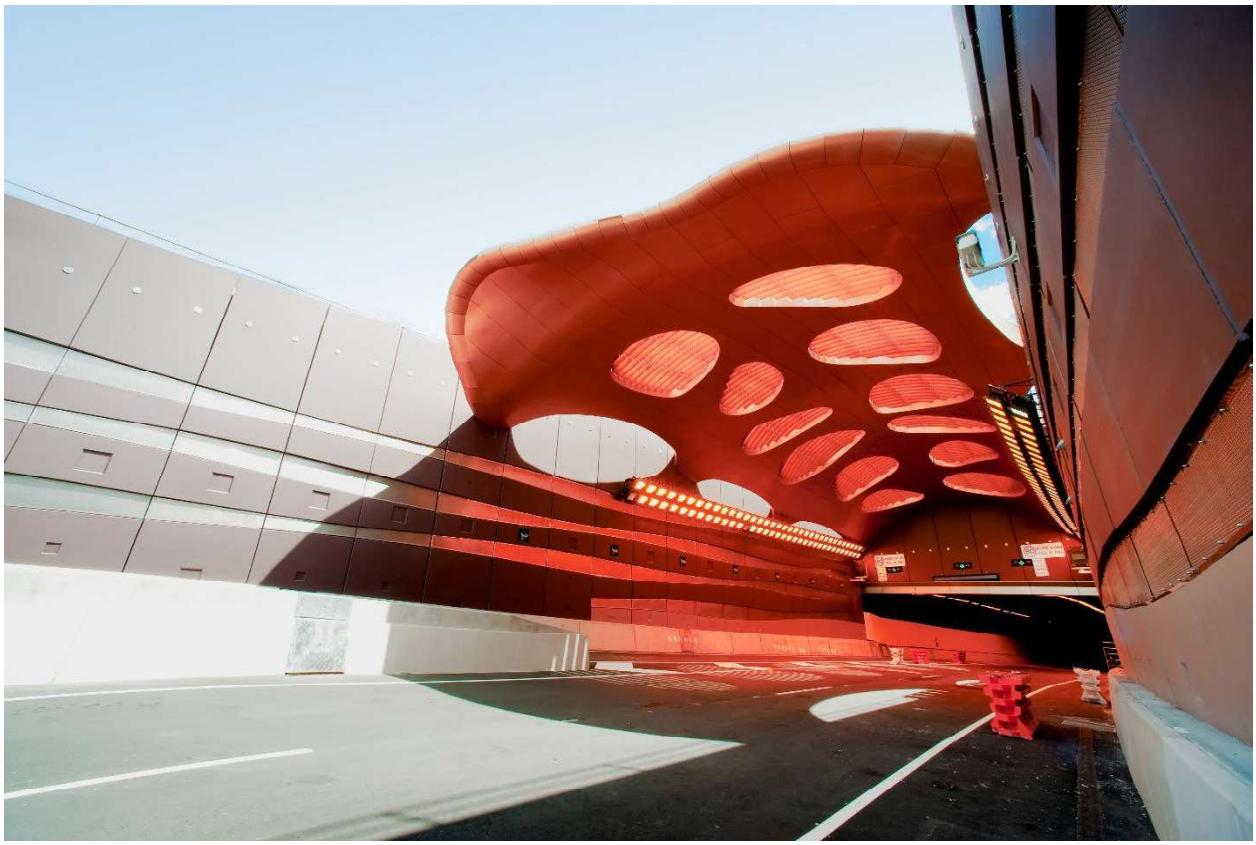
KING STATION FACILITY INC.

GEOTECHNICAL INVESTIGATION FOR PROPOSED DEVELOPMENT, 14 STATION ROAD, CALEDON, ONTARIO

MARCH 01, 2024



GEOTECHNICAL INVESTIGATION FOR PROPOSED DEVELOPMENT, 14 STATION ROAD, CALEDON, ONTARIO

KING STATION FACILITY INC.

GEOTECHNICAL REPORT

PROJECT NO.: CA0011873.4918
DATE: MARCH 01, 2024

WSP CANADA INC.
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March 01, 2024

King Station Facility Inc.
410-3120 Rutherford Road
Concord, ON
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Attention:

Subject: **Geotechnical Investigation for Proposed Development,**
14 Station Road, Caledon, Ontario
Project No: 211-12932-14

Dear Sir/Madam:

Please find enclosed our geotechnical investigation report for the above-referenced site. We appreciate the opportunity to be of service to you, and trust that this report provides geotechnical engineering information to facilitate the planning and development of this project.

We look forward to providing you with continuing service during the detailed design and construction stage(s).

Please do not hesitate to contact our office should you wish to discuss any aspects of this project.

Yours sincerely,

Nick La Posta, P.Eng.
Team Lead, Ground Engineering West

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REVISION HISTORY

FIRST ISSUE

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Prepared by	Reviewed by	
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Prepared by	Reviewed by	
Kether Huang	Nick La Posta	

SIGNATURES

PREPARED BY

March 1, 2024

Kether Huang, P.Eng.,
Geotechnical Engineer

Date

REVIEWED BY

March 1, 2024

Nick La Posta, P.Eng.,
Team Lead, Ground Engineering West

Date

WSP Canada Inc. prepared this report solely for the use of the intended recipient, King Station Facility Inc., in accordance with the professional services agreement. The intended recipient is solely responsible for the disclosure of any information contained in this report. The content and opinions contained in the present report are based on the observations and/or information available to WSP Canada Inc. at the time of preparation. If a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP Canada Inc. does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report. This limitations statement is considered an integral part of this report.

The Report summarizes WSP's review of available data in accordance with the principal components of the stated regulations, standards and guidelines and the scope, terms and conditions of the contract or proposal to which the Assignment was conducted. No other warranties are either expressed or implied with respect to the professional services provided under the terms of the contract or proposal and represented in this Report. Conditions may exist which were not detected given the nature of the inquiry WSP was retained to undertake with respect to the Site. Additional geotechnical investigation and actions may be recommended.

The Report is based on data and information collected at the time of this Assessment, as stated in the Report. Site use or conditions change and the information and conclusions in the Report may no longer apply following the date of this Report. If any conditions become apparent that differ significantly from that presented in this Report, we request that we be notified to reassess the conclusions and recommendations provided herein. WSP disclaims any obligation to update this Report for conditions that may be identified after the date of this Report; however, WSP reserves the right to amend or supplement this report based on additional information, documentation or evidence.

In evaluating the Site, WSP has relied in good faith on information provided by others, as noted in the Report. WSP has assumed that the information provided is correct and WSP assumes no responsibility for the accuracy, completeness or workmanship of any such information.

The Report is intended to be used in its entirety. No excerpts may be taken to be representative of the findings in the assessment.

The conclusions are based on the Site conditions observed by WSP at the time the work was performed and may include information obtained at specific testing and/or sampling locations. It is recognized that overall conditions can only be extrapolated to an undefined limited area around these testing and sampling locations. The conditions that WSP interprets to exist between testing and sampling points may differ from those that actually exist. The accuracy of any extrapolation and interpretation beyond the sampling locations will depend on natural conditions, the history of Site development and changes through construction and other activities. In addition, analysis has been carried out for the identified chemical and physical parameters only, and it should not be inferred that other chemical species or physical conditions are not present. WSP cannot warrant against undiscovered environmental liabilities or adverse impacts off-Site.

The conclusions presented in this Report are based on Work undertaken by trained professional and technical staff and the reasonable and professional interpretation of the information considered. Conclusions presented in this report should not be construed as legal advice. WSP makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in the Report, including, but not limited to, ownership of any property, or the application of any law to the findings of the Assessment.

The original of this digital file will be conserved by WSP Canada Inc. for a period of not less than 10 years. As the digital file transmitted to the intended recipient is no longer under the control of WSP Canada Inc., its integrity cannot be assured. As such, WSP Canada Inc. does not guarantee any modifications made to this digital file subsequent to its transmission to the intended recipient.

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1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by King Station Facility Inc. (the Client) to provide a geotechnical investigation for the proposed development located at 14 Station Road, Caledon, Ontario. It's WSP's understanding that the proposed development will consist of a new at-grade asphalt parking lot to provide additional parking spaces for residents and visitors of the Sorrento Retirement Residence.

The purpose of the geotechnical investigation was to obtain subsurface soil and groundwater information in the area that was within or close to the proposed parking lot footprint by means of four (4) boreholes to supplement the existing data. Based on our interpretation of the borehole data, this report presents the findings of the investigations and provides geotechnical engineering recommendations for the planning and design of the proposed development.

This report is provided on the basis that the design will be in accordance with the applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this office can be relied upon.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for the Client and Client's designers only. Third party use of this report without WSP consent is prohibited.

2 FIELD AND LABORATORY WORK

The field work for this investigation was carried out by WSP on December 4 and 5, 2023, during which time four (4) boreholes (BH23-1 to BH23-4) were advanced to depths ranging approximately from 6.7 m to 9.6 m below ground surface (mbgs), as shown on Borehole Location Plan, Figure 1. The boreholes were advanced using a track mounted drilling machine provided by a drilling sub-contractor under the direction and supervision of WSP technical personnel. Soil samples were retrieved at regular intervals from the boreholes with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method (ASTM D 1586).

This SPT sampling method recovers samples from the soil strata, and the number of blows (SPT 'N'-values) required to drive the sampler 0.3 m depth into the undisturbed soil gives an indication of the compactness condition or consistency of the sampled soil material. It should be noted that the split spoon samplers used limit the particle size of the retrieved samples to less than 50 mm. As such any particles greater than that are not retrieved or represented within the laboratory particle size distributions analyses.

Following completion of drilling the soil samples were transported to WSP's laboratory where they were subject to further visual examination. Laboratory testing was completed on select soil samples including the following:

- Water content testing on all soil samples;
- Grain size analysis of three (3) soil samples; and
- Atterberg limits testing of two (2) soil samples.

Water level observations were made during drilling in the open boreholes and upon completion of drilling operation. A 50-mm diameter monitoring well was installed in each of Boreholes BH23-1, BH23-3 and BH23-4 to permit further monitoring of the groundwater levels.

The ground surface elevations at the borehole locations were derived from the topographic drawing. It should be noted that the elevations at the as-drilled borehole locations should be considered to be approximate. Contractors performing any work referenced to the borehole elevations should confirm the borehole elevations for their work.

3 SITE AND SUBSURFACE CONDITIONS

The subject site is located at 14 Station Road, Caledon, Ontario. At the time of the investigation, the site is currently vacant and generally well vegetated with shrubs.

The locations of the boreholes advanced on site are shown in the borehole location plan, Figure 1. Notes on soil samples description are presented in Appendix A. The subsurface conditions in the boreholes are presented on the individual borehole log (Refer to Appendix A). The subsurface conditions in the boreholes are summarized in the following sections.

3.1 SOIL CONDITIONS

In summary, underlying the existing surficial topsoil, fill materials were encountered in all boreholes and extended to the depth of about 0.7 mbgs. The native soil encountered at the site mainly consisted of glacial tills with both sandy and clayey texture, as well as locally cohesive soils.

3.1.1 TOPSOIL

Surficial topsoil was encountered in all boreholes, with thicknesses ranging approximately from 100 mm to 135 mm.

It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

3.1.2 FILL MATERIAL

Fill materials, consisting of silty clay, were encountered in all boreholes except and extended to the depth of about 0.7 mbgs. SPT 'N' values measured within the cohesive fill ranged from 3 to 11 blows per 0.3 m penetration, indicating a soft to stiff consistency. Water contents measured in samples of fill materials ranged from 20% to 27%.

3.1.3 SILTY CLAY TILL TO CLAYEY SILT TILL

Silty clay till to clayey silt till deposits were encountered in all boreholes except BH23-3, which extended to the depth of about 7.1 mbgs in BH23-4 and to the termination depth of about 6.7 mbgs in boreholes BH23-1 and BH23-2. SPT 'N' values measured within the silty clay till to clayey silt till ranged from 17 blows to 42 blows per 0.3 m penetration, indicating a very stiff to hard consistency. Water contents measured in samples of silty clay till to clayey silt till ranged from 13% to 18%.

One (1) sample was selected for grain size analysis and one (1) sample was selected for Atterberg limits testing. The results of the laboratory testing are presented in Appendix B as well as summarized in Table 3.1 and Table 3.2. The soil is classified as low plasticity (CL) according to the Unified Soil Classification System.

Table 3.1 Grain Size Distribution for Silty Clay Till To Clayey Silt Till

BOREHOLE NO.	SAMPLE NO.	% GRAVEL	% SAND	% SILT AND CLAY
BH23-4	SS4	1	16	83

Table 3.2 Atterberg Limits for Silty Clay Till To Clayey Silt Till

BOREHOLE NO.	SAMPLE NO.	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)
BH23-1	SS6	23	15	8

3.1.4 SANDY SILT TILL

Sandy silt till was encountered in boreholes BH23-2 and BH23-3, which extended to the depths ranging approximately from 4.0 mbgs to 7.1 mbgs. SPT 'N' values measured within the sandy silt till deposits ranged from 25 blows to 38 blows per 0.3 m penetration, indicating a compact to dense state of compactness. Water contents measured in samples of the sandy silt till ranged from 11% to 16%.

One (1) sample was selected for grain size analyses. The results of the laboratory testing are presented in Appendix B as well as summarized in Table 3.3. The soil is classified as non plasticity according to the Unified Soil Classification System.

Table 3.3 Grain Size Distribution for Sandy Silt Till

BOREHOLE NO.	SAMPLE NO.	% GRAVEL	% SAND	% SILT AND CLAY
BH23-2	SS5	2	29	69

3.1.5 SILTY CLAY TO CLAYEY SILT

Silty clay to clayey silt deposits were encountered in all boreholes except BH23-2, which extended to the depth of about 4.0 mbgs in BH23-1 and to the termination depth of about 9.6 mbgs in boreholes BH23-3 and BH23-4. SPT 'N' values measured within the silty clay to clayey silt ranged from 9 blows to 27 blows per 0.3 m penetration, indicating a stiff to very stiff consistency. Water contents measured in samples of silty clay to clayey silt ranged from 13% to 18%.

One (1) sample was selected for both grain size analysis and Atterberg limits testing. The results of the laboratory testing are presented in Appendix B as well as summarized in Table 3.1 and Table 3.2. The soil is classified as low plasticity (CL) according to the Unified Soil Classification System.

Table 3.4 Grain Size Distribution for Silty Clay To Clayey Silt

BOREHOLE NO.	SAMPLE NO.	% GRAVEL	% SAND	% SILT AND CLAY
BH23-4	SS8	0	1	99

Table 3.5 Atterberg Limits for Silty Clay To Clayey Silt

BOREHOLE NO.	SAMPLE NO.	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)
BH23-4	SS8	27	16	11

3.2 GROUNDWATER CONDITIONS

All boreholes were dry upon completion of drilling. Boreholes BH23-1, BH23-3 and BH23-4 were instrumented with a 50-mm diameter monitoring well to permit further monitoring the groundwater levels. The details of the monitoring well installations are presented on the borehole logs in Appendix A. Groundwater levels observed in the monitoring wells are presented in Table 3.6.

Table 3.6 Groundwater Levels Measured in Monitoring Wells

BOREHOLE NO.	MEASURED DATE	DEPTH OF GROUNDWATER TABLE (MBGS)	ELEVATION OF GROUNDWATER TABLE (MASL)	NOTES
BH23-1	December 16, 2023	Dry	-	50mm dia. monitoring well
BH23-3	December 16, 2023	Dry	-	
BH23-4	December 16, 2023	Dry	-	

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events.

4 RECOMMENDATIONS

4.1 GENERAL

In this section of the report, the soil and groundwater conditions are interpreted as relevant to the design of the proposed development as described herein. Comments relating to construction are intended solely for the guidance of the design engineer to establish constructability. Construction methods described in this report must not be considered as being specifications or direct recommendations to the contractors, or as being the only suitable methods. Prospective contractors should evaluate all of the factual information, obtain additional subsurface information as they might deem necessary and should select their construction methods, sequencing and equipment based on their own experience in similar ground conditions. The readers of this report are also reminded that the conditions are known only at the borehole locations and conditions may vary significantly in-between and beyond the boreholes. WSP will not assume any responsibility for construction-related decisions made by contractors on the basis of this report.

4.2 SITE PREPARATION

4.2.1 SITE PREPARATION AND GRADING

Considering the proposed development with respect to subsurface soil and groundwater conditions at the Site, it is anticipated that minor grade adjustments may be required by using cut / fill methods or imported engineered fill materials.

Guidelines for Engineered Fill placement are attached in Appendix C and are summarized below.

Proper site grading and site preparation are critical for the success of any planned development. For the effective and efficient design and construction of the proposed development, the following items highlight the fundamental geotechnical requirements to be followed during grading and site preparation, and detail recommendations are provided in the following sections:

a) All pertinent trees, shrubs and vegetation must be removed from the area of the proposed development. The existing ground surface cover (e.g., asphalt pavement, topsoil, etc.) should be stripped and removed from the area of the proposed development. It is assumed that all construction waste / debris, including that potentially from the previous construction of the existing nearby building which may be present on site, must be removed from the area of proposed development and site grading.

b) Subsequent to stripping of ground surface cover, any exposed soils which contain excessive organics and other soft/loose/wet compressible and deleterious materials including all existing fill materials and incompetent native soil deposits, must be sub-excavated and removed, throughout the proposed development area. The base of the excavation should be proof rolled with heavy compactors (minimum 10,000 kg), and the entire area must be inspected and approved by a geotechnical personnel from WSP.

c) After approval of the exposed subgrade, the grade can then be brought up to the design subgrade level with compacted engineered fill, if necessary. Materials used for engineered fill may consist of approved on-site inorganic soils and/or select imported soils. Some reconditioning (i.e., drying) prior to reuse may require, if the materials are found to be too wet. Any imported soils to the Site for engineered fill must meet the requirements of current environmental regulations as determined by WSP.

d) During the excavation, groundwater should be kept at least 1 m below the base of excavation.

e) To reduce the post-construction settlements, all new fills must be placed in thin lifts, not exceeding 200 mm thick loose lifts, within ±2 % of its optimum moisture content, and thoroughly compacted with suitable heavy compactors to 100% of Standard Proctor Maximum Dry Density (SPMDD), before placing the next lift. Full time inspection must be completed by geotechnical personnel from WSP during all filling activities.

f) Surface water runoff from the neighboring properties should not be permitted to enter and/or pond within the construction area. If this is occurring, consideration should be given to redirecting the surface water runoff from the neighboring properties (temporary and/or permanent) if there would be a down gradient and grade difference between site grades and existing neighboring property grades. This is especially important to the success of the planned construction.

g) The existing on-site soils are susceptible to disturbance when exposed to weather and construction traffic. Construction traffic over exposed subgrade materials should be minimized, and temporary construction hauling routes should be established. If these routes coincide with future paved areas, adequately reinforced haul roads (e.g., increased thickness of granular sub-base, geo-fabrics, etc.) should be constructed to reduce disturbance to the subgrade soils. Alternatively, if the subgrade becomes excessively wet or rutted during construction activities, additional sub-base material may be required. The need for additional subbase material is best determined during construction.

h) In regard to slopes at the site, any existing slope or a slope required to be constructed, should be reviewed if the inclination is steeper than 3 Horizontal to 1 Vertical (3H:1V). It is our understanding that slopes steeper than this inclination are not or will not be present at the site as part of this planned development.

4.2.2 REUSE OF ON-SITE SOILS

Based on the conditions encountered in the boreholes, portions of on-site excavated soils which do not contain organics and deleterious materials can be re-used for backfill as an engineered fill. However, depending upon the weather conditions, the excavated soils may require some reconditioning prior to reuse, i.e., maintain the moisture contents of these materials within ±2% of SPMDD values (i.e., Proctor values) to obtain the required compaction.

Unsuitable material such as organic rich pockets, frozen soils, cobbles, boulders, remnants of demolished structures, etc., should be wasted. Ideally, dissimilar materials should be stockpiled separately during excavation.

4.3 FOUNDATIONS

Based on the engineering plan prepared by BluePlan ENGINEERING, dated on January 30, 2024, the proposed development will consist of a new at-grade asphalt parking lot. The proposed development may also include underground structures such as stormwater chambers.

Based on the borehole information, the proposed structures can be supported by conventional spread/strip footings founded in the competent, undisturbed native soil encountered at the proposed elevation of about 239 mASL, by using the following geotechnical bearing resistances subject to inspection and adequate groundwater control during construction.

- Bearing Resistance at Serviceability Limit State (SLS) (25 mm of settlement) = 150 kPa
- Factored Geotechnical Resistance at Ultimate Limit State (ULS) = 225 kPa

Foundations designed to the specified bearing resistances at Serviceability Limit States (SLS) are expected to settle less than 25 mm total and 19 mm differential.

All footings exposed to seasonal freezing conditions must have at least 1.2 m of soil cover for frost protection or be otherwise protected by artificial insulation.

Where it is necessary to place footings at different levels, the footing at the higher level must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

All foundation excavations at the site should be carried out in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects. The founding materials are susceptible to disturbance by construction activity especially during wet weather and care should be taken to preserve the integrity of the materials as bearing strata. Prior to pouring concrete for the footings, the foundation excavations must be inspected by WSP to confirm that the footings are founded on undisturbed and competent bearing stratum that has been cleaned of ponded water and all disturbed, softened, loosened, organic and other deleterious material.

It should be noted that the recommended bearing capacities have been calculated by WSP from the borehole information for the design stage only. The investigation and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by WSP to validate the information for use during the construction stage.

4.4 EXCAVATIONS AND GROUNDWATER CONTROL

Excavations at the site will generally extend through engineered fill materials, cohesive soils, glacial till deposits, and potentially existing fill soils.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill materials, stiff to very stiff or compact to dense native soils can be classified as Type 3 Soil above the groundwater table and as Type 4 Soil below the groundwater table. The hard glacial till deposits can be classified as Type 2 Soil above the groundwater table and Type 4 Soil below the groundwater table. For excavations through multiple soil types, the side slope geometry is governed by the soil with the highest number Type designation.

All monitoring wells were observed to be dry during the site visit on December 16, 2023. As relatively shallow excavations are anticipated for the site development, major problems with groundwater are not anticipated for the proposed excavations provided they are completed above the depth noted above. We note that groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events.

If excavation is required below the groundwater table, active dewatering (including the use of well point/eductors or other dewatering means) may be required. The groundwater level should be lowered to at least 1 m below the excavation base to maintain the stability of the base and side slopes of the excavations in these areas. Surface water should be directed away from the open excavations.

It should be recognized that groundwater and saturated soil levels may be influenced by the effects of precipitation as well as seasonal fluctuations. Discontinuous perched lenses of groundwater may exist within proposed excavation depths, which may be a source of intermittent groundwater seepage, requiring appropriate management. Groundwater control measures that extract more than 50,000 L/day of water are subject to Environmental Activity Sector Registry (EASR) or Permit to Take Water (PTTW), as regulated by The Ministry of the Environment, Conservation and Parks (MECP). It is understood that a hydrogeological study has been carried out.

4.5 SITE SERVICING

Based on the engineering plan prepared by BluePlan ENGINEERING, dated on January 30, 2024, it is understood that the storm service invert depth is estimated to be at Elev. 239.67 mASL to 240.23 mASL. The native soils are considered to be suitable for supporting the pipes, provided the integrity of the base of the trench can be maintained during construction. Once the actual service invert depths are finalized, the following comments and recommendations should be reviewed and revised as necessary.

4.5.1 TRENCHING EXCAVATION

Based on the geotechnical findings, excavations for the site servicing will be excavated through the existing fill materials, native cohesive soils and glacial till deposits.

For trench excavation and groundwater control, please refer to Section 4.4 Excavation and Groundwater Control.

Where the excavation side slopes must be steepened to limit the extent of the excavation, some form of temporary trench support, such as a trench box system, will be required. Where cohesionless sandy/silty soils are present in close proximity to the proposed excavation above the invert elevations, some loss of ground should be expected for the sections of nearly vertical excavation where a trench box is used. It is anticipated that the unsupported cohesionless soils on the trench sides will relax, filling the void between the trench walls and trench box. This may lead to loss of ground. In order to minimize this effect, the gap between the trench walls and trench box should be minimized during the excavation and trench box installation. It must be emphasized that a trench liner box provides protection for construction personnel but does not provide any lateral support for the adjacent excavation walls, underground services

or existing structures. In addition, steepened excavations should be left open for as short a duration as possible and completely backfilled at the end of each working day.

The excavated material should be placed well back from the edge of the excavation and stockpiling of materials adjacent to the excavation should be prohibited, to minimize surcharge loading near the excavation crest.

4.5.2 BEDDING

The bedding for storm sewer should be compatible with the type and class of pipe, the surrounding subsoil and anticipated loading conditions and should be designed in accordance with the standards of the local municipality. Where granular bedding is deemed to be acceptable, it should consist of at least 150 mm of OPSS Granular A or 19 mm crusher run limestone material. The thickness of the bedding may, however, have to be increased depending on the pipe diameter or in accordance with local standards or if wet or weak subgrade conditions are encountered, especially when the soil at the trench base level consists of wet sandy/silty deposits.

To avoid the loss of soil fines from the subgrade, clear stone bedding material should not be used in any case for pipe bedding unless it is fully wrapped by geotextile.

4.5.3 BACKFILLING OF TRENCHES

The excavated materials at suitable water contents may be reused as trench backfill provided they are free of significant amounts of topsoil, organics or other deleterious material, and are placed and compacted as outlined below. It should be noted that due to the predominantly fine-grained, silty nature of the majority of the site soils, some difficulty would be expected in achieving adequate compaction.

The backfill should be placed in maximum 300 mm loose lifts at or near (±2%) their optimum moisture content and each lift should be compacted to at least 98% SPMDD. Unsuitable materials such as organic soils, boulders, cobbles, frozen soils, etc. should not be used for backfilling.

It should be noted that if the soils for trench backfilling were placed and compacted at water contents higher than their optimum water content, we would expect pumping and rolling conditions which would require mitigative measures in order to construct roads and utilities. This might include significant extra thickness of granular base, base reinforcement using geogrids or importing of higher quality fill.

Normal post-construction settlement of the compacted trench backfill should be anticipated, with the majority of such settlement taking place within about 6 months following the completion of trench backfilling operations. This settlement may be compensated for, where necessary, by placing additional granular material prior to asphalt paving. Alternatively, if the asphalt binder course is placed shortly following the completion of trench backfilling operations in these areas, any settlement that may be reflected by subsidence of the binder asphalt should be compensated for by placing an additional thickness of binder asphalt or by padding.

4.6 EARTH PRESSURES

The lateral earth pressures acting on underground structures may be calculated from the following expression:

$$p = K(\gamma h + q)$$

where p = Lateral earth pressure in kPa acting at depth h

K = Earth pressure coefficient, see table below

γ = Unit weight of backfill, see table below

h = Depth to point of interest in meters

q = Equivalent value of surcharge on the ground surface in kPa

The above expression assumes that the perimeter drainage system prevents the buildup of any hydrostatic pressure behind the wall.

Coefficients of lateral earth pressure given in the table below may be used for the design of temporary shoring and for other lateral loading considerations.

Table 4.1 Lateral Earth Pressure Coefficients (Unfactored)

SOIL TYPE	FRICTION ANGLE (Φ')	K_a	K_0	K_p	UNIT WEIGHT (kN/m^3)
Fill	28	0.36	0.53	2.77	19
Native Cohesive Soils	30	0.33	0.50	3.00	20
Glacial Tills	32	0.31	0.47	3.25	21

4.7 PAVEMENT

The recommended pavement structures provided in Table 4.2 are based upon an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples. The values may need to be adjusted based on local standards. Consequently, the recommended pavement structures should be considered for preliminary design purposes only. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific data input from the client:

Table 4.2 Recommended Pavement Structure Thickness

PAVEMENT LAYER.	COMPACTION REQUIREMENTS	LIGHT DUTY PARKING (CARS)
ASPHALTIC MATERIALS (OPSS 1150)	92 % OR HIGHER MAXIMUM RELATIVE DENSITY (MRD)	40 mm HL 3 Surface Course 80 mm HL 8 Binder Course
OPSS GRANULAR A BASE (OR 19 MM CRUSHER RUN LIMESTONE)	100% SPMDD*	150 mm
OPSS GRANULAR B (OR 50 MM CRUSHER RUN LIMESTONE)	100% SPMDD	300 mm

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening. This is particularly important in heavy-duty pavement areas.

Additional comments on the construction of parking areas and access roadways are as follows:

1. As part of the subgrade preparation, proposed parking areas and access roadways should be stripped of existing pavement structure and other obvious objectionable material. Fill required to raise the grades to design elevations should conform to backfill requirements outlined in previous sections of this report. The subgrade should be properly shaped, crowned then proof-rolled in the full-time presence of a representative of this office. Soft or spongy subgrade areas should be sub-excavated and properly replaced with suitable approved backfill compacted to 98% SPMDD.
2. The locations and extent of sub-drainage required within the paved areas should be reviewed by this office in conjunction with the proposed lot grading. Assuming that satisfactory crossfalls in the order of two percent have been provided, subdrains extending from and between catch basins may be satisfactory. In the event that shallower crossfalls are considered, a more extensive system of sub-drainage may be necessary and should be reviewed by WSP.
3. The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted access lanes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavorable weather.
4. It is recommended that WSP be retained to review the final pavement structure designs and drainage plans prior to construction to ensure that they are consistent with the recommendations of this report.

5 LIMITATIONS OF REPORT

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to WSP Canada Inc. at the time of preparation. Unless otherwise agreed in writing by WSP Canada Inc., it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

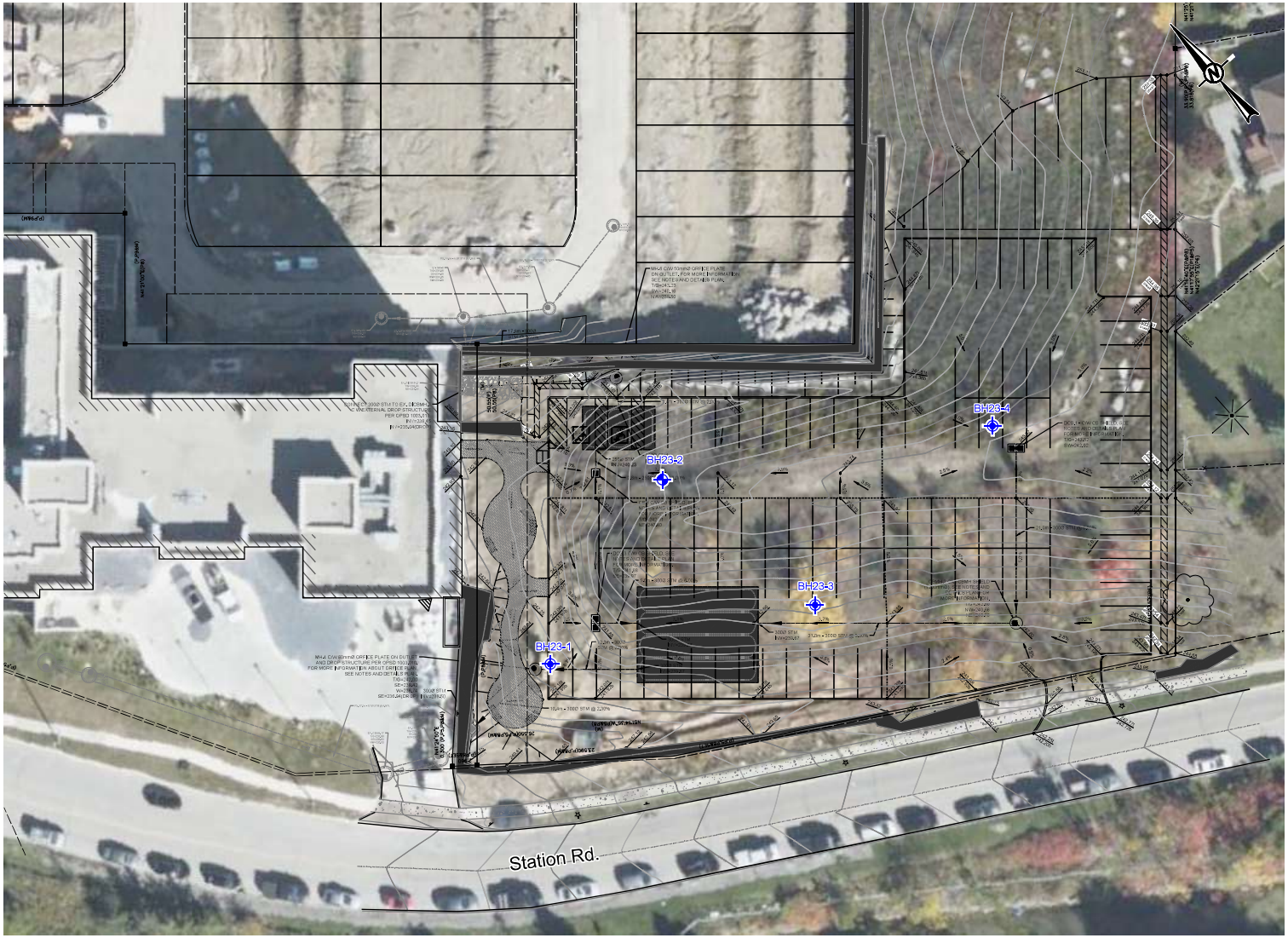
The conclusions and recommendations given in this report are based on the information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

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

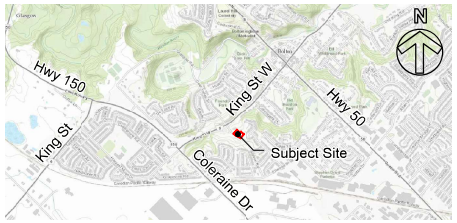
FIGURES



LEGEND

- BOREHOLE LOCATION (WSP 2023)
- MONITORING WELL LOCATION (WSP 2023)

KEY MAP



NOTE(S)

1. PROJECTION: UTM NAD83, ZONE17.

0 10 20
1:500 METRES

CLIENT
KING STATION FACILITY INC.

CONSULTANT
wsp

YYYY-MM-DD	2024-02-05
DESIGNED	KH
PREPARED	WSL
REVIEWED	KH
APPROVED	KH

PROJECT
GEOTECHNICAL INVESTIGATION
PROPOSED PARKING LOT
14 STATION ROAD, TOWN OF CALEDON, ONTARIO

TITLE
BOREHOLE LOCATION PLAN

PROJECT NO.	CONTROL	REV.	FIGURE
CA0011873.4918	0001	A	1

APPENDIX

A NOTES ON SAMPLE DESCRIPTION AND BOREHOLE LOGS

Enclosure 1-A: Notes on Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by WSP also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Enclosure 1-B: Explanation of Terms Used in the Record of Borehole

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
NR	No recovery
RC	Rock core
SC	Soil core
SS	Spoon sample
SH	Shelby tube sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

WH – Samples sinks under "weight of hammer"

Dynamic Cone Penetration Resistance, N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in).

Textural Classification of Soils (ASTM D2487-10)

Classification	Particle Size
Boulders	> 300 mm
Cobbles	75 mm - 300 mm
Gravel	4.75 mm - 75 mm
Sand	0.075 mm - 4.75 mm
Silt	0.002 mm - 0.075 mm
Clay	<0.002 mm(*)

(*) Canadian Foundation Engineering Manual (4th Edition)

Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. sand and gravel)	> 35%

Soil Description

a) Cohesive Soils(*)

Consistency	Undrained Shear Strength (kPa)	SPT "N" Value
Very soft	<12	0-2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

(*) Hierarchy of Shear Strength prediction

1. Lab triaxial test
2. Field vane shear test
3. Lab. vane shear test
4. SPT "N" value
5. Pocket penetrometer

b) Cohesionless Soils

Density Index (Relative Density)	SPT "N" Value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Soil Tests

w	Water content
w_p	Plastic limit
w_l	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement
D_R	Relative density (specific gravity, Gs)
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
U	Unconsolidated Undrained Triaxial Test
V	Field vane (LV-laboratory vane test)
Γ	Unit weight

PROJECT: CA0011873.4918

LOCATION: N 4858589.38; E 600870.06

RECORD OF BOREHOLE: BH23-1

SHEET 1 OF 1

BORING DATE: December 4, 2023

DATUM:

DRILL RIG: CME-55

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION / GRAIN SIZE DISTRIBUTION (%)
		GROUND SURFACE		243.30							GR SA SI CL
0	Power Auger O.D. 250 mm; I.D. 150 mm Hollow Stem Auger	TOPSOIL (~ 135 mm thick)		0.00							
		FILL - (CL) SILTY CLAY, some sand, trace gravel, trace rootlets; brown; cohesive, w~PL, soft		0.13	1	SS	3				
				242.62							
1		(CL) SILTY CLAY, trace sand; brown; cohesive, w<PL, stiff		0.68	2	SS	10				Bentonite
					3	SS	9				
2				241.09							
		(ML) CLAYEY SILT, some sand, trace to some gravel; brown to grey; cohesive, w<PL, very stiff		2.21	4	SS	16				Sand
3		- Becoming grey at a depth of about 3.35 m			5	SS	27				
4				239.26							
		(CL) SILTY CLAY, trace sand, trace gravel; grey (TILL); cohesive, w<PL, very stiff		4.04	6	SS	22				Screen
5											
6					7	SS	17				Bentonite
				236.59							
		END OF BOREHOLE		6.71							
7		NOTE(s):									
		1. Borehole dry and caved to a depth of 5.78 m below ground surface upon completion of drilling.									
8		2. A 50 mm dia. monitoring well was installed in the borehole upon completion of drilling.									
		Water Level Reading:									
		Date — Depth (m bgs.)									
9		Dec. 16, 2023 — Dry									
10											

DEPTH SCALE

1 : 50

LOGGED: SPC

CHECKED: KH

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PROJECT: CA0011873.4918

LOCATION: N 4858597.08; E 600894.78

RECORD OF BOREHOLE: BH23-2

SHEET 1 OF 1

BORING DATE: December 4, 2023

DATUM:

DRILL RIG: CME-55

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION / GRAIN SIZE DISTRIBUTION (%)
		GROUND SURFACE		248.50							GR SA SI CL
0	CME-55 Track Mount Drill; O. D. 250 mm Hollow Stem Auger	TOPSOIL (~ 100 mm thick)		0.00							
		FILL - (CL) SILTY CLAY, some sand, trace gravel, trace rootlets; brown; cohesive, w<PL, stiff		0.10	1	SS	11				
				247.82							
1		(ML) Sandy SILT, trace to some gravel; brown (TILL): non-cohesive, moist, compact to dense		0.68	2	SS	38				
2					3	SS	34				
					4	SS	33				
3					5	SS	29				2 29 (69)
4				244.46							
		(ML) CLAYEY SILT, trace sand, trace gravel; brown (TILL); cohesive, w<PL, very stiff to hard		4.04	6	SS	27				
5											
6					7	SS	42				
				241.79							
7		END OF BOREHOLE		6.71							
		NOTE(s):									
		1. Borehole dry and caved to a depth of 5.78 m below ground surface upon completion of drilling.									
		2. Borehole dry on December 16, 2023.									
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: SPC

CHECKED: KH

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PROJECT: CA0011873.4918

LOCATION: N 4858573.69; E 600898.58

RECORD OF BOREHOLE: BH23-3

SHEET 1 OF 2

BORING DATE: December 5, 2023

DATUM:

DRILL RIG: CME-55

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION / GRAIN SIZE DISTRIBUTION (%)
		GROUND SURFACE		247.30							GR SA SI CL
0	CME-55 Track Mount Drill; O. D. 250 mm Hollow Stem Auger	UNDOCUMENTED OVERBURDEN MATERIAL		0.00							
				242.73							
		(ML) Sandy SILT, trace to some gravel; brown (TILL): non-cohesive, moist, compact to dense		4.57	1	SS	25				
					2	SS	32				
				240.21							
		(CL) SILTY CLAY, trace sand; grey; cohesive, w>PL, stiff		7.09	3	SS	14				
					4	SS	12				
				237.70							
		END OF BOREHOLE		9.60							
		CONTINUED NEXT PAGE									

Bentonite

Sand

Screen

Bentonite

DEPTH SCALE

1 : 50

LOGGED: SPC

CHECKED: KH

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PROJECT: CA0011873.4918

LOCATION: N 4858573.69; E 600898.58

RECORD OF BOREHOLE: BH23-3

SHEET 2 OF 2

BORING DATE: December 5, 2023

DATUM:

DRILL RIG: CME-55

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION / GRAIN SIZE DISTRIBUTION (%)
		--- CONTINUED FROM PREVIOUS PAGE ---									GR SA SI CL
10		NOTE(s): 1. Borehole dry and caved to a depth of 8.23 m below ground surface upon completion of drilling. 2. A 50 mm dia. monitoring well was installed in the borehole upon completion of drilling. Water Level Reading: Date Depth (m bgs.) Dec. 16, 2023 Dry									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: SPC

CHECKED: KH

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PROJECT: CA0011873.4918

LOCATION: N 4858575.72; E 600928.77

RECORD OF BOREHOLE: BH23-4

SHEET 1 OF 2

BORING DATE: December 4, 2023

DATUM:

DRILL RIG: CME-55

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q- ●, U- ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION / GRAIN SIZE DISTRIBUTION (%)
		GROUND SURFACE		251.10							GR SA SI CL
0		TOPSOIL (~ 115 mm thick)		0.00							
		FILL - (CL) SILTY CLAY, some sand, some organics; brown; cohesive, w<PL, firm		0.10	1	SS	7				
				250.42							
		(ML) CLAYEY SILT, some sand, trace to some gravel; brown, oxidation stains (TILL); cohesive, w<PL, very stiff to hard		0.68							
1					2	SS	17				
					3	SS	21				
2					4	SS	23				1 16 (83) Bentonite
3					5	SS	21				
4											
					6	SS	27				
5											Sand
6					7	SS	40				
7				244.01							
		(CL) SILTY CLAY, trace sand; grey; cohesive, w>PL, stiff		7.09							Screen
8					8	SS	10				0 1 (99)
9					9	SS	11				Bentonite
				241.50							
		END OF BOREHOLE		9,60							
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

LOGGED: SPC

CHECKED: KH

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PROJECT: CA0011873.4918

LOCATION: N 4858575.72; E 600928.77

RECORD OF BOREHOLE: BH23-4

SHEET 2 OF 2

BORING DATE: December 4, 2023

DATUM:

DRILL RIG: CME-55

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION / GRAIN SIZE DISTRIBUTION (%)
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									GR SA SI CL
		NOTE(s): 1. Borehole open and dry upon completion of drilling. 2. A 50 mm dia. monitoring well was installed in the borehole upon completion of drilling. Water Level Reading: Date Depth (m bgs.) Dec. 16, 2023 Dry									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: SPC

CHECKED: KH

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APPENDIX

B RESULTS OF GRAIN SIZE ANALYSES AND ATTERBERG LIMITS TESTING

WSP Canada Inc.
100 Scotia Court
Whitby, Ontario L1N8Y6
905-723-2727

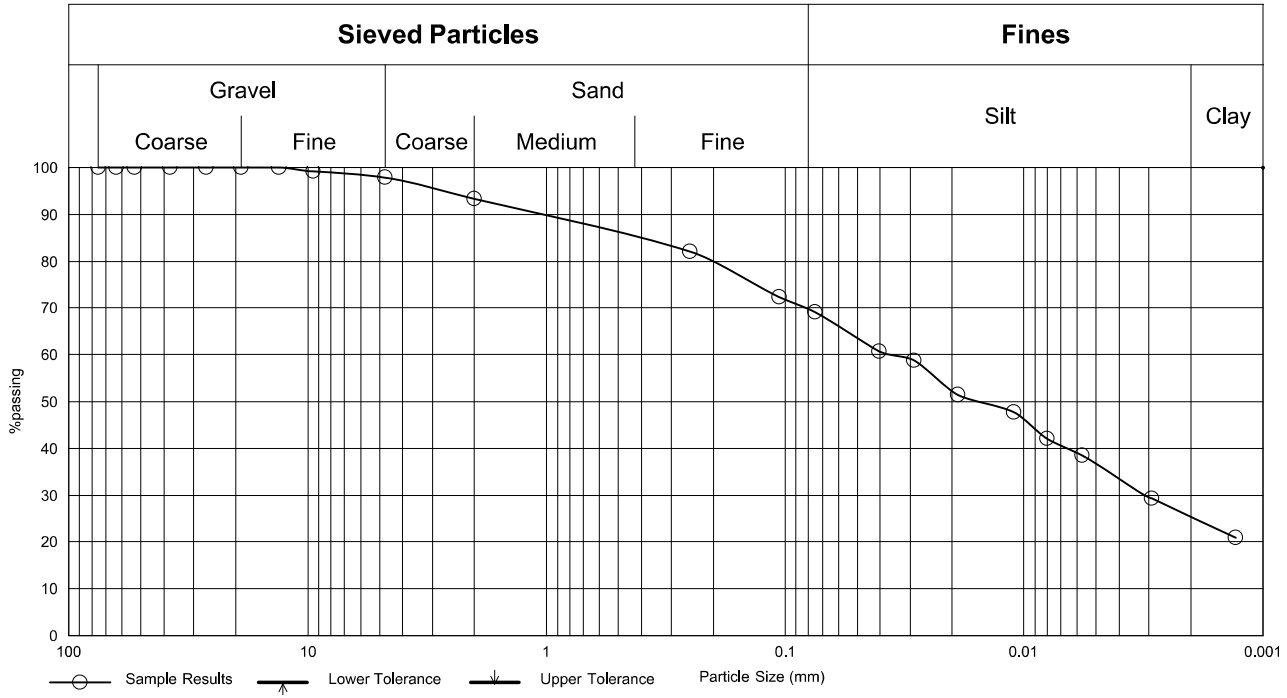
02/20/2024

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	016611	Project Number:	CA0011873.4918-1000
Client:	King Station Facility Inc.	Project Location:	
Project Name:	14 Station Road	Sample Location:	23-2
Source:		Borehole Type:	SS
Report Number:	WHB00410-24	Borehole Depth (m):	-
Sample Number:	5	WSP Lab Number:	WHB24-00583
Soil Description:	(ML) Sandy SILT	Specimen Depth (m):	3.05 - 3.66
Soil Classification:		Date of Test:	02/12/2024
Specification:		Tested By:	Brown, Leah

Grain Size Distribution	Gravel	Sand	Silt / Clay
	2.1	28.9	69.0



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0405	60.6
		0.0289	58.8
		0.0189	51.4
		0.0110	47.7
		0.0080	42.1
		0.0057	38.5
75.0		0.0029	29.2
63.0		0.0013	20.9
53.0		0.0000	0.0
37.5			
26.5			
19.0			
13.2	100.0		
9.5	99.2		
4.75	97.9	0.005mm	36.7
2.00	93.4	0.002mm	24.9
0.850	89.7	D60	0.037
0.425	86.5	D30	0.003
0.250	82.1	D10	NA
0.106	72.3	Cu	NA
0.075	69.0	Cc	NA

Notes:

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By: John Taylor Title: Laboratory Team Lead

Signature:

CERTIFIED BY CCIL

WSP Canada Inc.
100 Scotia Court
Whitby, Ontario L1N8Y6
905-723-2727

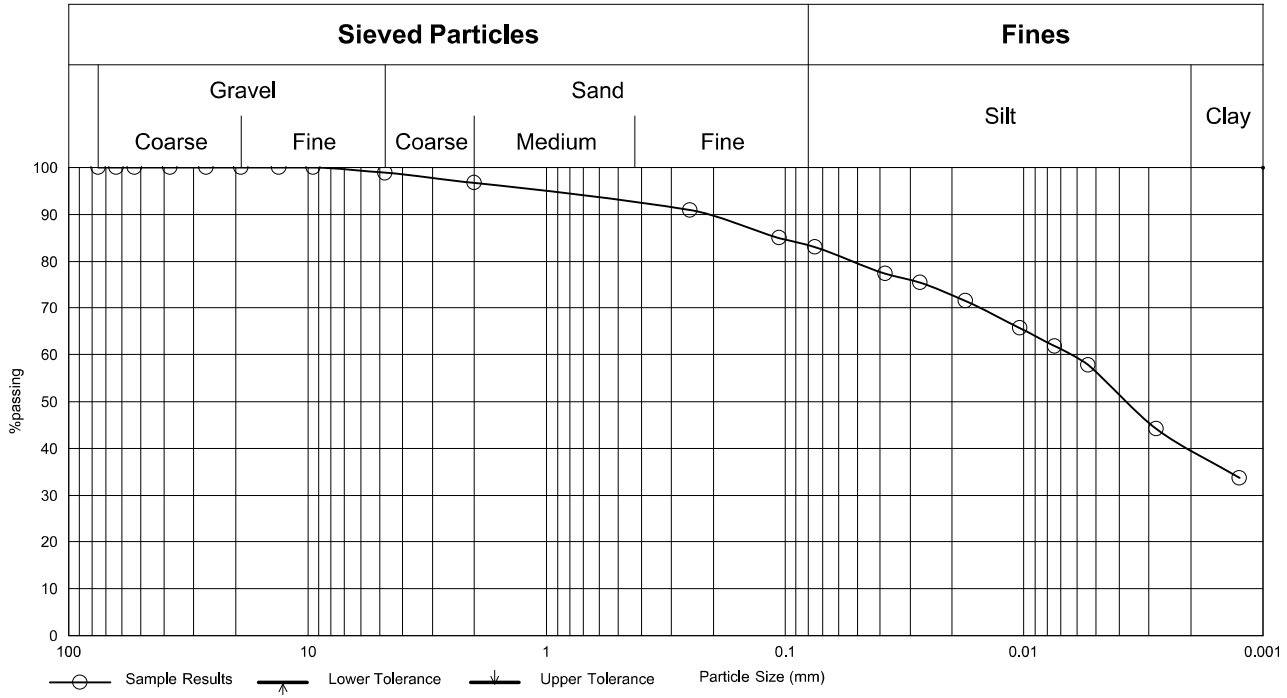
02/20/2024

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	016615	Project Number:	CA0011873.4918-1000
Client:	King Station Facility Inc.	Project Location:	
Project Name:	14 Station Road	Sample Location:	23-4
Source:		Borehole Type:	SS
Report Number:	WHB00412-24	Borehole Depth (m):	-
Sample Number:	4	WSP Lab Number:	WHB24-00598
Soil Description:	(ML) Sandy SILT	Specimen Depth (m):	2.29 - 2.9
Soil Classification:		Date of Test:	02/12/2024
Specification:		Tested By:	Brown, Leah

Grain Size Distribution	Gravel	Sand	Silt / Clay
	1.1	15.9	83.0



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0382	77.4
		0.0272	75.4
		0.0176	71.6
		0.0104	65.7
		0.0075	61.7
		0.0054	57.8
75.0		0.0028	44.2
63.0		0.0013	33.7
53.0		0.0000	0.0
37.5			
26.5			
19.0			
13.2			
9.5	100.0		
4.75	98.9	0.005mm	56.2
2.00	96.7	0.002mm	39.1
0.850	95.0	D60	0.006
0.425	93.3	D30	NA
0.250	91.0	D10	NA
0.106	84.9	Cu	NA
0.075	83.0	Cc	NA

Notes:

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By:	John Taylor	Title:	Laboratory Team Lead
Signature:			

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WSP Canada Inc.
100 Scotia Court
Whitby, Ontario L1N8Y6
905-723-2727

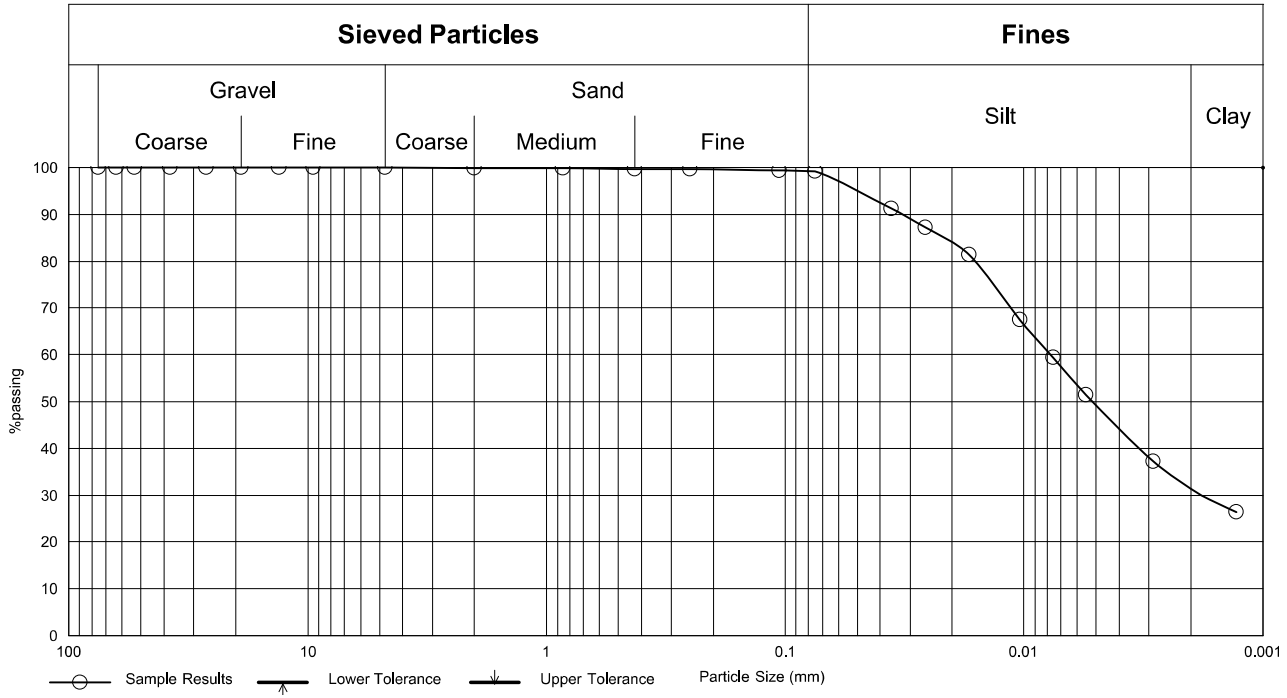
02/20/2024

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	016615	Project Number:	CA0011873.4918-1000
Client:	King Station Facility Inc.	Project Location:	
Project Name:	14 Station Road	Sample Location:	23-4
Source:		Borehole Type:	SS
Report Number:	WHB00412-24	Borehole Depth (m):	-
Sample Number:	8	WSP Lab Number:	WHB24-00602
Soil Description:	(MH) CLAYEY SILT	Specimen Depth (m):	7.62 - 8.08
Soil Classification:		Date of Test:	02/12/2024
Specification:		Tested By:	Brown, Leah

Grain Size Distribution	Gravel	Sand	Silt / Clay
		0.9	99.1



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0361	91.2
		0.0260	87.3
		0.0169	81.4
		0.0104	67.4
		0.0076	59.4
		0.0055	51.4
75.0		0.0029	37.2
63.0		0.0013	26.4
53.0		0.0000	0.0
37.5			
26.5			
19.0			
13.2			
9.5			
4.75	100.0	0.005mm	49.2
2.00	99.9	0.002mm	31.4
0.850	99.8	D60	0.008
0.425	99.7	D30	0.002
0.250	99.6	D10	NA
0.106	99.3	Cu	NA
0.075	99.1	Cc	NA

Notes:

Disclaimer:

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Reviewed By: John Taylor Title: Laboratory Team Lead

Signature:

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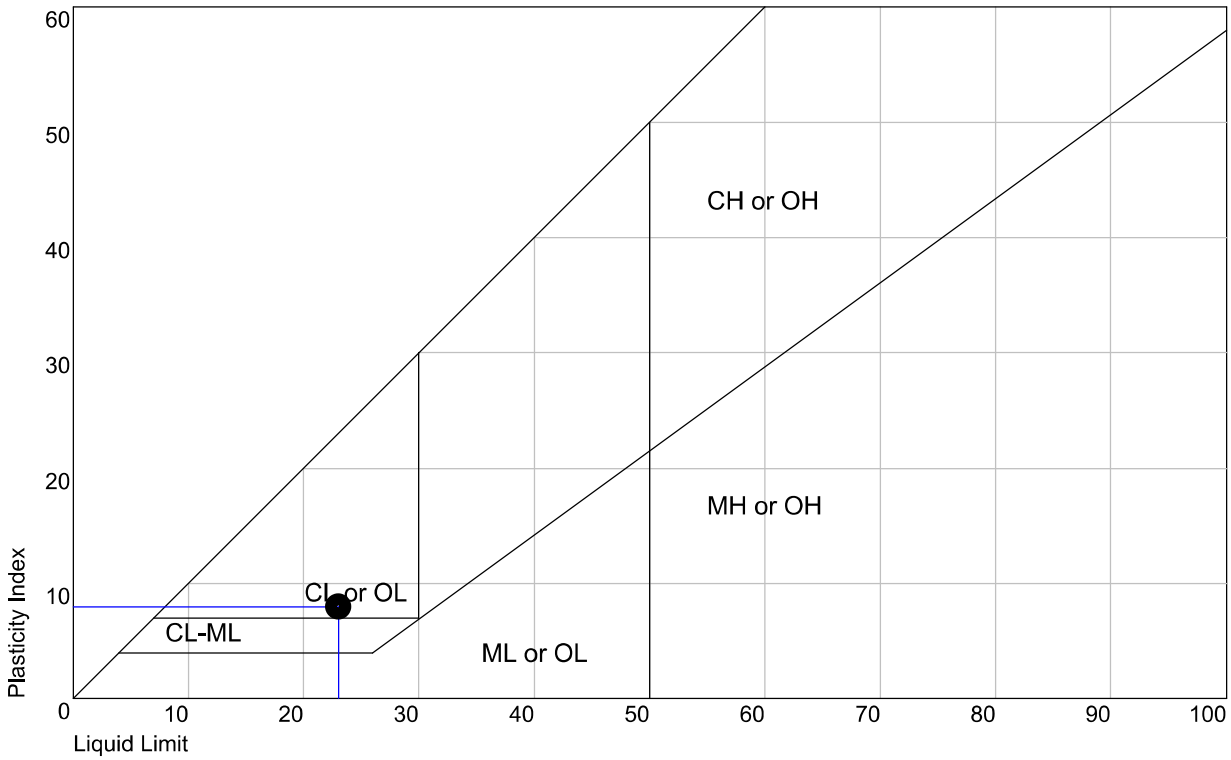
905-723-2727

02/20/2024

Liquid Limit, Plastic Limit and Plasticity Index

Testing Standard: ASTM D4318-17e1

Testing Program #:	016609	Project Number:	CA0011873.4918-1000
Client:	King Station Facility Inc.	Project Location:	
Project Name:	14 Station Road	Sample Location	23-1
Source:		Borehole Type:	SS
Report Number:	WHB00409-24	Borehole Depth (m):	-
Sample Number:	6	WSP Lab Number:	WHB24-00577
Soil Description:	(MH) Clayey SILT	Specimen Depth (m):	4.59 - 5.18
Soil Classification:		Date of Test:	02/14/2024
		Tested By:	Jennie Timms



Sample Location	Sample Number	Top Depth (m)	Base Depth (m)	Percent Passing 425um Sieve	Natural Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index
23-1	6	4.59	5.18		13.4	23	15	8	-0.20

NP = Non-Plastic
ND = Not Determined

Test Preparation
Lab Testing Comments / Deviations:
General Comments:

Reviewed By: John Taylor Title: Laboratory Team Lead

Signature:

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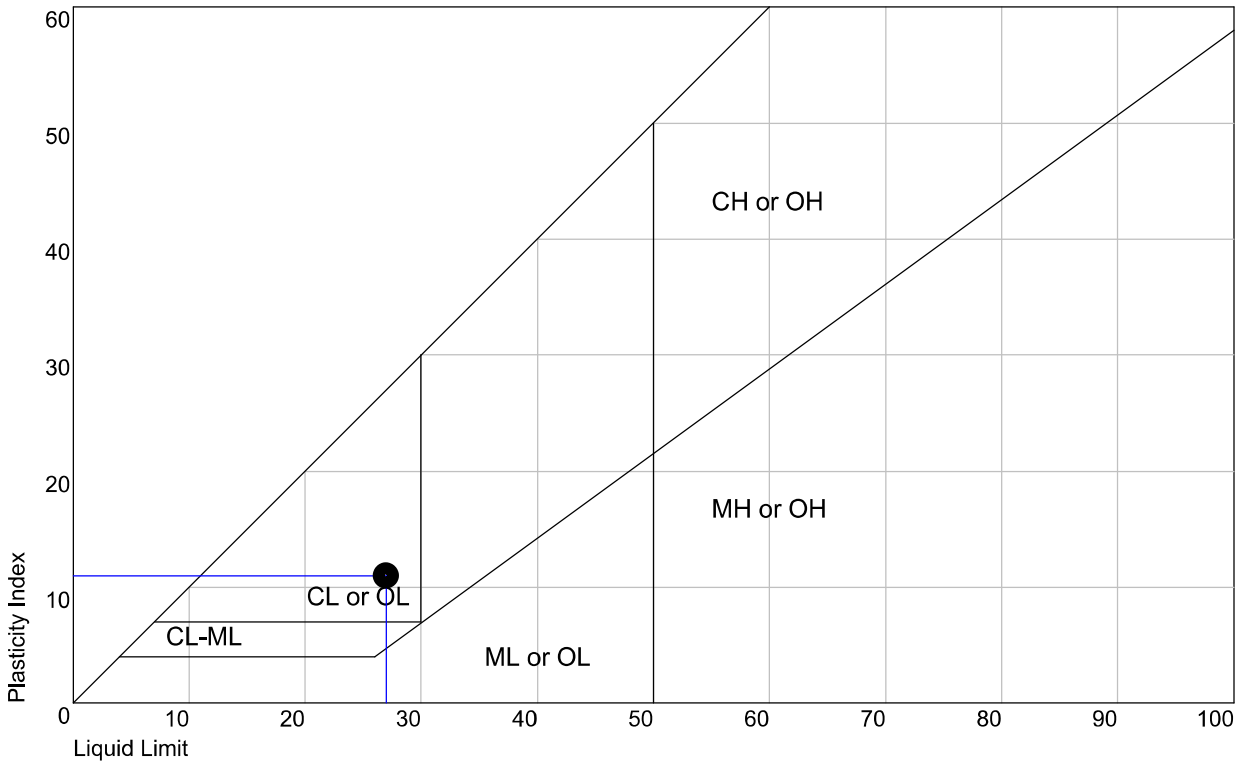
WSP Canada Inc.
100 Scotia Court
Whitby, Ontario L1N8Y6
905-723-2727

02/20/2024

Liquid Limit, Plastic Limit and Plasticity Index

Testing Standard: ASTM D4318-17e1

Testing Program #:	016615	Project Number:	CA0011873.4918-1000
Client:	King Station Facility Inc.	Project Location:	
Project Name:	14 Station Road	Sample Location	23-4
Source:		Borehole Type:	SS
Report Number:	WHB00412-24	Borehole Depth (m):	-
Sample Number:	8	WSP Lab Number:	WHB24-00602
Soil Description:	(MH) CLAYEY SILT	Specimen Depth (m):	7.62 - 8.08
Soil Classification:		Date of Test:	02/14/2024
		Tested By:	Jennie Timms



Sample Location	Sample Number	Top Depth (m)	Base Depth (m)	Percent Passing 425um Sieve	Natural Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index
23-4	8	7.62	8.08		18.2	27	16	11	0.20

NP = Non-Plastic
ND = Not Determined

Test Preparation
Lab Testing Comments / Deviations:
General Comments:

Reviewed By: John Taylor Title: Laboratory Team Lead

Signature:

CERTIFIED BY CCIL

APPENDIX

C GENERAL REQUIREMENTS FOR ENGINEERED FILL

GENERAL REQUIREMENTS FOR ENGINEERED FILL

Compacted imported soil that meets specific engineering requirements and is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of a site or can be brought in from other sites. In general, most Ontario soils are too wet to achieve the 98% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. For engineered fill, we recommend use of OPSS Granular 'B' sand and gravel fill material. Materials for the use of engineered fill must be approved by WSP prior to placement.

Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows; however, the geotechnical report must be reviewed for specific information and requirements.

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.

2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.

3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and WSP. Without this confirmation no responsibility for the performance of the structure can be accepted by WSP. Survey drawing of the "pre- and post" fill location and elevations will also be required.

4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a WSP Canada Inc. engineer prior to placement of fill.

5. The approved engineered fill material must be compacted to 98% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 98% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.

6. Full-time geotechnical inspection by WSP Canada Inc. during placement of engineered fill is required. Work cannot commence or continue without the presence of the WSP Canada Inc. representative.

7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

8. A bearing capacity of 150 kPa at SLS (225 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.

9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.

10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from WSP Canada Inc. prior to footing concrete placements. All excavations must be backfilled and compacted under full time supervision by WSP Canada Inc. to the same degree as the engineered fill pad. Surface water cannot be allowed to pond in excavations or to be trapped in pre-approved backfill material. Clear stone backfill can only be used with the approval of WSP.

11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and/or protected from excessive moisture take up.

12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.

13. The geometry of the engineered fill as illustrated in these General Requirements is general in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be greater.

14. These guidelines are to be read in conjunction with WSP Canada Inc. report attached.