 4.5		X										
TH25-13	SS96	5.0 - 6.5		X										
TH25-13	G97	8.0 - 8.5		X										
TH25-13	SS98	10.0 - 10.5		X										
TH25-13	G99	12.0 - 12.5		X										
TH25-13	SS100	15.0 - 16.3		X										
TH25-13	G101	18.0 - 18.5		X										
TH25-14	G102	0.5 - 1.0		X										
TH25-14	G103	3.0 - 3.5		X										
TH25-14	G104	4.5 - 5.0		X										
TH25-14	SS105	5.0 - 6.5		X										

REQUESTED BY: Tyson Roeland REPORT TO: _____
 REQUISITION DATE: _____ DATE REQUIRED: _____
 COMMENTS: _____

REQUISITION NO. _____

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR_0105-098-00.GPJ TREK GEOTECHNICAL.GDT 1/2/25



LABORATORY REQUISITION

CLIENT Burns Maendel Consulting Engineers Ltd.
 PROJECT NAME Rock Lake Colony

PROJECT NO: 0105-098-00
 FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS	ALS To be sulfate	Soil Description/Comments
TH25-14	G106	8.0 - 8.5		X								
TH25-14	SS107	10.0 - 11.0		X								
TH25-14	G108	13.0 - 13.5		X								
TH25-14	SS109	15.0 - 16.5		X								
TH25-14	G110	17.5 - 18.0		X								
TH25-15	G111	0.5 - 1.0		X								
TH25-15	G112	3.0 - 3.5		X								
TH25-15	G113	4.0 - 4.5		X								
TH25-15	SS114	5.0 - 6.5		X								
TH25-15	G115	8.0 - 8.5		X								
TH25-15	SS116	10.0 - 11.5		X								
TH25-15	G117	13.0 - 13.5		X								
TH25-15	SS118	15.0 - 16.5		X								
TH25-15	G119	18.0 - 18.5		X								
TH25-15	SS120	20.0 - 21.5		X								
TH25-15	G121	23.0 - 23.5		X								
TH25-16	G122	0.5 - 1.0		X								
TH25-16	G123	2.5 - 3.0		X								
TH25-16	G124	4.5 - 5.0		X								
TH25-16	SS125	5.0 - 6.5		X								
TH25-16	G126	7.0 - 7.5		X								
TH25-16	SS127	10.0 - 11.5		X								
TH25-16	G128	13.0 - 13.5		X								
TH25-17	G130	0.0 - 0.5		X								
TH25-17	G131	2.0 - 2.5		X								
TH25-17	G132	4.0 - 4.5		X								
TH25-17	SS133	5.0 - 6.5		X								
TH25-17	G134	8.0 - 8.5		X								
TH25-17	SS135	10.0 - 10.3		X								
TH25-17	G136	13.5 - 14.0		X								
TH25-17	SS137	14.0 - 14.3		X								
TH25-18	G138	0.0 - 0.5		X								
TH25-18	G139	2.0 - 2.5		X								
TH25-18	G140	4.0 - 4.5		X								
TH25-18	SS141	5.0 - 6.5		X								

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK GEOTECHNICAL.GDT 1/2/25

REQUESTED BY: Tyson Roeland REPORT TO: _____
 REQUISITION DATE: _____ DATE REQUIRED: _____
 COMMENTS: _____

REQUISITION NO. _____
 PAGE 4 OF 6



LABORATORY REQUISITION

CLIENT: Burns Maendel Consulting Engineers Ltd.
 PROJECT NAME: Rock Lake Colony

PROJECT NO.: 0105-098-00
 FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS	Flexible Wall Permeability	ALS	Soil Description/Comments
TH25-18	G142	8.0 - 8.5		X								X	Clay fill
TH25-18	SS143	10.0 - 11.5		X									
TH25-19	G144	0.0 - 0.5		X									
TH25-19	G145	2.0 - 2.5		X									
TH25-19	G146	4.0 - 4.5		X									
TH25-19	SS147	5.0 - 6.5		X									
TH25-19	G148	8.0 - 8.5		X									
TH25-19	SS149	10.0 - 11.5		X									
TH25-20	G150	0.0 - 0.5		X									
TH25-20	G151	2.0 - 2.5		X									
TH25-20	G152	4.0 - 4.5		X									
TH25-20	SS153	5.0 - 6.5		X									
TH25-20	G154	8.0 - 8.5		X		X	X						Clay fill
TH25-20	SS155	10.0 - 11.5		X									
TH25-20	G156	12.5 - 13.0		X									
TH25-20	SS157	15.0 - 16.5		X									
TH25-20	G158	18.0 - 18.5		X									
TH25-21	G159	0.0 - 0.5		X									
TH25-21	G160	2.5 - 3.0		X									
TH25-21	G161	4.5 - 5.0		X									
TH25-21	SS162	5.0 - 6.5		X									
TH25-21	G163	8.0 - 8.5		X									
TH25-21	SS164	10.0 - 11.0		X									
TH25-21	G165	13.0 - 13.5		X									
TH25-21	SS166	15.0 - 16.5		X									
TH25-21	G167	17.0 - 17.5		X									
TH25-21	SS168	19.0 - 20.0		X									
TH25-22	G169	0.0 - 0.5		X									
TH25-22	BLK170	0.5 - 4.0		X					X				Combine w BLK 171
TH25-22	G171	4.5 - 5.0		X									
TH25-22	SS172	5.0 - 6.5		X									
TH25-22	G173	8.0 - 8.5		X									
TH25-22	SS174	10.0 - 11.5		X									
TH25-22	G175	13.0 - 13.5		X									
TH25-22	SS176	15.0 - 16.5		X									

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK GEOTECHNICAL_GDT 1/2/25

REQUESTED BY: Tyson Roeland REPORT TO: _____
 REQUISITION DATE: _____ DATE REQUIRED: _____
 COMMENTS: _____

REQUISITION NO. _____
 PAGE 5 OF 6



LABORATORY REQUISITION

CLIENT Burns Maendel Consulting Engineers Ltd.
 PROJECT NAME Rock Lake Colony

PROJECT NO: 0105-098-00
 FIELD TECHNICIAN: Tyson Roeland

TEST HOLE NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILIARY TESTS	Soil Description/Comments
TH25-22	SS177	20.0 - 21.5		X							
TH25-23	G178	0.0 - 0.5		X							
TH25-23	BLK179	0.5 - 5.0		X							
TH25-23	G180	6.0 - 6.5		X							COMBINE WITH BLK170 TO DO PROCTOR AND PERM
TH25-23	G181	8.5 - 9.0		X							
TH25-23	G182	13.0 - 13.5		X							
TH25-23	SS183	15.0 - 16.5		X							
TH25-23	G184	19.0 - 19.5		X							
TH25-24	G185	0.0 - 0.5		X							
TH25-24	G186	2.0 - 2.5		X							
TH25-24	G187	4.0 - 4.5		X							
TH25-24	SS188	5.0 - 6.5		X							
TH25-24	G189	8.0 - 8.5		X							
TH25-24	SS190	10.0 - 11.5		X							
TH25-24	G191	13.0 - 13.5		X							
TH25-24	SS192	15.0 - 16.5		X							
TH25-24	G193	19.0 - 19.5		X							
TH25-24	SS194	20.0 - 21.5		X							
TH25-25	G195	0.0 - 0.5		X							
TH25-25	BLK196	0.5 - 5.0		X							
TH25-25	G197	7.5 - 8.0		X							
TH25-25	SS198	10.0 - 11.5		X							
TH25-25	G199	13.0 - 13.5		X							
TH25-25	SS200	15.0 - 16.5		X							
TH25-25	G201	19.0 - 19.5		X							
TH25-26	G202	0.0 - 0.5		X							
TH25-26	G203	2.0 - 2.5		X							
TH25-26	G204	4.0 - 4.5		X							
TH25-26	SS205	5.0 - 6.5		X							
TH25-26	G206	8.0 - 8.5		X							
TH25-26	SS207	10.0 - 11.5		X							
TH25-26	G208	12.5 - 13.0		X							

Flexible Perm

COMBINE WITH BLK170 TO DO PROCTOR AND PERM

TREK LABORATORY REQUISITION LOGS 2025-01-27 ROCK LAKE COLONY 0_A_TR 0105-098-00.GPJ TREK GEOTECHNICAL.GDT 1/2/25

REQUESTED BY: Tyson Roeland REPORT TO: _____
 REQUISITION DATE: _____ DATE REQUIRED: _____
 COMMENTS: _____

REQUISITION NO. _____
 PAGE 6 OF 6



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Hydraulic Conductivity Determination (Flexible Wall)
 ASTM D5084-16

Project No.	0105-098-00	Location	BLK 170 and BLK 179 (combined)
Client	Burns Maendel	Trek Sample #	R25-030
Project	Rock Lake Colony	Depth (m)	N/A
		Sample Date	20-Jan-25
		Test Date	14-Feb-25
		Technician	K. Franklin

Specimen Details

Visual Clay, silty, trace sand, grey, stiff, high plasticity
Classification

Comments The specific gravity of the soil was assumed to be 2.75. Sample compacted to 95.5% of SPMDD.

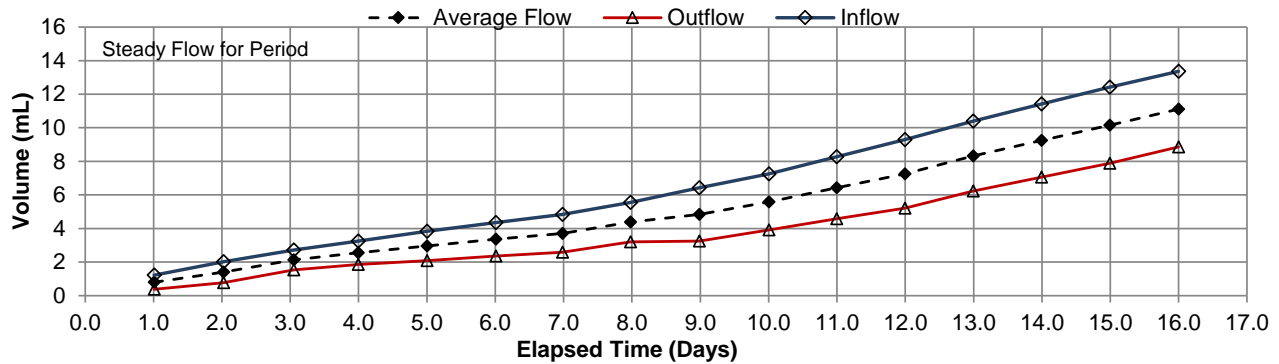
Index Testing

Liquid Limit	69
Plastic Limit	21
Plasticity Index	48
Clay Content (%)	64

Test Details

Permeant	Distilled, de-aired water
Method	Constant Rate
Cell Pressure	135.5 kPa
Influent Pressure	115.7 kPa
Effluent Pressure	85.9 kPa
Gradient	14.17

Permeation Graph



Steady Flow Permeation Data

Time Increment (Days)	Elapsed Time (Days)	Flow (Q)		Inflow / Outflow Ratio	Average Flow (mL)	Temperature Correction	Corrected Hydraulic Conductivity, k_{20} (m/s)
		Influent (mL)	Effluent (mL)				
1.00	12.99	10.40	6.24	1.078	1.06	0.98	8.98E-11
1.00	13.99	11.42	7.06	1.244	0.92	0.97	7.86E-11
1.00	14.99	12.42	7.88	1.220	0.91	0.98	7.83E-11
1.01	16.00	13.36	8.86	0.959	0.96	0.99	8.23E-11

Average Temperature Corrected Hydraulic Conductivity, k_{20} **8.23E-11** m/s **8.23E-09** cm/s

Consolidation Data

	Average Height (m)	Average Diameter (m)	Moisture Content (%)	Dry Density (kN/m^3)	Degree of Saturation (%)	Cell Pressure	Back Pressure
Initial	0.0978	0.0737	27.1	14.3	84.2	119.8	85.0
Final	0.0986	0.0744	33.6	14.0	99.7	119.7	83.8



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Standard Proctor Compaction Test
ASTM D698-12e2

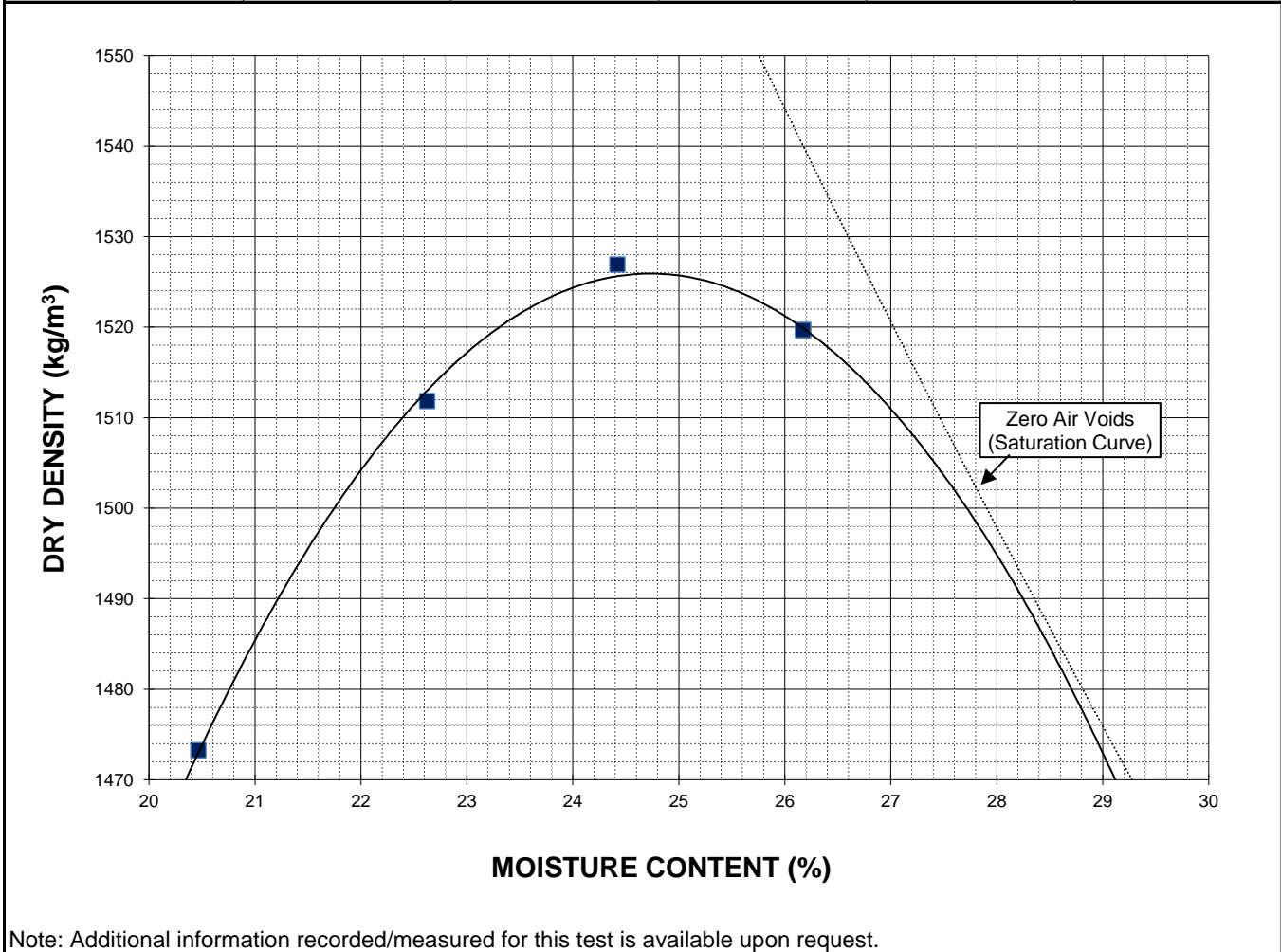
Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony



Sample # R25-030
Source BLK170 and BLK179 (combined)
Material Clay
Sample Date 20-Jan-25
Test Date 12-Feb-25
Technician AD

Maximum Dry Density (kg/m³)	1526
Optimum Moisture (%)	24.7

Trial Number	1	2	3	4
Wet Density (kg/m³)	1775	1854	1900	1917
Dry Density (kg/m³)	1473	1512	1527	1520
Moisture Content (%)	20.5	22.6	24.4	26.2



Note: Additional information recorded/measured for this test is available upon request.



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Atterberg Limits
ASTM D4318-10e1

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony

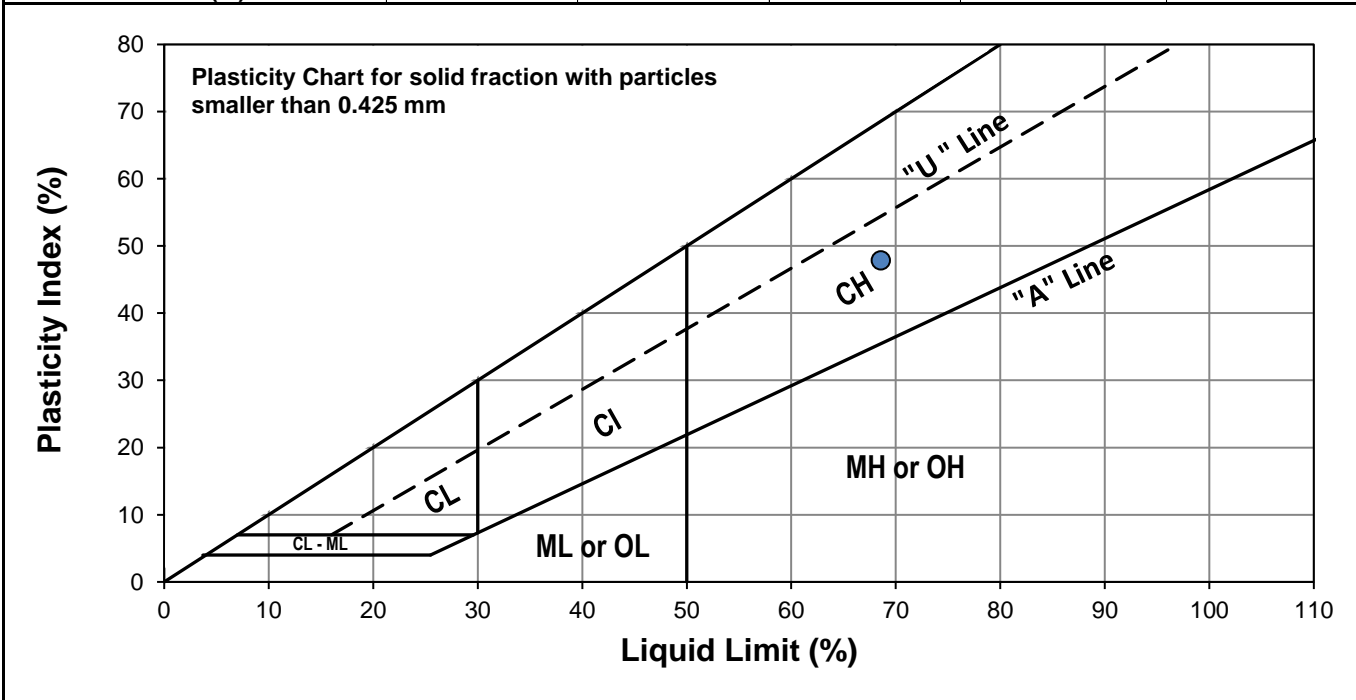


Test Hole Bulk 170 & 179 combined
Sample # -
Depth (m) -
Sample Date 20-Jan-25
Test Date 17-Mar-25
Technician A.Bhullar

Liquid Limit	69
Plastic Limit	21
Plasticity Index	48

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	15	22	35
Mass Tare (g)	14.042	14.150	14.108
Mass Wet Soil + Tare (g)	27.494	27.272	28.405
Mass Dry Soil + Tare (g)	21.814	21.882	22.742
Mass Water (g)	5.680	5.390	5.663
Mass Dry Soil (g)	7.772	7.732	8.634
Moisture Content (%)	73.083	69.710	65.590



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.044	14.057			
Mass Wet Soil + Tare (g)	23.187	23.216			
Mass Dry Soil + Tare (g)	21.619	21.643			
Mass Water (g)	1.568	1.573			
Mass Dry Soil (g)	7.575	7.586			
Moisture Content (%)	20.700	20.736			

Note: Additional information recorded/measured for this test is available upon request.



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

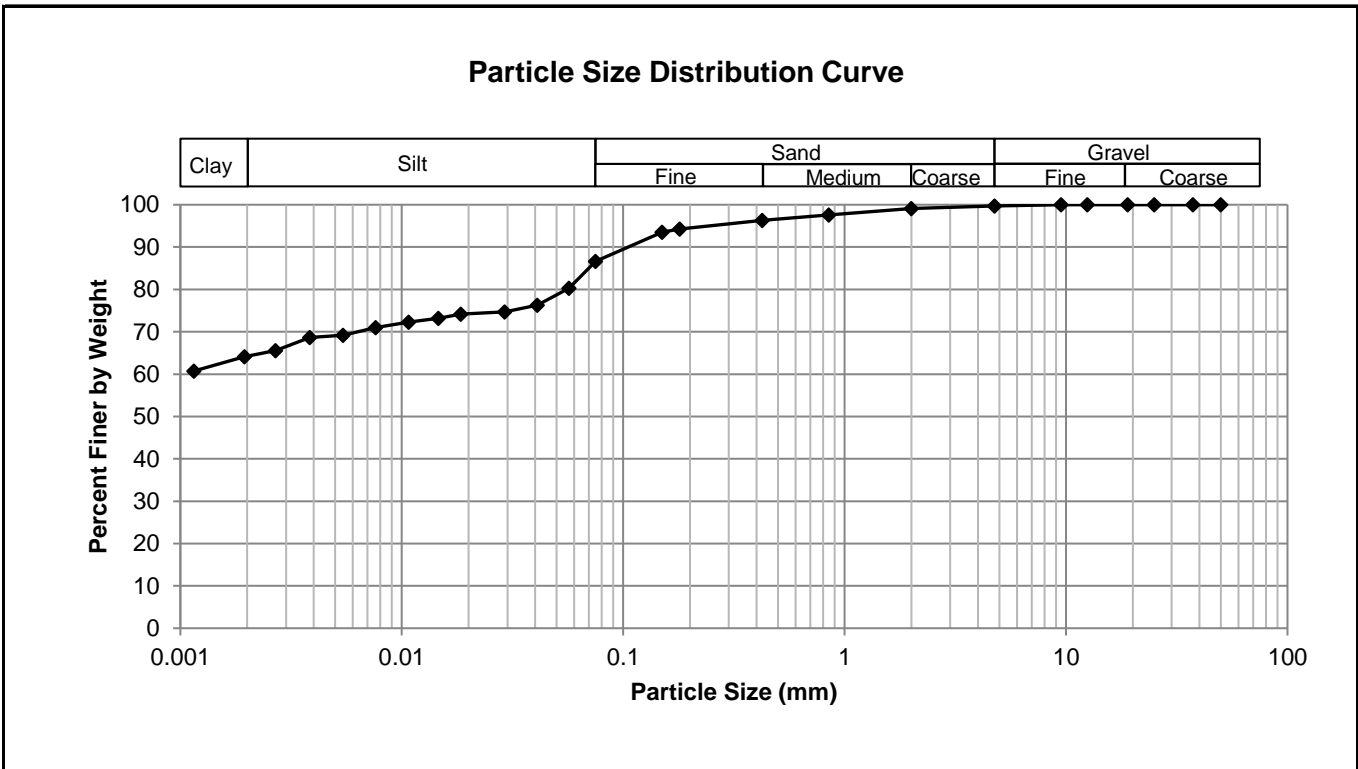
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony



Test Hole BLK 170 & 179 combined
Sample # -
Depth (m) -
Sample Date 20-Jan-25
Test Date 14-Mar-25
Technician K.Franklin

Gravel	0.3%
Sand	13.0%
Silt	22.4%
Clay	64.2%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	99.67	0.0750	86.63
37.5	100.00	2.00	99.10	0.0569	80.29
25.0	100.00	0.850	97.62	0.0410	76.27
19.0	100.00	0.425	96.32	0.0292	74.72
12.5	100.00	0.180	94.26	0.0185	74.13
9.50	100.00	0.150	93.48	0.0147	73.20
4.75	99.67	0.075	86.63	0.0107	72.27
				0.0076	71.03
				0.0054	69.21
				0.0038	68.62
				0.0027	65.59
				0.0020	64.11
				0.0012	60.74



Quality Engineering | Valued Relationships

MEMORANDUM

Date March 26, 2025
To Tyson Roeland, TREK Geotechnical
From Angela Fidler-Kliwer, TREK Geotechnical
Project No. 0105-098-00
Project Rock Lake Colony
Subject Laboratory Testing Results – Lab Req. R25-073

Distribution

Attached are the laboratory testing results for the above noted project. The testing included particle size distribution (Hydrometer method).

Regards,

Angela Fidler-Kliwer, C.Tech.

Attach.

Review Control:

<i>Prepared By:</i> KF	<i>Reviewed By:</i> AFK	<i>Checked By:</i> NJF
------------------------	-------------------------	------------------------



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Grain Size Analysis (Hydrometer Method)
AASHTO T 88

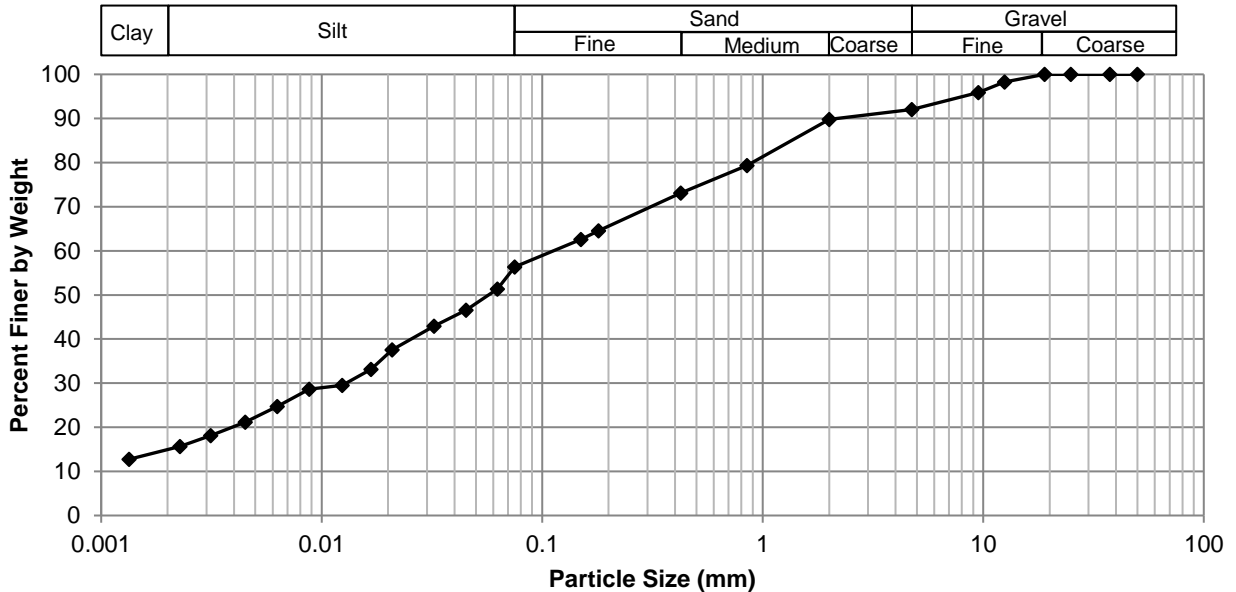
Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony



Test Hole TH25-13
Sample # G93
Depth (m) 0.0 - 0.2
Sample Date 23-Jan-25
Test Date 24-Mar-25
Technician Z. Dypiangco

Gravel	8.0%
Sand	35.7%
Silt	41.5%
Clay	14.8%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	92.02	0.0750	56.32
37.5	100.00	2.00	89.81	0.0625	51.35
25.0	100.00	0.850	79.36	0.0451	46.58
19.0	100.00	0.425	73.13	0.0323	42.93
12.5	98.29	0.180	64.54	0.0209	37.59
9.50	95.90	0.150	62.57	0.0167	33.14
4.75	92.02	0.075	56.32	0.0124	29.49
				0.0088	28.65
				0.0063	24.76
				0.0045	21.15
				0.0031	18.14
				0.0023	15.66
				0.0013	12.74



www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

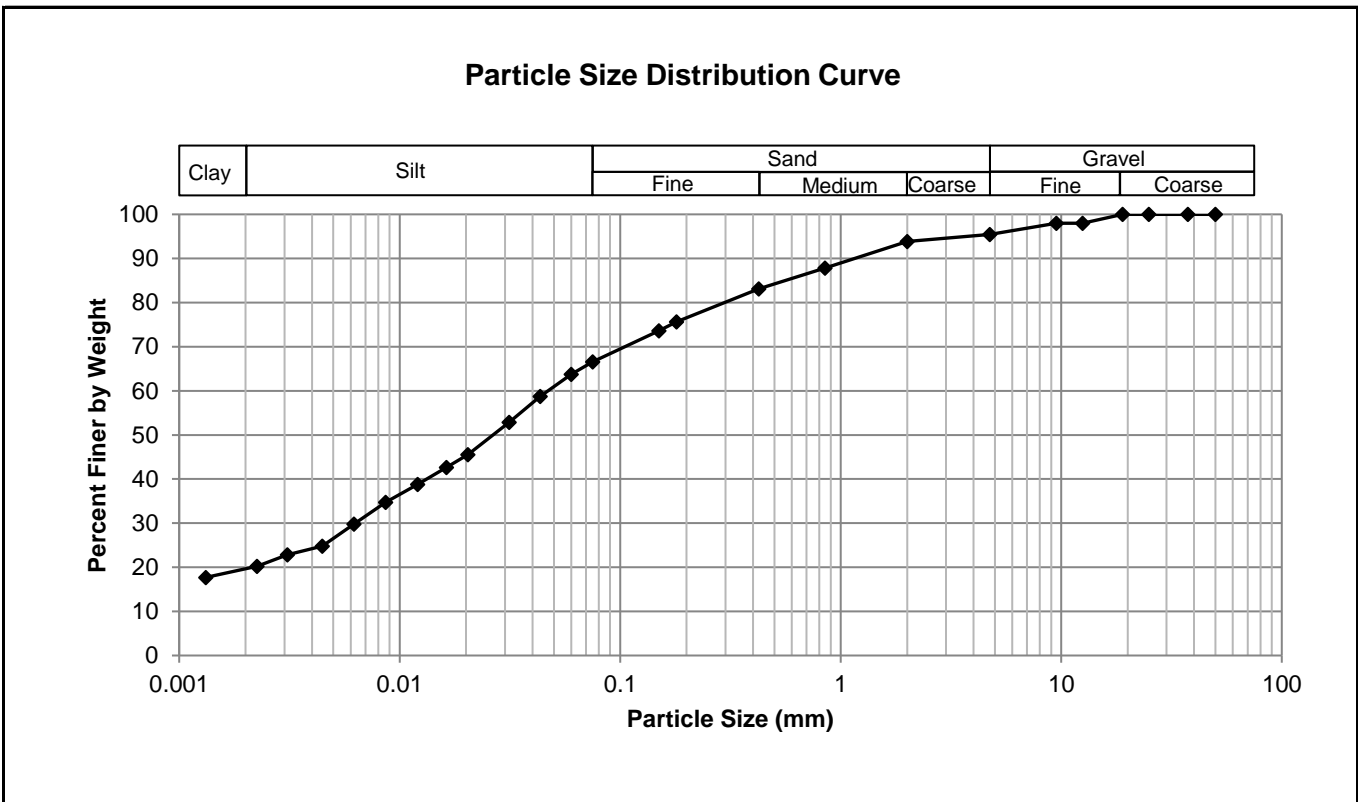
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 0105-098-00
Client Burns Maendel Consulting Engineers Ltd.
Project Rock Lake Colony



Test Hole TH25-15
Sample # G111
Depth (m) 0.2 - 0.3
Sample Date 23-Jan-25
Test Date 24-Mar-25
Technician Z. Dypiangco

Gravel	4.6%
Sand	28.9%
Silt	47.0%
Clay	19.6%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	95.43	0.0750	66.55
37.5	100.00	2.00	93.87	0.0600	63.73
25.0	100.00	0.850	87.84	0.0433	58.74
19.0	100.00	0.425	83.08	0.0314	52.87
12.5	97.98	0.180	75.67	0.0204	45.57
9.50	97.98	0.150	73.65	0.0163	42.64
4.75	95.43	0.075	66.55	0.0121	38.82
				0.0086	34.76
				0.0062	29.77
				0.0045	24.82
				0.0031	22.86
				0.0023	20.26
				0.0013	17.69