SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUTION

DeKalb County Fire Station No. 7
Decatur, DeKalb County, Georgia
November 23, 2016

Submitted to:
DeKalb County
Facilities Management Department
DeKalb County, Georgia

Submitted by:
Willmer Engineering Inc.
Project No. 71.4175

November 23, 2016

VIA EMAIL

Dulce M. Guzman
Senior Project Manager
Architectural & Engineering Services
DeKalb County Facilities Management Department
Clark W. Harrison Building
330 W. Ponce de Leon Avenue, 4th Floor
Decatur, Georgia 30030

SUBJECT: **Subsurface Exploration and Geotechnical Engineering Evaluation**
Fire Station No. 7
Decatur, DeKalb County, Georgia
Willmer Project No. 71.4175

Dear Ms. Guzman:

Willmer Engineering Inc. (Willmer) is pleased to provide this report of subsurface exploration and geotechnical engineering evaluation for the proposed Fire Station No. 7 project located east of the intersection of Columbia Drive and Peachcrest Road in Decatur, DeKalb County, Georgia. This work was performed for DeKalb County under our Master Services Agreement in general accordance with our proposal dated October 6, 2016. The results of our evaluation and our recommendations are summarized in this report.

This engineering report is divided into five sections. Section 1 contains the project background information and a summary of the objectives and scope of our work. Summaries of the field exploration and laboratory testing programs are provided in Sections 2 and 3, respectively. Section 4 presents regional geologic conditions and subsurface conditions at the site, and the results of our geotechnical engineering evaluations and our recommendations are presented in Section 5.

We greatly appreciate the opportunity to be of service to you on this project. Please contact us if you have any questions concerning this report or require further assistance.

Sincerely,

WILLMER ENGINEERING INC.

Joseph Sura, PE
Project Geotechnical Engineer

Sujit K. Bhowmik, PhD, PE
Chief Engineer

James L. Willmer, PE
Executive Vice President/Principal Consultant

JMS/SKB/JLW:jms *P:\4175 DeKalb County Fire Station No. 7\Reports\01 - 4175 DeKalb County Fire Station.docx*

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Executive Summary

The following summary highlights significant aspects of the project and our conclusions and recommendations. The reader is referred to the report text for detailed descriptions of our geotechnical investigation, analyses, and recommendations.

- The purpose of this project is to build a new Fire Station and associated parking lot areas and driveways in an existing wooded area located east of the intersection of Columbia Drive and Peachcrest Road in Decatur, DeKalb County, Georgia.
- The geotechnical exploration for this project consisted of 10 Standard Penetration Test (SPT) borings, soil sampling, and laboratory tests.
- The subsurface profile at the site generally consists of residuum underlain by partially weathered rock (PWR) and parent bedrock. Auger refusal was encountered at two locations at depths of 11.5 and 40 feet below the existing ground surface. Groundwater was not encountered within the exploration depths of the boreholes during drilling.
- The fire station building can be supported by a system of shallow foundations consisting of spread and strip footings, bearing on existing residuum. An allowable bearing pressure of 3,000 psf is recommended for design.
- In accordance with the procedures and site class definitions described in IBC 2012, the seismic site class for proposed office building is Site Class D, defined as “Stiff Soil”.
- We recommend that a CBR of 4 and subgrade reaction modulus value of 190 pci be used for design of pavement.
- We recommend that Willmer Engineering Inc. be retained to provide geotechnical engineering oversight, construction materials testing, and special inspections for the County during construction of the facilities to confirm that the subsurface conditions encountered during construction are consistent with our interpretation based on the results of our geotechnical investigation and that the recommendations provided herein are properly interpreted and implemented.

1.0 Introduction

1.1 Project Description and Site Location

DeKalb County plans to build a new fire station on an undeveloped property east of the intersection of Columbia Drive and Peachcrest Road in Decatur, Georgia. Based on discussions with DeKalb County, the development will include a typical fire station building and associated parking lot areas and driveways; however, a specific building plan has not yet been established. A map showing the location of the site is presented in Figure 1.

1.2 Objectives and Scope of Present Work

The primary objectives of the study reported herein were to obtain geotechnical information and provide recommendations for evaluation of foundation types, assessment of shallow foundations, and pavement subgrade for parking areas and driveways. To achieve these objectives, Willmer performed the following major tasks:

- Review of available topographic maps, aerial photographs, and geologic literature pertaining to the subject site.
- Planning and performance of a field exploration program consisting of: (i) visual inspection of the site to document existing topography and land use, above-ground utilities, accessibility for drilling equipment, and other features relevant to the field exploration work, (ii) coordination with Georgia Utilities Protection Center and a private utility locator for subsurface utility clearance at boring locations, (iii) site clearing for drilling access, (iv) drilling 10 Standard Penetration Test (SPT) borings within the construction limits of the project, (v) undisturbed and bulk sampling from selected soil layers for use in laboratory testing, and (vi) groundwater level measurements at the boring locations.
- Performance of a laboratory testing program consisting of classification and engineering property tests on representative soil samples.
- Compilation and evaluation of the collected field and laboratory test data and selection of engineering properties for use in geotechnical analyses.
- Performance of geotechnical analyses including determination of pavement and foundation design parameters with allowable bearing pressures.
- Preparation of this report summarizing all relevant field and laboratory test data, the results of our analyses and evaluation, and our recommendations for design.

2.0 Field Exploration Program

2.1 General

A field exploration program was conducted by Willmer to determine the type, strength, and deformation characteristics of *in situ* soils and to assess the groundwater conditions at the site of the proposed development. The field exploration consisted of SPT borings, bulk soil sampling, undisturbed soil sampling, and groundwater table measurements.

The boring locations and termination depths were selected by Willmer based on a template of typical fire station design provided by DeKalb County. A path to the borings was cleared using a D650 bulldozer. The borings were located in the field by Willmer using a handheld GPS device with an accuracy of +/- 10 feet. Existing ground elevations were estimated from Google Earth and should be considered approximate. Subsurface utility clearance at the boring locations was provided by the subscribers of Georgia Utilities Protection Center and a private utility locator. Upon completion of drilling and groundwater depth measurements, the boreholes were backfilled using soil cuttings from the drilling operation.

2.2 Standard Penetration Test Borings

The field exploration program consisted of drilling 10 SPT borings (S-1 through S-5 and D-1 through D-5) to depths below ground surface ranging from 10 feet to 40 feet. The locations of the SPT borings are shown in Figure 2.

The borings were drilled using an ATV-mounted rotary drill rig to advance continuous hollow-stem augers. All work was performed under the observation of our geotechnical engineer. The SPT borings were performed in general accordance with ASTM Standard D 1586. The Standard Penetration Test is a widely accepted method for *in situ* testing of soils. A 2-foot long, 2-inch outside-diameter split-barrel sampler attached to the end of a string of drilling rods is driven 18 inches into the ground by successive blows of a 140-pound hammer freely dropping 30 inches. The number of blows needed for each 6 inches of penetration is recorded. The blows required for the first 6 inches of penetration are allowed for seating the sampler into any loose cuttings, and the sum of the blows required for penetration of the second and third 6-inch increments constitutes the penetration resistance or N-value. After the test, the sampler is extracted from the ground and opened to allow visual examination and classification of the retained soil sample. The N-value has been empirically correlated with various soil properties including consistency, relative density, strength, compressibility, and potential for difficult excavation. Correlations between the N-value and the relative density of cohesionless soils (sands) and consistency of cohesive soils (clays/silts) are included in Appendix II.

Results of the SPT borings are summarized in Table 1, and presented in the form of individual boring logs in Appendix I along with a list of the legends used in the boring logs, and a reference sheet describing the Unified Soil Classification System.

2.3 Soil Sampling

Soil samples (split-spoon, bulk, and undisturbed samples) obtained during the field exploration program were classified by our geotechnical engineer. The split-spoon samples were obtained from all borings

and collected in plastic bags. Bulk samples were collected in plastic bags from boring S-2 and a location approximately 10 feet north of boring S-4 from depths ranging from 0 to 10 feet. Two undisturbed Shelby tube samples were recovered from borings D-4 and S-2 for possible use in laboratory consolidation testing. Locations of the undisturbed samples are shown on the individual boring logs in Appendix I. The samples were returned to our laboratory for further classification and characterization. Soil classification was performed in general accordance with ASTM D 2487 / D 2488 classification system.

2.4 Groundwater Level Measurement

Groundwater was not encountered in any of the boreholes during drilling. However, it should be noted that groundwater levels fluctuate due to climactic and seasonal variations, and may be encountered during construction. Groundwater fluctuations as much as 15 feet have been observed in the Atlanta area.

3.0 Laboratory Testing

3.1 General

A laboratory testing program was conducted to determine the engineering properties of soils for use in our analyses and recommendations for the proposed facilities. The laboratory testing program consisted of: (i) a consolidation test on a selected undisturbed soil sample, and (ii) Standard Proctor compaction, natural moisture content, and California Bearing Ratio (CBR) tests on remolded bulk soil samples, and (iii) United Soil Classifications Tests including sieve tests and Atterberg Limits tests on two selected soil samples. All laboratory tests were performed in general accordance with appropriate ASTM standards.

3.2 Standard Proctor Compaction and CBR Tests

The bulk samples obtained from ten feet north of S-4 and boring S-2 (referred to as bulk samples 1 and 2, respectively) were used to perform Standard Proctor compaction tests to determine the compaction characteristics of these soils. Results of these tests are summarized in Table 2. The Standard Proctor maximum dry density values were 98.7 and 110.3 pcf, for bulk samples 1 and 2, respectively. The optimum moisture contents were 17.1% and 15.6%, for bulk samples 1 and 2, respectively. The natural moisture content values of the bulk samples were 6.5% and 7.4%, about 10.6% and 8.2% drier than the optimum values for bulk samples 1 and 2, respectively.

CBR tests were performed on the samples selected for compaction testing to determine the subgrade-support characteristics of these soils. The CBR tests were performed on specimens molded to about 95 percent of the Standard Proctor maximum dry density at a moisture content approximately equal to the optimum moisture content. The resulting CBR values are summarized in Table 2. As shown in Table 2, the CBR values were reported to be 4.3 and 13.2, for bulk samples 1 and 2, respectively. It is noted that the CBR value of 13.2 reported for bulk sample 2 was probably exaggerated due to the presence of rock fragments within the residuum soil.

3.3 Consolidation Test

One consolidation test was performed on an undisturbed soil sample obtained from boring D-4 at a depth of 20 to 22 feet to evaluate the consolidation characteristics of the existing residuum soil. The laboratory data is presented in the form of void ratio and percent strain, and coefficient of consolidation versus effective vertical stress plots in Appendix III. The compression index of the tested soil sample was 0.4; the recompression index was 0.03; and the pre-consolidation pressure was approximately 2.5 kips per square foot (ksf). The coefficient of consolidation for the applicable stress range is about 1.6 ft^2/day.

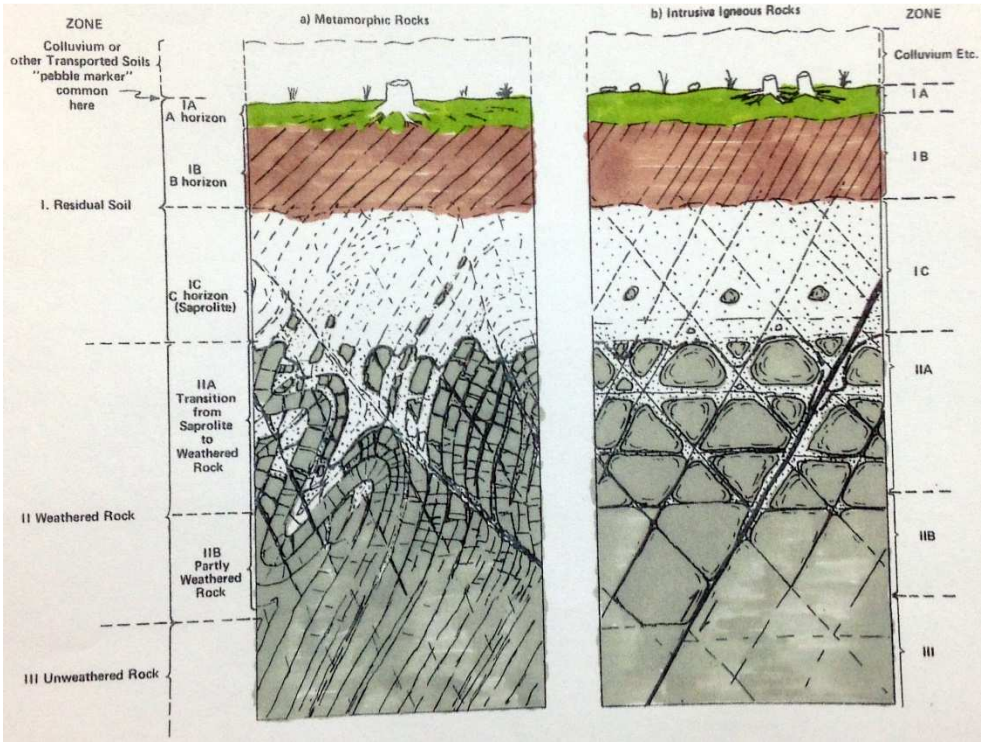
4.0 Area Geology and Subsurface Conditions

4.1 Area Geology

Based on the USGS Database for the 'Geologic Units of Georgia', the project site is underlain by Biotitic Gneiss / Mica Schist/ Amphibolite formation, located within the Southern Piedmont Physiographic Province of Georgia.

The Piedmont is composed of metamorphic rocks with localized igneous intrusions. The residual overburden soils encountered in the Piedmont are the product of in-situ chemical and physical weathering of the underlying parent rock. Typically, weathering is most advanced near the surface and decreases with depth. Below the residual soils, partially weathered rock is usually encountered as a transition zone to the underlying bedrock. Partially weathered rock (PWR) is locally defined as a material with a Standard Penetration Resistance in excess of 50 blows per 6 inches of penetration.

An important aspect of the Piedmont subsurface profile is that highly variable conditions may exist over relatively short horizontal distances. This is caused by variation in mineral composition of the parent rock and the intensity of fractures and joints within the rock. Zones of partially weathered rock may be encountered within residual soils, and lenses of soil may occur in the rock mass. The subsurface profile may be altered by excavating or filling, or by effects of water through the process of erosion or alluvial deposition. Typical schematic profiles of Piedmont metamorphic rocks and intrusive igneous rocks are depicted in the figure below.



4.2 Subsurface Conditions

Results of the SPT borings are presented in the form of individual boring logs in Appendix I, a summary of the boring records is presented in Table 1, and subsurface profiles obtained from the boring logs are presented in Figure 3, 4, and 5. The stratification lines shown on the boring logs represent our interpretation of the field logs and laboratory test results, in accordance with generally accepted geotechnical engineering practice. The stratification lines represent approximate boundaries between soil types; actual transitions between soil types are expected to be gradual. Although individual test borings are representative of the subsurface conditions at the precise boring locations on the dates shown, they are not necessarily indicative of the subsurface conditions at other locations or at other times. Also, in the absence of foreign substances, it is difficult to distinguish between virgin (undisturbed) residual soils and clean soil fill. However, based on historical USGS topographic maps dating back to 1954, the property appears to be undeveloped. Based on visual classification and historical records, the soil has been characterized to be virgin residual soils.

The subsurface profile at the site can be generally characterized as a natural soil profile consisting of residual soils underlain by partially weathered rock (PWR) then parent bedrock. A generalized discussion of the soil types encountered at the site is presented in the following paragraphs. For the purpose of this discussion, partially weathered rock (PWR) is characterized for engineering purposes as residual soils exhibiting N-values in excess of 50 blows for 6 inches of penetration. Auger refusal is considered indicative of the top of parent bedrock.

4.2.1 Topsoil

Topsoils were encountered at borings D-2, D-3, D-5, S-2, S-3, and S-4 and consisted of brown and black sandy silts with organics. The maximum thickness of topsoil was approximately 1 foot in boring S-3.

4.2.2 Residuum

Residual soils were encountered at all borings and consisted of stiff to very hard sandy silts, medium dense to very dense silty sands, and stiff to very hard sandy fat clay. The maximum thickness of residual soils encountered in the borings was 33.5 feet in boring D-4. The relative density of residual soils varied with SPT N-values ranging from 11 to 66 blows per foot.

4.2.3 Partially Weathered Rock

Partially weathered rock (PWR) was encountered in borings D-1, D-2 and D-4 at depths of 11.5 feet, 29 feet and 33.5 feet, respectively. Lenses of PWR were encountered in borings D-4, S-1, S-2, and S-4, however these blow counts may be exaggerated by rock fragments.

4.2.4 Auger Refusal Material

Two borings were extended to auger refusal. Auger refusal is generally indicative of the top of bedrock. The depth to auger refusal was 40 feet in boring D-4, corresponding to an elevation of approximately 963 feet. Auger refusal was also encountered in boring D-1 at a depth of 11.5 feet, corresponding to an elevation of approximately 989.5 feet.

4.2.5 Groundwater Table

Groundwater was not encountered in any of the boreholes during drilling. However, it should be noted that groundwater levels fluctuate due to climactic and seasonal variations, and may be encountered during construction. Groundwater fluctuations as much as 15 feet have been observed in the Atlanta area.

5.0 Geotechnical Engineering Evaluations and Recommendations

5.1 General

The geotechnical engineering evaluations and recommendations presented herein are based on the soil boring and laboratory test data gathered during this investigation, our understanding of the proposed design and construction, and our experience with similar site and subsurface conditions. These recommendations were prepared in accordance with generally accepted geotechnical engineering practice for the exclusive use of DeKalb County and their designated consultants for use in the design of the proposed Fire Station No. 7. No other warranty, expressed or implied, is made.

We request that we be advised of any significant changes in the proposed development from that described in this report so that we may amend our recommendations accordingly. In addition, we request the opportunity to review the portions of the project specifications that relate to geotechnical engineering to ensure that our recommendations are properly incorporated.

5.2 Site and Subgrade Preparation

Site and subgrade preparation should begin with the removal of any trees, surface vegetation, organic-laden soil, topsoil, and any other deleterious materials within the proposed construction area. Following the site preparation and excavation to grade for foundations and pavements, the newly exposed subgrade should be evaluated by the project geotechnical engineer. During this evaluation, we recommend that all areas at subgrade level and areas that are to receive structural fill be proof-rolled using a fully loaded tandem axle dump truck (20-ton minimum) or similar rubber-tired vehicle. If soils exhibit excessive deflections or pumping when proof-rolled, an appropriate remedial measure would be recommended by the project geotechnical engineer at that time. Typically, any areas which pump or rut excessively and cannot be densified by continued rolling should be undercut to more stable soils, replaced with new compacted fill, or stabilized using geotextiles or admixtures, if feasible.

If localized undercutting and backfilling becomes necessary during construction, structural fill must be used for backfilling. The structural fill should be free of significant organic matter or debris, have a low to moderate plasticity, uniform composition, and be free of rock fragments greater than three inches in diameter. Soils selected for use as structural fill material should also have a Plasticity Index (PI) less than 30 percent and a Standard Proctor (ASTM D 698) maximum dry density of at least 95 pounds per cubic foot (pcf). Based on the results of our field exploration, it appears that existing residual soils consisting of silty sands and sandy silts are suitable for use as structural fill.

Structural fill, if needed, must be brought to the proposed subgrade elevation by placing and compacting approved fill materials upon a subgrade approved by the geotechnical engineer. Compaction of engineered fill must be accomplished by placing the fill material in vertical lifts of eight inches maximum loose thickness and compacting each lift with a vibratory compactor to a dry density that corresponds to at least 95 percent of the Standard Proctor (ASTM D 698) maximum dry density of the fill soil. The upper 12 inches of structural fill beneath slabs, building footings, pavement and retaining wall foundations should be compacted to 98 percent of this maximum dry density.

In confined areas, such as utility trenches where large compaction equipment cannot be used, portable compaction equipment and the use of a thinner lift (i.e., 4 inches of loose thickness) may be necessary to achieve the specified level of compaction. In addition to the requirement for dry density, the engineered fill must be placed at a moisture content ±3 percent of the optimum moisture content, as determined by the Standard Proctor compaction test.

Care must be exercised during grading and fill placement operations. The combination of heavy construction equipment traffic and excess surface moisture can cause pumping and deterioration of the near-surface silty soils. Once wet, these soils hold moisture and are difficult to dry. The severity of this potential problem depends to a great extent on the weather conditions prevailing during construction. The contractor must exercise discretion when selecting equipment sizes and make a concerted effort to control surface water while the subgrade soils are exposed. If such problems do arise, the operations in the affected area must be halted and the geotechnical engineer contacted to evaluate the condition.

5.3 Excavation Methods

No proposed grading plan was available at the time of preparation of this report, however, it is possible that cut and fill may be required for construction. Based on the boring data, site grading in cut areas will mostly require excavation of sandy silt, silty sand, and fat clay. These soils can be excavated with conventional earth-moving equipment.

PWR was encountered in the borings at both shallow (e.g., 4 feet in D-4) and deep (e.g., 29 feet in D-2) depths. If PWR needs to be removed to reach the design grades, PWR and fractured/weathered rock would likely be rippable with equipment such as a D-8 dozer with single ripper claw attachment, or a CAT 330 or equivalent trackhoe. Material that cannot be removed with such equipment may have to be removed with a hydraulic jack hammer attached to a trackhoe.

Auger refusal material (indicative of top of bedrock) was encountered at boring D-4 at a depth of 40 feet below the existing ground surface and at boring D-1 at a depth of 11.5 feet below the existing ground surface. We do not anticipate foundation installation or building construction requiring excavation to auger refusal depth or below. The following definitions can be used to clarify material classification, excavation techniques and required equipment capabilities:

1) Rip Rock: Any material that cannot be moved by scrapers, loaders, pans, or graders and that requires the use of a single-tooth ripper mounted on a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds.

2) Blast Rock (General Excavation): Any material which cannot be excavated with a single-tooth ripper mounted on a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (Caterpillar D-8K or equivalent) or by a Caterpillar 977 front-end loader or equivalent, and occupying an original volume of at least one cubic yard.

3) Blast Rock (Trench Excavation): Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 25,700 pounds (Caterpillar Model 225 or equivalent), and occupying an original volume of at least one half cubic yard.

In evaluating site grading and excavation requirements, it must be noted that subsurface conditions, particularly the location and elevation of rock, whether in boulders or massive form, can vary erratically in the Piedmont Physiographic Province in which this site is located. Therefore, there is always a possibility that rock may be encountered at shallower depths in unexplored areas. If large boulders or massive rocks are encountered during the grading operations, blasting may be necessary to facilitate removal.

5.4 Drainage and Groundwater Management

The proposed construction areas must be provided with adequate drainage measures to maintain the integrity of the silty subgrade soils, especially during wet-weather conditions. When free water is allowed to stand on a stable subgrade, the soils can absorb water, soften, swell and experience a reduction in their support capability. Without adequate drainage provisions, site preparation activities during wet-weather periods may result in subgrade conditions that will necessitate undercutting or other subgrade stabilization measures. Therefore, we recommend that the site be graded to provide positive drainage away from the proposed pavement and foundation subgrade areas, and toward suitable drainage handling areas.

Proper drainage of the finished pavements and ground surfaces is also important to maintain the integrity of the subgrade soils after construction is completed. When free water is allowed to infiltrate into a stable subgrade, the soils will absorb water, swell, and experience a reduction in their support capability. Therefore, all finished grades must be sloped to prevent any ponding of surface water adjacent to structures and pavements.

It should be noted that groundwater elevations fluctuate with seasonal and climatic variations and may be different at different times. Groundwater was not encountered in the borings which extended from 10 to 40 feet; however, groundwater level variations as much as 15 feet have been observed in DeKalb County. While no serious dewatering problems are anticipated, some seepage into excavations may be experienced during foundation construction, depending on the seasonal conditions. It is anticipated that this seepage can be handled by pumping from sumps. Groundwater should be maintained at least 2 feet below the bearing level of all footings until concrete is placed.

5.5 Foundation Recommendations

Based on information provided to us by DeKalb County, the structure will be a one or two floor fire station. No design loads were available at this time, however, based on the Standard Penetration resistances, a bearing pressure of 3,000 psf is recommended for footing design for footings bearing on properly compacted fill or residual soil.

5.6 Seismic Site Classification

The seismic site class for the proposed structures was determined in accordance with the procedures outlined in Section 1613 of the 2012 International Building Code (IBC). According to the IBC, fire stations are designated as “essential facilities” and are classified in Risk Category IV. The seismic site class is based on soil/rock properties within the top 100 feet below the proposed final grade at the site. The soil/rock properties that can be used in this classification are SPT N-value, shear wave velocity, and/or

undrained shear strength. For this project, the method based on SPT N-value was used in the seismic site classification.

The weighted average N-value within the top 100 feet of the subsurface profile was calculated in accordance with the procedures outlined in Section 20 of ASCE 7-10. Rock was encountered within the top 100 feet at boring D-4 (at 40 feet) and in accordance with ASCE 7-10 guidelines, materials below this depth were assigned an SPT N-value of 100 blows/foot.

In accordance with the site class definitions outlined in Table 20.3-1 of ASCE 7-10, the proposed site was classified as Site Class 'D', defined as "Stiff Soil", based on boring D-4.

As outlined in Section 1613.3 of IBC, the design spectral response acceleration parameters for 0.2-second period and 1-second period were determined based on the site classes described above, the contour maps of maximum considered earthquake ground motion in Figures 1613.3.1(1) and 1613.3.1(2), and the procedures outlined in Sections 1613.3.3 and 1613.3.4 of IBC. The spectral response acceleration parameters along with other seismic design parameters are provided below:

Seismic Design Parameters	
Parameter	Value
Risk Category	IV
Seismic Importance Factor (I_e)	1.50
Mapped Spectral Response Acceleration Parameter – 0.2 second Period (S_S)	0.183
Mapped Spectral Response Acceleration Parameter – 1 second Period (S_1)	0.089
Long-Period Transition Period (T_L)	12 seconds
Site Class	D
Design Spectral Response Acceleration Parameter – 0.2 second Period (S_{DS})	0.195
Design Spectral Response Acceleration Parameter – 1 second Period (S_{D1})	0.143
Seismic Design Category	D

A design response spectrum curve constructed using the above acceleration value is presented in Figure 5 for use in seismic design of the proposed fire station structure.

5.7 Pavement Design

The soils encountered at the boring locations are suitable for use as pavement subgrade. The subgrade should be prepared in accordance with the 'Site and Subgrade Preparation' section of this report. If rock is encountered at or above the bottom of the pavement section, 6 inches of rock below the pavement should be over-excavated and replaced with compacted graded aggregate base (GAB).

The design of a pavement is dependent on the traffic volumes and weights of cars and trucks, and the soil strength which can be related to the Soil Support Value (determined using CBR tests). The CBR values for soil samples compacted to about 95 percent of the Standard Proctor maximum dry density were reported to be 4.3 and 13.2. As mentioned before, the reported CBR value of 13.2 is probably exaggerated due to rock fragments. Based on a database created by the Georgia Department of Transportation (GDOT), the default CBR value for DeKalb County is approximately 3.5. Considering the laboratory test results and the GDOT-established default values, we recommend that a CBR value of 4 and a corresponding subgrade reaction modulus of 190 pci be used for pavement design for this project.

It should be noted that if offsite borrow soils are used for fill, Standard Proctor compaction and classification tests should be performed on the borrow material to ensure that the above design parameters can be achieved.

5.8 Geotechnical Engineering Oversight during Construction

The recommendations provided herein are based on the geotechnical information gathered for the site, our interpretation of the available data, and our experience with similar soils and similar projects in the DeKalb County area. Geotechnical recommendations cannot be considered complete until the geotechnical engineer has the opportunity to confirm the subsurface conditions by performing actual field observations during construction. It is critical that our engineering staff provide inspection during proof-rolling and foundation installations. It is recommended that Willmer be retained to provide geotechnical engineering oversight, construction materials testing, and special inspections during construction to confirm that the recommendations provided herein are properly interpreted and implemented.

TABLES

Table 1
Summary of Subsurface Conditions
DeKalb County Fire Station No. 7
Decatur, DeKalb County, Georgia
Willmer Engineering Project No. 71.4175

Boring Number	Approximate Surface Elevation (feet)[1]	Depth to Top of Layer and Corresponding Elevations (feet)								Termination Depth and Elevation (feet)	
		Topsoil		Residuum		PWR		Auger Refusal			
		Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
D-1	1001	--	--	0	1001	4	997	11.5	989.5	--	--
D-2	1000	0	1000	0.5	1000	29	971	--	--	29.5	970.5
D-3	1004	0	1004	0.5	1003.5	--	--	--	--	30	974
D-4	1003	--	--	0	1003.0	33.5	969.5	40	963	--	--
D-5	1000	0	1000	0.5	999.5	--	--	--	--	30	970
S-1	1001	--	--	0	1001	--	--	--	--	10	991
S-2	1000	0	1000	0.5	999.5	--	--	--	--	30	970
S-3	1001	0	1001	1	1001	--	--	--	--	10	991
S-4	1001	0	1001	0.5	1000.5	--	--	--	--	10	991
S-5	1000	--	--	0	1000	--	--	--	--	10	990

Notes:

1. Surface elevations were estimated with a handheld GPS and Google Earth.
2. PWR - Partially Weathered Rock
3. Lenses of PWR (encountered in D-4, S-1, S-2, and S-4) are not included in this table.

Table 2
Summary of Standard Proctor Compaction and CBR Test Results
DeKalb Fire Station No. 7
Decatur, DeKalb County, Georgia
Willmer Project No. 71.4175

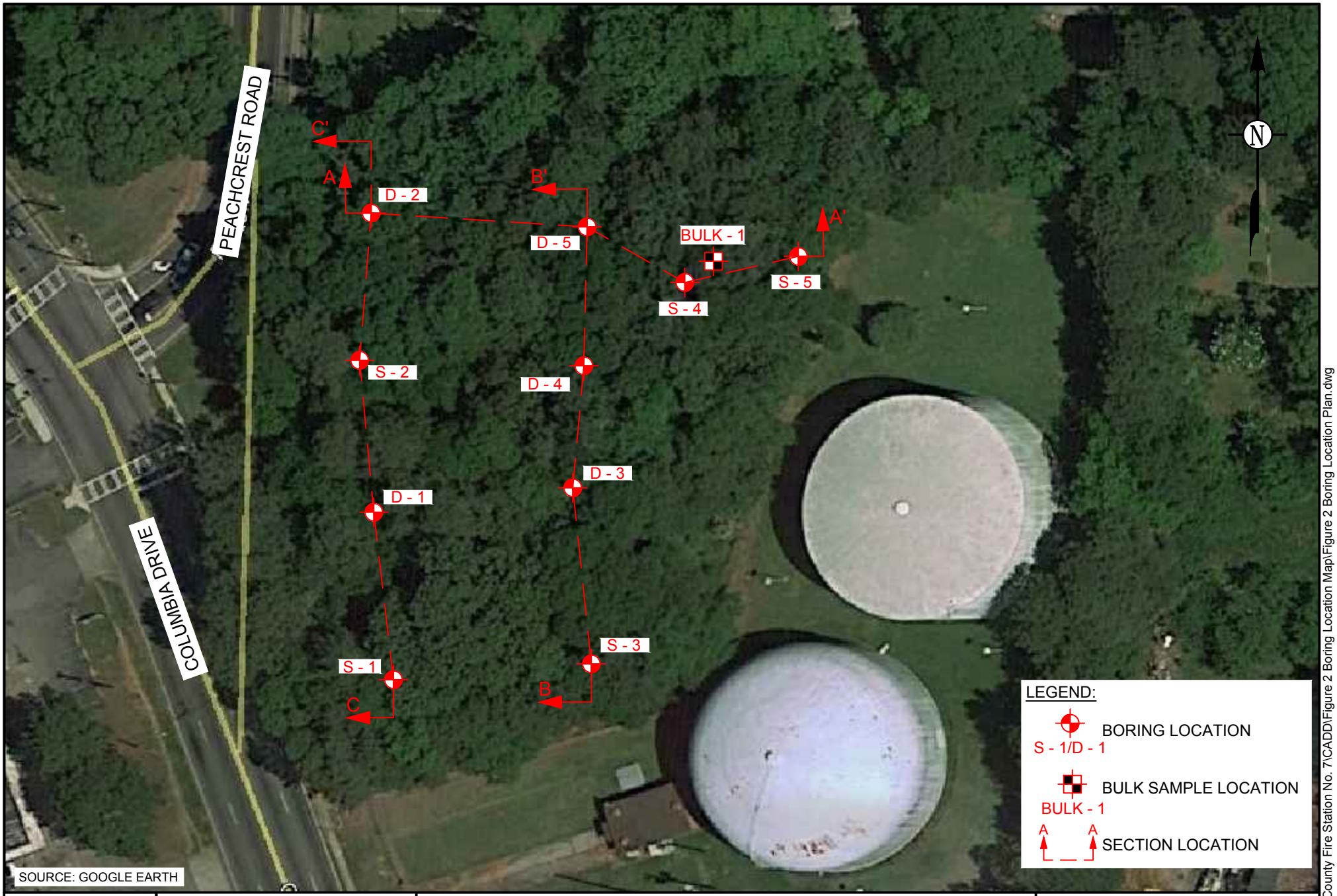
Location	Sample Depth (feet)	Soil Description	Natural Moisture Content (%)	Standard Proctor Compaction Test		CBR Test Results	
				Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Compaction (%)	CBR Value (%)
Bulk-1	0 – 3’	Residuum: Red sandy fat CLAY with organics	6.5	98.7	17.1	94.9	4.3
Bulk-2	0 – 10’	Residuum: Brown medium to fine sandy SILT with organics and rock fragments	7.4	110.3	15.6	95.0	13.2[2]

Notes:
1. CBR = California Bearing Ratio
2. This CBR value may be exaggerated due to the presence of rock fragments within the fill.

FIGURES

SCALE: 1" = 2000'	WILLMER Engineering	GEOTECHNICAL ENGINEERING CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270
DATE: 11/16/2016		FIGURE 1 PROJECT LOCATION MAP DEKALB COUNTY FIRE STATION No. 7 DECATUR, DEKALB COUNTY GEORGIA WILLMER PROJECT No. 71.4175
DRAWN BY: SM		
REVIEWED BY: JS		

P:\4175 DeKalb County Fire Station No. 7\CADD\Figure 1 Project Location Map\Figure 1 Project Location Map.dwg



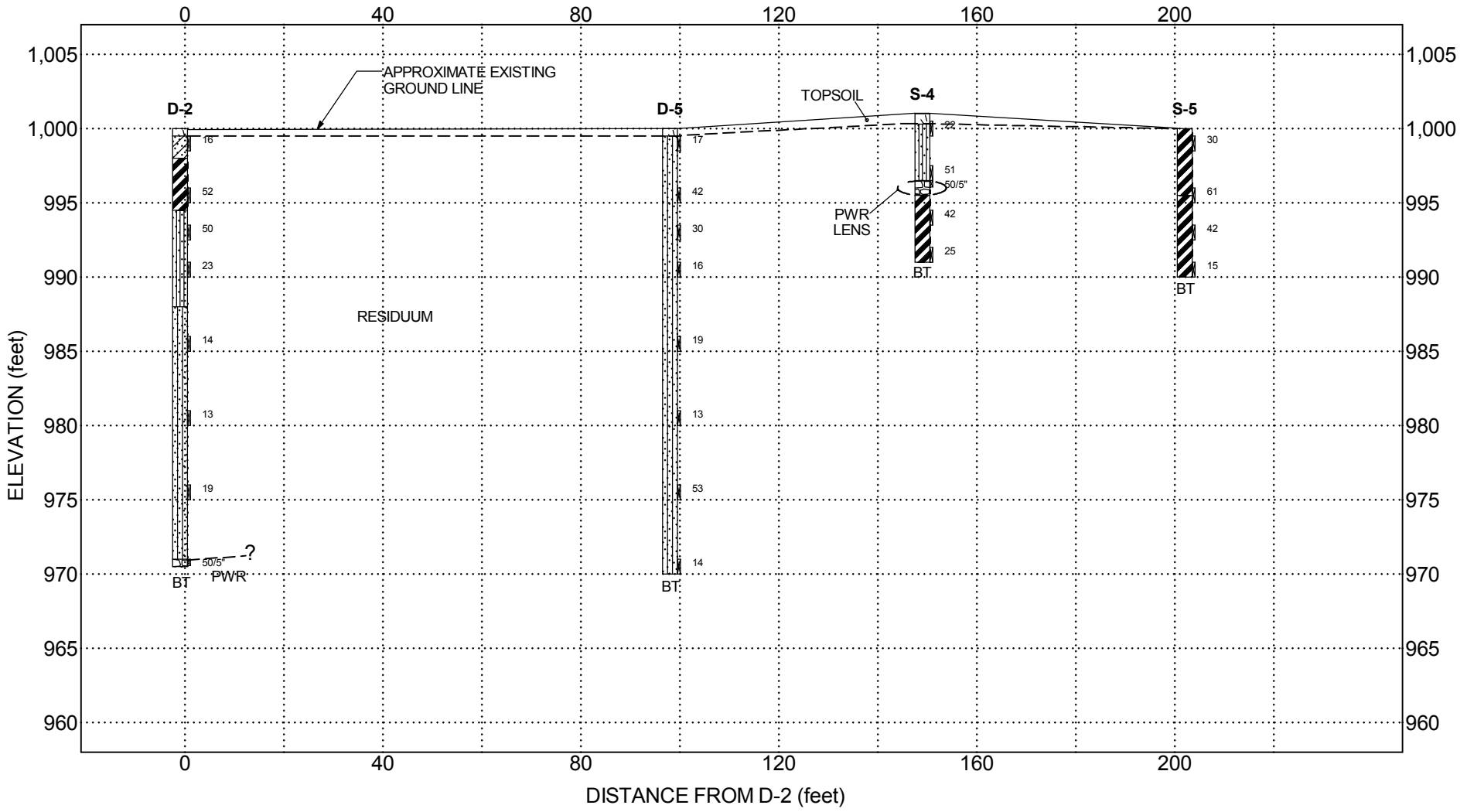
SCALE: 1" = 60'	
DATE: 11/23/2016	
DRAWN BY: SM	
REVIEWED BY: JS	

WILLMER Engineering

GEOTECHNICAL ENGINEERING ¤ CONSTRUCTION SERVICES
ENVIRONMENTAL SERVICES AND ENGINEERING
3772 PLEASANTDALE ROAD - SUITE 165
ATLANTA, GA 30340-4270

FIGURE 2
BORING LOCATION PLAN
DEKALB COUNTY FIRE STATION No. 7
DECATUR, DEKALB COUNTY GEORGIA
WILLMER PROJECT No. 71.4175

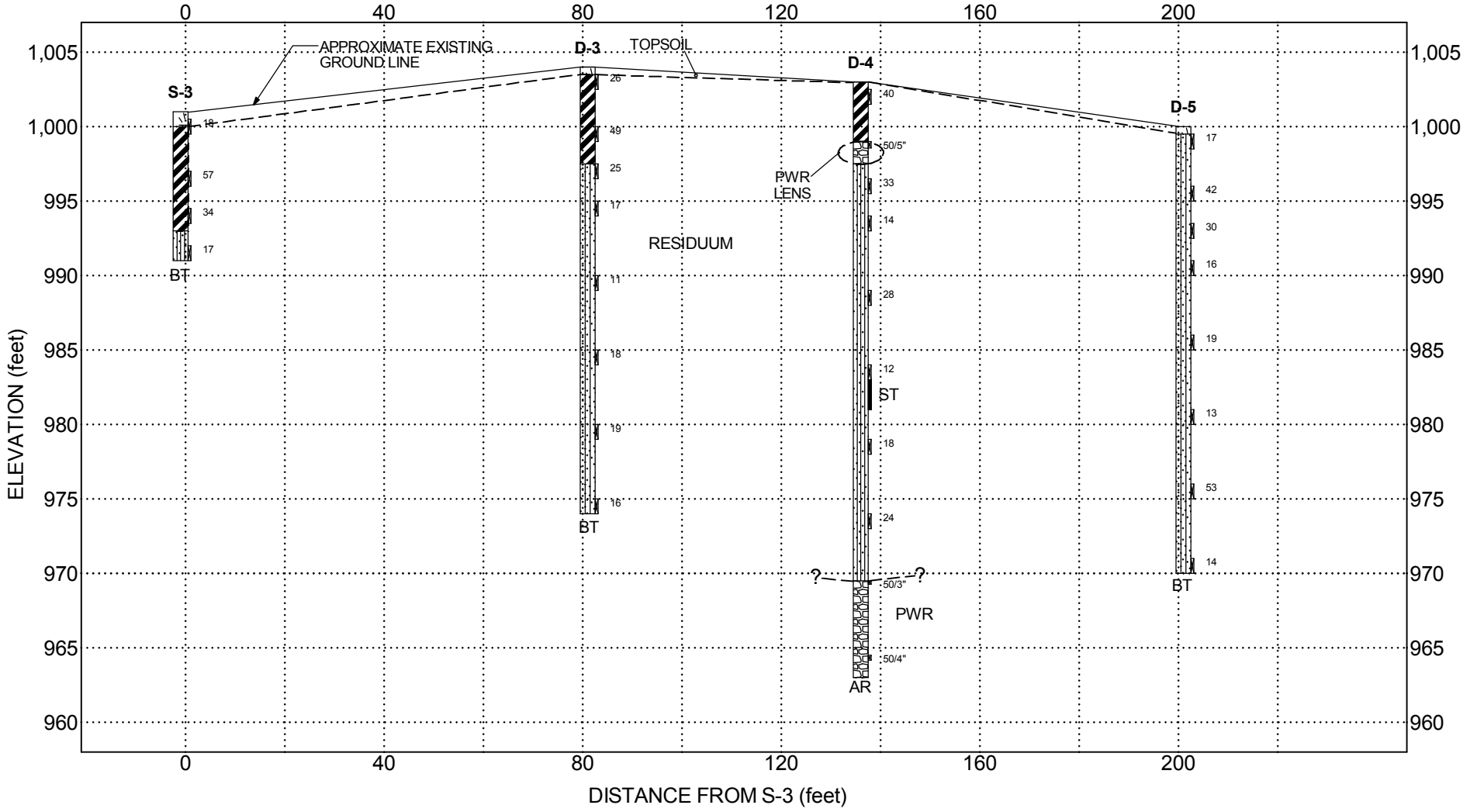
P:\4175 DeKalb County Fire Station No. 7\CADD\Figure 2 Boring Location Map\Figure 2 Boring Location Plan.dwg



LEGEND:

ST - Shelby Tube
BT - Boring Terminated
AR - Auger Refusal
PWR - Partially Weathered Rock

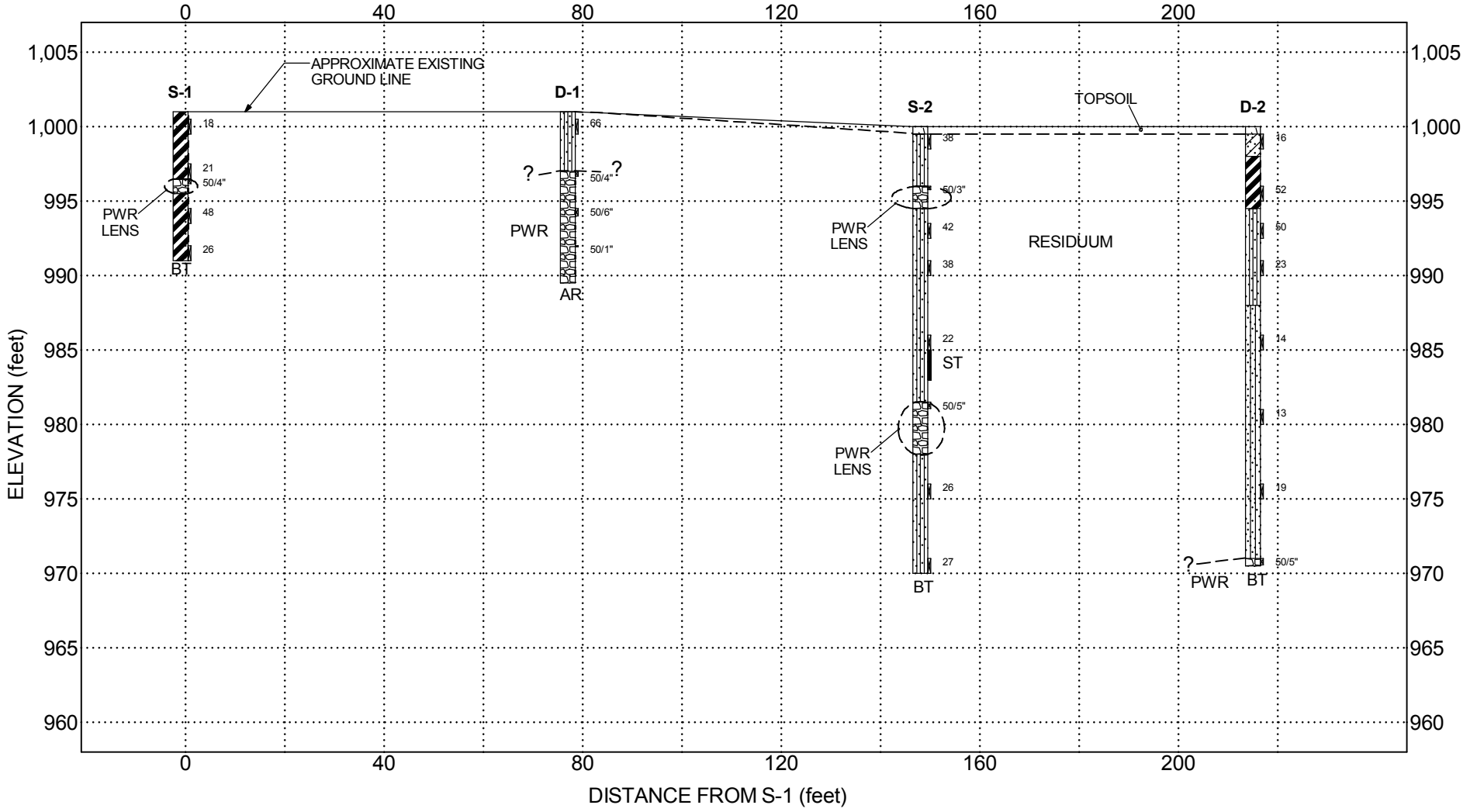
SCALE: 1"=30' (H) 1"=10' (V) DATE: 11/23/2016 DRAWN BY: JMS REVIEWED BY: SKB	WILLMER Engineering	GEOTECHNICAL ENGINEERING | CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	FIGURE 3 SUBSURFACE PROFILE A-A DEKALB COUNTY FIRE STATION NO. 7 DECATUR, DEKALB COUNTY, GEORGIA WILLMER PROJECT No. 71.4175



LEGEND:

ST - Shelby Tube
BT - Boring Terminated
AR - Auger Refusal
PWR - Partially Weathered Rock

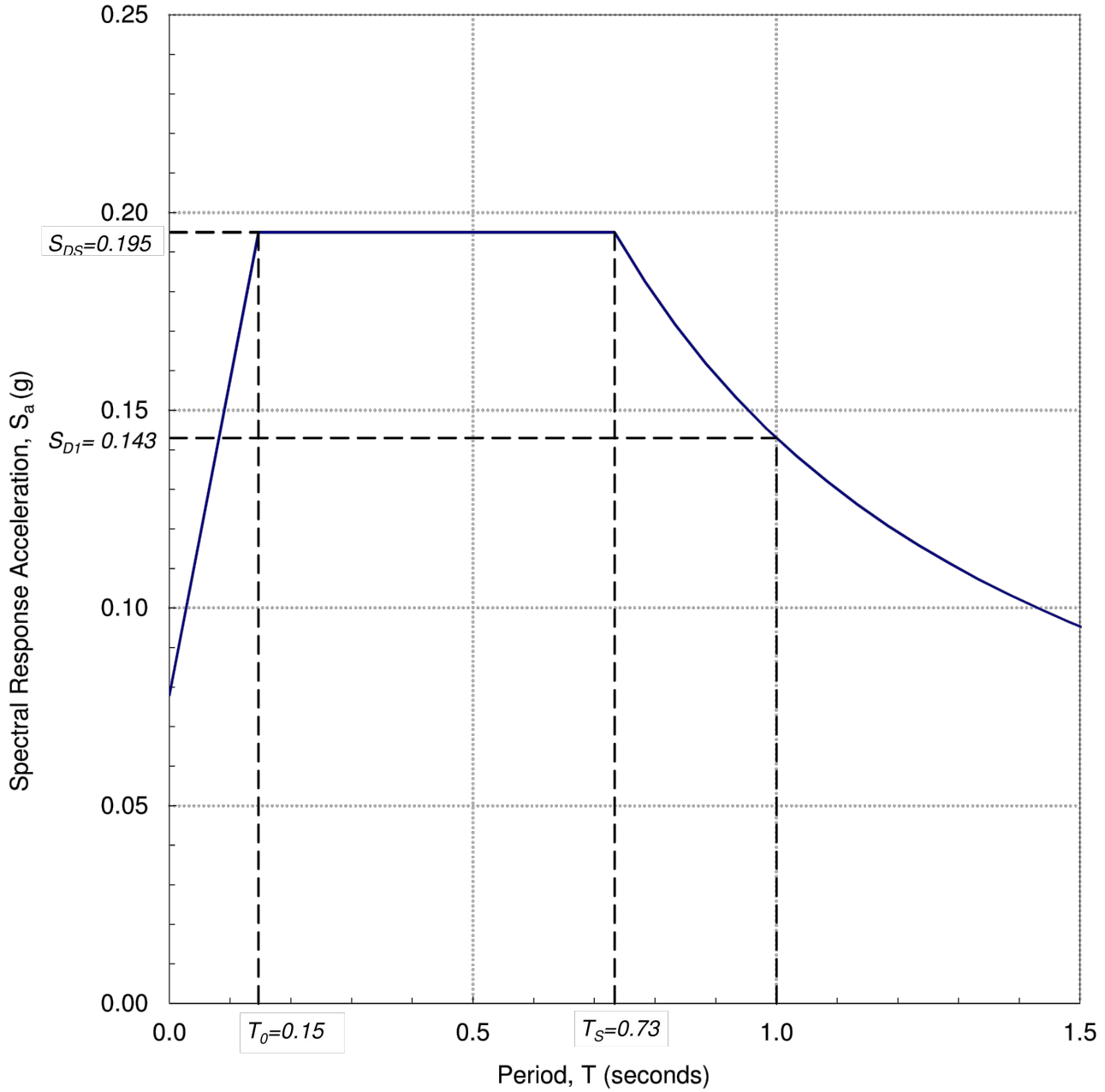
SCALE: 1"=30' (H) 1"=10' (V) DATE: 11/23/2016 DRAWN BY: JMS REVIEWED BY: SKB	WILLMER Engineering	GEOTECHNICAL ENGINEERING | CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	FIGURE 4 SUBSURFACE PROFILE B-B DEKALB COUNTY FIRE STATION NO. 7 DECATUR, DEKALB COUNTY, GEORGIA WILLMER PROJECT No. 71.4175



LEGEND:

ST - Shelby Tube
BT - Boring Terminated
AR - Auger Refusal
PWR - Partially Weathered Rock

SCALE: 1"=30' (H) 1"=10' (V) DATE: 11/23/2016 DRAWN BY: JMS REVIEWED BY: SKB	WILLMER Engineering	GEOTECHNICAL ENGINEERING | CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	FIGURE 5 SUBSURFACE PROFILE C-C DEKALB COUNTY FIRE STATION NO. 7 DECATUR, DEKALB COUNTY, GEORGIA WILLMER PROJECT No. 71.4175



Design Response Spectrum

SCALE: NO SCALE DATE: 11/17/2016 DRAWN BY: JS REVIEWED BY: SKB	WILLMER Engineering GEOTECHNICAL ENGINEERING CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	FIGURE 6 DESIGN RESPONSE SPECTRUM DEKALB COUNTY FIRE STATION NO. 7 DECATUR, DEKALB COUNTY, GEORGIA WILLMER PROJECT No. 71.4175

P:\4175 DeKalb County Fire Station No. 7\CADD\Figure 5 Seismic Design\FIGURE 5 - SEISMIC DESIGN 4175.dwg

APPENDIX I

WILLMER Engineering

BORING RECORD LEGEND

SM, CL, etc: - GROUP SYMBOL based on Unified Soil Classification System.
(Refer to ASTM D-2488 and Table 1 of D-2487)

N-VALUE: BLOWS PER FOOT- Standard Penetration Resistance (SPT) blow count , the sum of the second and third 6-inch increments of the SPT test.
(Refer to ASTM D-1586)

CONSISTENCY / RELATIVE DENSITY Correlated with SPT Blow Count, N:

SILTS AND CLAYS

N (blows per foot)	Consistency
0 - 2	Very Soft
3 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very Stiff
31 - 50	Hard
> 50	Very Hard

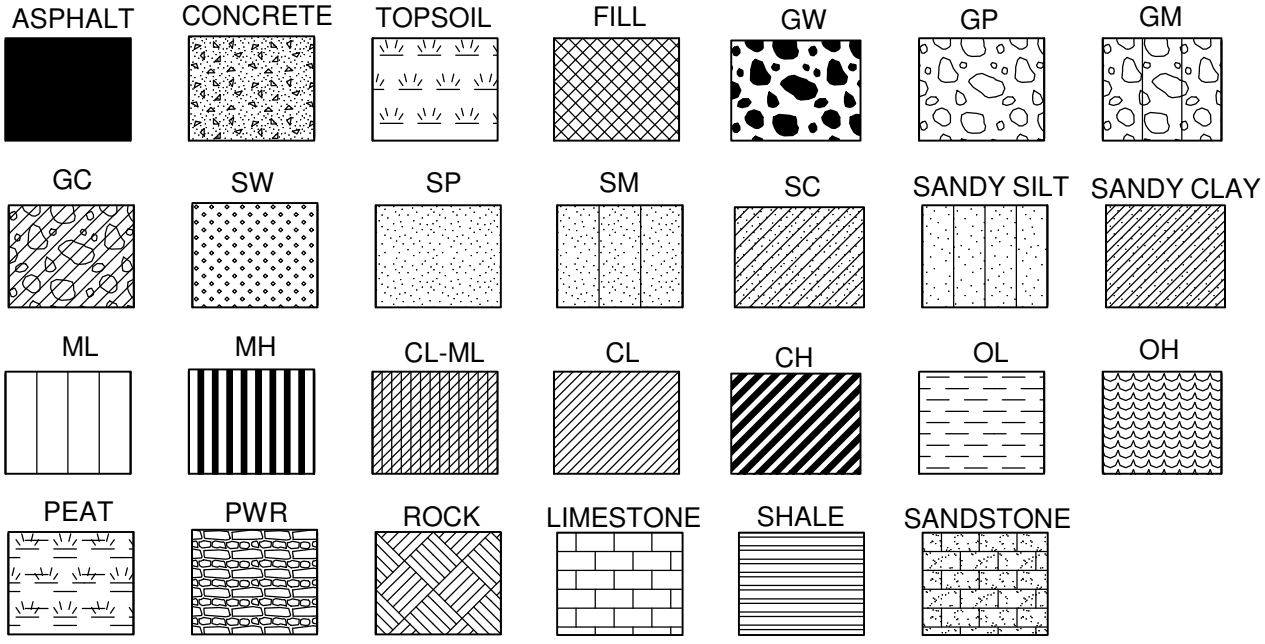
SANDS

N (blows per foot)	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
> 50	Very Dense

NOTES:

Groundwater Measurements:

- Water level at 24 hours
- Water level at time of boring
- Caved level at 24 hours



Willmer Engineering Inc.
3772 Pleasantdale Road, Suite 165
Atlanta, Georgia 30340

UNIFIED SOIL CLASSIFICATION SYSTEM REFERENCE SHEET

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

WILLMER Engineering

Project: **DeKalb County Fire Station No. 7**
Location: **Decatur, Dekalb County, Georgia**
Project Number: **71.4175**

HOLE No. D-1

Sheet 1 of 1
Location: **SEE FIGURE 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1001.00** Station: **N/A**

Drilling Equipment: **D-50** Drilling Method: **HSA - MANUAL HAMMER**

Core Boxes: **N/A** Samples: **4** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **11.5**

Logged By: **JS** Date Drilled: **10/24/16**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/foot) 5 10 20 40 60 80	N-VALUE
0		SS			RESIDUUM: Very hard brown medium to fine sandy **SILT** with organics and rock fragments	ML	1001.0		
		SS					1000		66
5		SS			PARTIALLY WEATHERED ROCK: Sampled as very hard red and brown medium to fine sandy **SILT**	PWR	995		50/4"
		SS							50/6"
10		SS			Sampled as very dense grey medium to fine **SAND** with rock fragments	PWR	990		50/1"
15					Auger refusal was encountered at 11.5 feet below the existing ground surface.		985		
20					Groundwater was not encountered at the time of boring completion.		980		
25							975		
30							970		
35							965		
40							960		
45							955		
50							950		
55									

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **D-1**

SPTN 4175 DEKALB COUNTY FS 7.GPJ 11/23/16

WILLMER Engineering

Project: **DeKalb County Fire Station No. 7**
Location: **Decatur, Dekalb County, Georgia**
Project Number: **71.4175**

HOLE No. D-2

Sheet 1 of 1
Location: **SEE FIGURE 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1000.00** Station: **N/A**
Drilling Equipment: **D-50** Drilling Method: **HSA - MANUAL HAMMER**
Core Boxes: **N/A** Samples: **8** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **29.5**
Logged By: **JS** Date Drilled: **10/24/16**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0	SS			TOPSOIL: Very stiff brown **SILT** with organics	1000.0	16
5	SS			RESIDUUM: Medium dense brown medium to fine clayey **SAND**	995	52
	SS			Very hard red medium to fine sandy fat **CLAY** (micaceous)		50
10	SS			Very hard to very stiff red and tan medium to fine sandy **SILT**	990	23
15	SS			Medium dense red silty medium to fine **SAND** (very micaceous)	985	14
20	SS				980	13
25	SS				975	19
30	SS			PARTIALLY WEATHERED ROCK: Sampled as very dense brown and black silty medium to fine **SAND** with gravel (very micaceous)	970	50/5"
				Boring was terminated at 29.5 feet below the existing ground surface.		
35				Groundwater was not encountered at the time of boring completion.	965	
40					960	
45					955	
50					950	
55					945	

STANDARD PENETRATION TEST DATA (blows/foot)
5 10 20 40 60 80

SC
CH
ML
SM
PWR

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **D-2**

SPTN 4175 DEKALB COUNTY FS 7.GPJ 11/23/16

WILLMER Engineering

Project: **DeKalb County Fire Station No. 7**
Location: **Decatur, Dekalb County, Georgia**
Project Number: **71.4175**

HOLE No. D-3

Sheet 1 of 1
Location: **SEE FIGURE 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1004.00** Station: **N/A**
Drilling Equipment: **D-50** Drilling Method: **HSA - MANUAL HAMMER**
Core Boxes: **N/A** Samples: **8** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **30.0**
Logged By: **JS** Date Drilled: **10/24/16**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0		SS			TOPSOIL: Very stiff brown **SILT** with organics **CH**	1004.0	26
5		SS			RESIDUUM: Very stiff to hard red medium to fine sandy fat **CLAY**	1000	49
		SS			Medium dense tan silty medium to fine **SAND** (slightly micaceous) **SM**		25
10		SS			- becomes red and brown (micaceous)	995	17
15		SS			- becomes very micaceous	990	11
20		SS				985	18
25		SS			- becomes brown and tan (micaceous)	980	19
30		SS			- becomes grey	975	16
					Boring was terminated at 30 feet below the existing ground surface.		
35					Groundwater was not encountered at the time of boring completion.	970	
40						965	
45						960	
50						955	
55						950	

STANDARD PENETRATION TEST DATA (blows/foot)
5 10 20 40 60 80

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **D-3**

SPTN 4175 DEKALB COUNTY FS 7.GPJ 11/23/16

WILLMER Engineering

Project: **DeKalb County Fire Station No. 7**
Location: **Decatur, Dekalb County, Georgia**
Project Number: **71.4175**

HOLE No. D-4

Sheet 1 of 1
Location: **SEE FIGURE 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1003.00** Station: **N/A**
Drilling Equipment: **D-50** Drilling Method: **HSA - MANUAL HAMMER**
Core Boxes: **N/A** Samples: **11** Overburden (ft): **40** Rock (ft): **N/A** Total Depth (ft): **40.0**
Logged By: **JS** Date Drilled: **10/24/16**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N-VALUE
0	SS			RESIDUUM: Hard red and brown medium to fine sandy fat **CLAY** (slightly micaceous)	CH	1003.0	40
	SS			PARTIALLY WEATHERED ROCK: Sampled as very hard red and brown sandy fat **CLAY**	PWR / ML	1000	50/5"
5	SS			Stiff and very stiff red medium to fine sandy **SILT** with rock fragments		995	33
	SS						14
10	SS			- become brown		990	28
15	SS					985	12
	SS						
20	ST					980	18
	SS			- becomes brown, tan, and white (very micaceous)		975	24
25	SS					970	50/3"
30	SS			PARTIALLY WEATHERED ROCK: Sampled as very hard black medium to fine sandy **SILT** (very micaceous)	PWR	965	50/4"
35	SS					960	
40				Auger refusal was encountered at 40 feet below the existing ground surface.		955	
45				Groundwater was not encountered at the time of boring completion.		950	
50							
55							

STANDARD PENETRATION TEST DATA (blows/foot): 5, 10, 20, 40, 60, 80

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **D-4**

SPTN 4175 DEKALB COUNTY FS 7.GPJ 11/23/16

WILLMER Engineering

Project: **DeKalb County Fire Station No. 7**
Location: **Decatur, Dekalb County, Georgia**
Project Number: **71.4175**

HOLE No. D-5

Sheet 1 of 1
Location: **SEE FIGURE 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1000.00** Station: **N/A**

Drilling Equipment: **D-50** Drilling Method: **HSA - MANUAL HAMMER**

Core Boxes: **N/A** Samples: **8** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **30.0**

Logged By: **JS** Date Drilled: **10/24/16**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0	SS			TOPSOIL: Brown **SILT** with organics **SM**	1000.0	17
				RESIDUUM: Medium dense to very dense tan and red silty medium to fine **SAND** (slightly micaceous)		
5	SS				995	42
	SS					30
10	SS				990	16
15	SS			- becomes brown, tan, and grey (very micaceous)	985	19
20	SS				980	13
25	SS				975	53
30	SS			- becomes brown, red, and black (very micaceous)	970	14
				Boring was terminated at 30 feet below the existing ground surface.		
35				Groundwater was not encountered at the time of boring completion.	965	
40					960	
45					955	
50					950	
55					945	

STANDARD PENETRATION TEST DATA (blows/foot)
5 10 20 40 60 80

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **D-5**

SPTN 4175 DEKALB COUNTY FS 7.GPJ 11/23/16

WILLMER Engineering

Project: **DeKalb County Fire Station No. 7**
Location: **Decatur, Dekalb County, Georgia**
Project Number: **71.4175**

HOLE No. S-1

Sheet 1 of 1
Location: **SEE FIGURE 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1001.00** Station: **N/A**

Drilling Equipment: **D-50** Drilling Method: **HSA - MANUAL HAMMER**

Core Boxes: **N/A** Samples: **4** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **10.0**

Logged By: **JS** Date Drilled: **10/24/16**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0		SS			RESIDUUM: Very stiff red medium to fine sandy fat **CLAY** with organics **CH**	1001.0	
		SS				1000	18
5		SS			PARTIALLY WEATHERED ROCK: Sampled as very hard red medium to fine sandy fat **CLAY** **PWR** **CH**		21
		SS				995	50/4"
		SS			RESIDUUM: Hard to very stiff red medium to fine sandy fat **CLAY**		48
10		SS			Boring was terminated at 10 feet below the existing ground surface.	990	26
15					Groundwater was not encountered at the time of boring completion.	985	
20						980	
25						975	
30						970	
35						965	
40						960	
45						955	
50						950	
55							

STANDARD PENETRATION TEST DATA (blows/foot)
5 10 20 40 60 80

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **S-1**

SPTN 4175 DEKALB COUNTY FS 7.GPJ 11/23/16

WILLMER Engineering

Project: **DeKalb County Fire Station No. 7**
Location: **Decatur, Dekalb County, Georgia**
Project Number: **71.4175**

HOLE No. S-2

Sheet 1 of 1
Location: **SEE FIGURE 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1000.00** Station: **N/A**
Drilling Equipment: **D-50** Drilling Method: **HSA - MANUAL HAMMER**
Core Boxes: **N/A** Samples: **9** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **30.0**
Logged By: **JS** Date Drilled: **10/24/16**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N-VALUE
0	SS			TOPSOIL: Black medium to fine sandy **SILT** with organics	ML	1000.0	38
5	SS			RESIDUUM: Hard brown and black medium to fine sandy **SILT** with organics	PWR	995	50/3"
	SS			PARTIALLY WEATHERED ROCK: Sampled as very hard brown medium to fine sandy **SILT**	ML		42
10	SS			RESIDUUM: Very stiff to hard red, brown, and white medium to fine sandy **SILT** with rock fragments		990	38
15	SS					985	22
	ST						
20	SS			PARTIALLY WEATHERED ROCK: Sampled as very hard red, brown, and white medium to fine sandy **SILT** with rock fragments	PWR	980	50/5"
					ML		
25	SS			RESIDUUM: Very stiff brown and red medium to fine sandy **SILT** (very micaceous)		975	26
30	SS			Boring was terminated at 30 feet below the existing ground surface.		970	27
				Groundwater was not encountered at the time of boring completion.			
35						965	
40						960	
45						955	
50						950	
55						945	

STANDARD PENETRATION TEST DATA (blows/foot)
5 10 20 40 60 80

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **S-2**

SPTN 4175 DEKALB COUNTY FS 7.GPJ 11/23/16

WILLMER Engineering

Project: **DeKalb County Fire Station No. 7**
Location: **Decatur, Dekalb County, Georgia**
Project Number: **71.4175**

HOLE No. S-3

Sheet 1 of 1
Location: **SEE FIGURE 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1001.00** Station: **N/A**

Drilling Equipment: **D-50** Drilling Method: **HSA - MANUAL HAMMER**

Core Boxes: **N/A** Samples: **4** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **10.0**

Logged By: **JS** Date Drilled: **10/24/16**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0		SS			TOPSOIL: Very stiff dark brown **SILT** with organics	1001.0	18
					CH		
		SS			RESIDUUM: Very stiff to hard red medium to fine sandy fat **CLAY**	1000	57
5		SS				995	34
		SS			Very stiff red medium to fine sandy **SILT** (slightly micaceous)		17
					ML		
10					Boring was terminated at 10 feet below the existing ground surface.	990	
					Groundwater was not encountered at the time of boring completion.		
15						985	
20						980	
25						975	
30						970	
35						965	
40						960	
45						955	
50						950	
55							

STANDARD PENETRATION TEST DATA (blows/foot)
5 10 20 40 60 80

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **S-3**

SPTN 4175 DEKALB COUNTY FS 7.GPJ 11/23/16

WILLMER Engineering

Project: **DeKalb County Fire Station No. 7**
Location: **Decatur, Dekalb County, Georgia**
Project Number: **71.4175**

HOLE No. S-4
Sheet 1 of 1
Location: **SEE FIGURE 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1001.00** Station: **N/A**

Drilling Equipment: **D-50** Drilling Method: **HSA - MANUAL HAMMER**

Core Boxes: **N/A** Samples: **4** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **10.0**

Logged By: **JS** Date Drilled: **10/24/16**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0		SS			TOPSOIL: Very stiff brown **SILT** with organics	1001.0	22
		SS			RESIDUUM: Very stiff brown sandy **SILT**	1000	51
5		SS			PARTIALLY WEATHERED ROCK: Sampled as very hard red **CLAY** with medium to fine sand	995	50/5"
		SS			RESIDUUM: Hard to very stiff red sandy fat **CLAY**		42
10		SS			Boring was terminated at 10 feet below the existing ground surface.	990	25
					Groundwater was not encountered at the time of boring completion.	985	
15						980	
20						975	
25						970	
30						965	
35						960	
40						955	
45						950	
50							
55							

STANDARD PENETRATION TEST DATA (blows/foot)
5 10 20 40 60 80

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **S-4**

SPTN 4175 DEKALB COUNTY FS 7.GPJ 11/23/16

WILLMER Engineering

Project: **DeKalb County Fire Station No. 7**
Location: **Decatur, Dekalb County, Georgia**
Project Number: **71.4175**

HOLE No. S-5

Sheet 1 of 1
Location: **SEE FIGURE 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1000.00** Station: **N/A**

Drilling Equipment: **D-50** Drilling Method: **HSA - MANUAL HAMMER**

Core Boxes: **N/A** Samples: **4** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **10.0**

Logged By: **JS** Date Drilled: **10/24/16**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/foot)	N-VALUE
0		SS			RESIDUUM: Very stiff to very hard reddish brown medium to fine sandy fat **CLAY** with organics **CH**	1000.0		30
5		SS			Very hard to stiff reddish brown medium to fine sandy fat **CLAY** (micaceous) **CH**	995		61
		SS						42
10		SS			Boring was terminated at 10 feet below the existing ground surface.	990		15
					Groundwater was not encountered at the time of boring completion.			
15						985		
20						980		
25						975		
30						970		
35						965		
40						960		
45						955		
50						950		
55						945		

STANDARD PENETRATION TEST DATA (blows/foot): 5 10 20 40 60 80

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **S-5**

SPTN 4175 DEKALB COUNTY FS 7.GPJ 11/23/16

APPENDIX II

Completed Borehole and Surrounding Area, Boring Location S-1

Drill Rig Set-up, Boring Location S-2

Completed Borehole and Surrounding Area, Boring Location S-3

Close-up of Completed Borehole, Boring Location S-3

Completed Borehole and Surrounding Area, Boring Locations S-4 and Bulk-1

Completed Borehole and Surrounding Area, Boring Location D-1

Close-up of Completed Borehole, Boring Location D-3

Completed Borehole and Surrounding Area, Boring Location D-4

Drill Rig Set-up, Location S-2

Undisturbed Sampling, Location S-2

Completed Borehole and Surrounding Area, Location D-5

Close-up of Completed Borehole, Location D-5

APPENDIX III

TIMELY ENGINEERING SOIL TESTS, LLC
1874 Forge Street Tucker, GA 30084
Ph: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	RI
Date	10/31/16
Checked By	

Client Pr. #	71.4175	Lab. PR. #	1692-20-1
Project Name	DeKalb Fire Station No.7	S. Type	UD
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

ASTM D2435

Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Sample Data

	Initial	Final
Mass of Ring, g	194.73	194.73
Mass of Wet Sample and Ring, g	293.98	297.72
Mass of Wet Sample, g	99.25	102.99
Mass of Dry Sample, g	81.40	81.40
Height of Sample, in	0.9970	0.8832
Diameter of Sample, in	2.501	2.501
Area of Sample, in^2	4.91	4.91
Volume of Sample, in^3	4.90	4.34
Specific Gravity (Assumed)	2.700	2.700
Wet Unit Weight, pcf	77.2	90.4
Dry Unit Weight, pcf	63.3	71.5
Height of Solids, in	0.3745	0.3745
Height of Voids, in	0.6225	0.5087
Height of Water, in	0.2218	0.2682
Void Ratio	1.662	1.359
Degree of Saturation, %	35.6	52.7

Initial Seating Pressure, lbf/ft^2	100
Additional Vertical Pressure, lbf/ft^2	0
Total Seating Pressure, lbf/ft^2	100
STATION #	2
Consolidometer Ring ID Number	1
Consolidometer ID Number	1
Frame ID Number	66
Dial Gage ID Number	677
Initial Dial Gauge Reading, 10^{-4} in	0
Final Dial Gauge Reading, 10^{-4} in	1138

DESCRIPTION

NA

Condition of Test:

1. Damp porous stones w/t filter paper used.
2. Moist paper towel was placed on top of consolidometer to prevent sample from drying.

USCS (ASTM D2487;2488)

NA

REMARKS

Portion of sample used for testing was located 7" above the bottom of the shelby tube.

Moisture Content

	Trimmings	Initial	Final
Mass of Wet Sample and Tare, g	410.80	293.98	358.28
Mass of Dry Sample and Tare, g	357.10	276.13	336.69
Mass of Tare, g	94.80	194.73	255.31
Moisture Content, %	20.5	21.9	26.5

LL	-
PL	-
PI	-

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Project Name	DeKalb Fire Station No.7	S. Type	UD
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

ASTM D2435

Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Void Ratio, Strain Information and Coefficient of Consolidation Calculation

Pressure		Uncorrected Dial Reading, in		Apparatus Correction, in	Corrected Dial Reading, in		Change in specimen height, in		Sample Height, in		Height of Voids, in	Void Ratio		Strain, %		Fitting Time, min		Hd_{50}, in	Coefficient of Consolidation	
lbf/ft^2	Ksf	d_{100}	d_{50}		d_{100}	d_{50}	S D H_{100}	S D H_{50}	H_{100}	H_{50}	Hv^{100},in	e_{100}	e_{50}	e_{100}	e_{50}	t_{90}	t_{50}		in^2/min	ft^2/day
100	0.1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9970	0.9970	0.6225	1.662	1.662	0.00	0.00	-	-	0.4985	-	-
250	0.25	0.0052	0.0049	0.0000	0.0052	0.0049	0.0052	0.0049	0.9918	0.9921	0.6173	1.648	1.649	0.53	0.49	0.81	0.19	0.4960	0.26	2.58
500	0.5	0.0136	0.0130	0.0000	0.0136	0.0130	0.0136	0.0130	0.9834	0.9840	0.6089	1.626	1.628	1.36	1.30	0.90	0.21	0.4920	0.23	2.27
1000	1	0.0255	0.0245	0.0000	0.0255	0.0245	0.0255	0.0245	0.9715	0.9725	0.5970	1.594	1.597	2.56	2.46	0.64	0.15	0.4862	0.31	3.13
2000	2	0.0421	0.0414	0.0000	0.0421	0.0414	0.0421	0.0414	0.9549	0.9556	0.5804	1.550	1.552	4.22	4.16	1.21	0.28	0.4778	0.16	1.60
500	0.5	0.0360	0.0362	0.0000	0.0360	0.0362	0.0360	0.0362	0.9610	0.9608	0.5866	1.566	1.566	3.61	3.63	0.64	0.15	0.4804	0.31	3.06
1000	1	0.0377	0.0376	0.0000	0.0377	0.0376	0.0377	0.0376	0.9593	0.9594	0.5848	1.562	1.562	3.79	3.77	0.36	0.08	0.4797	0.54	5.42
2000	2	0.0438	0.0435	0.0000	0.0438	0.0435	0.0438	0.0435	0.9532	0.9535	0.5787	1.545	1.546	4.39	4.36	0.81	0.19	0.4768	0.24	2.38
4000	4	0.0677	0.0666	0.0000	0.0677	0.0666	0.0677	0.0666	0.9293	0.9304	0.5548	1.482	1.485	6.79	6.68	1.69	0.39	0.4652	0.11	1.09
8000	8	0.1138	0.1108	0.0000	0.1138	0.1108	0.1138	0.1108	0.8832	0.8862	0.5088	1.359	1.367	11.41	11.11	2.89	0.67	0.4431	0.06	0.58

Note: d_{100} = Dial gauge reading at 100% primary consolidation, in

d_{50} = Dial gauge reading at 50% primary consolidation, in

H_{100} = Specimen height at 100% primary consolidation, in

H_{50} = Specimen height at 50% primary consolidation, in

Hd_{50} = Length of the drainage path at 50% consolidation, in

e_{100} = Void ratio at 100% primary consolidation

e_{50} = Void ratio at 50% primary consolidation

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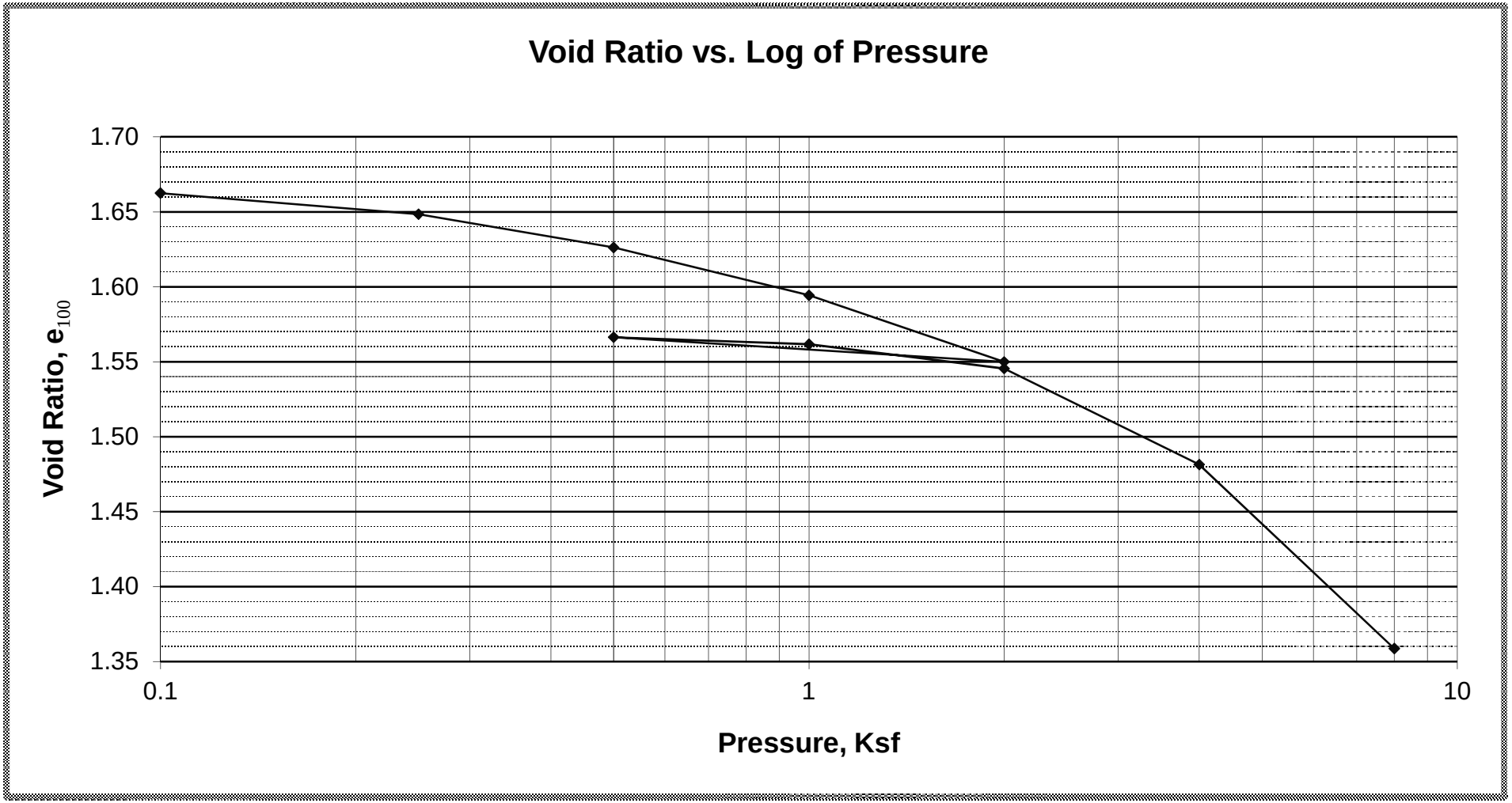
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	RI
Date	10/31/16
Checked By	

Client Pr. #	71.4175	Lab. PR. #	1692-20-1
Project Name	DeKalb Fire Station No.7	S. Type	UD
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

ASTM D 2435; Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)



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Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

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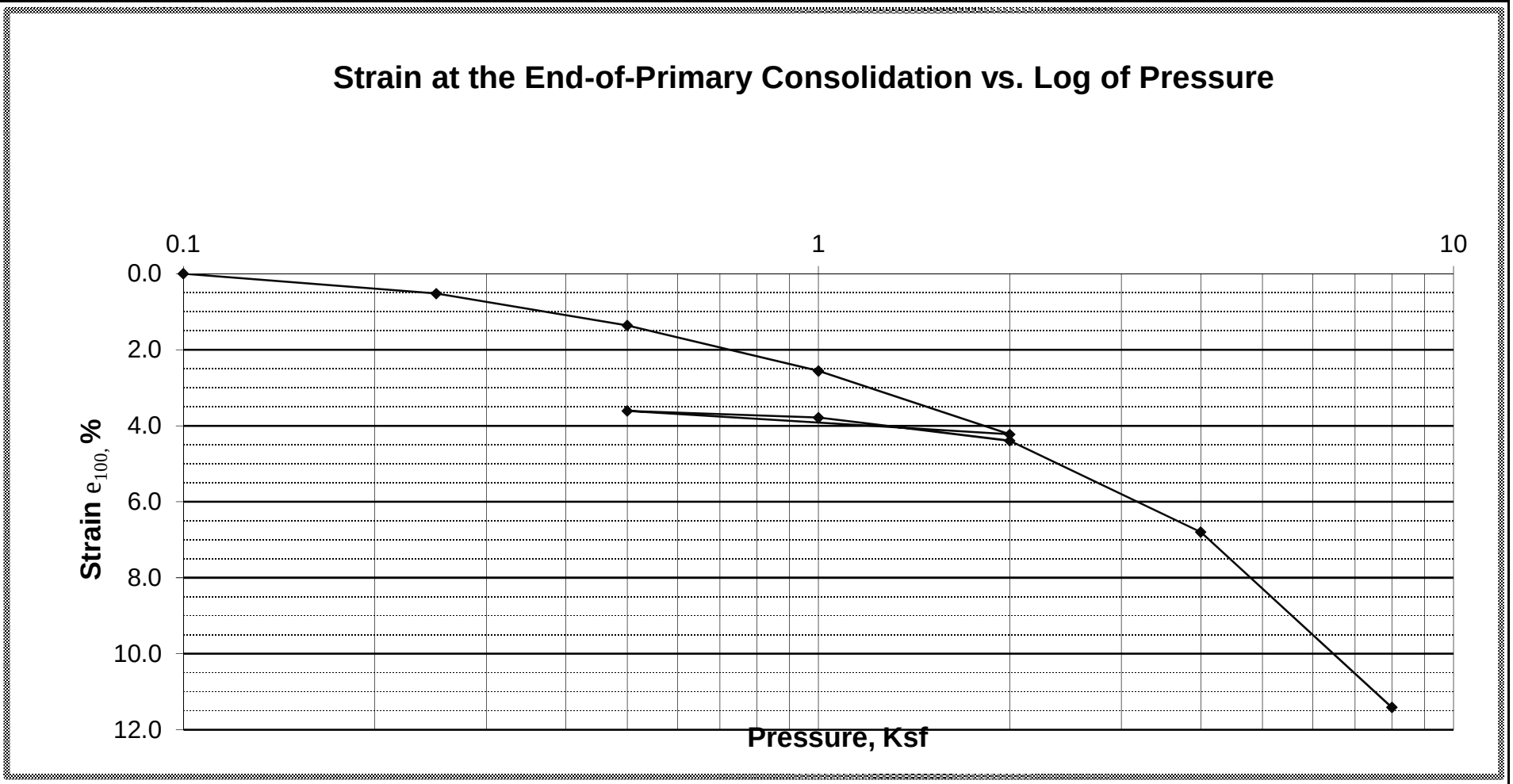

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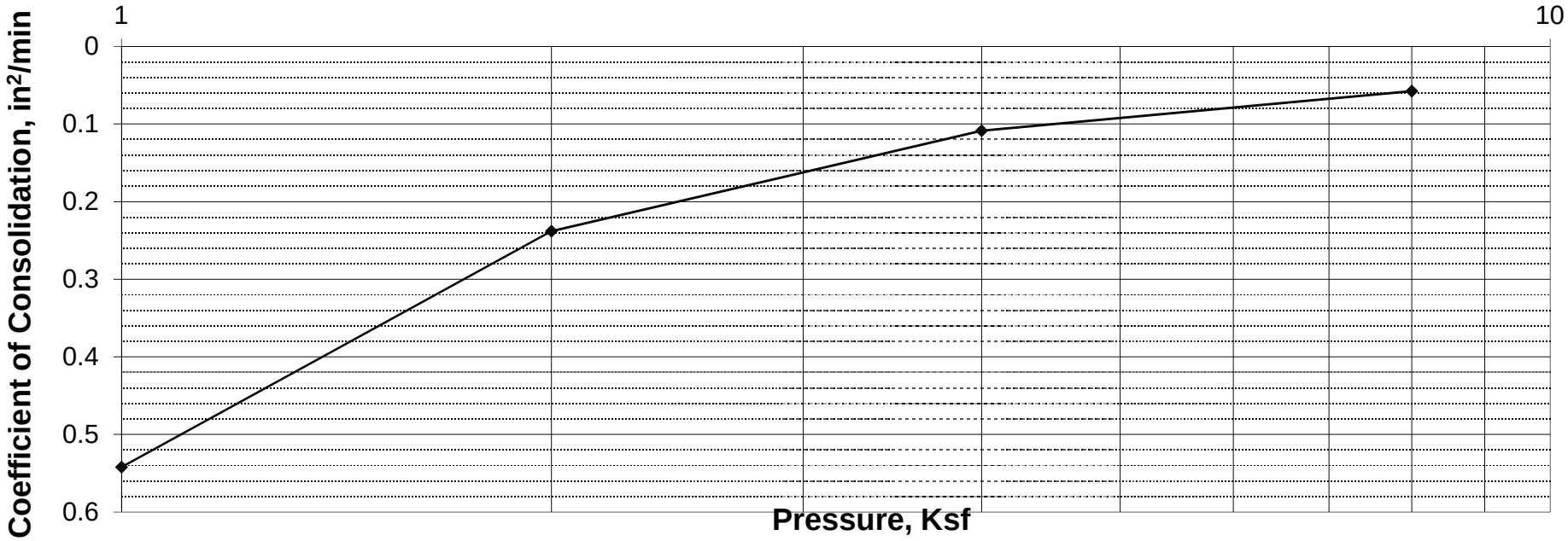
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

ASTM D 2435; Standard Test Method for One-Dimensional Consolidation Properties of Soils (Method B)

Coefficient of Consolidation vs. Log of Pressure



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Tested By	RI
Date	10/28/16
Checked By	

Client Pr. #	71.4175	Lab. PR. #	1692-20-1
Project Name	DeKalb Fire Station No.7	S. Type	UD
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 2

Point #	Time, min	Square Root of Time, $min^{1/2}$	Dial Gauge Reading, 10^{-4} in
1	0	0	0
2	0.1	0.32	48
3	0.25	0.50	50
4	0.5	0.71	51
5	1	1.00	52
6	2	1.41	53
7	4	2.00	54
8	8	2.83	54
9	15	3.87	58
10	30	5.48	60
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			

Pressure* on Specimen, lbf/ft^2

250

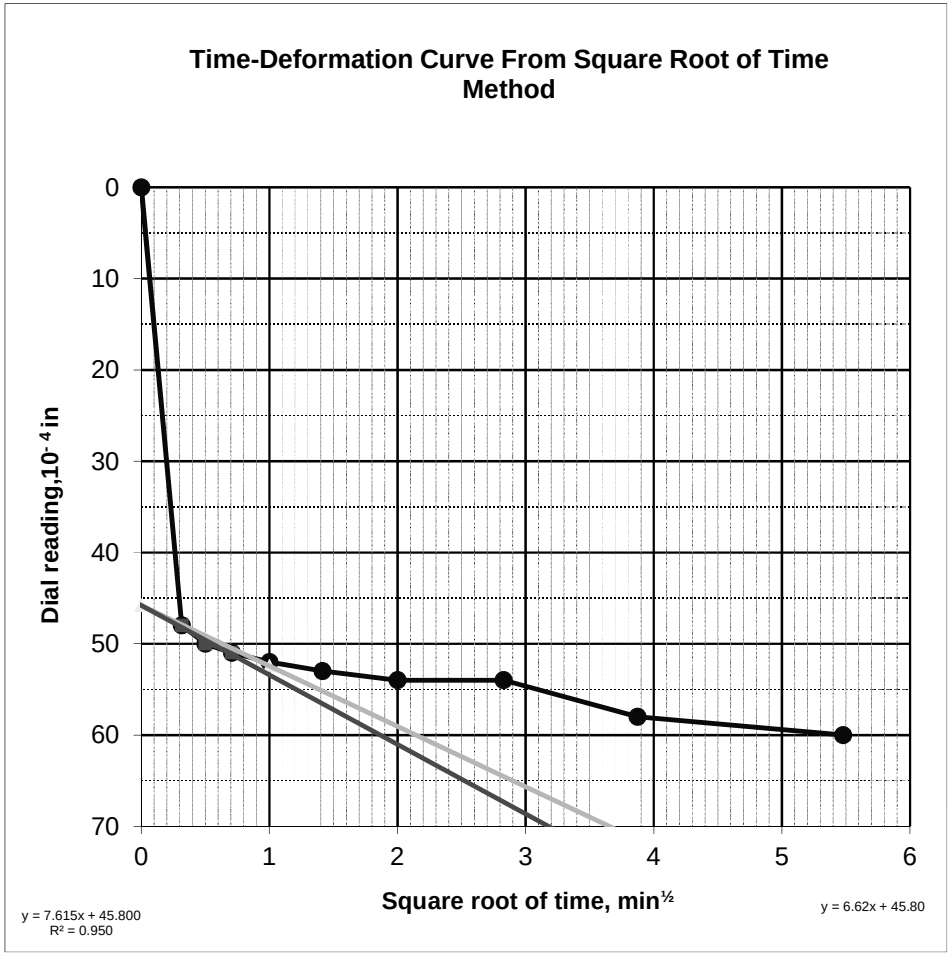
Selection	4
m_1	7.62
m_2	6.62

X	Y
0	45.80
1	52.42

d_0	45.8
d_{90}	52
d_{100}	52
d_{50}	49
$sq.root\ t_{90}$	0.9
t_{90}, min	0.81
$sq.root\ t_{50}$	0.43
t_{50}, min	0.19

d=dial gauge reading, 10^{-4} in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.



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Date	10/28/16
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Client Pr. #	71.4175	Lab. PR. #	1692-20-1
Project Name	DeKalb Fire Station No.7	S. Type	UD
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 3

Point #	Time, min	Square Root of Time, $min^{1/2}$	Dial Gauge Reading, 10^{-4} in
1	0	0	60
2	0.1	0.32	128
3	0.25	0.50	131
4	0.5	0.71	133
5	1	1.00	134
6	2	1.41	137
7	4	2.00	137
8	8	2.83	138
9	15	3.87	140
10	30	5.48	141
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			

Pressure* on Specimen, lbf/ft^2

500

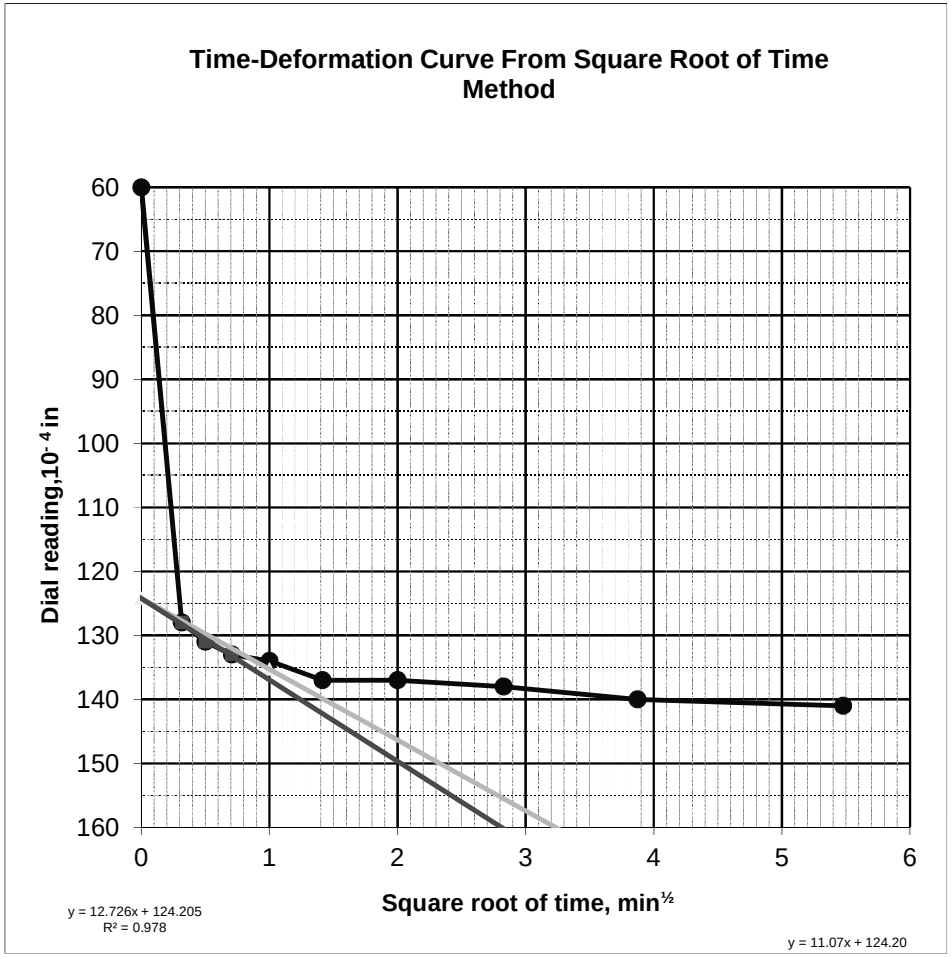
Selection	4
m_1	12.73
m_2	11.07

X	Y
0	124.20
1	135.27

d_0	124.2
d_{90}	135
d_{100}	136
d_{50}	130
sq.root t_{90}	0.95
t_{90}, *min*	0.90
sq.root t_{50}	0.46
t_{50}, *min*	0.21

d=dial gauge reading, 10^{-4} in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.



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Client Pr. #	71.4175	Lab. PR. #	1692-20-1
Project Name	DeKalb Fire Station No.7	S. Type	UD
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 4

Point #	Time, min	Square Root of Time, $min^{1/2}$	Dial Gauge Reading, 10^{-4} in
1	0	0	141
2	0.1	0.32	243
3	0.25	0.50	249
4	0.5	0.71	253
5	1	1.00	254
6	2	1.41	255
7	4	2.00	257
8	8	2.83	258
9	15	3.87	261
10	30	5.48	262
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			

Pressure* on Specimen, lbf/ft^2

1000

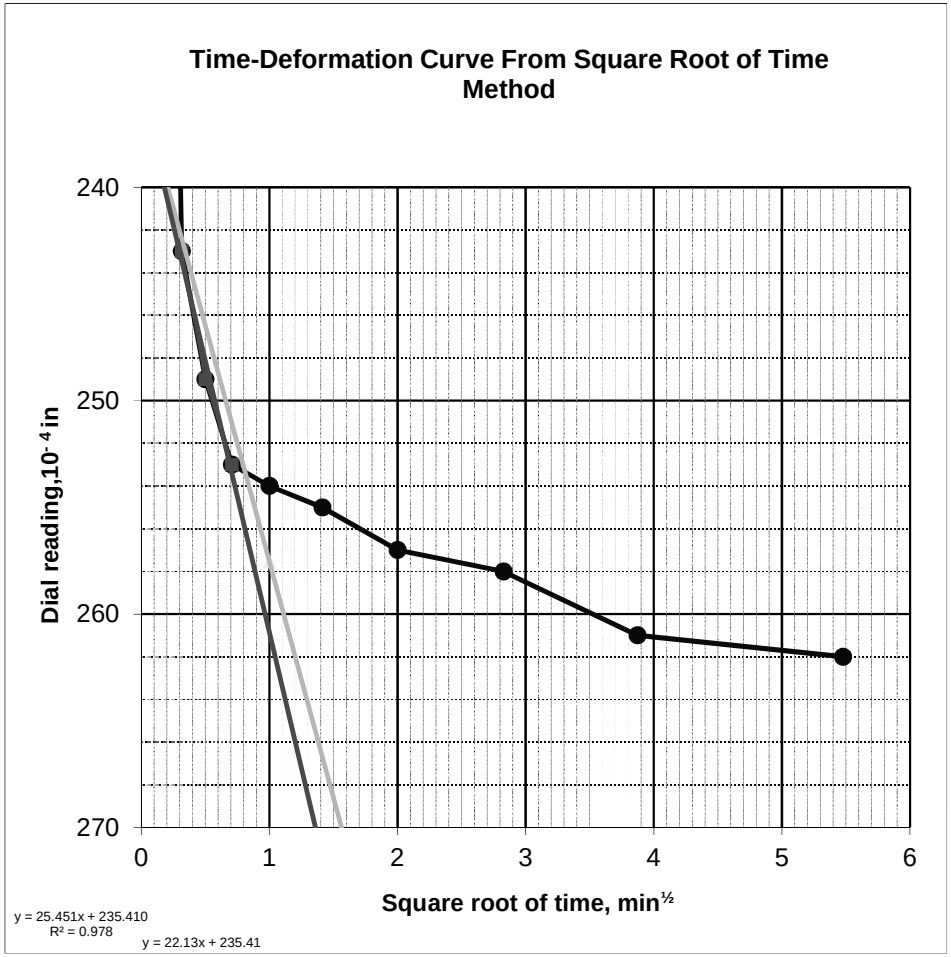
Selection	4
m_1	25.45
m_2	22.13

X	Y
0	235.41
1	257.54

d_0	235.4
d_{90}	253
d_{100}	255
d_{50}	245
sq.root t_{90}	0.8
t_{90}, *min*	0.64
sq.root t_{50}	0.39
t_{50}, *min*	0.15

d=dial gauge reading, 10^{-4} in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.



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Project Name	DeKalb Fire Station No.7	S. Type	UD
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 5

Point #	Time, min	Square Root of Time, $min^{1/2}$	Dial Gauge Reading, 10^{-4} in
1	0	0	262
2	0.1	0.32	411
3	0.25	0.50	415
4	0.5	0.71	417
5	1	1.00	420
6	2	1.41	422
7	4	2.00	423
8	8	2.83	425
9	15	3.87	427
10	30	5.48	429
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			

Pressure* on Specimen, lbf/ft^2

2000

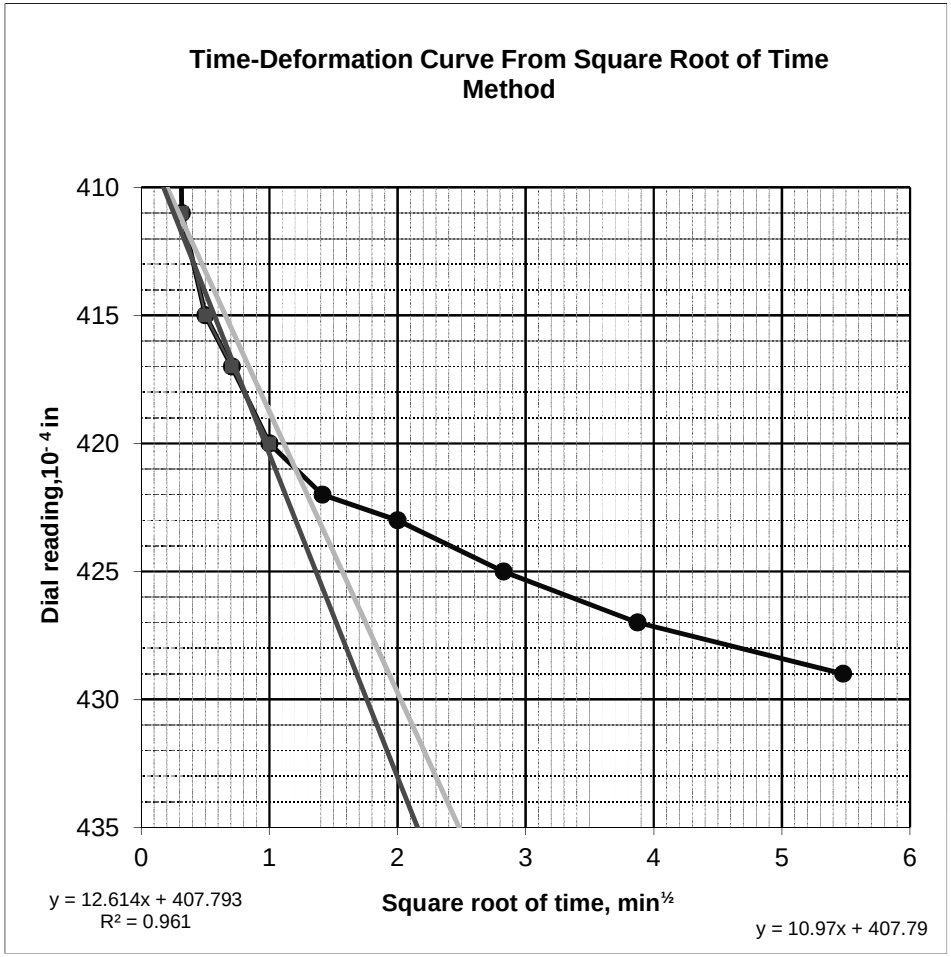
Selection	5
m_1	12.61
m_2	10.97

X	Y
0	407.79
1	418.76

d_0	407.8
d_{90}	420
d_{100}	421
d_{50}	414
sq.root t_{90}	1.1
t_{90}, *min*	1.21
sq.root t_{50}	0.53
t_{50}, *min*	0.28

d=dial gauge reading, 10^{-4} in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.



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Checked By	

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Project Name	DeKalb Fire Station No.7	S. Type	UD
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 6

Point #	Time, min	Square Root of Time, $min^{1/2}$	Dial Gauge Reading, 10^{-4} in
1	0	0	429
2	0.1	0.32	362
3	0.25	0.50	361
4	0.5	0.71	360
5	1	1.00	360
6	2	1.41	359
7	4	2.00	359
8	8	2.83	359
9	15	3.87	357
10	30	5.48	357
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			

Pressure* on Specimen, lbf/ft^2

500

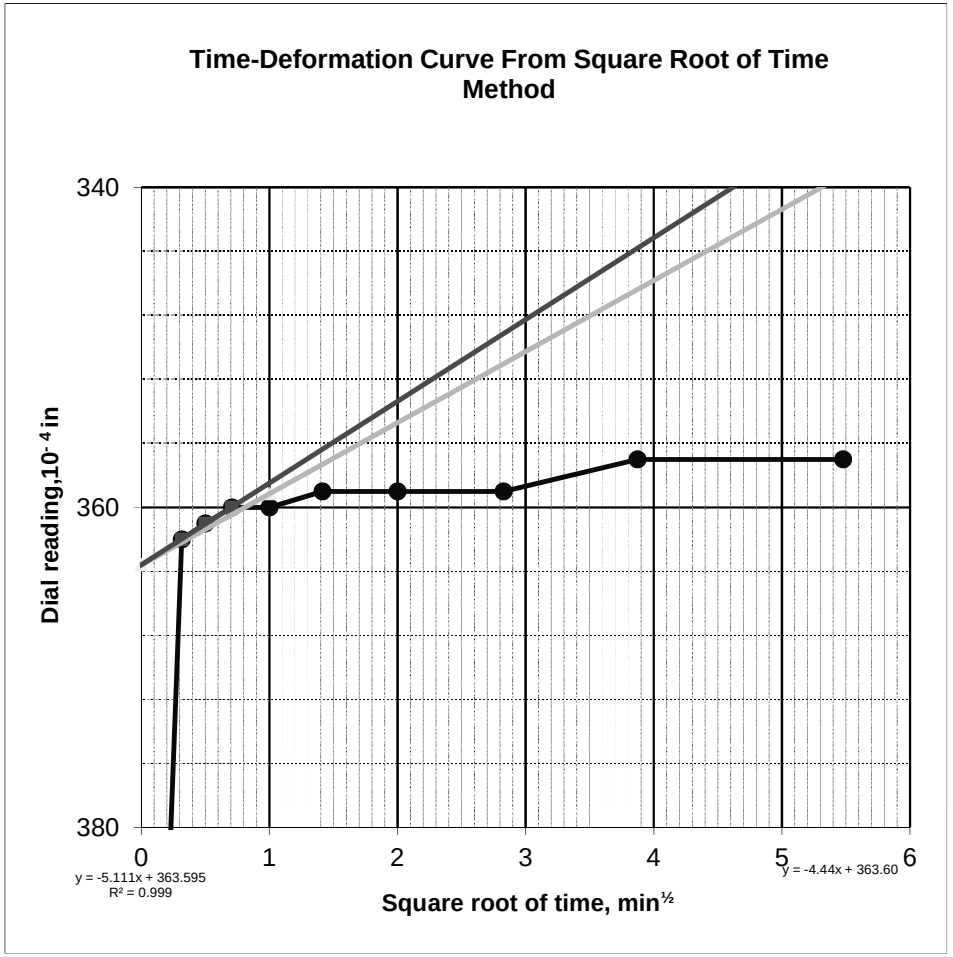
Selection	4
m_1	-5.11
m_2	-4.44

X	Y
0	363.60
1	359.15

d_0	363.6
d_{90}	360
d_{100}	360
d_{50}	362
sq.root t_{90}	0.8
t_{90}, *min*	0.64
sq.root t_{50}	0.39
t_{50}, *min*	0.15

d=dial gauge reading, 10^{-4} in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.



TIMELY
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SOIL
TESTS, LLC

1874 Forge Street Tucker, GA 30084
Ph: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	RI
Date	10/28/16
Checked By	

Client Pr. #	71.4175	Lab. PR. #	1692-20-1
Project Name	DeKalb Fire Station No.7	S. Type	UD
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 7

Point #	Time, min	Square Root of Time, $min^{1/2}$	Dial Gauge Reading, 10^{-4} in
1	0	0	357
2	0.1	0.32	376
3	0.25	0.50	377
4	0.5	0.71	377
5	1	1.00	377
6	2	1.41	377
7	4	2.00	377
8	8	2.83	377
9	15	3.87	378
10	30	5.48	378
11			
12			
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22			
23			
24			
25			
26			

Pressure* on Specimen, lbf/ft^2

1000

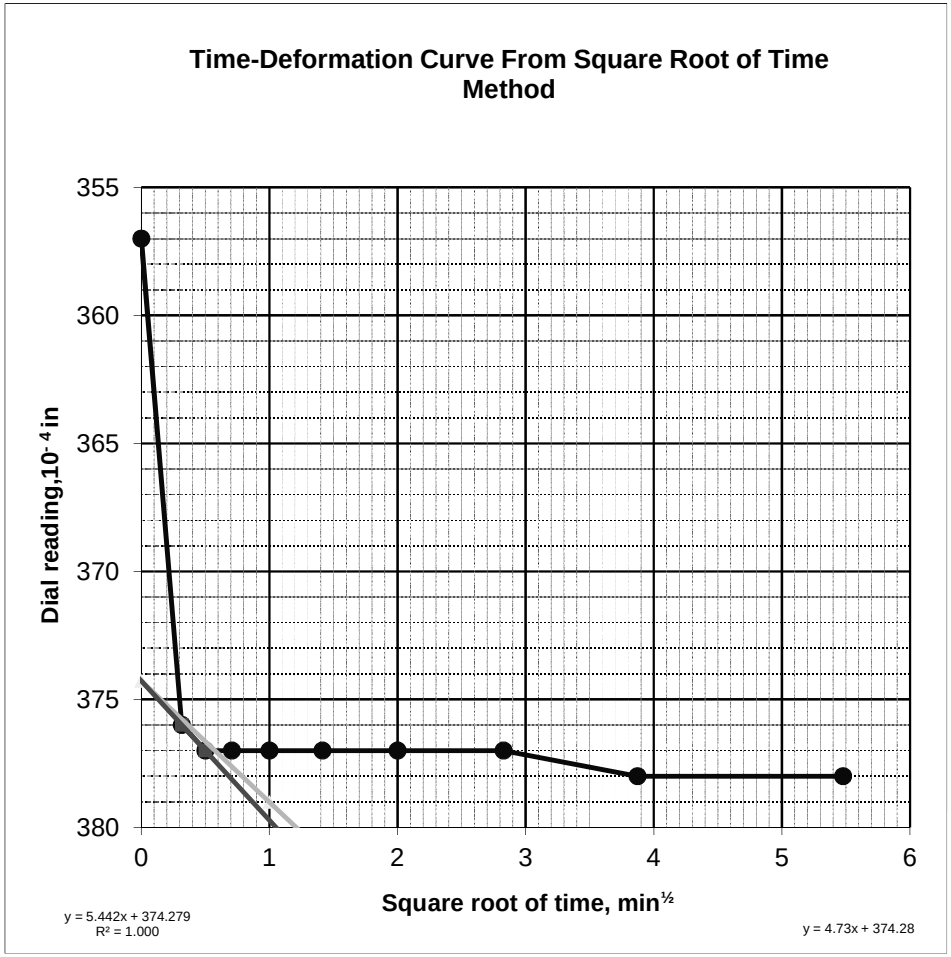
Selection	3
m_1	5.44
m_2	4.73

X	Y
0	374.28
1	379.01

d_0	374.3
d_{90}	377
d_{100}	377
d_{50}	376
sq.root t_{90}	0.6
t_{90}, *min*	0.36
sq.root t_{50}	0.29
t_{50}, *min*	0.08

d=dial gauge reading, 10^{-4} in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.



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Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 8

Point #	Time, min	Square Root of Time, $min^{1/2}$	Dial Gauge Reading, 10^{-4} in
1	0	0	378
2	0.1	0.32	434
3	0.25	0.50	435
4	0.5	0.71	437
5	1	1.00	437
6	2	1.41	438
7	4	2.00	439
8	8	2.83	440
9	15	3.87	441
10	30	5.48	442
11			
12			
13			
14			
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16			
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22			
23			
24			
25			
26			

Pressure* on Specimen, lbf/ft^2

2000

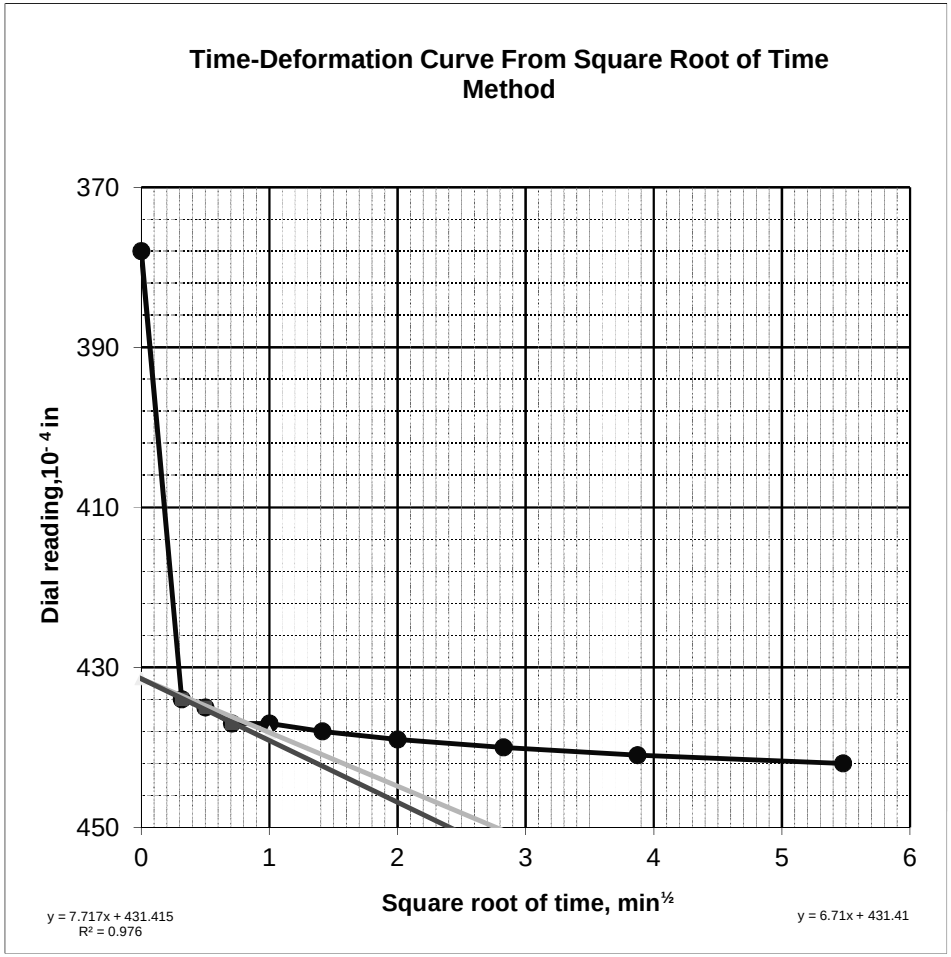
Selection	4
m_1	7.72
m_2	6.71

X	Y
0	431.41
1	438.13

d_0	431.4
d_{90}	437
d_{100}	438
d_{50}	435
$sq.root\ t_{90}$	0.9
t_{90}, min	0.81
$sq.root\ t_{50}$	0.43
t_{50}, min	0.19

d=dial gauge reading, 10^{-4} in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.



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Client Pr. #	71.4175	Lab. PR. #	1692-20-1
Project Name	DeKalb Fire Station No.7	S. Type	UD
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 9

Point #	Time, min	Square Root of Time, $min^{1/2}$	Dial Gauge Reading, 10^{-4} in
1	0	0	442
2	0.1	0.32	659
3	0.25	0.50	664
4	0.5	0.71	668
5	1	1.00	672
6	2	1.41	676
7	4	2.00	679
8	8	2.83	680
9	15	3.87	685
10	30	5.48	688
11	640	25.30	698
12			
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19			
20			
21			
22			
23			
24			
25			
26			

Pressure* on Specimen, lbf/ft^2

4000

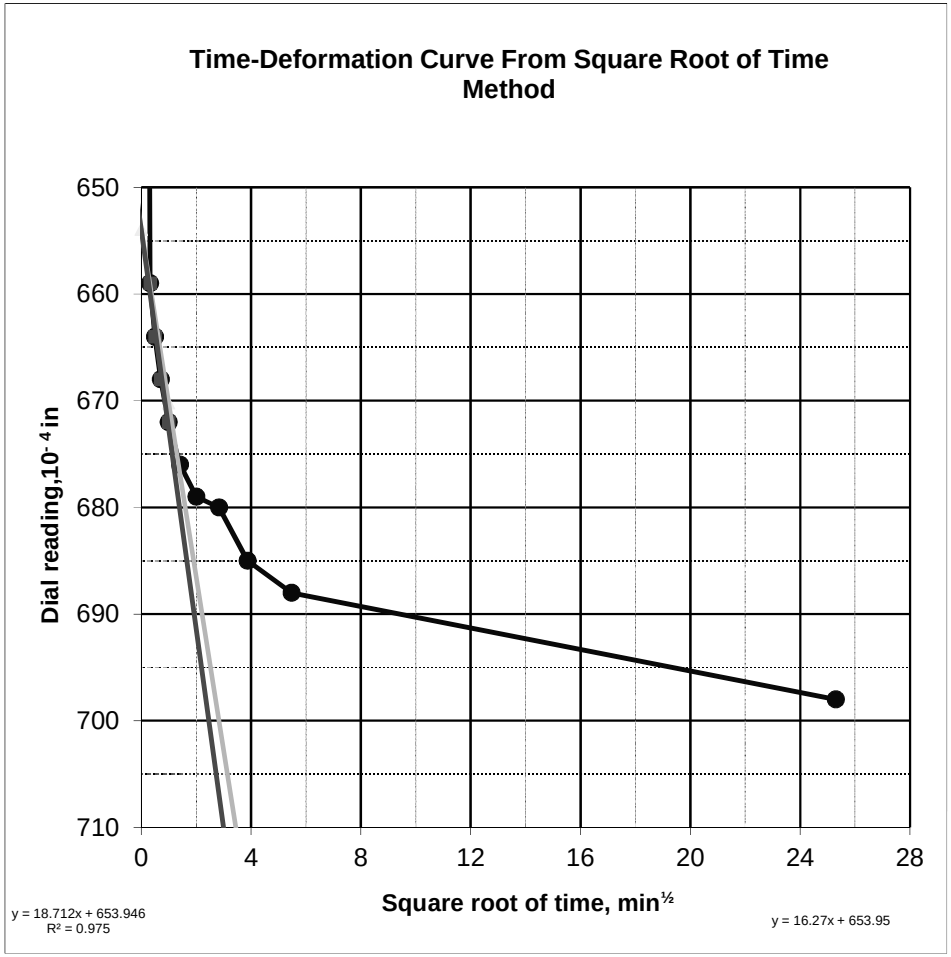
Selection	5
m_1	18.71
m_2	16.27

X	Y
0	653.95
1	670.22

d_0	653.9
d_{90}	675
d_{100}	677
d_{50}	666
sq.root t_{90}	1.3
t_{90}, *min*	1.69
sq.root t_{50}	0.63
t_{50}, *min*	0.39

d=dial gauge reading, 10^{-4} in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.



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Project Name	DeKalb Fire Station No.7	S. Type	UD
Sample ID	22756/D-4	Depth/Elev.	20-22'
Location	-	Add. Info	-

Standard Test Method for One-Dimensional Consolidation Properties of Soils, ASTM D2435 (Method B)/AASHTO T 216

STEP # 10

Point #	Time, min	Square Root of Time, $min^{1/2}$	Dial Gauge Reading, 10^{-4} in
1	0	0	699
2	0.1	0.32	1085
3	0.25	0.50	1099
4	0.5	0.71	1105
5	1	1.00	1116
6	2	1.41	1127
7	4	2.00	1136
8	8	2.83	1144
9	15	3.87	1150
10	30	5.48	1158
11	60	7.75	1164
12	120	10.95	1170
13	240	15.49	1176
14	2823	53.13	1198
15			
16			
17			
18			
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20			
21			
22			
23			
24			
25			
26			

Pressure* on Specimen, lbf/ft^2

8000

Selection	6
m_1	36.41
m_2	31.66

X	Y
0	1077.73
1	1109.39

d_0	1077.7
d_{90}	1132
d_{100}	1138
d_{50}	1108
sq.root t_{90}	1.7
t_{90}, *min*	2.89
sq.root t_{50}	0.82
t_{50}, *min*	0.67

d=dial gauge reading, 10^{-4} in

Note: * - Reported Pressure is not including seating pressure of 100 psf and possible additional vertical pressure applied to sample to prevent swell. If swell was observed additional vertical pressure is reported on page 1 of report.