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Proposed Circle K Westlake

Westlake, Louisiana

Report of Subsurface Investigation

and Geotechnical Evaluation

Prepared For:
MDM Services, Inc.
Lakeland, FL
February 20, 2020

Baton Rouge Office

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SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials

February 20, 2020

MDM SERVICES, INC.
1055 Kathleen Rd.
Lakeland, FL 33805

ATTENTION: Mr. Barrett Sathianathan

REFERENCE: Report of Subsurface Investigation
and Geotechnical Engineering Evaluation
Proposed Circle K Westlake
Westlake, LA
SESI Project No: B19-223

Dear Mr. Sathianathan

Southern Earth Sciences, Inc (SESI) has completed the subsurface investigation and preliminary geotechnical engineering evaluation for the referenced project. This report presents our understanding of the available project information and outlines our soil-related recommendations and comments regarding construction of the proposed new structure.

We appreciate this opportunity to be of service. Please do not hesitate to contact us if you have any questions.

Sincerely,

SOUTHERN EARTH SCIENCES, INC.

Leigh E. Brister, E.I.
Project Manager
Registered, Louisiana 33949

STATE OF LOUISIANA
JOSEPH C. COBENA
License No. 42069
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING
2/20/2020

Joe Cobena, P.E.
Branch Manager
Registered, Louisiana 42069

LB/JC

Attachments

MDM Services, Inc.

Report of Subsurface Investigation and Geotechnical Engineering Evaluation
Proposed Circle K Westlake
Westlake, Louisiana
SESI Project No: B19-223
February 20, 2020

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APPENDIX

Test Location Plan

CPT Sounding Logs

Macro Core Logs

1.0 PROJECT INFORMATION

Based on our understanding of the provided information, the project will consist of a new Circle K store with associated underground gas tanks/pumps with canopy and signage. The proposed project site is located at 2336 Westwood Road in Westlake, Louisiana.

Detailed structural information was not available at the time of our investigation. For reporting purposes, we have assumed that the proposed building will be constructed and supported on conventional shallow foundations and typical slab on grade construction. We have assumed a maximum column and wall load of 25 kips and 2.0 kips per linear foot, respectively. Additionally, we assume the gas pump canopy foundation will be designed primarily to resist uplift forces. Furthermore, grading and topographic information was not provided at this time, reportedly, no more than two (2) feet of fill is anticipated to achieve the design grade.

At the time of our fieldwork, the site was heavily wooded, which caused access issues to our equipment resulting in two mobilizations to the project site. The site has since been partially cleared in certain areas to establish ingress/egress to our proposed test locations. Based on historical imagery from Google Earth, we understand the project site has never been developed.

2.0 FIELD INVESTIGATION

The field investigation included a total of five (5) Cone Penetrometer Test (CPT) soundings performed to depths ranging from 20 feet to 25 feet below existing grade. Additionally, macro core borings were performed to depths of about 10 feet below grade at each CPT location for a total of five (5) macro core borings. Due to the heavily wooded nature of the project site, SESI was unable to access all of the proposed test locations, and therefore mobilized to the project site on two different occasions. During the original field investigation, we performed test locations 'CPT-3,5/M-3,5'. Once the project site was cleared in order to allow access to our equipment, SESI remobilized to the site to complete the remainder of the proposed test locations ('CPT-1,2,4/M-1,2,4'). Test locations were performed in the field by SESI personnel using the provided site plan and reference to onsite features. Locations were marked and recorded using a handheld GPS accurate to 25 feet. A Test Location Plan is attached in the **Appendix.**

The CPT soundings were performed in general accordance with ASTM Specification D-5778. CPT Log sheets graphically showing the cone tip resistance, friction, equivalent SPT N-value, and interpreted soil behavior type at each sounding location are attached in the Appendix. Soil behavior types were interpreted from methods recommended by Robertson and Campanella. Correlations between Cone Resistance values and Standard Penetration Testing "N" values were performed according to the methods developed by Robertson, Campanella and Wightman. The soil types and stratigraphy shown on the CPT

Log sheets are based upon material parameters measured and evaluated as the cone is advanced. All reference to depth has been made with respect to the existing ground surface encountered during our field investigation.

3.0 SITE AND SUBSURFACE CONDITIONS

The following is a general description of subsurface conditions encountered during our site investigation. The descriptions provided below are brief and generalized. Additional details on soil layers and the collected data at each test location can be found on the individual CPT Sounding Logs attached in the **Appendix**. All reference to depth has been made with respect to the existing ground surface encountered during our field investigation.

3.1 Subsurface Conditions

Soils encountered on site vary with location, but generally consist of medium to very stiff lean and fat clay with varying amounts of silt content to a depth of about 10 feet. Below about 10 feet, medium dense to very dense clayey silt with varying amounts of clay and sand content extend to 25 feet, the maximum depth explored.

3.2 Groundwater

Groundwater was not encountered within the investigated depths at the time of our site investigation. It should be noted that fluctuation in the static groundwater table will occur due to variances in rainfall, elevation, drainage, types of soil encountered and other factors. Water can be perched at higher elevations in parts of the site above the general groundwater level during periods of wet weather. Groundwater levels should be verified prior to construction.

3.3 Presence of Expansive Soils

Based on the laboratory test results, the subsurface soils encountered within the building pad are considered to have high swelling potential. Generally, the subsurface soils with swelling potential above the ground water level and within the depths subjected to moisture content changes are expected to undergo volume change behavior and were considered in our potential vertical rise (PVR) estimation. **The potential vertical rise (PVR) is estimated to be 1.30 inches using an applied load of 1.0 psi.** The PVR estimates were performed using the TEX 124E method analyzing the upper 10 feet of soil.

One (1) inch of PVR is generally accepted as the maximum allowable value for design and construction. However, the Structural Engineer or others should determine if these PVR values are within the acceptable limits. These PVR estimations assume that the soils are allowed to increase/decrease in

moisture content from a relatively wet condition to a relatively dry condition over a depth of approximately ten (10) feet from the existing ground surface at the time of field exploration.

4.0 FOUNDATION RECOMMENDATIONS

Our evaluation of foundation conditions has been based on the project information and assumed foundation loadings previously described in this report and subsurface data obtained during the investigation. In evaluating the CPT soundings, we have relied on our experience with similar soil conditions and the use of empirical correlations between standard penetration resistances and foundation performance observed in soil conditions similar to those encountered at the subject site.

Soils encountered generally consist of medium to very stiff lean/fat clays. After analysis of subsurface conditions and provided/assumed data, SESI determined that due to the high swell potential of the subsurface soils encountered at the site, the building can be supported by either conventional shallow spread foundations and slab on grade construction, after the upper four (4) feet of insitu soil are undercut and replaced with a low-swell structural fill material, or by a stiffened, post-tensioned slab with grade beam foundation system with a minimal amount of cut and fill. Recommendations for each option can be found in **Section 4.3 and 4.4.** The proposed canopy and underground tanks can be supported on traditional shallow foundations assuming that some differential movement can be tolerated. The previously outlined foundation systems can be used to support the proposed structures assuming the site preparation measures discussed in the following sections are completed. Site preparation and foundation recommendations are discussed in the following sections of this report.

4.1 Site Preparation Recommendations

Based on our experience with similar site conditions, effective drainage, including ditching and positive grading, should be established across the working areas during the initial stages of site grading, and modified as necessary during construction. Once adequate site drainage is in place, the initial step in site preparation should be the complete removal of topsoil and organic-laden material, stumps and roots, debris, rubble, any existing abandoned foundations, utilities and pavements.

Excavation depths required during the initial site preparations to ensure complete removal of all organic laden material will vary with location and are expected to range from 12 to 18 inches below existing grade. Areas of deeper undercut are anticipated and should be planned for. We expect deeper undercut depths in the lower elevations of the site to remove soft and/or organic laden soils prior to fill placement. Any over-excavated areas should be backfilled using well-compacted structural fill placed in horizontal lifts as described below.

The exposed subgrade in areas to support pavements, structures, or fill embankments should be proof rolled with a loaded dump truck or heavy compaction equipment. Any areas that deflect excessively

under the equipment and do not stabilize with further compaction should be lowered further by excavation until more stable material is reached.

Pavement areas that contain deeper unstable soils that are not practical to fully undercut can typically be stabilized by partial undercutting of unstable surface materials, placement of a geotextile fabric or geogrid, and placement of a bridge lift of 24 to 36 inches of clean sand material with less than 10 percent passing the No. 200 mesh sieve. Structural fill placed over the bridge lift should be compacted in accordance with project specifications for structural fill.

Excavations made as part of the undercutting or foundation construction should remain open for the least amount of time practical. If soils at the bottom of the excavation are disturbed, saturated, or otherwise become unstable, the excavation should be extended deeper to stable materials. Care should be taken to ensure that any soft or excessively yielding areas are undercut to firmer materials. All demolished pavements and other debris should be disposed of offsite. Since the lateral and vertical extent may vary, we recommend the excavation and backfilling operation be observed by an experienced soils technician under the direct supervision of the registered project geotechnical engineer of record.

4.2 Structural Fill

Imported structural fill material shall consist of lean clays and sandy lean clays (CL) or clayey sands (SC) having the following material properties: a maximum plasticity index of 22, inert material (non-expansive soil), free of organics (>5%), and a maximum particle size of 2 inches. Fill material should be compacted in 10-inch (maximum) lifts to at least 95 percent of the soil's standard Proctor maximum dry density as determined by ASTM D 1557, Method "A". In place density tests should be made at frequent intervals to measure the effectiveness of the compaction operations. Samples of candidate fill material should be submitted to SESI prior to construction to verify that the fill material is suitable for use as structural fill and to establish compaction moisture-density relationships for use as reference for the field density testing.

4.3 Conventional Shallow Spread Foundations

Based on the laboratory test results, the soils encountered during our field investigation are considered to have high swelling potential which could cause damage to structures sensitive to movement. In order to bring the swell potential within acceptable parameters (less than one (1) inch) the addressee should undercut and replace the in-situ soils within the building pad areas with imported structural fill material to a depth of approximately four (4) feet below the existing ground surface. Imported structural fill parameters can be found in **Section 4.2** of this report. Undercutting and replacing the in-situ soils will reduce the swelling potential of the soils to acceptable parameters, allowing for the design of conventional shallow spread foundations for the new building. The

proposed canopy and underground tanks can be supported on conventional shallow spread foundations as follows, assuming some differential movement can be tolerated.

After site preparation operations have been completed as previously discussed, shallow footings bearing at least 18 inches below surrounding grade may be designed for an allowable soil bearing pressure of up to 2,000 psf. Minimum footing widths of 18 and 24 inches for strip and column footings, respectively, should be observed. Soils exposed in the bottom of footing excavations should be compacted to a minimum of 95 percent of the standard Proctor maximum dry density to a depth of at least 12 inches below the footing bearing elevation. The bottom of all footing excavations should be observed by an experienced soil technician. Any footing areas found to contain unsuitable materials, poorly compacted soils, or soils that have become softened due to exposure to weather should be undercut and backfilled with new well-compacted structural fill prior to footing construction.

Settlements of properly constructed shallow foundations supporting the assumed structural loads are expected to be less than 1-inch and are anticipated to occur relatively rapidly during placement of fill, construction of the building, and upon initial loading. Differential settlements are expected to be within tolerable limits.

4.4 Post-Tensioned Slab and Grade Beam Design Parameters

Provided the site is prepared as described in the "Site Preparation Recommendations" section, lightly to moderately loaded structures not sensitive to settlement may be supported on post-tensioned slab-on-grade system. **The grade beams/ribs should bear within properly compacted insitu soils or structural fill material, a minimum of 18 inches below the lowest adjacent finished grade, and can be designed for an allowable bearing pressure of 2,000 psf.**

The soil parameters for the design of waffle slab are as follows:

1. Differential Soil Movement:

Differential Soil Movement	Existing Soil Conditions
$y_{m\ center}$ (inches)	0.83
$y_{m\ edge}$ (inches)	0.76

2. Edge Moisture Variation:

Edge Moisture Variation	Existing Soil Conditions
$e_{m\ center}$ (feet)	9.0
$e_{m\ edge}$ (feet)	5.3

3. Sub-Grade Friction Coefficient, μ = 1.0 (if slab is cast on sand)
   μ = 0.75 (if slab is cast on polyethylene sheeting)

4. Average Unconfined Compressive Strength, q_u = 1,250 psf

5. The Potential for Vertical Rise (PVR) is estimated to be **1.30 inches** at the project site for an applied pressure of about **1.0 psi**.

These parameters were calculated following the procedures of the *PTI Design of Post-Tensioned Slabs-on-Ground*, 3rd Edition (2008). Potential vertical rise was calculated following the procedures of Tex-124-E method. Furthermore, they are based on correlations established with the results of the tests performed at the time of the original subsurface investigation. When specific data was not available, the most conservative values were assumed.

SESI understands that for 12-inch-wide grade beams, the effective bearing width is anticipated to be in the order of about four (4) feet for exterior beams and two (2) feet for interior beams. Based on this, total and differential settlements for a continuous loading condition with the above anticipated effective bearing widths are expected to be less than 1.0 inch. Settlements were estimated for a net allowable bearing pressure on the order of about 2,000 psf over the anticipated effective bearing widths, plus a net fill amount of about two (2) feet or less, using empirical correlations between Atterberg Limits and compressibility. While settlement of this magnitude is generally considered tolerable for structures of the type proposed, the Structural Engineer shall confirm if these magnitudes are within tolerance limits. If not, SESI shall be notified in order to provide some remedial measures and/or change the foundation type.

The bottom of the foundation excavations must be dry, clean and free of loose, soft materials and construction debris prior to placement of steel or concrete. It should be observed by SESI's Geotechnical Engineer or his representative prior to steel or concrete placement. Concrete shall be

poured as quickly as possible to avoid exposure of the footing materials to moisture changes (wetting or drying). Surface run-off water should be channeled away from the excavation and not be allowed to pond. If for any reason the excavation is required to be open for more than one (1) day, it shall be protected to minimize moisture loss/gain.

4.5 Building Floor Slab

It is understood that either a traditional or post-tensioned slab design will be used to support the building floor slab. Any soft or unstable soils encountered should be removed from the floor slab area prior to fill placement and/or floor slab construction. These soils should be replaced with properly compacted structural fill as described in this report.

In order to assist with drainage and to increase the modulus of subgrade reaction (k value), a four (4) inch thick free-draining granular mat may be used. The soil surface shall be graded to drain away from the building without low spots that can trap water prior to placing the granular drainage layer. Polyethylene sheeting should be placed to act as a vapor retarder where the floor will be in contact with moisture sensitive equipment or products such as tile, wood, carpet, etc., as directed by the design engineer. The decision to locate the vapor retarder in direct contact with the slab or beneath the layer of granular fill should be made by the design engineer after considering the moisture sensitivity of subsequent floor finishes, anticipated project conditions, and the potential effects of slab curling and cracking. The floor slabs should have an adequate number of joints to reduce cracking resulting from differential movement and shrinkage.

For subgrade prepared as recommended and properly compacted fill, a modulus of subgrade reaction (k value) of 120 pounds per cubic inch (pci) may be used in the grade slab design. If a four (4) inch granular layer is used, a modulus of subgrade reaction (k value) of 140 pounds per cubic inch (pci) may be used.

4.6 Floor Slab Precautions

The precautions listed below are for informational purposes for the construction of traditional or post-tensioned slab-on-grade pads. These details will not reduce the amount of movement but are intended to reduce potential damage should some settlement of the supporting subgrade take place. Some increase in moisture content is inevitable as a result of development and associated landscaping. However, extreme moisture content increases can be largely controlled by proper and responsible site drainage, building maintenance and irrigation practices.

- Cracking of slab-on-grade concrete is normal and should be expected. Cracking can occur not only as a result of heaving or compression of the supporting soil material, but also as a result of concrete curing stresses. The occurrence of concrete shrinkage cracks and problems

associated with concrete curing may be reduced and/or controlled by limiting the slump 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 three times the thickness of the slab (in inches) in both directions. For example, joints are recommended at a maximum spacing of twelve (12) feet based on having a four-inch slab. SESI also recommends that the slab be independent of the foundation walls. Using fiber reinforcement in the concrete can also control shrinkage cracking.

- Areas supporting slabs should be properly moisture conditioned and compacted. Backfill in all interior and exterior water and sewer line trenches should be carefully compacted to reduce the shear stress in the concrete extending over these areas.

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.

5.0 PAVEMENT RECOMMENDATIONS

Recommendations for pavements in the parking and drive areas are based on the macro core borings performed at the proposed parking/drive areas, the assumption that final grades will be at or slightly above existing grades (within 1 to 2 feet) and typical vehicular traffic characteristics for a project of this type. These typical minimum pavement sections are based on our experience with similar project assuming mostly passenger vehicle traffic.

Site preparation for parking and drive areas should generally be the same as outlined in **Section 4.1** to include complete removal of topsoil, organics, tree root systems, abandoned utilities, etc. Excavations should extend as required by grades to allow placement of at least 12 inches of improved compacted fill below final subgrade elevation. Tables 1 and 2 outline the minimum recommended pavement section for flexible and rigid pavement design. Rigid pavement for pedestrian walkways can be placed directly on prepared subgrade.

Based on our empirical analysis from field and lab test results, a Modulus of Subgrade Reaction (k) of 100 pci should be assigned to the near surface soils. With these assumptions, it is possible to use a typical "standard" pavement section consisting of the following:

TABLE 1

Recommended Minimum Rigid Pavement Section

Paved Area	Compacted Fill Thickness	Aggregate Base[2, 3]	Concrete [1] (4000 psi)
Automobile Parking Areas	12 inches	4 inches	5 inches
Standard Duty Drives	12 inches	4 inches	6 inches
Heavy Duty Drives	12 inches	6 inches	7 inches
Entrances and Dumpster Pads	12 inches	6 inches	8 inches

1. Proper finishing of concrete pavement requires the use of appropriate construction joints to reduce cracking. Construction joints shall be designed in accordance with the current Portland Cement. Association and the American Concrete Institute guidelines (ACI330R-08). Joints should be sealed to reduce the potential for water infiltration into the supporting soils. The design of steel reinforcement should be in accordance with current accepted codes.
2. Aggregate base should consist of 610 Limestone or other approved base course Class II base course installed and tested in accordance with section 302 of 2016 LSSRB.
3. 12 inch cement and/or lime treated fill base constructued in accordance with Section 305 of the 2016 LSSRB can be substituted for the aggregate base. Actual cement and lime addition rates should be based on classification testing perfromed on actual proposed fill at time of construction in accordance with Section 305.04(a).

TABLE 2

Recommended Minimum Flexible Pavement Section

Paved Area	Compacted Fill Thickness [2]	Aggregate Base[1, 2]	Asphalt Surface and Binder
Automobile Parking Areas	12 inches	6 inches	3 inches
Standard Duty Drives	12 inches	6 inches	4 inches
Heavy Duty Drives	12 inches	8 inches	4 inches

1. Aggregate base should consist of 610 Limestone or other approved base course Class II base course installed and tested in accordance with section 302 of 2016 LSSRB.
2. 12 inch cement and/or lime treated fill base constructued in accordance with Section 305 of the 2016 LSSRB can be substituted for the aggregate base. Actual cement and lime addition rates should be based on classification testing perfromed on actual proposed fill at time of construction in accordance with Section 305.04(a).

The base courses should be compacted to at least 95 percent of maximum dry density near the optimum moisture content in accordance with ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

Pavement materials may be placed after the subgrade or structural fill has been properly proof rolled or compacted, and fine-graded. These activities shall be accomplished following the 2016 Louisiana Department of Transportation and Development Standard Specifications for Road and Bridge (LSSRB) construction guidelines.

5.1 Moisture Control and Drainage for Pavements

One of the most destructive elements that pavement will be subjected to in its design lifetime is the presence of excess moisture. Therefore, pavements should be adequately sloped, and sufficient drainage provided such that excess water is allowed to run off before it can migrate into the pavement system. Sprinkler systems, if utilized in landscaped areas, should be properly installed and aimed such that they do not continually wet the paved surfaces.

6.0 GENERAL COMMENTS AND LIMITATIONS

While the CPT soundings are representative of subsurface conditions at the respective location and for the respective vertical reaches, local variations characteristic of the subsurface materials of the region are anticipated and may be encountered. The delineation between soil types shown on the log is approximate and the description represents our interpretation of subsurface conditions at the designated testing location and on the particular date performed.

This report has been prepared in order to aid in the evaluation of this project and to assist the engineers in the structural design. It is intended for use with regard to the specific project discussed herein and any substantial changes in the project, loads, locations, or assumed grades should be brought to our attention so that we may determine how such changes may affect our conclusions and recommendations. We would appreciate the opportunity to review the plans and specifications for construction to ensure that our conclusions and recommendations are interpreted correctly.

Professional judgments on design alternatives and criteria are presented in this report. These are based partly on our evaluations of technical information gathered, partly on our understanding of the

characteristics of the project being planned, and partly on our general experience with subsurface conditions in the area. We do not guarantee performance of the project in any respect, only that our engineering work and judgments rendered meet the standard of care of our profession.

As the project geotechnical engineer of record that developed the foundation design recommendations, please be aware that we cannot accept responsibility for the performance of the foundation system if we are not afforded the opportunity to confirm that our recommendations have been followed. Accordingly, we recommend that Southern Earth Sciences, Inc. be retained on this project to perform observation and field-testing services during the construction phase of the foundation system.

This report is exclusively for the use and benefit of the addressee(s) identified on the first page of this report and is not for the use or benefit of, nor may it be relied upon by any other person or entity. The contents of this report may not be quoted in whole or in part or distributed to any person or entity other than the addressee(s) hereof without, in each case, advanced written consent.

APPENDIX

Test Location Plan

CPT Sounding Logs

Macro Core Logs

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PROPOSED CIRCLE K WESTLAKE
WESTLAKE, LOUISIANA
SESI FILE NO.: B19-223

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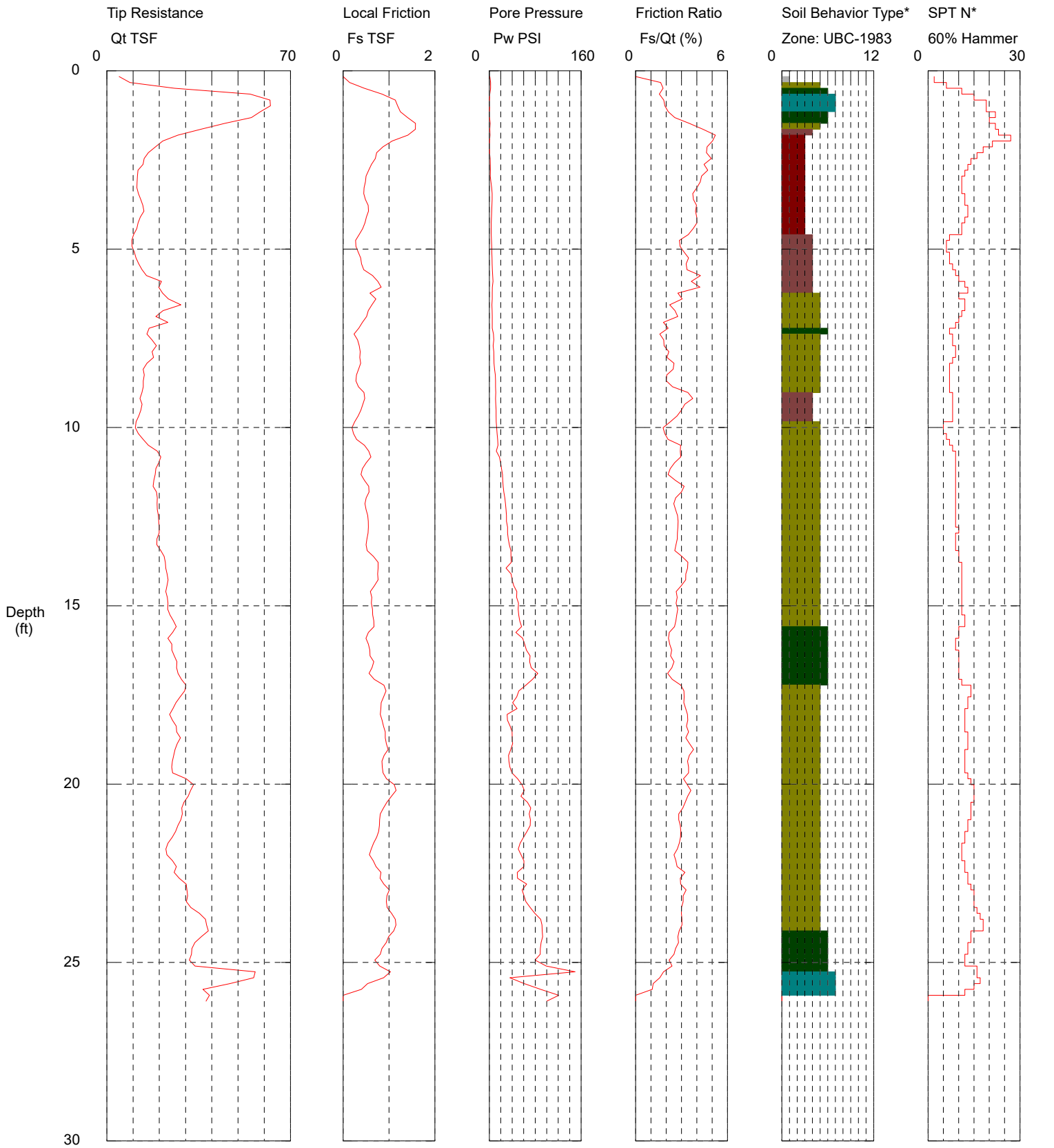
FIGURE 1
TEST LOCATION PLAN

SOUTHERN EARTH SCIENCES, INC.

Operator: DUSTIN THOMPSON
Sounding: CPT-1
Cone Used: DSG1034
GPS Location: 30°15'49.80"N 93°15'26.75"W

CPT Date/Time: 1/15/2020 10:23:22 AM
Location: CIRCLE K WESTLAKE
Job Number: B19-223



Maximum Depth = 26.08 feet

Depth Increment = 0.164 feet

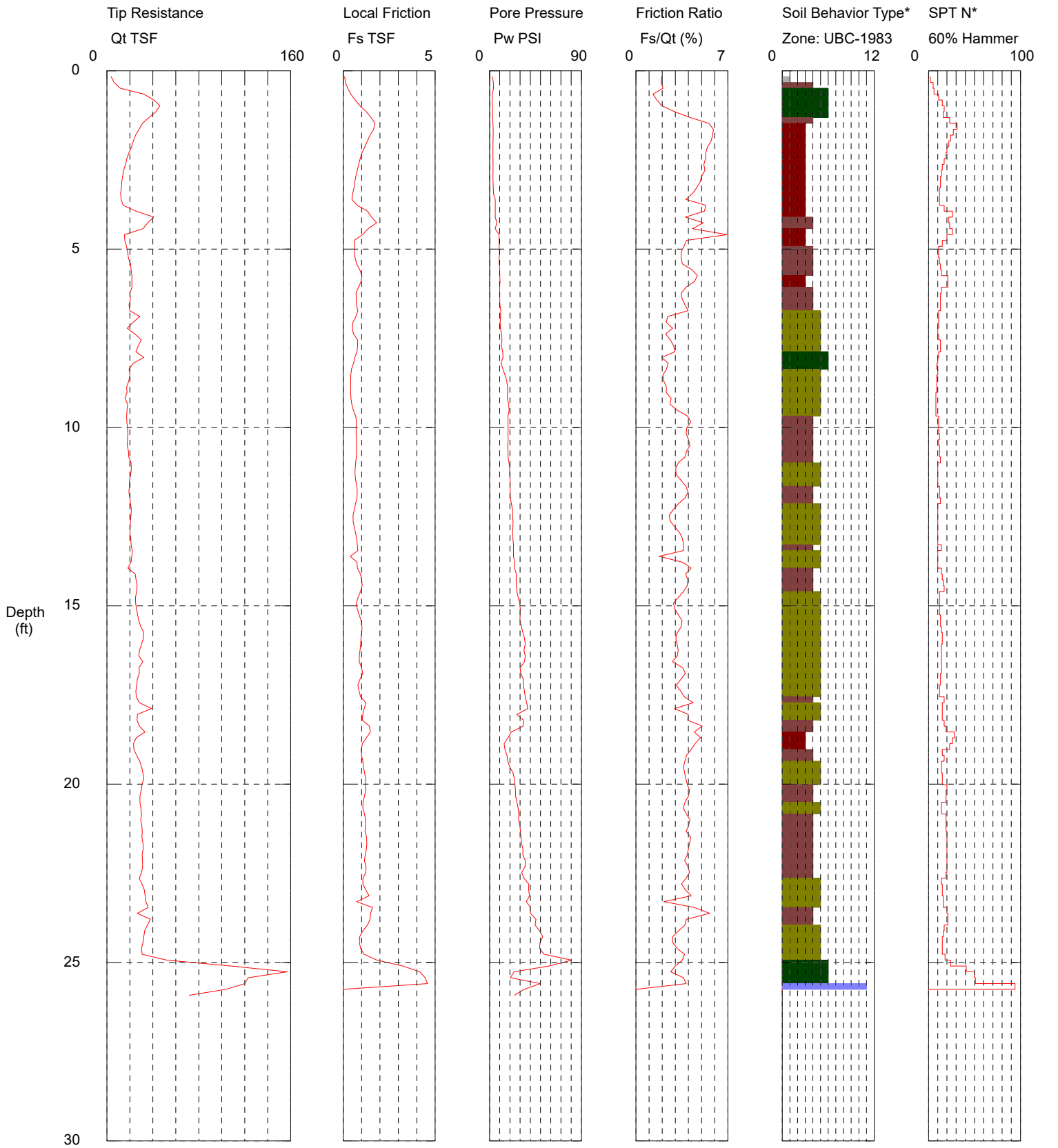
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

SOUTHERN EARTH SCIENCES, INC.

Operator: DUSTIN THOMPSON
Sounding: CPT-2
Cone Used: DSG1034
GPS Location: 30°15'49.05"N 93°15'26.93"W

CPT Date/Time: 1/15/2020 10:51:02 AM
Location: CIRCLE K WESTLAKE
Job Number: B19-223



Maximum Depth = 25.92 feet

Depth Increment = 0.164 feet

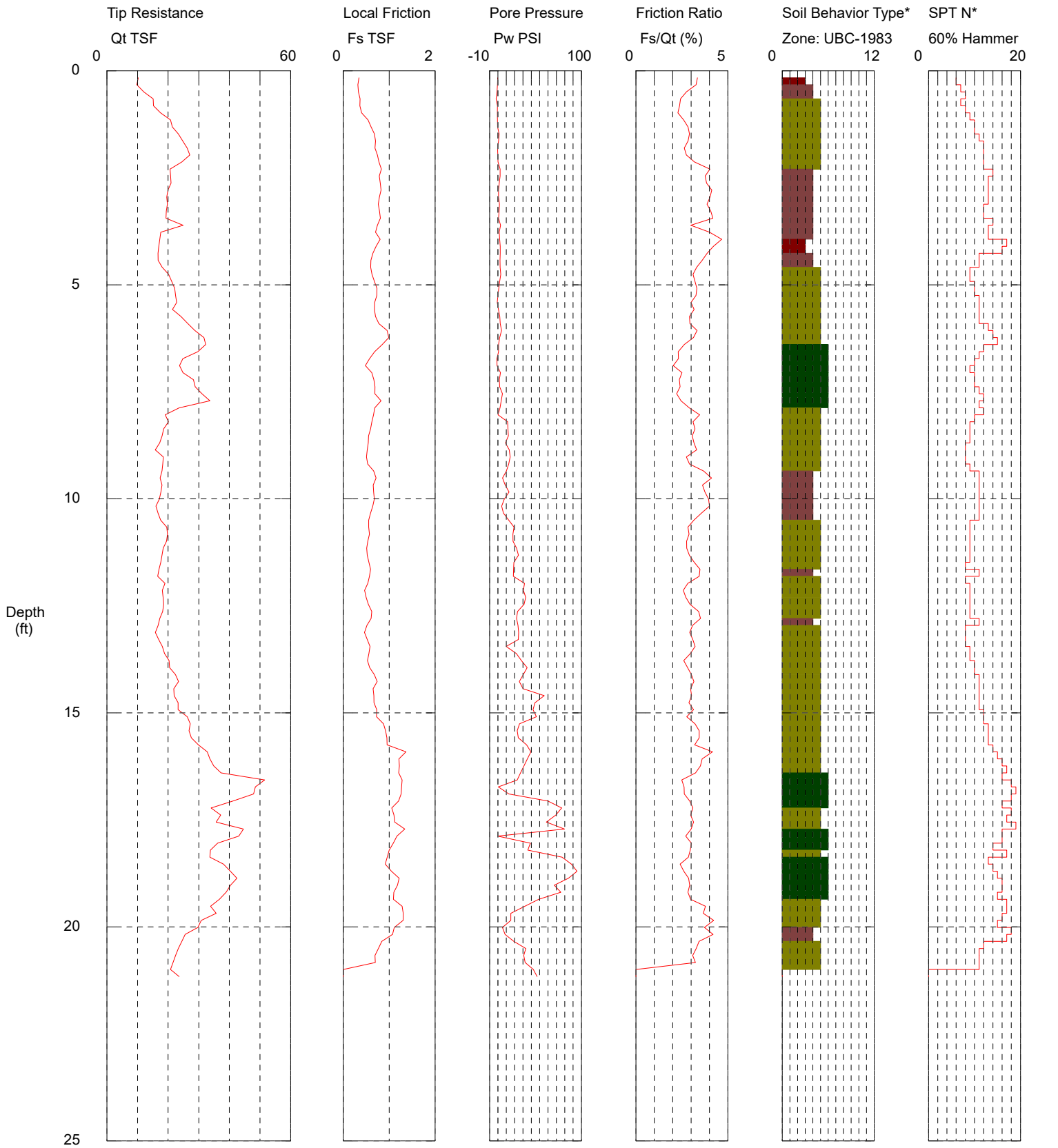
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

SOUTHERN EARTH SCIENCES, INC.

Operator: DUSTIN THOMPSON
Sounding: CPT-3
Cone Used: DSG1034
GPS Location: 30°15'48.75"N 93°15'28.69"W

CPT Date/Time: 10/10/2019 9:30:55 AM
Location: CIRCLE K WESTLAKE
Job Number: B19-223



Maximum Depth = 21.16 feet

Depth Increment = 0.164 feet

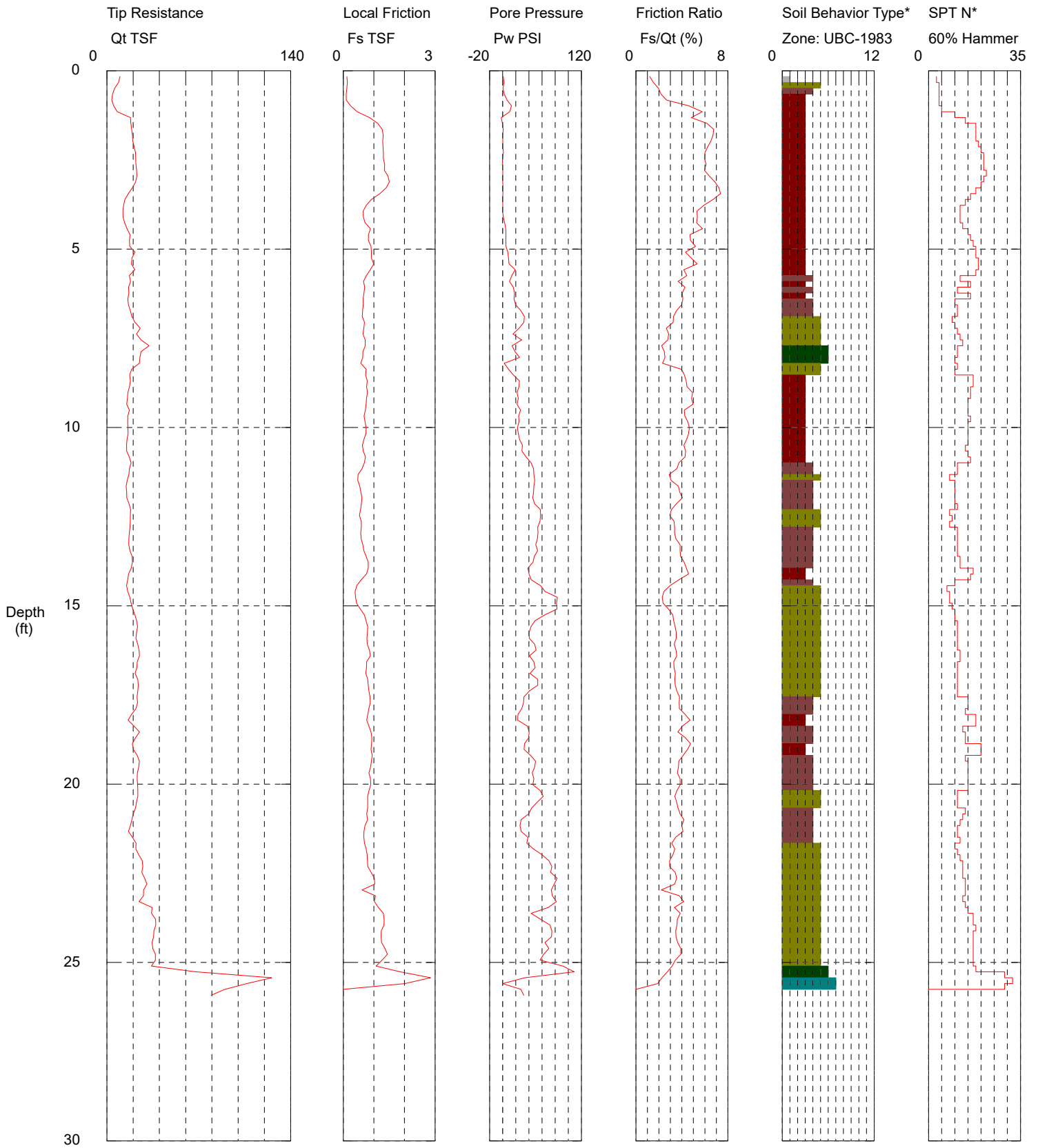
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

SOUTHERN EARTH SCIENCES, INC.

Operator: DUSTIN THOMPSON
Sounding: CPT-4
Cone Used: DSG1034
GPS Location: 30°15'49.43"N 93°15'27.99"W

CPT Date/Time: 1/15/2020 9:57:57 AM
Location: CIRCLE K WESTLAKE
Job Number: B19-223



Maximum Depth = 25.92 feet

Depth Increment = 0.164 feet

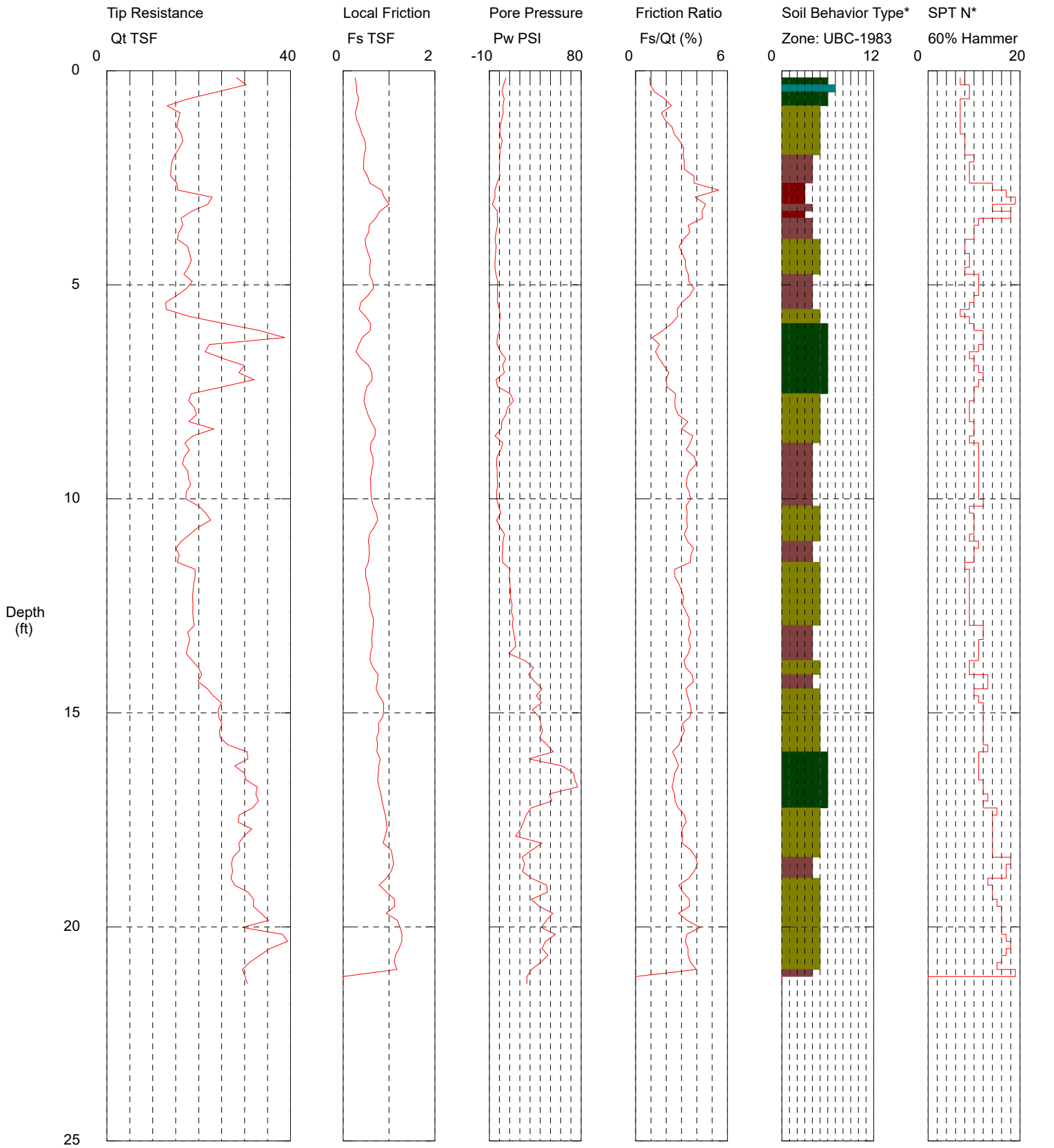
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

SOUTHERN EARTH SCIENCES, INC.

Operator: DUSTIN THOMPSON
Sounding: CPT-5
Cone Used: DSG1034
GPS Location: 30°15'48.75"N 93°15'28.69"W

CPT Date/Time: 10/10/2019 9:10:07 AM
Location: CIRCLE K WESTLAKE
Job Number: B19-223



Maximum Depth = 21.33 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

BORING LOG

BORING NO.: M-1
PROJECT: CIRCLE K WESTLAKE
PROJECT LOCATION: WESTLAKE, LA
BORING LOCATION: 30°15'49.80"N 93°15'26.75"W
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: JC
METHOD: MACROCORE

PROJECT NO.: B19-223
DATE DRILLED: 01/15/20
DATE COMPLETED: 01/15/20
DEPTH TO WATER LEVEL: NE
WATER LEVEL DATE: 01/15/20
LOGGED BY: DT
DRILLER: SESI

DEPTH (FEET)	SAMPLE	Moisture Content (%)	LL	PI	SYMBOL	MATERIAL CLASSIFICATION
1		31	40	22		Gray Lean CLAY with roots (CL)
2						Light Gray and Tan Fat CLAY (CH)
3		23	60	43		
4						
5						Reddish Tan and Light Gray Fat CLAY with silt pockets and ferrous nodules (CH)
6		25				
7						
8						
9		25				
10						Bottom at 10 Feet
11						
12						
13						
14						
15						

COMMENTS: NE = Not Encountered

MCORE

SOUTHERN EARTH SCIENCES, INC.

BORING LOG

BORING NO.: M-2
PROJECT: CIRCLE K WESTLAKE
PROJECT LOCATION: WESTLAKE, LA
BORING LOCATION: 30°15'49.05"N 93°15'26.93"W
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: JC
METHOD: MACROCORE

PROJECT NO.: B19-223
DATE DRILLED: 01/15/20
DATE COMPLETED: 01/15/20
DEPTH TO WATER LEVEL: NE
WATER LEVEL DATE: 01/15/20
LOGGED BY: DT
DRILLER: SESI

DEPTH (FEET)	SAMPLE	Moisture Content (%)	LL	PI	SYMBOL	MATERIAL CLASSIFICATION
1		29				Gray and Brown Lean CLAY with roots (CL)
2						
3						Tan and Light Gray Fat CLAY with ferrous nodules and calcareous nodules (CH)
4		24	58	41		
5						Reddish Tan and Light Gray Fat CLAY with silt pockets (CH)
6		23				
7						
8						
9		27	62	42		
10						Bottom at 10 Feet
11						
12						
13						
14						
15						

COMMENTS: NE = Not Encountered

MCORE

SOUTHERN EARTH SCIENCES, INC.

BORING LOG

BORING NO.: M-3
PROJECT: CIRCLE K WESTLAKE
PROJECT LOCATION: WESTLAKE, LA
BORING LOCATION: 30°15'50.16"N 93°15'28.49"W
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: JC
METHOD: MACROCORE

PROJECT NO.: B19-223
DATE DRILLED: 10/10/19
DATE COMPLETED: 10/10/19
DEPTH TO WATER LEVEL: NE
WATER LEVEL DATE: 10/10/19
LOGGED BY: DT
DRILLER: SESI

DEPTH (FEET)	SAMPLE	Moisture Content (%)	LL	PI	SYMBOL	MATERIAL CLASSIFICATION
1		16	30	13		Gray and Tan Lean CLAY with roots (CL)
2						Reddish Tan, Tan, and Light Gray Fat CLAY with calcareous nodules and silt pockets (CH)
3		26	67	51		
4						
5						
6		22	54	37		
7						
8						
9		23				
10						Bottom at 10 Feet
11						
12						
13						
14						
15						

COMMENTS: NE = Not Encountered

MCORE

SOUTHERN EARTH SCIENCES, INC.

BORING LOG

BORING NO.: M-4
PROJECT: CIRCLE K WESTLAKE
PROJECT LOCATION: WESTLAKE, LA
BORING LOCATION: 30°15'49.43"N 93°15'27.99"W
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: JC
METHOD: MACROCORE

PROJECT NO.: B19-223
DATE DRILLED: 01/15/20
DATE COMPLETED: 01/15/20
DEPTH TO WATER LEVEL: NE
WATER LEVEL DATE: 01/15/20
LOGGED BY: DT
DRILLER: SESI

DEPTH (FEET)	SAMPLE	Moisture Content (%)	LL	PI	SYMBOL	MATERIAL CLASSIFICATION
1		19				Gray Lean CLAY with roots (CL)
2						
3						Tan and Light Gray Fat CLAY with calcareous nodules (CH)
4		24	56	40		
5						Light Gray and Reddish Tan Fat CLAY with silty sand pockets (CH)
6		24	55	38		
7						
8						
9		27				
10						Bottom at 10 Feet
11						
12						
13						
14						
15						

COMMENTS: NE = Not Encountered

MCORE

SOUTHERN EARTH SCIENCES, INC.

BORING LOG

BORING NO.: M-5
PROJECT: CIRCLE K WESTLAKE
PROJECT LOCATION: WESTLAKE, LA
BORING LOCATION: 30°15'48.75"N 93°15'28.69"W
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: JC
METHOD: MACROCORE

PROJECT NO.: B19-223
DATE DRILLED: 10/10/19
DATE COMPLETED: 10/10/19
DEPTH TO WATER LEVEL: NE
WATER LEVEL DATE: 10/10/19
LOGGED BY: DT
DRILLER: SESI

DEPTH (FEET)	SAMPLE	Moisture Content (%)	LL	PI	SYMBOL	MATERIAL CLASSIFICATION
1		20				Gray and Tan Lean CLAY with roots (CL)
2						Reddish Tan, Tan, and Light Gray Fat CLAY with calcareous nodules and ferrous nodules (CH)
3		21	59	44		
4						
5						
6		23	56	41		
7						
8						Reddish Tan, Tan, and Light Gray Lean CLAY with calcareous nodules and sand (CL)
9		22	38	25		
10						Bottom at 10 Feet
11						
12						
13						
14						
15						

COMMENTS: NE = Not Encountered

MCORE

SOUTHERN EARTH SCIENCES, INC.

SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing

Laboratory Test Results

Project: **Circle K Westlake** | **Technical Responsibility:** JC | **Quality Assurance Officer:** RLJ

Client: MDM Services, Inc. | Project No.: **B19-223** | PM: LB | Date Drilled: 1/15/2020

Boring No.	Depth (ft)	Classification	ASTM DESIGNATION D2216 ω %	D4318 Atterberg Limits LL	PL	PI	D2166 γ_{wet} pcf	γ_{dry} pcf	D2166 Cohesion U psf	D2850 UU psf	Confining Pressure psi	D422, C136 or C117 Grain Size (%) Gravel	Sand	Silt	Clay	% Passing #200	USCS	Remarks
M-1	0-2	Gray Lean CLAY with roots	30.8	40	18	22											(CL)	30°15'49.80"N 93°15'26.75"W
M-1	2-4	Light Gray and Tan Fat CLAY	22.8	60	17	43											(CH)	Water Level = Not Encountered
M-1	5-7.5	Reddish Tan and Light Gray Fat CLAY with silt pockets and ferrous nodules	25.1														(CH)	
M-1	7.5-10	Reddish Tan and Light Gray Fat CLAY with silt pockets and ferrous nodules	25.4														(CH)	
M-2	0-2.5	Gray and Brown Lean CLAY with roots	29.4														(CL)	30°15'49.05"N 93°15'26.93"W
M-2	2.5-5	Tan and Light Gray Fat CLAY with ferrous nodules and calcareous nodules	23.9	58	17	41											(CH)	Water Level = Not Encountered
M-2	5-7.5	Reddish Tan and Light Gray Fat CLAY with silt pockets	23.1														(CH)	
M-2	7.5-10	Reddish Tan and Light Gray Fat CLAY with silt pockets	27.2	62	20	42											(CH)	
M-4	0-2.5	Gray Lean CLAY with roots	19.0														(CL)	30°15'49.43"N 93°15'27.99"W
M-4	2.5-5	Tan and Light Gray Fat CLAY with calcareous nodules	23.8	56	16	40											(CH)	Water Level = Not Encountered
M-4	5-7.5	Light Gray and Reddish Tan Fat CLAY with silty sand pockets	23.5	55	17	38											(CH)	
M-4	7.5-10	Light Gray and Reddish Tan Fat CLAY with silty sand pockets	27.2														(CH)	

SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing

Laboratory Test Results

Project: **Circle K Westlake** | **Technical Responsibility:** JC | **Quality Assurance Officer:** RLJ

Client: MDM Services, Inc. | Project No.: **B19-223** | PM: LB | Date Drilled: 10/10/2019

Boring No.	Depth (ft)	Classification	ASTM DESIGNATION D2216 ω %	D4318 Atterberg Limits LL	PL	PI	D2166 γwet pcf	γdry pcf	D2166 Cohesion U psf	D2850 UU psf	Confining Pressure psi	D422, C136 or C117 Grain Size (%) Gravel	Sand	Silt	Clay	% Passing #200	USCS	Remarks
M-3	0-1.5	Gray and Tan Lean CLAY with roots	16.0	30	17	13											(CL)	30°15'50.16"N 93°15'28.49"W
M-3	1.5-4	Reddish Tan, Tan, and Light Gray Fat CLAY with calcareous nodules	25.8	67	16	51											(CH)	Water Level = Not Encountered
M-3	5-7.5	Reddish Tan, Tan, and Light Gray Fat CLAY with calcareous nodules and silt pockets	22.1	54	17	37											(CH)	
M-3	7.5-10	Reddish Tan, Tan, and Light Gray Fat CLAY with calcareous nodules and silt pockets	22.6														(CH)	
M-5	0-1.5	Gray and Tan Lean CLAY with roots	20.2														(CL)	30°15'48.75"N 93°15'28.69"W
M-5	1.5-4	Reddish Tan, Tan, and Light Gray Fat CLAY with calcareous nodules	21.0	59	15	44											(CH)	Water Level = Not Encountered
M-5	5-7.5	Reddish Tan, Tan, and Light Gray Fat CLAY with calcareous nodules and ferrous nodules	22.9	56	15	41											(CH)	
M-5	7.5-10	Reddish Tan, Tan, and Light Gray Lean CLAY with calcareous nodules and sand	21.7	38	13	25											(CL)	

Baton Rouge, LA 225-356-4355

SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing

CONSTRUCTION MATERIALS TESTING

Full Range of Services and Unparalleled Response

Southern Earth Sciences, Inc. laboratories are **certified** by **AASHTO, AMRL, CMEC** and the **U.S. Army Corps of Engineers** to perform soil, concrete, asphalt and materials testing. Our professional inspectors and technicians continually participate in proficiency testing programs to ensure internal quality control.

FIELD TESTING AND INSPECTION

In addition to our laboratory testing facilities, SESI maintains a fully outfitted mobile field laboratory available for on-site testing. This allows our OSHA safety certified technicians to perform both call-out services on small projects or full-time quality control testing and inspection on major projects. The on-site testing lab offers a full range of services.

Services

- Dipstick technology for flatness testing of concrete slabs
- Soil testing—compaction, pile load testing, pile and caisson inspection, plate load bearing tests
- Asphaltic concrete testing—core density and thickness, evaluation of aggregates, mix designs, plant and field control
- Portland cement concrete—batch plant and field control, core drilling, molding, curing and testing cylinders
- Slump testing, air content and unit weight
- Pipe and block inspection
- Soundness and abrasion of aggregates
- Bridge inspection
- Pile integrity testing
- Pile dynamic analysis (PDA)
- Vibration monitoring
- Rebar location/depth of cover
- Post tensioning inspection
- Welding and steel framing inspections
- Vacuum and pressure testing

LABORATORY TESTING OF MATERIALS

Strategically located laboratories make testing of soils, concrete, asphalt and metals quick and convenient. Branch managers supervise all lab operations in accordance with ASTM Specifications E-329 and E-699. All equipment is calibrated annually to ensure accurate data. SESI technicians are certified by appropriate accrediting agencies on a routine basis.

Services

- Consolidation testing
- Flexible wall permeability testing
- Triaxial testing
- Soil classification testing
- Concrete strength testing
- Steel strength testing

Affiliate Member PEDESTAL AIA Baton Rouge

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