Professional Service Industries, Inc.
95 Chastain Road, Suite 301, Kennesaw, GA 30144
Phone: (770) 424-6200
Fax: (770) 424-0199

Mr. James Kirk Farrelly, P.E.
Director of Engineering
Capital Growth Buchalter, Inc.
361 Summit Boulevard, Suite 110
Birmingham, Alabama

RE: Report of Geotechnical Subsurface Exploration
Proposed Starbucks
4383 Wade Green Road
Kennesaw, Cobb County, Georgia

Dear Mr. Farrelly:

Professional Service Industries, Inc. (PSI), an Intertek company, has completed a subsurface exploration program at the site of the above referenced project. The services were completed in general accordance with authorized PSI Proposal Number 0472-261876 dated November 13, 2018. The following report presents the results of our study as well as recommendations pertaining to the geotechnical aspects of the project.

1 PROJECT INFORMATION

1.1 Site Location and Project Description

The site is an approximately 0.71 acre developed parcel at 4383 Wade Green Road in Kennesaw Georgia. It is currently developed with a 1-story restaurant and associated parking and drives. The restaurant building is near the center of the south side of the site, separated from the property line by a concrete drive through lane. The remaining pavement is asphalt. The restaurant site is accessed from a shared driveway south of the property which is not on the subject site.

Site grades slope gently down from east to west. There is a block wall on the north property line with a maximum height of about 6 feet (adjacent property lower) and 10 +/- foot slope down beyond the west property line. Site Drainage is to a curb inlet in the northwest corner of the site. The area of the parking lot is filled with debris and it appears portions of the curb are missing.

The pavement is worn but serviceable except in the northwest corner. The pavement areas that are east and north of the building primarily exhibit block cracking. Two localized areas of alligator cracking were observed; east of the northeast building corner and north of the building in front of the apparent roof leader drain through the curb. Pavement cracking and distress worsens in the parking and drive areas west of the building and alligator cracking, gouged pavement and evidence of patching was

observed. In the northwest corner it appears that a catch basin is clogged with debris and water has jumped the curb and caused erosion. A portion of the curb is missing and the riser structure for the inlet is exposed when viewed from the wooded areas west of the site. Some subsidence of the pavement surface in the area within about 15 feet of the northwest corner was also observed.

The existing restaurant is planned to be demolished and a new 2492 square feet Starbucks constructed near the footprint of the existing restaurant. We assume all new slabs, foundations, pavements and utilities will be constructed. We do not anticipate any modifications or changes to the existing block wall along the northern property line or the existing slope along the western property line. Based on our experience with similar projects we anticipate the building will be one-story and light-framed with a preferred foundation of spread footings or a monolithic slab on grade. Maximum wall loads of 3 kips per linear foot and column loads of 75 kips or less are anticipated. The parking and drive areas will be reconfigured but general occupy the same areas.

The recommendations provided in this report are based in part on the project information described above. If any of the noted information is incorrect or has changed, please inform PSI so that we may amend the recommendations presented in this report, if appropriate.

1.2 Scope of Geotechnical Services

The purpose of this exploration was to provide a geotechnical study for the primary purpose of developing geotechnical recommendations for support of design of foundations and slabs for the planned project. The scope of work for this exploration included the following:

- PSI contacted the Georgia 811 Utilities Protection Center (UPC) to locate existing underground public utilities on-site. We also engaged a Private Utility Locator (PUL) to clear boring locations prior to drilling
- PSI performed a brief site reconnaissance and located the borings in the field.
- Four Standard Penetration Test (SPT) soil borings were performed at the approximate locations shown on the Boring Location Plan using a CME 550 drilling rig. Borings were field located by estimating right angles and distances from existing site features identified on the plans provided and should be considered approximate. Soil test borings were performed at this site using hollow-stem, continuous flight augers. At regular intervals, Standard Penetration Test and sampling operations were conducted in general compliance with ASTM D1586 using an automatic hammer. The N-values obtained were not corrected for hammer efficiency.
- We classified samples of soil obtained during the drilling operations and prepared boring logs for the test locations describing the types of soil encountered and other pertinent information in general accordance with the Unified Soil Classification System (USCS).
- The Seismic Site Class was determined, based on Standard Penetration Test (SPT) N-values, in accordance with the 2012 International Building Code (IBC).
- We prepared this engineering report presenting PSI's boring logs, site observations and recommendations for development of the site.

PSI did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence or the amplification of the same.

1.3 Site Geology

The site is located within the Piedmont Physiographic Province of Georgia. Native soils in upland areas within this province are formed from the in-place weathering and decomposition of native igneous and metamorphic bedrock materials. The residual soils near the ground surface are generally finer grained in texture due to advanced weathering. With depth, materials tend to be coarser grained and exhibit relict structure and fabric from the underlying bedrock. Separating the residual soil from the underlying parent bedrock is typically a transition zone of high consistency material referred to as partially weathered rock (PWR). PWR is defined as residual soil with standard penetration resistance (ASTM D1586) of at least 100 blows per foot (bpf).

The weathering processes that produced the residual soils and partially weathered rock were extremely variable. Differential weathering of the parent bedrock has resulted in highly variable subsurface conditions and can include abrupt changes in soil type and consistency over relatively short horizontal and vertical distances. Furthermore, depths to rock can also be highly variable; and suspended boulders, discontinuous rock layers/lenses, or rock pinnacles can be present within the residual soils and transitional zones of soft weathered rock.

The naturally occurring soil profile can be altered by excavation or placement of fill. No compaction testing or quality control reports from the fill placement that has occurred at the site were provided for review. Based on review of limited historical aerial photographs it appears the site was developed in the mid to late 1990s.

2 SUBSURFACE CONDITIONS

The following subsurface description is of a generalized nature and intended to highlight the major subsurface stratification features and material characteristics. The borings were performed in paved areas. The asphalt pavement was about 2 to 3 inches thick and underlain by 3 inches of base stone. The boring in the old drive-through lane encountered 9 inches of concrete underlain by 3 inches of base stone. Below surficial pavements the borings encountered localized apparent fill and residual soils.

Apparent fill was encountered in borings B-1, B-2 and B-4 to depths of 3 to 8 feet. The apparent fill was described as silty sand with clay, sandy silt with clay or silty clay with sand. Standard Penetration Test results varied from 9 to 11 blows per foot. Trace amounts of topsoil or slight topsoil staining was noted in the samples, but the fill sampled did not contain appreciable amounts of deleterious materials. The fill appears to have been placed with at least some compaction effort based on the soil boring results.

Below the pavement in B-3 and below apparent fill in other borings, residual soils were encountered that extended to the boring termination depths. The residual soils were typically silty clays with sand or silty sands with clay that transitioned with depth to silty sands. Standard Penetration Tests varied from 7 to 32 blows per foot.

Groundwater was not apparent at any of the boring locations at the time of drilling. Fluctuation of groundwater levels should be anticipated with seasonal and climatic changes in rainfall.

The Boring Logs, included in the Appendix, should be reviewed for specific information at the test

locations. These records include soil descriptions, stratification, penetration resistances, locations of the samples, and other pertinent data. The soil classifications are based on visual and tactile methods and not on laboratory testing, so they should be considered approximate. The material description shown on the logs represent the conditions only at the actual boring location at the time of our exploration. Variations may occur and should be expected between boring locations. Significant variation in fill soil type or the existence of debris or organic materials may exist between borings. Lines of stratification demarcation shown on the logs and discussed in the preceding paragraphs represent the approximate boundary between subsurface materials, but the transition may be more gradual than indicated.

3 CONCLUSIONS AND RECOMMENDATIONS

3.1 General

The following geotechnical design recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. If there are any changes in these project criteria, a review should be made by PSI to determine if modifications to the recommendations are warranted.

Apparent fill materials were encountered in a few borings and likely exist in other areas of the site. Our limited exploration data indicates that the fill likely received some compaction effort during placement, and we observed no significant concentrations of deleterious materials in our samples. The fill was likely placed during development of the existing restaurant. Although documentation of the origin or placement of the fill was not provided it was likely intended for support of retail buildings and pavements such as the current and proposed developments. Support of foundations and slabs on undocumented fill requires some acceptance of risk by the owner but since the fill encountered was relatively thin, had no readily apparent deleterious materials or debris and the relatively light loads anticipated for the proposed development; we consider the risk of poor foundation or slab performance due to poor fill conditions to be low. We do recommend a budget contingency be provided for shallow undercutting and replacement of lesser quality fills should they be encountered during site grading or construction. Since the existing structure will be demolished, some more poorly compacted trench backfills could be encountered.

PSI did not perform any services to evaluate or assess the condition of the existing block wall along the northern property line or the existing slope along the western property line. Based on our current project understanding, no modifications or improvements are planned to or immediately adjacent to these site features.

Following demolition and removal of the existing slab and underground construction, an evaluation should be performed by PSI using hand auger borings or backhoe pits to confirm that conditions at the planned restaurant are like those encountered in the borings and capable of satisfactorily supporting the proposed new construction.

3.2 Site Preparation

The initial phase of development will include demolition of the existing vertical and below grade construction including all foundations and building utilities that will be abandoned. All loose backfills

associated with underground construction or the removal of underground construction should be removed.

Following the demolition and undercutting of any identified loose backfills, and prior to placing compacted engineered fill materials or at grade construction, the exposed subgrade areas should be evaluated by a PSI representative. The evaluation should check that any loose fill has been removed and that where excavation have been made, that the side walls of the excavation are satisfactory for backfilling. The evaluation should include proof rolling areas by traversing the areas with a fully loaded dump truck or similar rubber-tired equipment with a minimum weight of 15 tons. Proof rolling operations should be observed by a representative of PSI. Unstable soft or wet soils which are revealed by proof rolling should be further evaluated. If they cannot be adequately densified in place, the soil should be undercut and replaced with compacted structural fill. If the undercut soils are of suitable classification as outlined below, they may be used as fill materials as described in Section 3.3.

Where below grade pipes or culverts are abandoned, we recommend the structures be removed if possible. If the pipes are abandoned by grouting, they should be filled and sealed. Old backfill above abandoned utilities should be thoroughly evaluated by PSI and if loose they should be removed. We note that exploration above underground utilities was not performed during this subsurface exploration to prevent damaging the existing utilities. Also, the condition of storm sewer pipes or other site construction was not included in our work scope. We note however that during our site reconnaissance we noted that some erosion has occurred to the soils that support the curb and surround the riser associated with a curb inlet in the northwest corner of the site. Excavation of this area and replacement of fills, curbs and pavements will likely be required.

3.3 Structural Fill

Materials selected to be used as structural fill should not contain more than 3 percent by weight of organic matter and be free of any waste construction debris, or other deleterious materials. Fill materials should have a Standard Proctor (ASTM D 698) maximum dry density of at least 95 pounds per cubic foot (pcf) and a maximum particle size of 3 inches or less. The fill should have an Atterberg Liquid Limit less than 50 and a Plasticity Index of less than 30. Preferred soil types for use as fill meet the requirements for classification as SM, SW, SP, SC, GM, GW, GC, CL, and ML as long as they also meet the grain size limitations outlined above.

The moisture content of fill soils at the time of placement and compaction should be within 2 percent of optimum moisture content. We recommend that the structural fill be compacted to a minimum of 95 percent of the Standard Proctor maximum dry density (ASTM D-698). The upper 12 inches beneath pavement and grade slab areas should further compacted to 98 percent of the maximum dry density. It is recommended that the fill be placed in lifts not exceeding 8 inches in loose thickness.

Density testing should be performed by a soils technician working under the supervision of a geotechnical engineer to determine the degree of compaction. Areas that do not meet the compaction requirement should be further compacted and retested. The frequency of testing will depend on the area of fill placement and the rate at which the fill is placed. As a guidance we recommend one tests be performed for every 5,000 square feet of fill in underfloor areas for every 1 to 2 vertical feet of fill placement (typically

every two or three lifts). Testing frequency should be increased in confined areas such as pipe trenches or wall backfills.

3.4 Foundation Recommendations

Once the proposed building footprint area has been prepared as described herein, it is our opinion that the proposed building can be supported on conventional shallow foundations. We recommend that spread footings and continuous wall foundations be designed for a maximum net allowable soil bearing capacity of 2,500 pounds per square foot or less. The recommended soil bearing capacity includes a factor of safety of at least 3 against shear failure. Isolated column foundations should have a minimum width of 24 inches and continuous wall foundations should have a minimum width of 18 inches. All foundations should bear at a minimum depth of 18 inches below the lowest adjacent final ground surface for frost penetration and protective embedment.

Foundation bearing surface evaluations should be performed in each foundation excavation prior to placement of reinforcing steel. These evaluations should be performed by a representative of PSI to confirm that the design allowable soil bearing capacity is available and that our design assumptions about the subgrade are applicable to the conditions encountered during construction. The foundation bearing surface evaluations should be performed using a combination of visual observation, hand auger borings and dynamic cone penetrometer testing.

If soft or loose soil pockets, or fill containing debris or excess organic are observed during the footing evaluations, the footing should be extended to suitable bearing material, or these materials should be removed and replaced with suitable compacted structural fill. Water and possibly some loose soil may collect in the footing excavations as a result of surface precipitation and near ground surface seepage. Water, loose soil and soil softened by water should be removed from the bottom of the footing excavations before placing concrete.

We recommend that foundations be cast the same day the excavations are made. The moisture content of the foundation soils should not be allowed to dry to more than 3 percentage points below optimum moisture.

Footing excavations should be protected from surface water run-off and freezing. If water is allowed to accumulate within a footing excavation and soften the bearing soils, or if the bearing soils are allowed to freeze, the deficient soils should be removed from the excavation prior to concrete placement.

3.5 Settlement

Following the recommendations stated above, we estimate potential post-construction total settlements will generally be less than 1 inch. Differential settlement is estimated to be generally less than ½ inch between adjacent columns or along 20 feet of continuous footing length. Although total and differential settlements of these magnitudes are usually considered tolerable for most commercial construction, we recommend consulting the project structural engineer to confirm.

3.6 Floor Slab Recommendations

A concrete slab-on-grade floor system bearing in suitable engineered fill or residual soil may be utilized for the building. We recommend that a minimum 4-inch thick granular mat be placed beneath the floor slab

to enhance drainage and provide a capillary break. In areas with moisture sensitive floor finishes or if required by code or the floor manufacturer, a vapor retarder should be placed. Where vapor retarders are used, the contractor must follow appropriate slab finishing and curing methods to reduce the risk of slab curling. The floor slabs should have an adequate number of joints to reduce cracking resulting from any differential movement and shrinkage. The floor slab should not be rigidly connected to columns, walls, or foundations. If the slab design is based on subgrade modulus, a modulus value of 100 pci may be assumed for the residual soils and engineered fill.

The precautions listed below should be followed for construction of slabs-on-grade. These details will not reduce the amount of slab movement but are intended to reduce potential damage should some settlement of the supporting subgrade take place.

- Isolation joints should be used between foundations and the slab, or the transitions should be suitably reinforced.

- The occurrence of concrete shrinkage cracks, and problems associated with concrete curing may be reduced and/or controlled by limiting the water/cement ratio of the concrete, proper concrete placement, finishing, and curing, and by the placement of crack control joints at frequent intervals, particularly, where re-entrant slab corners occur. The American Concrete Institute (ACI) recommends a maximum panel size (in feet) equal to approximately two to three times the thickness of the slab (in inches) in both directions. Details of the ACI recommendations for slab design and construction are provided in ACI 302.1.

- Some increase in moisture content is inevitable as a result of development and associated landscaping; however, extreme moisture content increases can be detrimental to floor slab performance. This can be largely controlled by proper and responsible site drainage, building maintenance and irrigation practices.

- All backfill in areas supporting slabs should be moisture conditioned and compacted as described earlier in this report. Backfill in all interior and exterior water and sewer line trenches should be carefully compacted.

- Exterior slabs should be isolated from the building. These slabs should be reinforced to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.

The soil subgrade in the area of concrete slab-on-grade support is often disturbed during foundation and superstructure construction. We recommend that the floor slab subgrade be evaluated by a representative of PSI immediately prior to final slab subgrade preparation. The moisture content of the soils should be adjusted to within 2 percent of optimum moisture prior to final slab subgrade preparation and slab construction. If low consistency soils are encountered which cannot be adequately densified in place, such soils should be removed and replaced with well-compacted fill material or with well-compacted crushed stone materials.

3.7 Drainage Considerations

It is not anticipated that special groundwater control measures will be required for the anticipated construction activities. We recommend that the Contractor determine groundwater levels at the time of construction to determine potential impacts on the planned construction procedures. Water should not be allowed to collect in the foundation excavations, on the floor slab areas, or on prepared subgrade of the construction area either during or after construction. The subgrade beneath structures should be sloped to a low point to facilitate removal of any collected rainwater, groundwater, or surface runoff. Positive site drainage (i.e. sloping grade) should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slab area of the building.

3.8 Excavation Considerations

The borings encountered moderate consistency soils which can typically be excavated with conventional grading equipment.

3.9 Slope Considerations

Our scope of services did not include a detailed evaluation of slope stability for permanent or temporary slopes, consequently the following recommendations are based on our experience with similar soils. Temporary slopes should be constructed in accordance with OSHA or other regulatory guidelines. The contractor is solely responsible for construction of safe excavations. Permanent slopes up to 10 feet high may be constructed no steeper than 2H:1V. Slopes should be constructed of engineered fill compacted to at least 95 percent of the Standard Proctor maximum dry density (ASTM D-698) or residual soils. Buildings should be set back at least 10 feet from the crest of slopes or as required by regulatory authorities. We recommend pavements be set back at least 5 feet from the crest edge.

3.10 Seismic Design Calculations

The project site is located within a municipality that employs the International Building Code, 2012 edition. As part of this code, the design of structures must consider dynamic forces resulting from seismic events. These forces are dependent upon the magnitude of the earthquake event as well as the properties of the soils that underlie the site.

As part of the procedure to evaluate seismic forces, the code requires the evaluation of the Seismic Site Class, which categorizes the site based upon the characteristics of the subsurface profile within the upper 100 feet of the ground surface. To define the Site Class for this project, we have interpreted the results of soil test borings drilled within the project site and estimated appropriate soil properties below the base of the borings to a depth of 100 feet based upon data available in published geologic reports as well as our experience with subsurface conditions in the general site area.

Based upon our evaluation, it is our opinion that the subsurface conditions within the site are consistent with the characteristics of Site Class “D”. The associated USGS-NEHRP probabilistic ground motion values for the general site area were obtained from the USGS geohazards web page and are presented in the table below.

Ground Motion Values*

Period (sec)	Mapped MCE Spectral Response Acceleration (g)		Site Coefficients		Adjusted MCE Spectral Response Acceleration (g)		Design Spectral Response Acceleration (g)	
	PGA	0.111	F_{PGA}	1.578			PGA_M	0.175
0.2	S_s	0.227	F_a	1.600	S_{Ms}	0.363	S_{Ds}	0.242
1.0	S_1	0.097	F_v	2.400	S_{M1}	0.234	S_{D1}	0.156

** For Latitude 34.060 degrees and Longitude -84.593 degrees.*

The Site Coefficients, Fa and Fv presented in the above table were also obtained from the noted USGS web page, as a function of the site classification and mapped spectral response acceleration at the short (S_S) and 1-second (S_1) periods but can also be interpolated from IBC Tables 1613.3.3(1) and 1613.3.3(2). For Seismic Design Category designations of C, D, E or F, which are contingent on the structure "Occupancy Category", the code also, requires an assessment of slope stability and surface rupture due to faulting or lateral spreading. Detailed evaluations of these factors were beyond the scope of this study. However, the following table presents a qualitative assessment of these issues considering the site class, the subsurface soil properties, the groundwater elevation and probabilistic ground motions:

Qualitative Seismic Site Assessments

Hazard	Relative Risk	Comments
Liquefaction	Low	The subsurface silty materials contain sufficient fines to limit the potential for liquefaction.
Slope Stability	Low	The probabilistic ground accelerations are low and site grades are relatively flat.
Surface Rupture	Low	No active faults underlie the site.

3.11 Pavement Design

Specific traffic loading information was not provided for the planned development. Based on our experience, typical minimum flexible pavement sections for subgrades prepared as described in previous sections of this report for similar type facilities is the following:

<u>Parking Stall Pavement Areas</u>

Material	Minimum Recommended Thickness
Superpave 9.5mm Type I Topping	1 ½ inch
Superpave 19mm Binder	2 inches
Graded Aggregate Base (GAB)	6 inches

Driveway and Aisles Parking Area

Material	Minimum Recommended Thickness
Superpave 9.5mm Type I Topping	2 inches
Superpave 19mm Binder	2 inches
Graded Aggregate Base (GAB)	8 inches

Concrete Pavement

Material	Minimum Recommended Thickness
Portland Cement Concrete	6 inches
Graded Aggregate Base (GAB)	6 inches

The concrete should be properly jointed, air-entrained, and should have a minimum 28-day compressive strength of 3500 psi. Expansion joints should be sealed with a polyurethane sealant so that moisture infiltration into the subgrade soils and resultant concrete deterioration at the joints is minimized.

All pavements should be sloped a minimum of one percent to provide rapid surface drainage. Water allowed to pond on or adjacent to the pavement could saturate the subgrade and cause premature pavement deterioration.

We recommend that the pavement subgrade moisture content be adjusted to be within 2 percentage points of optimum moisture prior to final preparation for pavement base placement. The subgrade should be evaluated by a representative of PSI immediately prior to placing GAB. The evaluation should include proofrolling of the final subgrade with a loaded tandem axle dump truck. If low consistency soils are encountered which cannot be adequately densified in place, such soils should be removed and replaced with well-compacted soil fill or crushed stone materials. We note that the subgrade surface should be recompacted prior to pavement construction in accordance with the "*Engineered Fill*" section of this report.

Graded Aggregate Base materials should be compacted to at least 98% of the modified Proctor (ASTM D 1557) maximum dry density near optimum moisture content.

The above sections represent minimum thickness representative of typical, local construction practices, and as such periodic maintenance should be anticipated.

4 REPORT LIMITATIONS

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area at the time of this report. No other warranties are implied or expressed.

The recommendations submitted are based on the soil information obtained by PSI and information provided by Capital Growth Buchalter. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation or other recommendations are required. If PSI is not retained to perform these functions, PSI cannot be responsible for the impact of those conditions on the performance of the project.

After the plans and specifications are more complete, the geotechnical engineer should be retained to review them to assess that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary commendations. This report has been prepared for the exclusive use of Capital Growth Buchalter for the specific application to the proposed Starbucks at 4383 Wade Green Road in Kennesaw, Cobb County Georgia.

Thank you for the opportunity to be of service on this project. Should you have any questions or if we can be of further assistance, please do not hesitate to contact our office.

For Professional Service Industries, Inc.

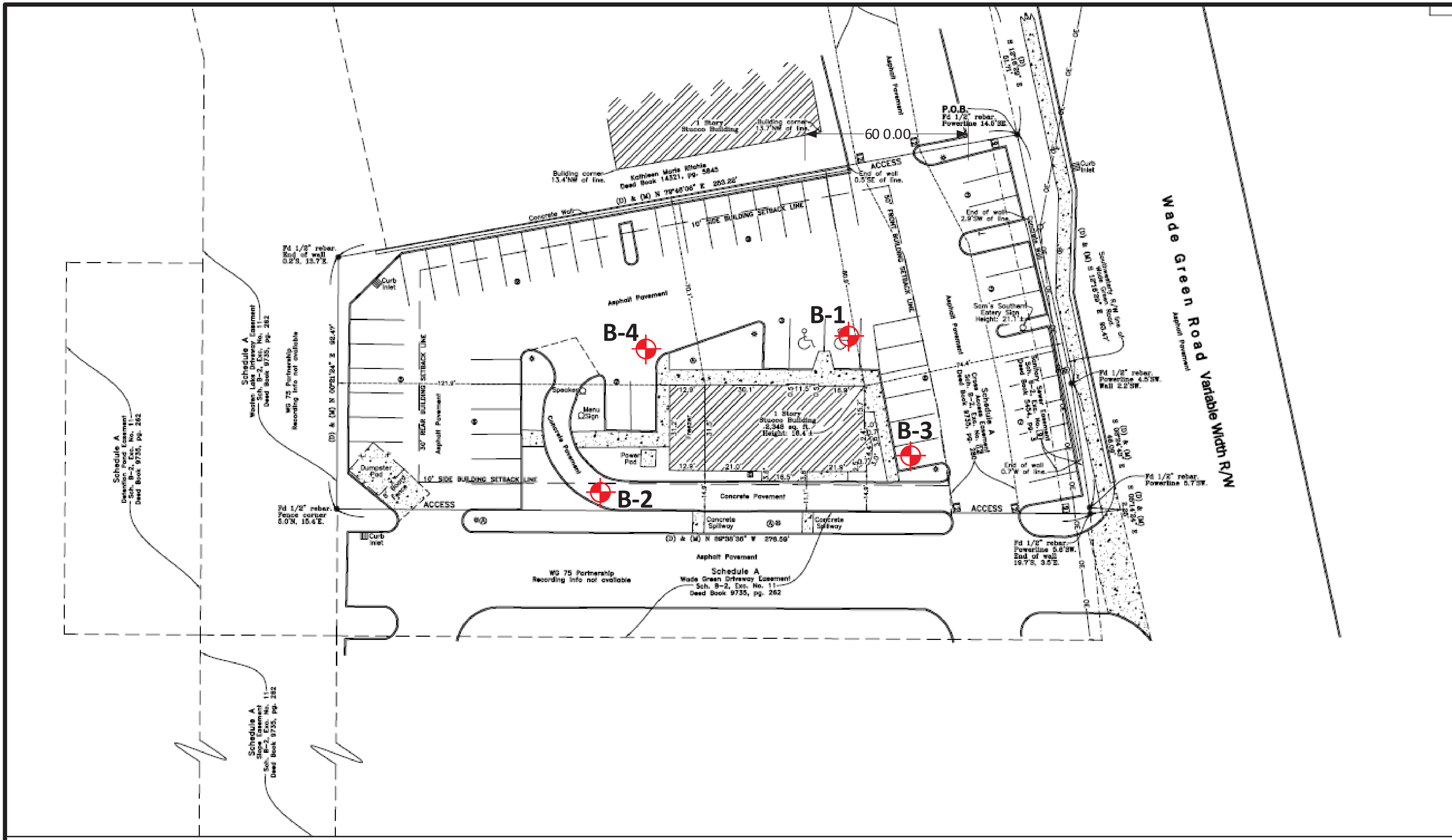
GEORGIA REGISTERED NO. 16632 PROFESSIONAL ENGINEER JOHN H. FIELY 12/11/18

John H. Fiely, PE
GA PE# 16632
Department Manager
Geotechnical Services

Lloyd T. Lasher, Jr.
Principal Consultant

Attachments: Boring Location Plan
Boring Logs
Soil Classification Chart

ATTACHMENTS



Test locations shown of client provided plan for indication of approximate test locations only.

Project Name:

Proposed Starbucks
4383 Wade Green Road
Kennesaw, Cobb County, Georgia

Boring Location Plan

Legend:

Approximate Boring Locations

0 ft. 30 ft. 50 ft. 100 ft.

Approximate Scale

N

Project No.: 472621

Date: December 2018

BORING B-1

DATE STARTED:	11/30/18	**DRILL COMPANY:**	Freedom Drilling
DATE COMPLETED:	11/30/18	**DRILLER:** Chad	**LOGGED BY:** J. Fiely
COMPLETION DEPTH	15.0 ft	**DRILL RIG:**	CME-550
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	L. Lasher
REMARKS:			

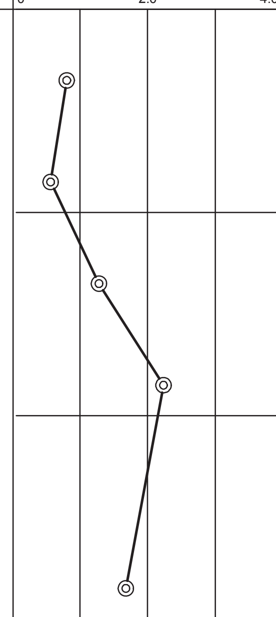
Water

While Drilling	N/A
Upon Completion	None
Delay	N/A

BORING LOCATION:

Elevation (feet)	Depth, (feet)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0	Asphalt Thickness = 2 inches				
		Graded Aggregate Base = 3 inches				
		FILL: Stiff Moist Red Brown SILT (ML), with sand	ML	6-5-5 N=10		
		RESIDUUM: Firm Moist Red Brown Silty CLAY (CL), trace topsoil	CL	2-3-4 N=7		
	5	Medium Dense Moist Red Brown Silty SAND (SM), with mica	SM	5-7-9 N=16		
	10	Medium Dense Moist Tan Micaceous Silty SAND (SM)	SM	7-11-17 N=28 5-8-13 N=21		
	15	Boring Terminated at 15 Feet				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0



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PROJECT NO.: 472621
PROJECT: Proposed Starbucks
LOCATION: 4383 Wade Green Road NW
Kennesaw, GA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-2

DATE STARTED:	11/30/18	**DRILL COMPANY:**	Freedom Drilling
DATE COMPLETED:	11/30/18	**DRILLER:** Chad	**LOGGED BY:** J. Fiely
COMPLETION DEPTH	15.0 ft	**DRILL RIG:**	CME-550
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	L. Lasher
REMARKS:			

Water

While Drilling	N/A
Upon Completion	None
Delay	N/A

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ / Moisture / PL / LL (0–25–50); STRENGTH, tsf Qu / Qp (0–2.0–4.0)	Additional Remarks
	0					Concrete Thickness = 9 inches					
						Graded Aggregate Base = 3 inches					
						FILL: Medium Dense Moist Red Brown Silty SAND (SM), with clay and trace topsoil	SM	3-4-7 N=11			
	5							4-5-5 N=10			
						RESIDUUM: Medium Dense Moist Brown Silty SAND (SM), trace clay	SM	7-10-8 N=18			
						Medium Dense Moist Brown Silty SAND (SM)	SM	4-7-10 N=17			
	10										
	15							5-8-8 N=16			
						Boring Terminated at 15 Feet					

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PROJECT NO.: 472621
PROJECT: Proposed Starbucks
LOCATION: 4383 Wade Green Road NW, Kennesaw, GA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-3

DATE STARTED:	11/30/18	**DRILL COMPANY:**	Freedom Drilling
DATE COMPLETED:	11/30/18	**DRILLER:** Chad	**LOGGED BY:** J. Fiely
COMPLETION DEPTH	15.0 ft	**DRILL RIG:**	CME-550
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	L. Lasher
REMARKS:			

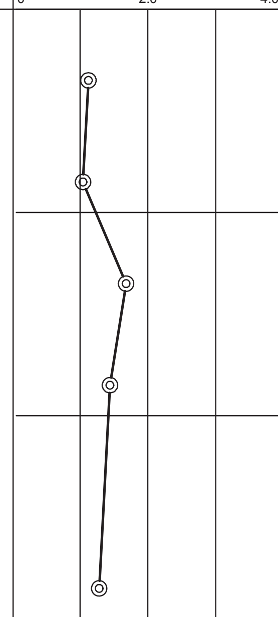
Water

▽	While Drilling	N/A
▼	Upon Completion	None
▽	Delay	N/A

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0					Asphalt Thickness = 2 inches				
						Graded Aggregate Base = 3 inches				
			SS			RESIDUUM: Medium Dense Moist Red Brown Silty SAND (SM), with clay	SM	4-5-9 N=14		
			SS			Medium Dense Moist Brown Red Micaceous Silty SAND (SM)		4-5-8 N=13		
	5		SS					6-8-13 N=21		
			SS				SM	4-7-11 N=18		
	10									
			SS					4-7-9 N=16		
	15					Boring Terminated at 15 Feet				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0



intertek psi
Professional Service Industries, Inc.
95 Chastain Road NW, Suite 301
Kennesaw, GA 30144
Telephone: (770) 424-6200

PROJECT NO.: 472621
PROJECT: Proposed Starbucks
LOCATION: 4383 Wade Green Road NW
Kennesaw, GA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-4

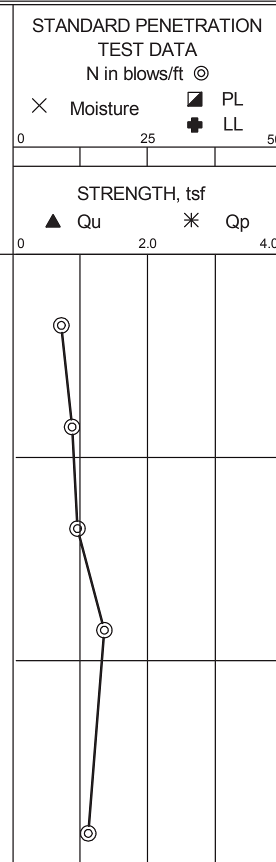
DATE STARTED:	11/30/18	**DRILL COMPANY:**	Freedom Drilling
DATE COMPLETED:	11/30/18	**DRILLER:** Chad	**LOGGED BY:** J. Fiely
COMPLETION DEPTH	15.0 ft	**DRILL RIG:**	CME-550
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	L. Lasher
REMARKS:			

Water

While Drilling	N/A
Upon Completion	None
Delay	N/A

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0					Asphalt Thickness = 3 inches				
						Graded Aggregate Base = 3 inches				
						FILL: Stiff Moist Red Brown Sandy SILT (ML), with clay and trace topsoil	ML	4-4-5 N=9		
								2-4-7 N=11		
	5							4-5-7 N=12		
						RESIDUUM: Medium Dense Moist Gray Brown Silty SAND (SM), trace mica	SM	3-6-11 N=17		
	10									
								3-6-8 N=14		
	15					Boring Terminated at 15 Feet				



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GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

- SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
- HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
- M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
- R.C.: Diamond Bit Core Sampler
- H.A.: Hand Auger
- P.A.: Power Auger - Handheld motorized auger

- SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
- ST: Shelby Tube - 3" O.D., except where noted.
- RC: Rock Core
- TC: Texas Cone
- BS: Bulk Sample
- PM: Pressuremeter
- CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

- N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
- N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
- Q_u: Unconfined compressive strength, TSF
- Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
- w%: Moisture/water content, %
- LL: Liquid Limit, %
- PL: Plastic Limit, %
- PI: Plasticity Index = (LL-PL),%
- DD: Dry unit weight, pcf
- ▼, ▽, ▼: Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated

Description	Criteria
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS