Geotechnical Engineering
Services Report

Proposed McDonald's Restaurant
Winchester Road and Malco Way
Memphis, Tennessee

Prepared for

McDonald's USA, LLC
3850 N. Causeway Boulevard, Suite 1200
Metairie, Louisiana 70002

Prepared by

Professional Service Industries, Inc.
4161 Ridgemoor Avenue
Memphis, Tennessee 38118

June 28, 2013

PSI Project No.: 0502841

Information To Build On
Engineering • Consulting • Testing

June 28, 2013

Ms. Jane Fenasci
McDonald's USA, LLC
3850 N. Causeway Boulevard
Suite 1200
Metairie, Louisiana 70002

Subject: Geotechnical Engineering Services Report
Proposed McDonald's Restaurant
Winchester Road and Malco Way
Memphis, Tennessee
PSI Project No.: 0502841

Dear Ms. Fenasci:

Professional Service Industries, Inc. (PSI) is pleased to transmit our Geotechnical Engineering Services Report for the referenced project. This report includes the results of field and laboratory testing, and recommendations for foundation design, as well as general site development.

We appreciate the opportunity to perform this Geotechnical Study and look forward to continued participation during the design and construction phases of this project. If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully Submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.

MATTHEW EDWARD DORSEY REGISTERED ENGINEER AGRICULTURE COMMERCE No. 00114978 STATE OF TENNESSEE

07/10/2013

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TABLE OF CONTENTS

1.0 PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

Professional Service Industries, Inc. (PSI) has completed a geotechnical exploration for the proposed McDonald's Restaurant in Memphis, Tennessee. Our services were authorized by Ms. Jane Fenasci of McDonald's USA, LLC on May 20, 2013 by purchase order #686169. This exploration was accomplished in general accordance with PSI Proposal No. 0502-95064 dated May 10, 2013.

1.2 PROJECT DESCRIPTION

Project information was obtained from Ms. Fenasci of McDonald's USA, LLC. PSI has been furnished with a drawing titled 'McDONALD'S - OPTION A1' dated February 6, 2013. The proposed structure will be a single story, metal framed building with brick veneer consisting of 5,177 square feet.

- The building will be supported by column loads up to 50 kips and continuous wall loads up to 2.0 kips per linear foot. Floor slab loads will be less than 150 psf.
- No below-grade walls will be required for the proposed structure.
- The structure will be constructed in accordance with the provision of the International Building Code 2009, with 2012 seismic provisions.
- Typical traffic data of 9,500 (car parking) and 35,000 (truck drive lanes) ESAL's over a 20-year design life is assumed.

The geotechnical recommendations presented in this report are based on the available project information, building location, and the subsurface materials described in this report. If the noted information is incorrect, please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to explore the subsurface conditions at the site to enable an evaluation of acceptable foundation systems for the proposed facility. Our scope of services included drilling nine (9) soil test borings at the site to depths of about 5 to 15 below the surface, select laboratory testing, and preparation of this geotechnical report. This report briefly outlines the testing procedures, presents available project information, describes the site and subsurface conditions, and presents recommendations regarding the following:

- A discussion of subsurface conditions encountered including pertinent soil properties and groundwater conditions.
- Geotechnical related recommendations for foundation design best suited to the encountered soils and proposed building construction.
- An evaluation of foundation settlements.

- Recommendations for overall site/soil preparation, including natural in-place soil and fill and overall suitability of the in-situ soils for use as utility backfill and structural fill.
- Recommendations for Light and Heavy Duty Pavement sections.
- Discussions on geotechnical issues that may impact the planned construction activities.

The scope of services for this geotechnical study did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious items or conditions are strictly for the information of the client. Prior to further development of this site, an environmental assessment is advisable.

As directed by the client, PSI did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminates in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same. Client acknowledges that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Client further acknowledges that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or recurrence of mold amplification.

2.0 SITE AND SUBSURFACE CONDITIONS

2.1 SITE LOCATION AND DESCRIPTION

The project site is located at the southeast corner of Winchester Road and Malco Way in Memphis, Tennessee. At the time of drilling operations, the site topography was observed to be predominantly flat with gentle sloping towards the eastern edge. Trees were present at the southeast corner of the site, with the remaining site area occupied by grass and weeds.

2.2 SITE GEOLOGY

Memphis, Shelby County, Tennessee is located in a narrow band that parallels the eastern bluffs of the Mississippi River known as the "Loess Hills". This band lies in a physiographic subdivision known as the East Gulf Section of the Atlantic and Gulf Coastal Plains Province and is included in a portion of the Section called the Mississippi Embayment. The Embayment was a bell-shaped arm of the Gulf of Mexico outlined roughly by Little Rock, Arkansas on the west; Cairo, Illinois on the north; and the Lower Tennessee River on the east.

Structurally, the Mississippi Embayment is a down-warped, partly down-faulted, trough in Paleozoic rocks. The axis of the trough has migrated in past geologic time but now approximates the course of the Mississippi River. The trough has been filled with unconsolidated gravels, sands, and clays ranging in age from upper Cretaceous to Recent.

In Tennessee, the unconsolidated sediments reach their maximum thickness at Shelby County where they are from 2,700 to 3,000 feet thick. Late in the Tertiary Period and early in the Quaternary Period streams carried extensive quantities of sand and gravel into the area and formed wide-spread terraces of these materials mixed with varying amounts of silt and clay on top of the older Tertiary deposits. Aeolian or wind-blown silts and clays (loess) comprise the presently exposed surface in the Shelby County area. In general, the loess is 75 feet or more thick at the bluffs of the Mississippi River, but thins out to the east and disappears within about 50 miles.

2.3 SEISMICITY

Memphis, Tennessee is in the general proximity of New Madrid, Missouri, the epicenter for some of the largest earthquakes in the North American continent. Four earthquakes of about magnitude 7.3 to 8 centered near New Madrid, Missouri occurred during the winter of 1811-1812. Presently, the New Madrid area contains the highest level of seismicity in the central and eastern parts of the United States.

Data obtained from Google data server (http://www.googleearth.com), indicated that the approximate site latitude and longitude are 35.04903°N and 89.82708°W, respectively. Using this information and the USGS Earthquake Hazards Program information (http://earthquake.usgs.gov/research/hazmaps) and the requirements of IBC 2012, the project site has a mapped 0.2 second spectral response acceleration (S_s) of approximately

0.797g and a mapped 1.0 second spectral response acceleration (S_1) of approximately 0.283g.

2.4 SUBSURFACE MATERIALS

The site subsurface conditions were explored with nine (9) soil test borings drilled within the proposed building area. The boring depths ranged from 5 to 15 feet. The boring locations and depths were selected by PSI, and the boring locations are illustrated on the Boring Location Plan enclosed in Appendix I. The borings were located in the field by PSI personnel by measuring distances from known site features. Topographic and grading information was not provided. PSI recommends that ground surface elevations at the borings be determined and provided to us for review along with the site grading plan, as it may impact our design recommendations.

The borings were advanced utilizing hollow stem auger drilling methods, and soil samples were routinely obtained during the drilling process. Drilling and sampling techniques were accomplished generally in accordance with ASTM procedures. The PSI General Notes for soil borings are enclosed in Appendix II and the boring logs are in Appendix III. Select soil samples were tested in the laboratory to determine material properties for our evaluation. Laboratory testing was accomplished generally in accordance with ASTM procedures.

The soils encountered throughout the boring locations were predominantly fine-grained which extended to the terminal depths explored. Based on visual classification results, the soils encountered were classified as silty clay (CL) in accordance with ASTM D 2488. However, traces of sand were observed within the silty clay (CL) material at various boring locations and depths. Standard penetration N-values within these fine-grained soils generally indicated consistencies ranging from very soft to stiff. Overall, the moisture content of the soils encountered ranged from 15 to 32 percent. The moisture content of the soils encountered within the upper 6 feet ranged from 21 to 32 percent, averaging 27 percent. Thus, the soils encountered within the upper 6 feet are considered to be very moist to wet. A summary of the soft soil depths encountered within each boring location are provided within the table below.

Boring No.	Soft Soil Depth, ft
B-1	0 to 6
B-2	0 to 4
B-3	0 to 4
B-4	0 to 4
B-5	0 to 4
B-6	0 to 4
B-7	0 to 5½*
B-8	0 to 2
B-9	0 to 2

*Terminal depth of boring.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs in the appendix should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratifications, penetration resistances, locations of the samples, and laboratory test data. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on these boring logs. The samples that were not altered by laboratory testing will be retained for 60 days from the date of this report and then will be discarded.

2.5 GROUNDWATER INFORMATION

Observations were made to determine if groundwater was present in the borings during drilling and at completion of drilling. During drilling operations, groundwater was measured at depths ranging from 4 feet in Boring B-5 to 5½ feet in Boring B-1. After completion of drilling, measurements indicated that groundwater was present at a depth of 13 feet in Boring B-1, but was not present within Boring B-5.

Some fluctuations of the groundwater level should be anticipated with changing climatic conditions. The groundwater information presented in this report was obtained at the time of drilling, but the groundwater level at the site may be different at the time of construction. However, based upon the saturated soil conditions present during drilling in the near surface soils across the site the contractor should anticipate implementing dewatering methods during the earthwork phase of construction.

3.0 EVALUATION AND RECOMMENDATIONS

3.1 GEOTECHNICAL DISCUSSION

Based upon the subsurface information obtained in conjunction with the structural loading information assumed, conventional spread footing foundations are marginally suitable without certain subgrade remediation. Due to saturated, soft soils encountered in the upper 6 feet, the foundation areas will most likely require full depth undercutting to firm, stable material in order to provide adequate support for the proposed structure. If undercut is not desired, rammed aggregate piers or stone columns used to reinforce the soil such that footings can be used is considered an alternative foundation support option.

Preliminary recommendations are provided herein for the use of rammed aggregate piers (GeoPiers). As indicated, stone columns can also be used. These elements can also be used to reinforce the soils beneath the foundations and floor slab. This decision, as to whether or not to support the floor slab, is dependent on the grading plan and the owner's tolerance for risk. We recommend, at a minimum, to reinforce the zones beneath the footings.

3.2 SITE PREPARATION

We recommend that all existing topsoil and vegetation within the construction area be stripped from the site. Depths of the topsoil ranged from 2 to 3 inches; however, deeper stripping depths may be necessary in low lying areas. The depth of adequate topsoil/vegetation removal should be determined by a representative of the Geotechnical Engineer during construction.

Due to various trees and brush present within the site area, clearing and grubbing operations will be required to remove all organic matter, roots, stumps, and any other remnants of the vegetation. Thus, deeper removal depths should be expected within these areas. Areas disturbed by tree and stump removal operations should be undercut to firm, stable material and backfilled with properly compacted fill as outlined within this report.

Existing utilities should be located and rerouted as necessary and any pipes or utility conduits should be removed. Utility trench excavations must be cut to competent bearing soils suitable for support of fill placement and then backfilled with properly compacted fill that is constructed as outlined in of this report.

After adequate stripping of the site, the construction areas should be proof-rolled with a moderately heavy pneumatic-tired vehicle such as a loaded tandem axle dump truck or similar rubber tired vehicle or should be tested using a hand-held cone penetrometer depending on the site conditions at that time. Soils that are observed to rut or deflect excessively under the moving load, or are otherwise judged to be unsuitable, should either be processed and re-compacted or undercut and replaced with properly compacted fill. Based upon the site conditions during our investigation, the contractor should anticipate removal and replacement of soft soils up to approximately 4 to 6 feet in depth within the building footprint. The undercut area should extend 5 feet outside of the proposed footprint in each direction, and be constructed with a slope of 2H:1V at the perimeter walls to ensure slope stability. However, the decision as to the most appropriate method of remedial action should be made by the Geotechnical Engineer based on the site conditions encountered during construction. The proof-rolling and undercutting operations should be witnessed by the Geotechnical Engineer or his representative and should be performed during a period of dry weather.

The subgrade soils should be scarified and compacted to at least 95 percent of the standard Proctor (ASTM D 698) maximum dry density for a depth of at least 6 inches below the surface. Dependent upon a final grading plan, subsequent lifts of structural fill should then be properly placed and compacted atop the prepared subgrade.

Groundwater was encountered at depths as shallow as 4 feet during drilling operations. Therefore, the contractor should anticipate encountering saturated soils and/or seepage during some construction operations such as utility construction or undercutting, which may require dewatering to proceed.

As previously discussed, significant amounts of soft, saturated soils were encountered during our investigation. Fine-grained soils that have moisture contents more than about 2 to 3 percentage points above the optimum moisture are generally prone to softening when dynamic loads such as those generated by the wheels of construction equipment are imposed upon them even if the soils exhibited substantial strength in an undisturbed state. After disturbance, these fine-grained soils typically rut and deflect significantly and do not provide adequate subgrade support for floor slabs, foundations, or fill placement. The presence of relatively wet fine-grained soils may require remediation measures such as aeration, drying, and re-compaction or undercutting.

If desired, bulk samples of the site soils may be obtained by PSI for Standard proctor tests to help define the optimum moisture contents of site soils. Based on these test results, more definitive statements can be made regarding the necessity to undercut or aerate and re-compact saturated soils. Past experience indicates that these earthwork operations could be time consuming and have the potential to add considerable cost to the earthwork portion of the project.

Should the contractor have difficulty in obtaining the required subgrade support due to inclement weather or a fast track construction schedule, consideration may be given to subgrade stabilization via the use of lime or cement. These materials can also be used to lower the moisture content of wet borrow soils. A specialty contractor will have to be retained if these methods are to be used, and laboratory tests will have to be conducted to determine if either cement or lime will be beneficial in stabilization of the soils. Additional recommendations will be required from the Geotechnical Engineer during construction regarding these operations.

An alternate method of obtaining the required subgrade support is the use of a suitable geotextile fabric or geogrid in conjunction with select granular fill after removal of the soft or otherwise unsuitable soils. In this event, the geotextile fabric or geogrid should be installed in accordance with the manufacturer's recommendations utilizing select granular fill that meets the manufacturer's specified gradation and thickness requirements. Supplementary recommendations must be provided by the Geotechnical Engineer during construction regarding these operations.

3.3 FILL REQUIREMENTS

After subgrade preparation and observation have been completed, fill placement may begin. The first layer of fill material should be placed in a relatively uniform horizontal lift on the prepared subgrade. Fill materials should be free of organic or other deleterious materials, have a maximum particle size of 3 inches, be relatively well graded, and have a liquid limit less than 45 and a plasticity index less than 25. Thus, the on-site soils are considered suitable for use as structural fill; however, the moisture content of the otherwise suitable soils will most likely have to be adjusted to coincide with the moisture range required for structural fill. If a fine-grained silt or clay fill soil is used, close moisture content control will be required to achieve the recommended degree of compaction.

Structural fill should be compacted to at least 95 percent of standard Proctor (ASTM D 698) maximum dry density. If granular fill soils are used and are of a free draining type (i.e., less than about 12 percent fines) in which impact compaction will not produce a well-defined moisture-density relationship curve, they should be compacted to at least 70 percent relative density (ASTM Designations D 4253 and D 4254).

Fill should be placed in maximum lifts of 8 inches of loose material and should be compacted within the range of 3 percentage points below to 2 percentage points above the optimum moisture content value. If the fill is too dry, water should be uniformly applied across the affected fill area. If the fill is too wet, it must be dried. In either event, the fill should be thoroughly mixed by disking to obtain a relatively uniform moisture content throughout the lift immediately prior to compaction.

Each lift of fill should be tested by a representative of the Geotechnical Engineer prior to placement of subsequent lifts. The properly compacted fill should extend horizontally outward beyond the exterior perimeter of the building and foundations a distance equal to the height of fill or 5 feet, whichever is greater, prior to significant sloping. However, as noted in Section **5.2 DRAINAGE AND GROUNDWATER CONSIDERATIONS** of this report, the grades should be gently sloped away from the building area to allow proper drainage of areas adjacent to foundations and slabs-on-grade. Permanent slopes should be constructed with a maximum slope of 3H:1V to provide long term stable slopes and also provide for easy maintenance of the vegetated slope face.

3.4 FOUNDATION RECOMMENDATIONS

Once the site has been properly prepared utilizing full depth excavation previously discussed, the planned construction can be supported on conventional spread footing foundations bearing on properly compacted fill. Spread footings for building columns and strip footings for bearing walls resting on firm, stable native subgrade or properly compacted fill can be designed for allowable net soil bearing pressures of 2,500 psf and 2,000 psf, respectively, based on dead load plus design live load. However, the bearing pressures may be increased by one-third for transient loading conditions involving wind or earthquake forces. Minimum dimensions of 30 inches for column footings and 18 inches for continuous footings should be used in the foundation design process to minimize the possibility of a local bearing capacity failure.

Exterior footings and foundations in unheated areas should be located at a depth of at least 18 inches below the final exterior grade to provide adequate frost protection. If the building is constructed during the winter months or if the foundation soils will likely be subjected to freezing temperatures after foundation construction, then the foundation soils should be adequately protected from freezing. Otherwise, interior foundations can be located at nominal depths compatible with architectural and structural considerations.

The foundation excavations should be observed by a representative of PSI prior to steel or concrete placement to assess that the foundation materials are capable of supporting the design loads and are consistent with the bearing materials recommended in this report. Unsuitable soil zones encountered at the bottom of the foundation excavations should be removed to the level of borderline firm to stiff natural fine-grained soils or properly compacted fill as directed by the Geotechnical Engineer. Cavities formed as a result of excavation of unsuitable soil zones should be backfilled with lean concrete or properly compacted fill.

If it is desired to use compacted fill to backfill the over excavated areas, then the backfill shall be placed, compacted and tested in accordance with the guidelines presented in this report and the recommendations of the Geotechnical Engineer based on the site conditions at the time of construction.

After opening, foundation excavations should be observed and concrete placed as quickly as possible to avoid exposure of the excavation bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. If possible, the foundation concrete should be placed during the same day the excavation is made. If it is required that the foundation excavations be left open for more than one day, they should be protected to reduce evaporation or entry of moisture.

Based on the project information, known subsurface conditions and site geology, laboratory testing and past experience, we anticipate that properly designed and constructed foundations supported on the recommended materials should experience maximum total and differential settlements between adjacent footings on the order of 1 inch and 3/4 inches, respectively.

Rammed Aggregate Pier or Stone Column Option

The available subsurface data when considered in conjunction with the design procedures in the Geopier Manual indicated that the use of conventional spread footing foundations supported on a subgrade reinforced with Geopiers is feasible to support the proposed building. We preliminarily anticipate that footing foundations supported on a properly designed and constructed Geopier reinforced subgrade can be designed for allowable bearing values of approximately 3,000 psf with associated total settlements on the order of about 1 inch. This methodology is typically proprietary and performed by a design-build contractor.

Be advised that as part of the foundation selection process, there is always a cost/benefit evaluation. Although we are recommending various foundation type(s) we have not accomplished the cost/benefit evaluation.

3.5 FLOOR SLAB RECOMMENDATIONS

The floor slabs can be grade supported on the firm, stable native subgrade or properly compacted fill. Site preparation activities including proof-rolling, as discussed earlier in this report, should be accomplished to identify any soft, unsuitable or unstable soils which should be removed from the slab areas prior to fill placement and/or floor slab construction.

We recommend that a minimum 4-inch thick free draining granular mat be placed beneath the slabs on grade to enhance drainage and provide increased subgrade strength. A suitable vapor barrier or vapor retarder should be placed on the granular mats as required by the designer or applicable codes. The slabs on grade should have an adequate number of joints to reduce cracking resulting from any differential movement and shrinkage.

Based on the existing soil conditions and the site preparation specified herein, the design of slabs on grade can be based on a subgrade modulus (k) of 75 pci; however, this value may be increased to 100 pci if a minimum 4-inch thick granular mat is placed below the floor slabs as recommended above. These subgrade modulus values represent anticipated values that would be obtained in a standard in-situ plate test with a 1-foot square plate. Use of these subgrades moduli for design of other on-grade structural elements should include appropriate modification based on dimensions as necessary.

The value should be adjusted for larger areas using the following expression for cohesive and cohesionless soil:

Modulus of Subgrade Reaction,

$$k_S = \left(\frac{k}{B}\right) \text{ for cohesive soil and}$$

$$k_S = k\left(\frac{B+1}{2B}\right)^2 \text{ for cohesionless soil}$$

where: k_S = coefficient of vertical subgrade reaction for loaded area,
k = coefficient of vertical subgrade reaction for 1x1 square foot area, and
B = width of area loaded, in feet

3.6 SITE CLASS

Quantitative determination of the site class in accordance with IBC 2012 requires specific actions, testing, analyses and subsurface investigation including a 100-foot deep boring. However, Section 1613.3.2 Site Class Definitions of IBC 2012 states that Site Class D shall be used when site specific soil properties are not known with sufficient detail to define the site class unless the available geotechnical data or the building official determines that Site Class E or F soil is likely to be present at the site. Although a 100-foot deep boring was not drilled, the available subsurface data suggests that Site Class D is appropriate for this site and we recommend that it be used.

Data obtained from the Google data server, the USGS Earthquake Hazards Program information, and the requirements of IBC 2012, the project site coefficients F_a and F_v have been determined to be 1.181 and 1.834, respectively. The design spectral response accelerations, S_{DS} and S_{D1}, were determined to be 0.628g and 0.346g, respectively.

According to IBC 2012, sites supporting structures in design category "C" and below must be evaluated for slope instabilities, liquefaction and surface rupture due to faulting or lateral spreading. A detailed study of these effects was beyond PSI's scope of services. 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:

HAZARD	**RELATIVE RISK**	**COMMENTS**
Liquefaction	Low - Moderate	The soil within the upper 15 feet of the subsurface profile is a cohesive soil; however, some silts can be susceptible to strain softening during a seismic event.
Slope Stability	Low	The site is relatively flat and does not/will not incorporate significant cut or fill slopes
Surface Rupture	Low	The site is not underlain by a mapped Holocene-aged fault

4.0 PAVEMENT RECOMMENDATIONS

Our scope of services did not include extensive sampling and California Bearing Ratio (CBR) testing of existing subgrade materials or potential sources of imported fill for the specific purpose of accomplishing a detailed pavement analysis. Instead, we have based the pavement-related design parameters on values that are considered to be typical for the area soil types.

For large areas of pavement, or where pavements are subjected to significant traffic, a more detailed analysis of the subgrade and traffic conditions should be made. The results of such a study will provide the information necessary to design an economical and serviceable pavement.

The recommended thicknesses presented below are considered typical and minimum for the parameters used as the basis of this report. We understand that budgetary considerations sometimes warrant thinner pavement sections than those presented. However, the client, the owner, and the project principals should be aware that thinner pavement sections may result in increased maintenance costs and lower than anticipated pavement life.

Due to the soft subgrade soils encountered during our investigation, it is recommended that a minimum of 2 feet of properly compacted structural fill be provided beneath the pavement section for adequate support. If stability cannot be achieved at the referenced depth, please refer to Section **3.2 SITE PREPARATION** for applicable subgrade remediation options.

We have estimated that the subgrade soils will be prepared to a CBR of at least 3. Based on this value, it is possible to use locally typical standard pavement sections consisting of the following:

Recommended Pavement Thickness (inches)

Pavement Materials	**Car Parking (Light Duty)**		**Drive Lanes/Truck Routes (Heavy Duty)**	
ESAL Values	**9,500**		**35,000**	
Asphalt Surface Course	2	2	3	4
Binder Course	- -	- -	- -	- -
Soil Cement Base	6	- -	9	- -
Crushed Stone Base	- -	8	- -	10

Alternately, a rigid concrete pavement with a thickness of 5 inches is recommended for the light duty (car parking) pavement areas, and a rigid concrete pavement with a thickness of 6 inches is recommended for the heavy duty (drive lanes) pavement areas. Rigid pavements are highly recommended for areas where the pavement is subjected to large shear forces due to sharp turns of the front wheels while the trucks are traveling at low speeds or are stopped.

Rigid concrete pavement consisting of 7 inches of concrete underlain by 6 inches of granular sub-base is recommended where trash dumpsters are to be parked on the pavement or where a considerable load is transferred from relatively small steel wheels. This should provide better distribution of surface loads to the subgrade without causing deformation of the surface.

The subgrade should be prepared as uniform as possible and it should be shaped so that the finished pavement will be the correct thickness throughout. To provide additional subgrade strength and inhibit the intrusion of fines into the pavement joints (mud pumping), we recommend that a 6-inch thick granular sub-base be placed and compacted over the prepared subgrade in the heavy duty rigid pavement areas. A granular sub-base, while not required in the light duty concrete pavement areas, could help to extend the pavement life by providing sub-slab drainage and more uniform support.

Pavement may be placed after the subgrade has been properly compacted, fine-graded and proof-rolled. The work should be done in accordance with Tennessee Department of Transportation guidelines.

Water should not be allowed to pond behind curbs and saturate the base materials. If the base material consists of granular fill, it should extend through the slope to allow any water entering the base-stone a path to exit. The project designer or Geotechnical Engineer should accomplish a site specific pavement design when actual traffic and loading information is available.

5.0 CONSTRUCTION CONSIDERATIONS

PSI should be retained to provide observation and testing of construction activities involved in the foundations, floor slabs, earthwork and related activities of this project. PSI cannot accept any responsibility for any conditions that deviate from those described in this report, nor for the performance of the foundations or floor slabs if not engaged to also provide construction observation and testing for this project.

5.1 MOISTURE SENSITIVE SOILS/WEATHER RELATED CONCERNS

Various upper soils encountered across this site were wet and are expected to be somewhat sensitive to disturbances caused by construction traffic and to changes in moisture content. The remaining upper soils that were relatively moist at the time of drilling are expected to be relatively sensitive to changes in moisture content; if these fine-grained soils become wet, they are also expected to be sensitive to disturbances caused by construction traffic.

During wet weather periods increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction during dry weather.

Also, some of the existing in-situ soils that will be present near the top of exposed subgrades or will be cut and used for fill may have to be dried to a suitable moisture content. Dry weather with favorable drying conditions (sunshine, low relative humidity, and/or wind) is best suited for these operations. This is especially important for this site considering the wet soils encountered in some areas.

5.2 DRAINAGE AND GROUNDWATER CONSIDERATIONS

Water should not be allowed to collect in excavations (foundations, utilities, etc.) or on prepared subgrades for floor slabs during construction. Positive site drainage should be maintained throughout construction activities. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater, or surface runoff.

The site grading plan should be developed to provide rapid drainage away from the building area and to inhibit infiltration of surface water around the perimeter of the building and beneath the floor slab. The grades should be sloped away from the building area. Careful consideration should be given to the potential impact of landscaped areas and/or sprinkler systems on adjacent foundations and floor slabs. Roof runoff should be piped to a storm sewer, discharged upon a paved surface, or conveyed at least 10 feet away from the building perimeter prior to discharge upon unpaved surfaces.

Providing proper drainage both during construction and throughout the service life of the facility is especially important at this site because of the moist to wet fine-grained soils identified in the borings. Increases in the moisture content of the fine-grained soils will result in reduced support capacity.

Groundwater was measured at depths as shallow as 4 feet in the borings. It is possible that seasonal variations will cause fluctuations or a water table to be present at higher levels. Considering these measured groundwater levels, it would be prudent to avoid lowering the existing site grade. Additionally, the contractor should anticipate encountering saturated soils and/or seepage during site preparation operations. These groundwater conditions should be considered relative to the building design. Some dewatering operations may be required to allow work to proceed (e.g., excavation of utility trenches, undercutting, etc.).

Any water accumulation should be removed from shallow excavations by pumping. The geotechnical engineer should be consulted if excessive or uncontrolled amounts of seepage occur.

5.3 EXCAVATIONS

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR Part 1926, Subpart P". This document and subsequent updates were issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that excavations (e.g., utility trenches, undercut areas, basement excavations, footing excavations, etc.) be constructed in accordance with the applicable OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person," as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in current local, state, and federal safety regulations.

We are providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's compliance with local, state, and federal safety or other regulations.

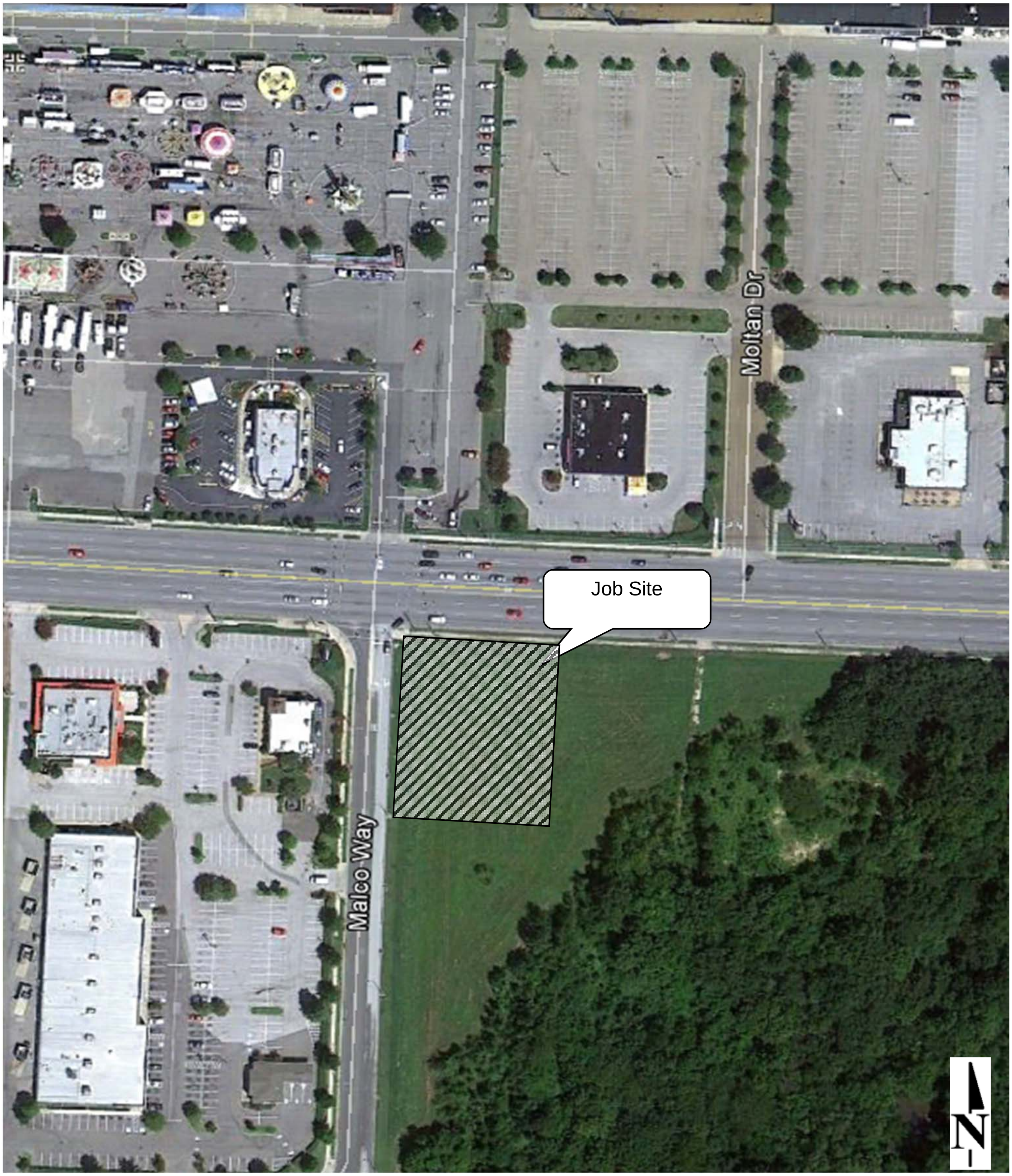
6.0 REPORT LIMITATIONS

The recommendations submitted in this report are based on the available subsurface information obtained by PSI and design details furnished by McDonald's USA, LLC for the proposed project. 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 recommendations are required. If PSI is not retained to review these changes, PSI will not be responsible for the impact of those conditions on the project.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made after being prepared in accordance with generally accepted professional engineering practice in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the Geotechnical Engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At this time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of McDonald's USA, LLC for the specific application to the proposed McDonald's Restaurant at Winchester Road and Malco Way in Memphis, Tennessee.

APPENDIX I



Information To Build On
Engineering • Consulting • Testing

Vicinity Map

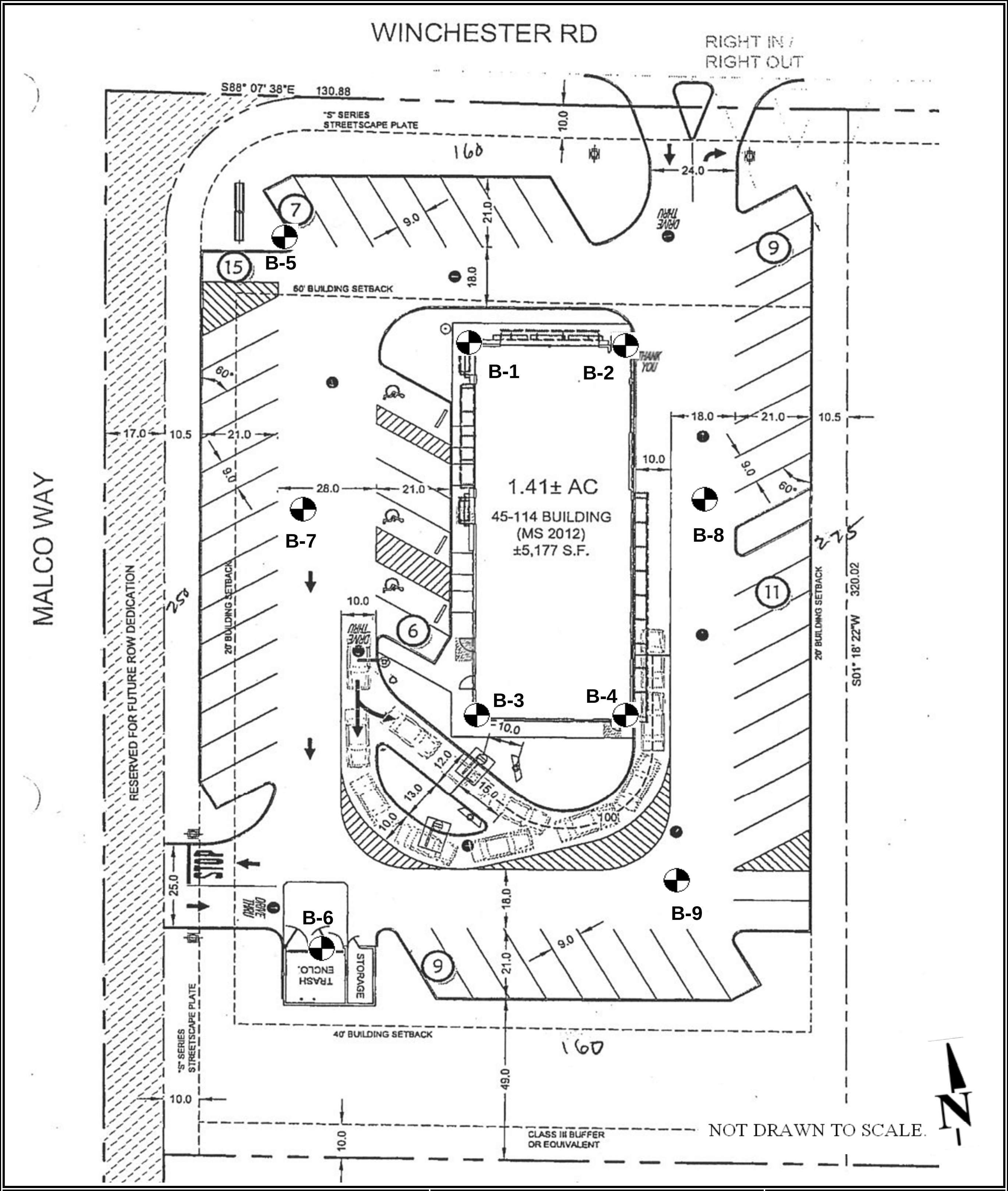
Proposed McDonald's Restaurant

Winchester Road and Malco Way

Memphis, Tennessee

PSI File No.
0502841

May, 2013



Boring Plan

Proposed McDonald's Restaurant

Winchester Road and Malco Way

Memphis, Tennessee

PSI File No. 0502841

May, 2013

psi Information To Build On
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APPENDIX II

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		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	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
	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

APPENDIX III

Professional Service Industries, Inc.
4161 Ridgemoor Avenue
Memphis, TN 38118
Telephone: (901) 365-1802
Fax: (901) 366-7233

LOG OF BORING B- 1

PSI Job No.:	0502841	Drilling Method:	Hollow Stem Auger
Project:	McDonald's	Sampling Method:	SS
Location:	Winchester Road and Malco Way, Memphis, Tennessee	Hammer Type:	Automatic
		Boring Location:	Building

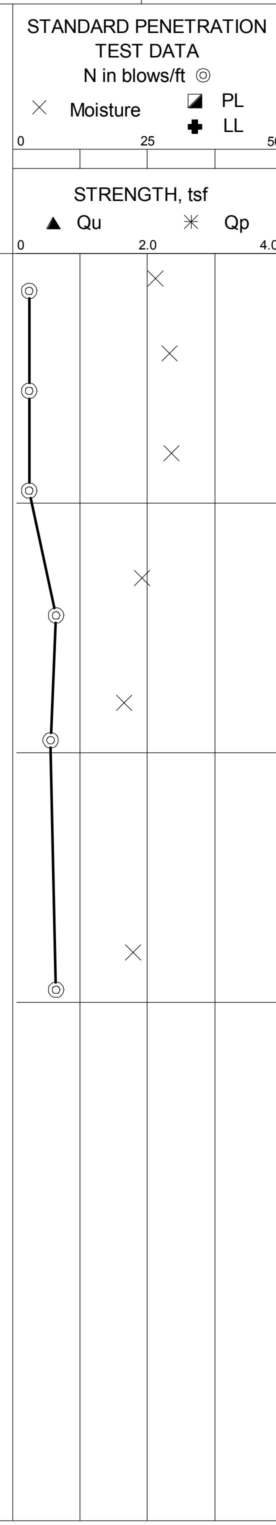
WATER LEVELS

While Drilling	5.5 feet
Upon Completion	13 feet
Delay	N/A

Station: N/A
Offset: N/A

Depth, (feet)	Sample Type	Sample No.	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %
0			Topsoil: 3 inches			
	Split-Spoon	1	Soft, Brown and Gray Silty Clay (CL)	CL	2-2-1 N=3	27
	Split-Spoon	2	Soft, Brown and Gray Silty Clay (CL) trace Sand	CL	2-1-2 N=3	29
5	Split-Spoon	3	Soft, Brown and Gray Silty Clay (CL) with Sand	CL	2-1-2 N=3	29
	Split-Spoon	4	Firm, Brown and Gray Silty Clay (CL) trace Sand	CL	2-3-5 N=8	24
10	Split-Spoon	5	Firm, Brown and Gray Silty Clay (CL)	CL	2-3-4 N=7	21
15	Split-Spoon	6	Firm, Brown and Gray Silty Clay (CL)	CL	2-3-5 N=8	22

Boring Terminal Depth: 15½ feet



Additional Remarks

Completion Depth:	15.5 ft
Date Boring Started:	5/29/13
Date Boring Completed:	5/29/13
Logged By:	Chad Smith
Drilling Contractor:	PSI

Sample Types: Auger Cutting, Split-Spoon, Rock Core, Shelby Tube, Hand Auger, Calif. Sampler, Texas Cone

Latitude:
Longitude:
Drill Rig: CME 75
Remarks:

Professional Service Industries, Inc.
4161 Ridgemoor Avenue
Memphis, TN 38118
Telephone: (901) 365-1802
Fax: (901) 366-7233

LOG OF BORING B- 2

PSI Job No.:	0502841	Drilling Method:	Hollow Stem Auger
Project:	McDonald's	Sampling Method:	SS
Location:	Winchester Road and Malco Way, Memphis, Tennessee	Hammer Type:	Automatic
		Boring Location:	Building

WATER LEVELS

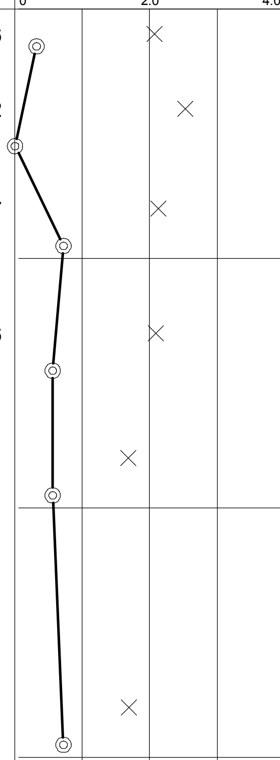
While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

Depth, (feet)	Sample Type	Sample No.	Material Description	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %
0			Topsoil: 3 inches			
	Split-Spoon	1	Soft, Brown and Gray Silty Clay (CL)	CL	2-2-2 N=4	26
	Split-Spoon	2	Very Soft, Brown and Gray Silty Clay (CL) with Sand	CL	0-0-0 N=0	32
5	Split-Spoon	3	Stiff, Brown and Gray Silty Clay (CL)	CL	3-4-5 N=9	27
	Split-Spoon	4	Firm, Brown and Gray Silty Clay (CL)	CL	3-4-3 N=7	26
10	Split-Spoon	5	Firm, Brown and Gray Silty Clay (CL)	CL	3-3-4 N=7	21
15	Split-Spoon	6	Stiff, Brown and Gray Silty Clay (CL)	CL	3-4-5 N=9	21

Boring Terminal Depth: 15½ feet

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

Completion Depth:	15.5 ft	Sample Types:	Latitude:
Date Boring Started:	5/28/13	Auger Cutting; Split-Spoon; Rock Core	Longitude:
Date Boring Completed:	5/28/13	Shelby Tube; Hand Auger; Calif. Sampler; Texas Cone	Drill Rig: CME 55
Logged By:	Russell Strunk		Remarks:
Drilling Contractor:	PSI		

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Memphis, TN 38118
Telephone: (901) 365-1802
Fax: (901) 366-7233

LOG OF BORING B- 3

Sheet 1 of 1

PSI Job No.: 0502841
Project: McDonald's
Location: Winchester Road and Malco Way
Memphis, Tennessee

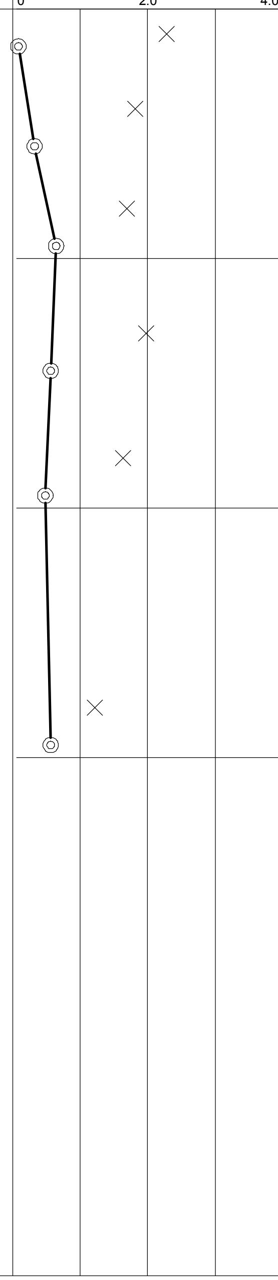
Drilling Method: Hollow Stem Auger
Sampling Method: SS
Hammer Type: Automatic
Boring Location: Building

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

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0				Topsoil: 3 inches				
		Split-Spoon	1		Very Soft, Brown and Gray Silty Clay (CL) with Sand	CL	1-0-1 N=1	28	
		Split-Spoon	2		Soft, Brown and Gray Silty Clay (CL) with Sand	CL	1-2-2 N=4	23	
	5	Split-Spoon	3		Firm, Brown and Gray Silty Clay (CL) with Sand	CL	4-4-4 N=8	21	
		Split-Spoon	4		Firm, Brown and Gray Silty Clay (CL)	CL	3-3-4 N=7	25	
	10	Split-Spoon	5		Firm, Brown and Gray Silty Clay (CL)	CL	3-3-3 N=6	20	
	15	Split-Spoon	6		Firm, Brown and Gray Silty Clay (CL)	CL	2-3-4 N=7	15	

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



Boring Terminal Depth: 15½ feet

Completion Depth:	15.5 ft	Latitude:	
Date Boring Started:	5/29/13	Longitude:	
Date Boring Completed:	5/29/13	Drill Rig:	CME 75
Logged By:	Chad Smith	Remarks:	
Drilling Contractor:	PSI		

Sample Types:
- Auger Cutting
- Split-Spoon
- Rock Core
- Shelby Tube
- Hand Auger
- Calif. Sampler
- Texas Cone

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LOG OF BORING B- 4

PSI Job No.:	0502841	Drilling Method:	Hollow Stem Auger
Project:	McDonald's	Sampling Method:	SS
Location:	Winchester Road and Malco Way, Memphis, Tennessee	Hammer Type:	Automatic
		Boring Location:	Building

WATER LEVELS

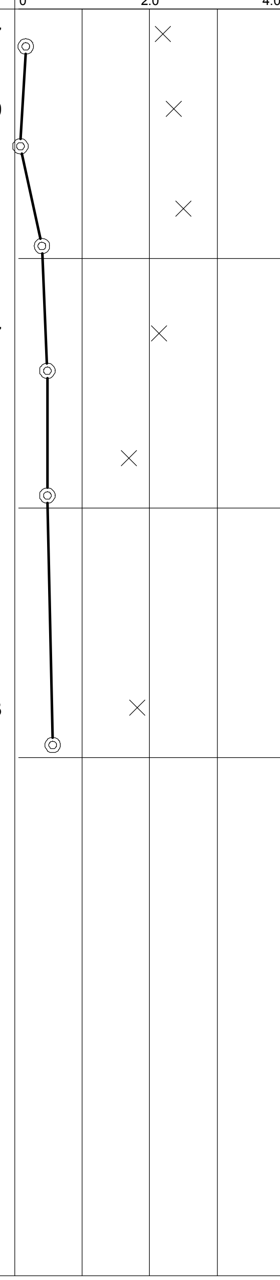
While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0				Topsoil: 2½ inches				
		Split-Spoon	1		Very Soft, Brown and Gray Silty Clay (CL) trace Sand	CL	1-1-1 N=2	27	
		Split-Spoon	2		Very Soft, Brown and Gray Silty Clay (CL) with Sand	CL	0-0-1 N=1	29	
	5	Split-Spoon	3		Firm, Brown and Gray Silty Clay (CL) trace Sand	CL	1-2-3 N=5	31	
		Split-Spoon	4		Firm, Brown and Gray Silty Clay (CL)	CL	3-3-3 N=6	27	
	10	Split-Spoon	5		Firm, Brown and Gray Silty Clay (CL)	CL	2-3-3 N=6	21	
	15	Split-Spoon	6		Firm, Brown and Gray Silty Clay (CL) trace Sand	CL	2-3-4 N=7	23	

Boring Terminal Depth: 15½ feet

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



Completion Depth:	15.5 ft	Sample Types:	Latitude:
Date Boring Started:	5/29/13	Auger Cutting; Split-Spoon; Rock Core; Shelby Tube; Hand Auger; Calif. Sampler; Texas Cone	Longitude:
Date Boring Completed:	5/29/13		Drill Rig: CME 75
Logged By:	Chad Smith		Remarks:
Drilling Contractor:	PSI		

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Memphis, TN 38118
Telephone: (901) 365-1802
Fax: (901) 366-7233

LOG OF BORING B- 5

PSI Job No.: 0502841
Project: McDonald's
Location: Winchester Road and Malco Way
Memphis, Tennessee

Drilling Method: Hollow Stem Auger
Sampling Method: SS
Hammer Type: Automatic
Boring Location: Sign

WATER LEVELS	
While Drilling	4 feet
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

Depth, (feet)	Sample Type	Sample No.	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %
0			Topsoil: 3 inches			
	Split-Spoon	1	Very Soft, Brown and Gray Silty Clay (CL)	CL	1-1-1 N=2	30
	Split-Spoon	2	Soft, Brown and Gray Silty Clay (CL) trace Sand	CL	1-2-1 N=3	30
5	Split-Spoon	3	Firm, Brown and Gray Silty Clay (CL) trace Sand	CL	2-3-4 N=7	26
	Split-Spoon	4	Firm, Brown and Gray Silty Clay (CL)	CL	3-3-3 N=6	24
10	Split-Spoon	5	Firm, Brown and Gray Silty Clay (CL)	CL	2-3-4 N=7	19
15	Split-Spoon	6	Stiff, Brown and Gray Silty Clay (CL) trace Sand	CL	2-4-6 N=10	19

Boring Terminal Depth: 15½ feet

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

Completion Depth: 15.5 ft
Date Boring Started: 5/28/13
Date Boring Completed: 5/28/13
Logged By: Russell Strunk
Drilling Contractor: PSI

Sample Types: Auger Cutting, Split-Spoon, Rock Core, Shelby Tube, Hand Auger, Calif. Sampler, Texas Cone

Latitude:
Longitude:
Drill Rig: CME 55
Remarks:

Professional Service Industries, Inc.
4161 Ridgemoor Avenue
Memphis, TN 38118
Telephone: (901) 365-1802
Fax: (901) 366-7233

LOG OF BORING B- 6

PSI Job No.:	0502841
Project:	McDonald's
Location:	Winchester Road and Malco Way Memphis, Tennessee
Drilling Method:	Hollow Stem Auger
Sampling Method:	SS
Hammer Type:	Automatic
Boring Location:	Dumpster Pad

WATER LEVELS

While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

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					Topsoil: 3 inches				
			Split-Spoon	1		Very Soft, Brown and Gray Silty Clay (CL) trace Sand	CL	1-0-1 N=1	26	
			Split-Spoon	2		Soft, Brown and Gray Silty Clay (CL) with Sand	CL	1-2-2 N=4	25	
	5		Split-Spoon	3		Firm, Brown and Gray Silty Clay (CL)	CL	3-4-4 N=8	23	

STANDARD PENETRATION TEST DATA: N in blows/ft ◎; × Moisture; PL; LL (scale 0, 25, 50). STRENGTH, tsf: ▲ Qu; ✳ Qp (scale 0, 2.0, 4.0)

Boring Terminal Depth: 5½ feet

Completion Depth:	5.5 ft
Date Boring Started:	5/29/13
Date Boring Completed:	5/29/13
Logged By:	Chad Smith
Drilling Contractor:	PSI

Sample Types: Auger Cutting, Split-Spoon, Rock Core, Shelby Tube, Hand Auger, Calif. Sampler, Texas Cone

Latitude:
Longitude:
Drill Rig: CME 75
Remarks:

Professional Service Industries, Inc.
4161 Ridgemoor Avenue
Memphis, TN 38118
Telephone: (901) 365-1802
Fax: (901) 366-7233

LOG OF BORING B- 7

PSI Job No.:	0502841	Drilling Method:	Hollow Stem Auger
Project:	McDonald's	Sampling Method:	SS
Location:	Winchester Road and Malco Way Memphis, Tennessee	Hammer Type:	Automatic
		Boring Location:	Parking Lot

WATER LEVELS

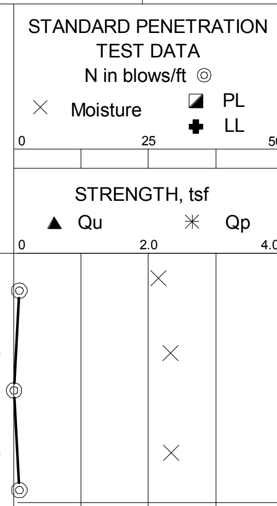
While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

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					Topsoil: 3 inches				
			Split-Spoon	1		Very Soft, Brown and Gray Silty Clay (CL)	CL	1-0-1 N=1	27	
			Split-Spoon	2		Very Soft, Brown and Gray Silty Clay (CL) with Sand	CL	1-0-0 N=0	29	
	5		Split-Spoon	3		Very Soft, Brown and Gray Silty Clay (CL) with Sand	CL	1-0-1 N=1	29	

Boring Terminal Depth: 5½ feet

STANDARD PENETRATION TEST DATA



Completion Depth:	5.5 ft
Date Boring Started:	5/29/13
Date Boring Completed:	5/29/13
Logged By:	Chad Smith
Drilling Contractor:	PSI

Sample Types: Auger Cutting, Split-Spoon, Rock Core, Shelby Tube, Hand Auger, Calif. Sampler, Texas Cone

Latitude:
Longitude:
Drill Rig: CME 75
Remarks:

Professional Service Industries, Inc.
4161 Ridgemoor Avenue
Memphis, TN 38118
Telephone: (901) 365-1802
Fax: (901) 366-7233

LOG OF BORING B- 8

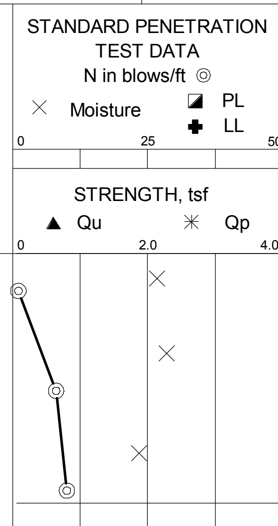
PSI Job No.:	0502841
Project:	McDonald's
Location:	Winchester Road and Malco Way Memphis, Tennessee
Drilling Method:	Hollow Stem Auger
Sampling Method:	SS
Hammer Type:	Automatic
Boring Location:	Parking Lot

WATER LEVELS

While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0				Topsoil: 3 inches				
		Split-Spoon	1		Very Soft, Brown and Gray Silty Clay (CL)	CL	1-0-1 N=1	27	
		Split-Spoon	2		FIrm, Brown and Gray Silty Clay (CL) with Sand	CL	2-2-6 N=8	29	
	5	Split-Spoon	3		Stiff, Brown and Gray Silty Clay (CL)	CL	3-4-6 N=10	23	



Boring Terminal Depth: 5½ feet

Completion Depth:	5.5 ft
Date Boring Started:	5/29/13
Date Boring Completed:	5/29/13
Logged By:	Chad Smith
Drilling Contractor:	PSI

Sample Types: Auger Cutting, Split-Spoon, Rock Core, Shelby Tube, Hand Auger, Calif. Sampler, Texas Cone

Latitude:
Longitude:
Drill Rig: CME 75
Remarks:

Professional Service Industries, Inc.
4161 Ridgemoor Avenue
Memphis, TN 38118
Telephone: (901) 365-1802
Fax: (901) 366-7233

LOG OF BORING B- 9

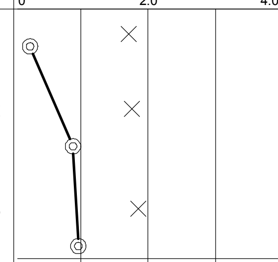
PSI Job No.:	0502841	Drilling Method:	Hollow Stem Auger
Project:	McDonald's	Sampling Method:	SS
Location:	Winchester Road and Malco Way Memphis, Tennessee	Hammer Type:	Automatic
		Boring Location:	Parking Lot

WATER LEVELS

While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

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					Topsoil: 2 inches					
			Split-Spoon	1		Soft, Brown and Gray Silty Clay (CL)		1-2-1 N=3	21		
			Split-Spoon	2		Stiff, Brown and Gray Silty Clay (CL)	CL	4-5-6 N=11	22		
	5		Split-Spoon	3		Stiff, Brown and Gray Silty Clay (CL)		4-5-7 N=12	23		
						Boring Terminal Depth: 5½ feet					



Completion Depth:	5.5 ft	Sample Types:		Latitude:
Date Boring Started:	5/29/13	Auger Cutting	Shelby Tube	Longitude:
Date Boring Completed:	5/29/13	Split-Spoon	Hand Auger	Drill Rig: CME 75
Logged By:	Chad Smith	Rock Core	Calif. Sampler	Remarks:
Drilling Contractor:	PSI		Texas Cone	