REPORT ON
GEOTECHNICAL INVESTIGATION
50 HIGH STREET EAST
MISSISSAUGA, ONTARIO

6857-25-GB
REPORT DATE: JULY 28, 2025
REVISION NO.: 01

PREPARED FOR
1001107627 ONTARIO INC.

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Toronto Inspection Ltd.

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1.0 INTRODUCTION

Toronto Inspection Ltd. carried out a geotechnical investigation, authorized by 1001107627 Ontario Inc., for the property located at 50 High Street East, Mississauga, Ontario (hereinafter described as “the Site”), on April 15, 2025. The investigation consisted of drilling four sampled boreholes (25BH-1 to 25BH-4), extending to depths of 3.8m to 5.2m from grade. A Geotechnical Investigation Report of our findings was issued on June 4, 2025, Project No.: 6857-25-GB.

The report is being revised based on the architectural drawings received from the client. A review of the architectural drawings, prepared by Chamberlain Architect Services Limited, print dated July 10, 2025, indicated that the proposed re-development at the Site will consist of a 11 storey residential building with a partial basement.

The purpose of this investigation was to determine the subsoil and groundwater conditions affecting the design and construction of a 11 storey residential building with a partial basement. In particular, geotechnical data was to be provided for:

- General founding conditions
- Foundation design bearing pressures
- Construction recommendations
- Excavation recommendations

This report is provided on the basis of the above terms of reference and on the assumption that the design of the addition to the existing building will be in accordance with the applicable building codes and standards. If there are any changes in the design features relevant to the geotechnical analysis, our office should be consulted to review the design and to confirm the recommendations and comments provided in the report.

This revised report supersedes the previous reports and / or any written or verbal recommendations provided for the client.

2.0 SITE CONDITION

The Site, approximately 1020 m^2 in area and retangle in shape, is located on the north side of High Street East, approximately 250m west of Hurontario Street, in Mississauga, Ontario.

At the time of the geotechnical investigation, the development at the Site consisted of a 2 storey residential building with a finished semi-basement, located in the middle portion of the Site. Asphalt paved driveway and parking area were located to the east and north of the building, with landscaped area to the west and south of the building.

The development of the adjacent properties consisted of mid-rise residential buildings with their underground parking.

The site gradient was fairly flat, at or slightly above the street level.

3.0 INVESTIGATION PROCEDURE

The field work for the investigation was carried out on April 15, 2025 and consisted of drilling four sampled boreholes (25BH-1 to 25BH-4), extending to depths of 3.8m to 5.2m from grade, where auger refusal encountered. The borehole locations are shown in Drawing No. 1.

The boreholes were advanced using a track mounted drill rig, equipped with continuous flight solid stem augers, supplied by a specialist drilling contractor. Soil samples were retrieved at 0.8m intervals to the termination depths, with a split spoon sampler in conjunction with Standard Penetration Tests using a driving energy of 475 joules (350 ft-lbs). The soil samples were identified and logged in the field and were carefully bagged for later visual identification and the determination of moisture content.

Groundwater observations were made in the open boreholes during and upon the completion of drilling. Boreholes 25BH-1 and 25BH-3 were completed as monitoring wells for the determination of groundwater conditions. The symbol (MW), besides the borehole identification, indicates a monitoring well. The groundwater records are presented in the borehole logs.

The borehole locations were established in the field by our site personnel. The ground elevations at the borehole locations were determined using the “TOP OF CB”, located at the north side of High Street East, to the south of the entrance driveway, as a temporary bench mark (TBM).

The temporary elevation of 100.00m for the TBM does not represent a geodetic elevation.

4.0 SUMMARISED SUBSURFACE CONDITIONS

Reference is made to the appended Log of Borehole sheets, Drawing Nos. 2 to 5, for details of the field work, including soil classification, inferred stratigraphy, and groundwater records.

The boreholes revealed that the subsoil, below the topsoil and asphalt pavement, consisted of a layer of fill, overlying a native sandy silt till deposit. Probable shale was encountered at the termination depths of the boreholes. However, the presence and the quality of the bedrock was not determined, as this was not in ***TIL's*** scope of work.

Brief descriptions of the subsoils, encountered at the borehole locations, were as follows:

4.1 Surface Course

Topsoil, approximately 75mm to 100mm in thickness, was contacted at the ground surface at Boreholes 25BH-1 and 25BH-2 locations.

Asphalt pavement, approximately 50mm asphalt over granular bases, was contacted at the ground surface at Boreholes 25BH-3 and 25BH-4 locations, extending to depths of 0.4m from grade.

4.2 Fill

Underlying the topsoil and asphalt pavement, a layer of fill was contacted at all borehole locations. The fill consisted of a mixture of sandy silt, some silty sand, and contained trace gravel and isolated clayey silt, with scattered minor topsoil, rootlets and some organics. The fill extended to depths varying from 0.4m to 2.4m from grade.

Based on the Standard Penetration N-values, in the range of 2 to 15 blows per 0.3m penetration, the fill was very loose to compact, generally very loose to loose at Boreholes 25BH-1 and 25BH-2 locations.

The in-situ moisture contents of the soil samples, retrieved from the fill, varied from 15% to 25%, indicating moist to very moist conditions. The high moisture content generally indicated the presence of organics.

4.3 Sandy Silt Till

A sandy silt till deposit was contacted below the fill at the borehole locations, at depths of 0.4m to 2.4m from grade. The sandy silt till deposit consisted of heterogeneous mixture of silt, sand and clay, trace gravel and contained some shale pieces near the bottom of the boreholes.

Boreholes 25BH-1 to 25BH-2 were terminated in the sandy silt till deposit, due to auger refusal on the probable shale bedrock, at depths of 3.8m to 5.2m from grade.

Based on the Standard Penetration N-values, in the range of 13 to 51 blows per 0.3m penetration, the relative density of the sandy silt till deposit was compact to very dense.

The in-situ moisture contents of the soil samples, retrieved from the sandy silt till deposit, varied from 11% to 18%, indicating moist to very moist conditions, with wet pockets.

A grain size analysis was carried out on one selected soil sample, obtained from Borehole 25BH-2 (SS4 at a depth of 2.3m), using mechanical sieves. The grain size distribution is shown on the appended Figure No. 1.

4.4 Groundwater

Free water was recorded in the open boreholes, 25BH-1 and 25BH-3, at depths of 3.51m and 5.03m from grade; and cave-in at Boreholes 25BH-3 and 25BH-4, at depths of 3.96m from grade, upon the completion of borehole drilling.

During the groundwater monitoring round on June 4, 2025, free water, measured in the monitoring well installed at Boreholes 25BH-1 and 25BH-3, was at depths of 1.30m and 4.16m from grade, respectively.

Based on the field observations and the moisture content profiles of the soil samples, retrieved from the boreholes, and the groundwater records, it is our opinion that the groundwater recorded in the boreholes represents perched water in the fill and in the sandy silt till deposit.

5.0 RECOMMENDATIONS

A review of the architectural drawings, prepared by Chamberlain Architect Services Limited, print dated July 10, 2025, indicated that the proposed re-development at the Site will consist of a 11 storey residential building with a partial basement.

At the time of preparation of this report, the ground floor elevation of the proposed building was not known. It is anticipated to be at and lightly higher the existing grade or similar to the existing building ground floor. The basement slab will be at a depth of 3.4m below the ground floor level, i.e. approximately 3.4m below the existing grade. The founding levels of the spread/strip footings of the basement are assumed to be 0.5m lower than the basement slab depth, i.e. at or below depth of 3.9m below the existing ground level. However, the elevator and the surrounding foundations are approximately 1.5m lower than the basement slab depth, i.e. at or below depth of 4.9m below the existing ground level.

Based on the subsoil data, obtained from the boreholes, our recommendations for the proposed addition to the existing building are provided below:

5.1 Site Preparation

The soil description and depth of fill shown on the Borehole Logs are specific depths at the borehole locations only. The thickness of topsoil and the depth of fill at locations beyond the boreholes may be thicker or deeper. We recommend that the contractor bidding for the job should determine the depths of deleterious material by test pits and allow for removal of any deleterious fill and material, with high moisture and/or organic content, during the site preparation for site grading.

Depending on the final grades, the Site may have to be regraded. The on-site excavated fill and/or native soils, to be used for site grading, should be organic free and maintained at or close to its optimum moisture content during placement and compaction. The new fill should be compacted in lifts of 200mm to at least 98% of its Standard Proctor maximum dry density (SPMDD).

At locations, where deep depths of fill were encountered during the investigation and might be revealed during the site grading, the building pad preparation should include removal of the existing fill and any compressible topsoil, organics and deleterious material, where encountered, and backfilling within the building pad areas with selected on-site material, free of organics, or pre-approved material, to the subgrade level. The backfill within the building pad areas should be placed and compacted in 200mm lifts to at least 100% of its SPMDD, according to the Guidelines of Engineered Fill, as attached in Appendix A.

Compressible topsoil and fill material containing relatively high organic content will not be suitable for reuse in areas where future settlement cannot be tolerated. This material will have to be disposed off-site or reused in landscaped areas, subject to approval by the landscape architect.

Any new fill at the Site should consist of organic free material, placed in lifts of 200mm to 300mm and compacted to at least 98% of its SPMDD.

5.2 Foundation Design

Conventional spread or strip footings founded in the engineered fill and native compact sandy silt till deposit at the borehole locations, at depths of 1.2m from grade, can be designed for following bearing pressures:

- 150 kPa at Serviceability Limit State (SLS)
- 225 kPa at Factored Ultimate Limit State (ULS)

Conventional spread or strip footings founded into the native dense sandy silt till deposit at the borehole locations, at and below depths of 2.6m from grade, can be designed for following bearing pressures:

- 250 kPa at Serviceability Limit State (SLS)
- 380 kPa at Factored Ultimate Limit State (ULS)

Conventional spread or strip footings founded into the native dense to very dense sandy silt till deposit at the borehole locations, at and below depths of 3.9m from grade, can be designed for following bearing pressures:

- 550 kPa at Serviceability Limit State (SLS)
- 750 kPa at Factored Ultimate Limit State (ULS)

For strip foundations founded in the engineered fill, we recommend that all strip footings should be reinforced with at least 2-15M rebar, continuously. This reinforcement will bridge any loose pockets in the engineered fill, if any, under the footings.

The total and differential settlement of footings, designed for the above recommended bearing pressure at SLS, will be less than 25mm and 20mm, respectively.

An alternative, that can be considered for the Site, is to use drilled caissons, founded in the sound shale bedrock. Caissons founded in the sound shale bedrock can be designed for axial bearing capacity of 10 MPa at ULS. The bearing capacity at SLS need not be considered. It will, however, be necessary to core the bedrock, below the termination depths of the current boreholes, to determination of sound rock depth. For estimation purposes, the sound bedrock depth can be assumed at depths of 1.5m below the termination depths.

All the perimeter wall footings and footings exposed to freeze and thaw cycles should be founded at a minimum depth of 1.2 m below the outside grade.

The depths of the new footings of the Site and the existing footings of the adjacent properties should meet the requirement of angle of repose 10H:7V to prevent potential undermining.

It should be noted that the above recommendations for foundations have been analyzed by ***Toronto Inspection Ltd.*** from the information obtained at the borehole locations. The bearing material, the interpretation between the boreholes and the recommendations of this report must be checked through field inspection provided by ***Toronto Inspection Ltd.*** to validate the information for use during the construction stage.

5.3 Floor Slab Construction

Following Section 5.1 Site Preparation, the ground floor slab of the building, and the basement slab, can be designed and constructed as a conventional slab-on-grade method.

After removal of the asphalt, the exposed subgrade / granular base, and the prepared subgrade should be proof rolled under the supervision of a geotechnical technician from ***Toronto Inspection Ltd.*** All compressible, loose, or weak spots observed during proof rolling should be removed from the subgrade and replaced with an approved granular material, compacted in a maximum of 200mm lifts to 98% Standard Proctor Maximum Dry Density (SPMDD).

A bedding consisting of at least 150 mm of Granular A (OPSS Form 1010), or its approved equivalent, is recommended as a moisture barrier. The bedding should be compacted to at least 100% SPMDD.

5.4 Earthquake Consideration

The Ontario Building Code requires that all buildings be designed to resist earthquake forces. In accordance with Table 4.1.8.4.A of the Ontario Building Code, the site classification for Seismic Site Response is Class C (very dense soil).

The acceleration and velocity based site coefficients, Fa and Fv, should conform to Tables 4.1.8.4.B and 4.1.8.4.C. These values should be reviewed by the Structural Engineer.

5.5 Excavation and Backfilling

All excavations should comply with the Ontario Occupational Health and Safety Act. Any excavation in soils should be sloped back to a safe angle of less than 45° or flatter.

We do not anticipate any ground water problem in the excavation for foundations. Localized seepage of water from perched water in the fill or native strata, if encountered, can be drained to sump pits and removed by pumping from sumps.

Organic free, on-site excavated soil may be reused for backfilling, provided it is dried sufficiently to the dry side of its optimum, prior to placement. Topsoil and other compressible fill removed from the Site may be reused in landscape areas, subject to approval of the landscape architect.

5.6 Lateral Earth Pressures

Where subsurface walls will retain unbalanced loads, the lateral earth pressure may be computed using the following equation:

$$P = K(\gamma H + q)$$

where	P = Lateral earth pressure	kPa
	K = Lateral earth pressure coefficient	0.4
	γ = Bulk unit weight of the soil	21.0 kN/m^3
	H = Depth of the wall below the finish grade	m
	q = Surcharge loads adjacent to the basement wall	kPa

The equation assumes that a permanent free draining system will be provided to prevent the buildup of hydrostatic pressure next to the wall. For an open cut excavation, the typical backfill and drainage are shown in Figure No. 2.

5.7 Pavement Design and Construction

After site grading and before the placement of granular bases for pavement construction, if encountered, the subgrade should be proofrolled to verify its stability. Any soft pockets, revealed by that process, should be sub-excavated and replaced with selected on-site suitable material or an approved imported material. The backfill should be compacted to 98% of SPMDD.

The thicknesses of pavement are highly dependent on the subgrade conditions. The following pavement design is based on an assumption that the subgrade soils for the driveway will consist of organic free mixture of silty sand to sandy silt.

The following minimum pavement thicknesses are recommended:

	Light Duty Parking	**Heavy Duty Driveways**
Topping, Asphaltic Concrete HL-3	65mm	40mm
Base course, Asphaltic Concrete HL-8	-	50mm
Base, OPSS Granular A or equivalent	150mm	150mm
Sub-base, OPSS Granular B or equivalent	200mm	300mm

The pavement thicknesses recommended above are based on the assumption that the construction would be carried out in the dry season and that the subgrade is stable, without excessive movement during proof rolling. If excessive movements are noticed, additional granular sub-base thickness will be necessary.

Granular bases should be compacted to 100% of Standard Proctor maximum dry density. Asphaltic concrete should be placed and compacted to at least 96% Marshall density.

6.0 GENERAL STATEMENT OF LIMITATION

The comments and recommendations presented in this report are based on the subsoil and ground water conditions encountered at the borehole locations, indicated in the borehole location plan, and are intended for the guidance of the design engineer.

Although we consider this report to be representative of the subsurface conditions at the subject property, the soil and the ground water conditions beyond the borehole locations may differ from those encountered at the time of our investigation and may become apparent during construction. Any contractor bidding on, or undertaking the works, should decide on their own investigation and interpretations. Any use and/or interpretation of the data presented in this report, and any decisions made on it by the third party are responsibility of the third parties. ***Toronto Inspection Ltd.'s*** responsibility is limited to the accurate interpretation of the soil and ground water conditions prevailing in the location investigated and accepts no responsibility for the loss of time and damages, if any, suffered by the third party as a result of decisions or actions based on this report.

To the fullest extent permitted by law, the client's maximum aggregate recovery against ***Toronto Inspection Ltd***., its directors, employees, sub-contractors and representatives, for any and all claims by client for all causes including, but not limited to, claims of breach of contact, breach of warranty and/or negligence, shall be the amount of the fee paid to ***Toronto Inspection Ltd***. for its professional services rendered under the agreement with respect to the particular site which is the subject of the claim by client.

Any legal actions arising directly or indirectly from this work and/or ***Toronto Inspection Ltd.'s*** performance of the Services shall be filed no longer than two years from the date of ***Toronto Inspection Ltd.'s*** substantial completion of the services. ***Toronto Inspection Ltd.*** shall not be responsible to the client for lost revenues, lost of profits, cost of content, claims of customers, or other special indirect, consequential or punitive damages.

Yours very truly,
TORONTO INSPECTION LTD.

LICENSED PROFESSIONAL ENGINEER
S. WANG
100131918
July 28, 2025
PROVINCE OF ONTARIO

David S. Wang

David S. Wang, P.Eng.
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
USS
U.S. SAPPAL
July 28, 2025
PROVINCE OF ONTARIO

Upkar S. Sappal, P.Eng.
Principal Engineer

Toronto Inspection Ltd.

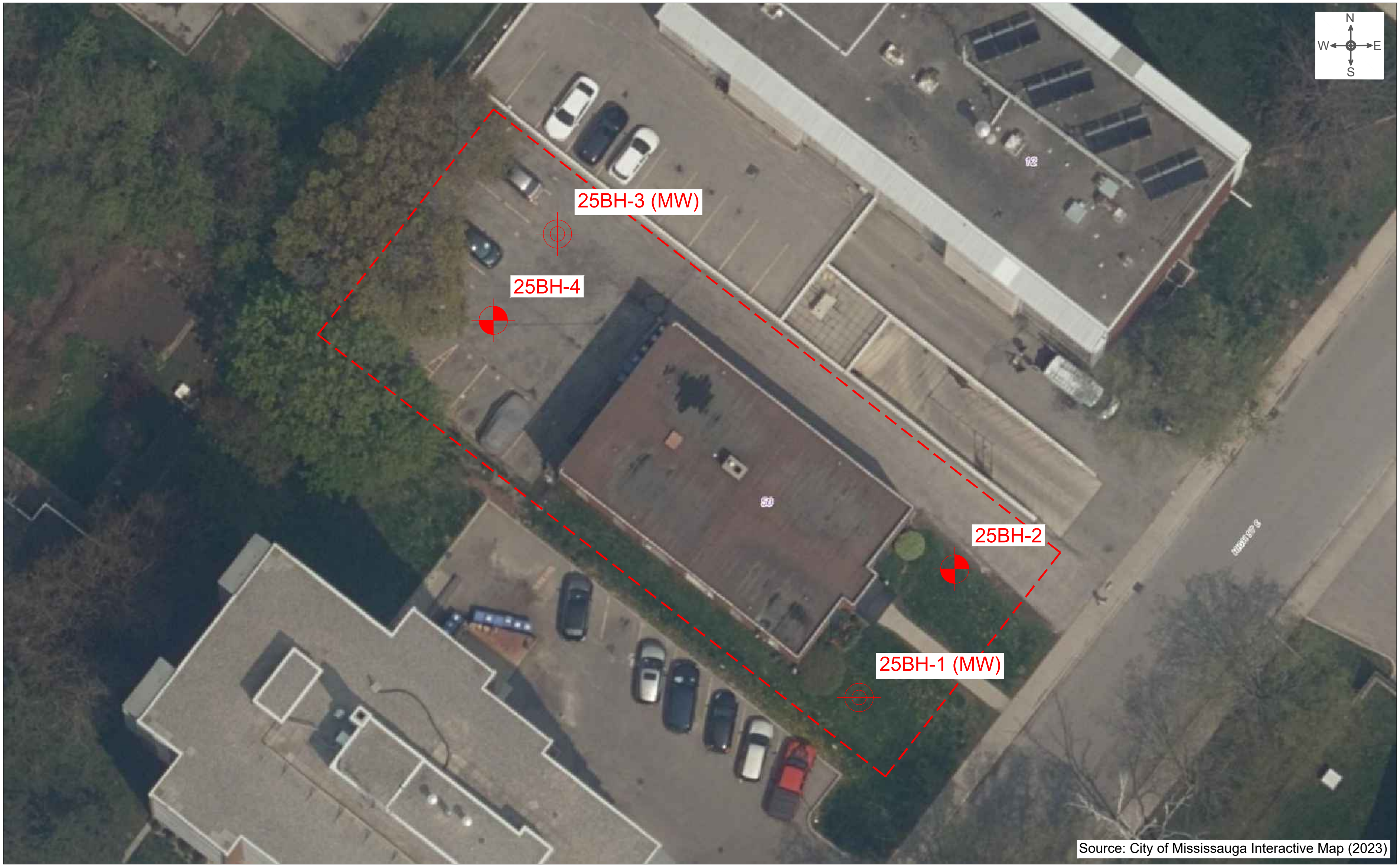
DRAWINGS & FIGURES

Borehole Location Plan

Borehole Logs

Gradation Curve

Drainage System for Open Cut Excavation



LEGEND:

Borehole and Monitoring Well Location

Site Boundary

NOT TO SCALE

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TITLE:	Borehole and Monitoring Well Location Plan
LOCATION:	50 High Street East, Mississauga, Ontario

PROJECT NO.	DATE :	DRAWING NO.
6857-25-GB	April 2025	1

Project No. 6857-25-GB

Log of Borehole 25BH-1 (MW)

Dwg No. 2

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 50 High Street East, Mississauga, Ontario

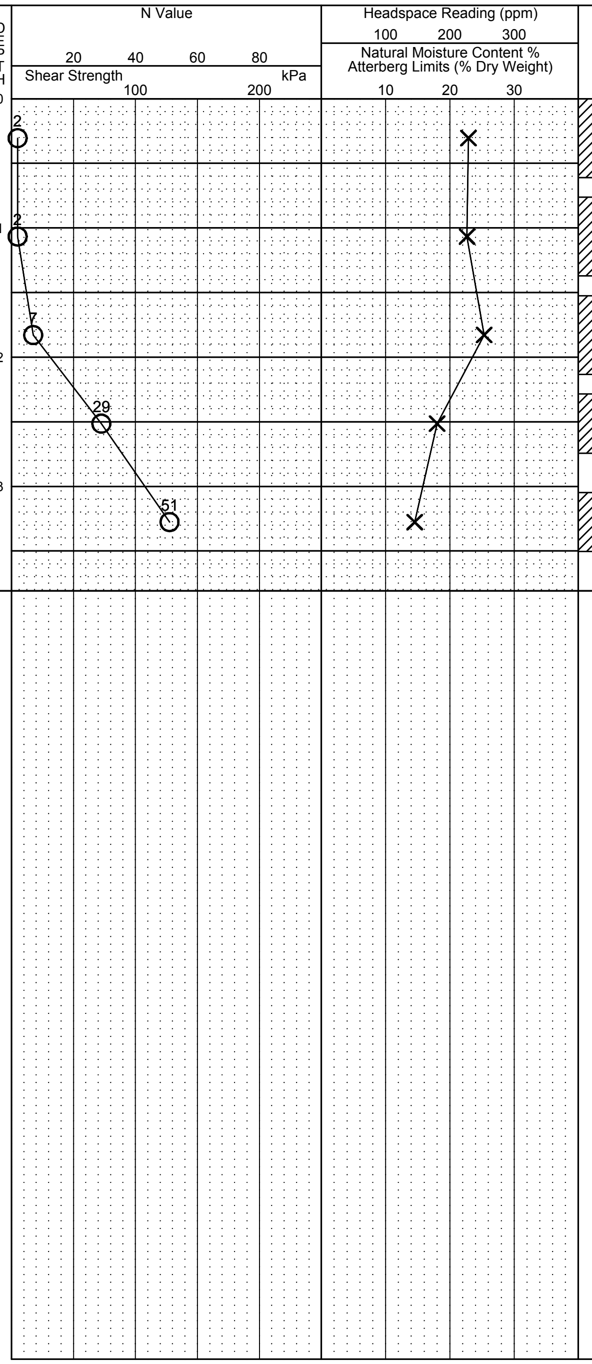
Date Drilled: 4/15/25

Drill Type: Track Mounted Drill Rig

Datum: Temporary

Auger Sample	⊠	Headspace Reading (ppm)	•
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	100.13	0
		TOPSOIL	100.05	
		FILL - dark brown to brown sandy silt - some topsoil, minor rootlets - trace gravel, trace clayey silt - some organics at 1.5m - very moist	98.83	1 2
		SANDY SILT TILL - compact to dense - grey - some gravel, some clayey silt - shale pieces from 3.8m - moist to very moist, wet pockets	97.69	3
			96.32	
		END OF BOREHOLE **NOTES:** Upon completion of drilling: - refusal to augering at 3.8m on probable shale bedrock - water level at 3.51m		



Natural Unit Weight kN/m3

LGBE3 6857-25-GB.GPJ 6/4/25

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
June 4, 2025	1.30m	

Project No. 6857-25-GB

Log of Borehole 25BH-2

Dwg No. 3

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 50 High Street East, Mississauga, Ontario

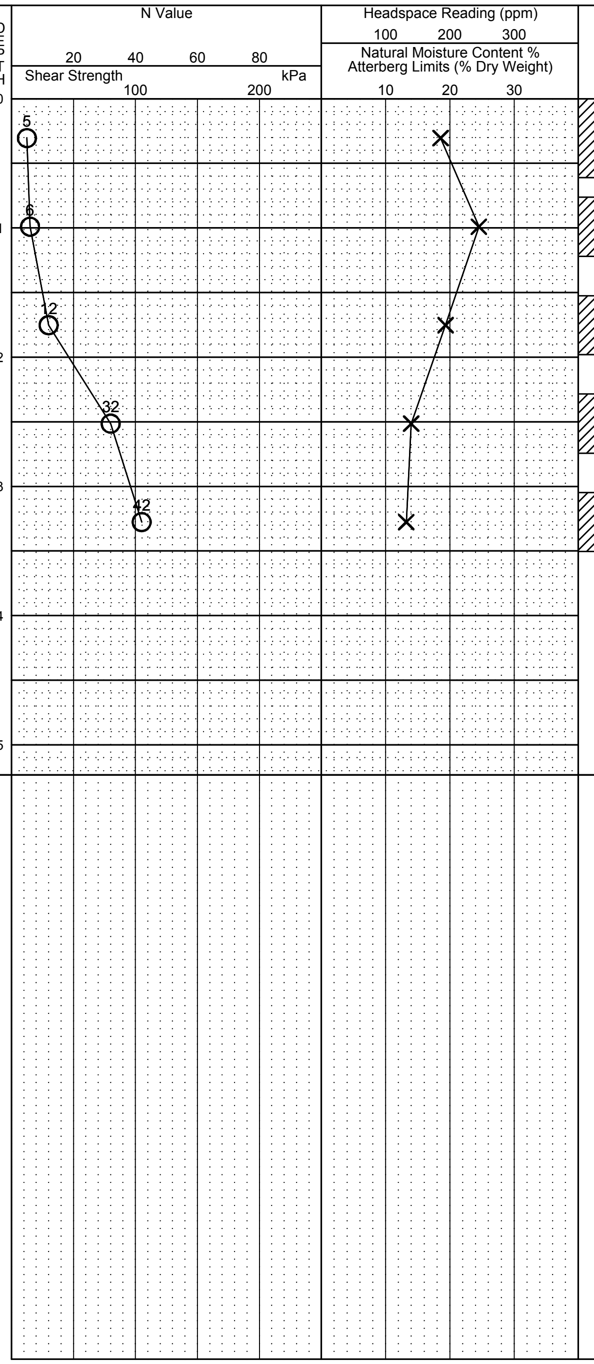
Date Drilled: 4/15/25

Drill Type: Track Mounted Drill Rig

Datum: Temporary

Auger Sample	⊠	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	——	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	100.28	0
		TOPSOIL	100.18	
		FILL - brown sandy silt to silty sand - some topsoil, minor rootlets - trace gravel - clayey silt with trace organics at 1.5m - moist to very moist		1 2
		SANDY SILT TILL - dense - brown, grey below 3.0m - some gravel, some clayey silt - shale pieces from 3.8m - moist	97.99	3 4
▼			95.25	5
		END OF BOREHOLE **NOTES:** Upon completion of drilling: - refusal to augering at 5.2m on probable shale bedrock - water level at 5.03m	95.05	



Natural Unit Weight kN/m3

LGBE3 6857-25-GB.GPJ 6/4/25

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 6857-25-GB

Log of Borehole 25BH-3 (MW)

Dwg No. 4

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 50 High Street East, Mississauga, Ontario

Date Drilled: 4/15/25

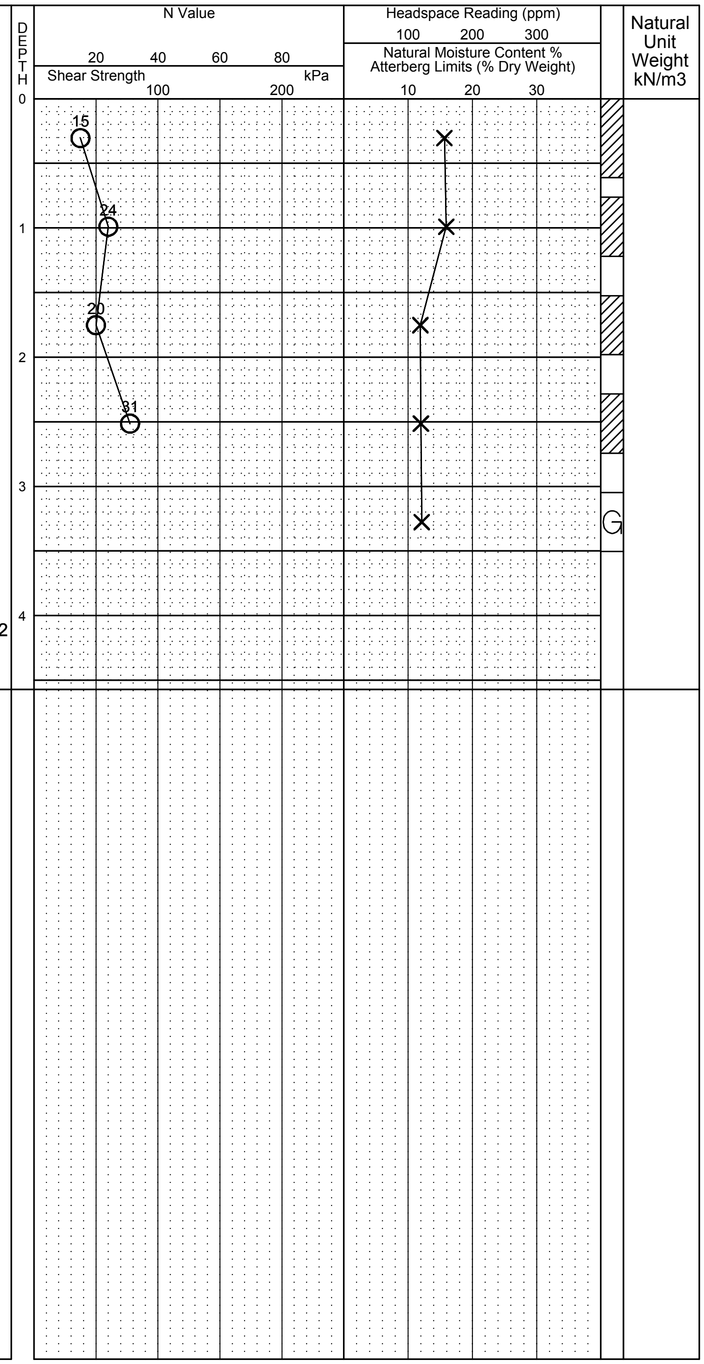
Drill Type: Track Mounted Drill Rig

Datum: Temporary

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	●
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	100.88
		ASPHALT PAVEMENT - 50mm asphalt over granular bases	100.83
			100.65
		FILL - brown sandy silt - trace gravel - moist	100.47
		SANDY SILT TILL - compact to dense - brown, grey below 1.5m - some gravel, some clayey silt - shale pieces from 3.0m - moist	
▼			96.72
			96.31

END OF BOREHOLE
NOTES:
Upon completion of drilling:
- refusal to augering at 4.6m on probable shale bedrock
- cave-in at 3.96m



LGBE3 6857-25-GB.GPJ 6/4/25

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
June 4, 2025	4.16m	

Log of Borehole 25BH-4

Project No. 6857-25-GB

Dwg No. 5

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: 50 High Street East, Mississauga, Ontario

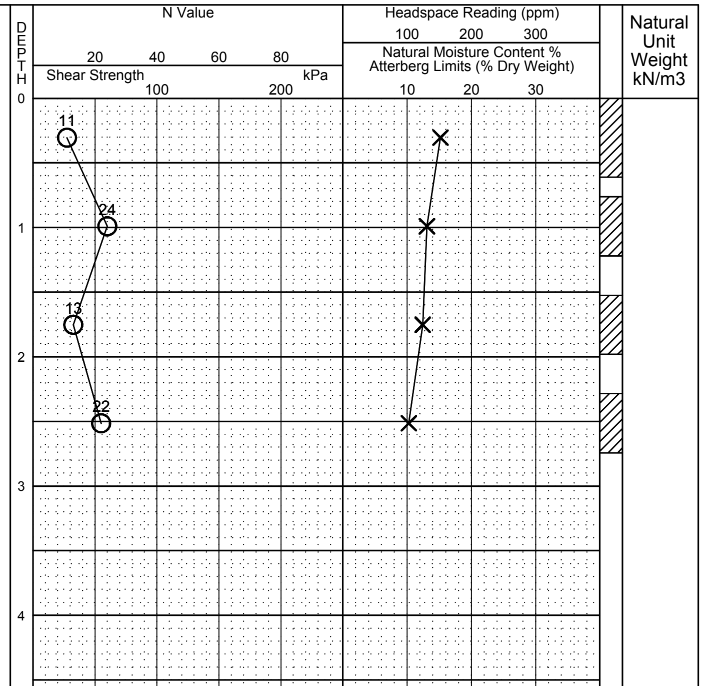
Date Drilled: 4/15/25

Drill Type: Track Mounted Drill Rig

Datum: Temporary

Auger Sample	⊠	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL	Symbol	Soil Description	ELEV. m	Depth
		Ground Surface	100.91	0
		ASPHALT PAVEMENT - 50mm asphalt over granular bases	100.86 100.68	
		FILL - brown sandy silt - trace gravel - moist	100.50	
		SANDY SILT TILL - compact - brown, grey below 1.5m - trace gravel, trace clayey silt - shale pieces from 3.0m - moist	96.34	



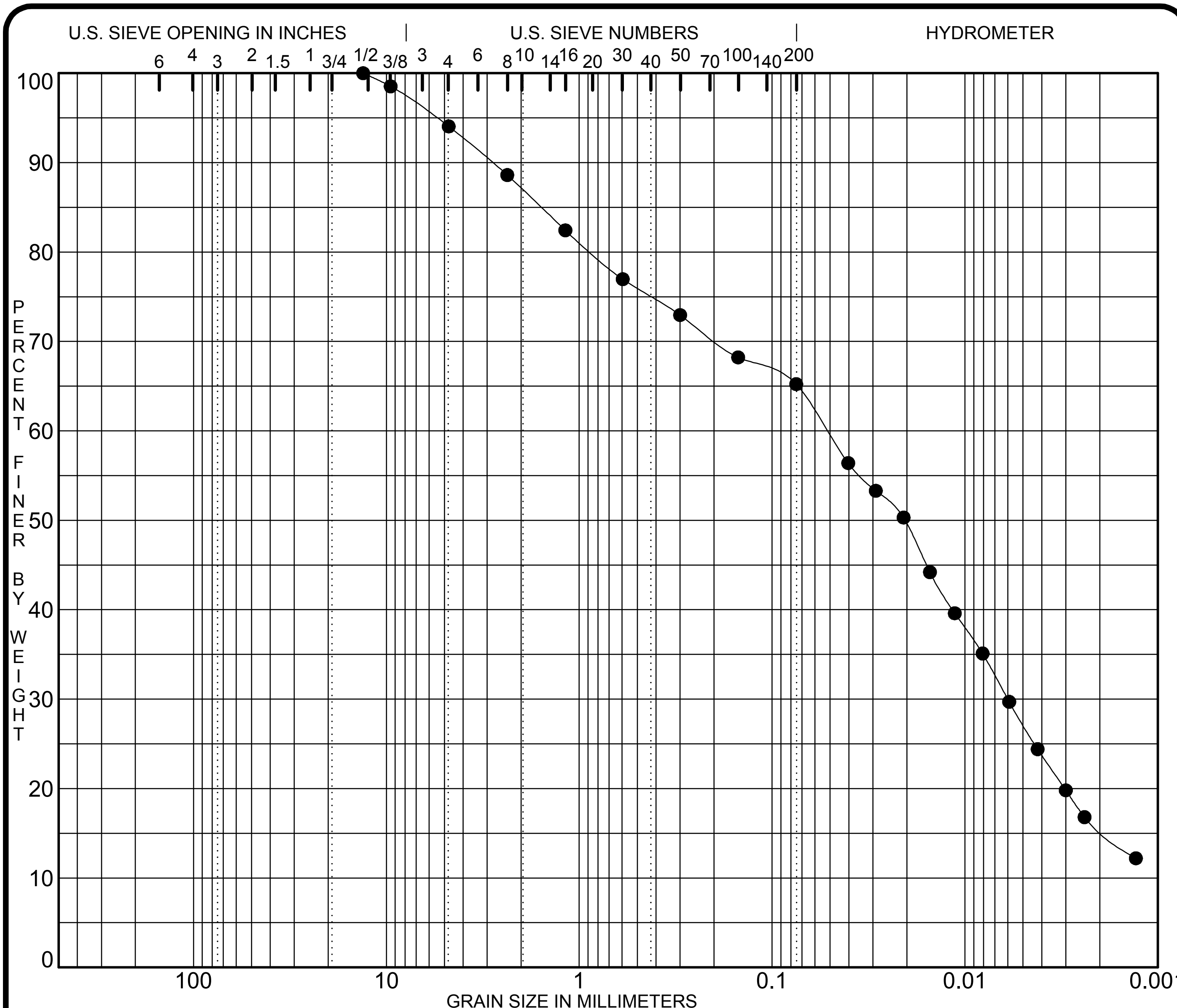
END OF BOREHOLE
NOTES:
Upon completion of drilling:
- refusal to augering at 4.6m on probable shale bedrock
- cave-in at 3.96m

LGBE3 6857-25-GB.GPJ 6/4/25

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**25BH-2**	**2.3**						**0.76**	**56.8**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**25BH-2**	**2.3**	**13.20**	**0.05**	**0.006**	**0.0009**	**6.0**	**28.8**	**38.1**	**27.1**

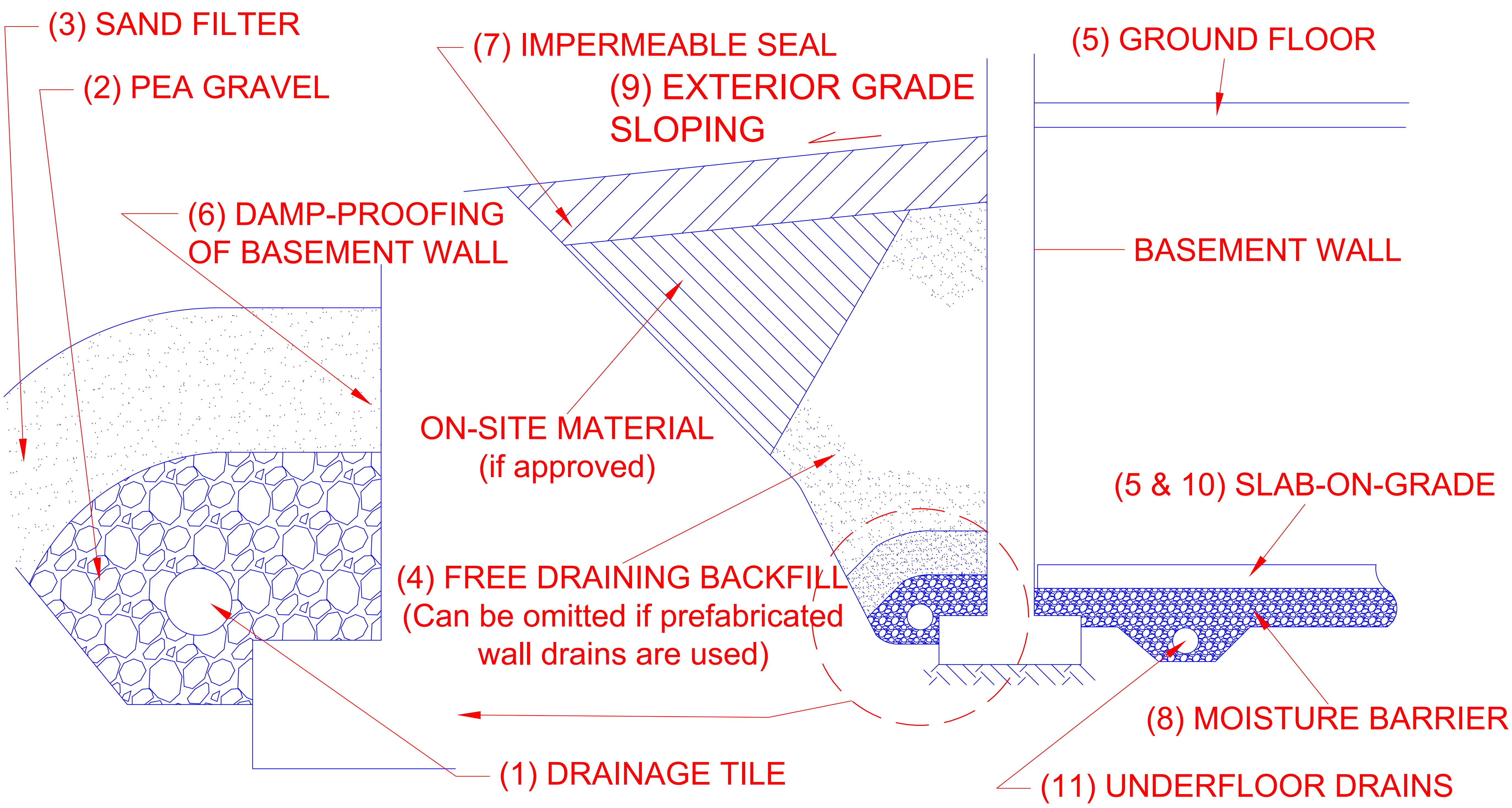
PROJECT **Geotechnical Investigation - 50 High Street East, Mississauga, Ontario**

JOB NO. **6857-25-GB**
DATE **5/9/25**

GRADATION CURVES

Toronto Inspection Ltd.

FIGURE NO. 1



Notes:

1. **Drainage tile**: consist of 100mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. invert to be at minimum of 150mm (6") below underside of basement floor level.
2. **Pea gravel**: at 150mm (6") on the top and sides of drain. If drain is not placed on footing, provide 100mm (4") of pea gravel below drain. The pea gravel may be replaced by 20mm clear stone provided that the drain is covered by a porous geotextile membrane of Terrafix 270 R or equivalent.
3. **Filter material**: consists of C.S.A. fine concrete aggregate. A minimum of 300mm (12") on the top and sides of gravel. This may be replaced by an approved porous geotextile membrane of Terrafix 270R or equivalent.
4. **Free-draining backfill**: OPSS Granular B or equivalent, compacted to 93 to 95% (maximum) Standard Proctor Density. Do not ocmpact closer than 1.8m (6ft.) from wall with heavy equipment. This may be replaced by on site material if prefabicated wall drains (Miradrain) extending from the finished grade to the bottom of the basement wall are used.
5. **Do not backfill** until the wall is supported by the basement floor slab and ground floor framing, or adequate bracing.
6. **Damp-proofing** of the basement wall is requred before backfilling.
7. **Impermeable backfill seal** of compacted clay, clayey silt or equivalent. If the original soil in the vicinity is a free draining sand, the seal may be omitted.
8. **Moisture barrier**: consists of 20mm clear stone or compacted OPSS Granular A, or equivalent. The thickness of this layer to be 150mm (6") minimum.
9. **Exterior Grade**: slope away from basement wall on all the sides of the building.
10. **Slab-on-grade** should not be structurally connected to walls or foundations.
11. **Underfloor drains** * should be placed in parallel rows at 6-8m (20-25 ft.) centre, on 100mm (4") of pea gravel with 150mm (6") of pea gravel on top and sides. The invert should be at least 300mm (12") below the underside of the floor slab. The drains should be connected to positive sumps or outlets. Do not connect the underfloor drains to the perimeter drains.

* Underfloor drains can be deleted where not required.

NOT TO SCALE

Toronto Inspection LTD. GEO-ENVIRONMENTAL CONSULTANTS	TITLE: Suggested Backfill and Drainage System for Open Cut Excavation
110 Konrad Cresent, Unit 16, Markham, Ontario L3R 9X2 Tel: 905-940 8509 Fax: 905-940 8192 Email: TIL@torontoinspection.com	FIGURE NO. 2

Appendix A

Engineering Fill Guidelines

GUIDELINES FOR ENGINEERED FILL

The information presented in this guideline is intended for general guidance only. Site specific and prevailing weather conditions may require modification of the material(s) to be used and the compaction standards or procedures changed. The site preparation and the material(s) to be used must be discussed and procedures agreed with ***Toronto Inspection Ltd.*** prior to the start of the earthworks and must be subjected to on going review during construction.

For fill to be classified as engineered fill, suitable for supporting structural loads, a number of conditions must be satisfied, including but not necessarily limited to the following:

1. Areal Extent

The engineered fill must extend beyond the envelope of the structure to be supported. The minimum extent should be 2.0m beyond the envelope in all directions at the foundation level, including the loading dock pad and the front sidewalk, and sloping downwards to the sub-grade at 45°. Once the envelope is set, the structure cannot be moved out of the envelope without consultation with ***Toronto Inspection Ltd.*** Similarly, no excavation should encroach on the engineered fill envelope without consultation with ***Toronto Inspection Ltd.***

2. Survey Control

Accurate survey control is essential to the success of an engineered fill project. The boundaries of the engineered fill must be laid out by a surveyor. During construction. it is necessary to have qualified surveyors providing control stations on the three-dimensional extent of the engineered fill.

3. Subsurface Preparation

Prior to placement of the engineered fill, the sub-grade must be prepared to the satisfaction of ***Toronto Inspection Ltd.*** All deleterious material must be removed and in some cases excavation of native mineral soils may also be required. Particular attention must be paid to wet sub-grade and possible additional measures required to achieve sufficient compaction. Where fill is placed against a slope, benching will be necessary and natural drainage paths must not be blocked.

4. Suitable Fill Material

All material to be used as fill must be approved by ***Toronto Inspection Ltd.*** Such approval will be influenced by weather factors. External sources of fill material must be sampled, tested and approved prior to material being hauled to the job site.

5. Trial Test Section

In advance of the construction of the engineered fill pad, the contractor should conduct a trial test section. The compaction criterion will be assessed for the backfill material to be used, using specified lift thicknesses and number of passes for the compaction equipment proposed by the contractor. To achieve a uniform degree of compaction of each layer, the lift thickness of loose material, prior to start of compaction, must not exceed 200mm (8 inches). Additional trial test section(s) may be required throughout the course of the project to reflect changes in material sources, the moisture content of the material and the weather conditions.

6. Degree of Compaction

The minimum degree of compaction for the engineered fill should not be less than 100% of the Standard Proctor maximum dry density, or 95% of the Modified Proctor maximum dry density, to the level at or above 0.3m from proposed footing founding level. Each layer must be tested and approved by this office before the next layer is placed.

7. Inspection and Testing

Uniform and thorough compaction is crucial to the performance of the fill and the supported structure. Hence, all subgrade preparation, filling and compacting must be done with full time inspection and to the satisfaction of ***Toronto Inspection Ltd.*** All founding surfaces must be inspected and approved by ***Toronto Inspection Ltd.*** prior to placement of concrete.

8. Protection of Fill

Fills are generally more susceptible to the effects of weather than are natural soils. Fill placed and approved to the level at which structural support is required must be protected from excessive wetting, drying, erosion or freezing. Where inadequate protection had been provided, it may be necessary to provide deeper founding level for footings or to strip and re-compact some of the filled layers.

9. Limitations

The engineered fill is subjected to the following limitations:

i. Proper drainage must be maintained at all times within the engineered fill pad.
ii. If the engineered fill is left in place during the winter months, adequate protection must be provided against frost penetration to the proposed footing depths.
iii. If the engineered fill depth exceeds 5m below the foundation depth, the construction of the foundations might have to be delayed for a period of 1 year after placement, depending on the type of fill material used.
iv. Strip footings and foundation walls founded on engineered fill must be reinforced continuously with a minimum of two 15mm steel bars with at least 1m of overlap.