GEOTECHNICAL EXPLORATION

on

NEW CONCESSIONS BUILDING
Wheat Middle School
Woodward Avenue & North Colonial Drive
Cleburne, Texas
ALPHA Report No. W140346

Prepared for:

CLEBURNE ISD
505 N. Ridgeway, #100
Cleburne, Texas 76033
Attention: Mr. Barry Hipp
March 21, 2014

Prepared By:

ALPHA TESTING, INC.
5058 Brush Creek Road
Fort Worth, Texas 76119

ALPHA TESTING
WHERE IT ALL BEGINS

Geotechnical
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March 21, 2014

Cleburne ISD
505 N. Ridgeway, #100
Cleburne, Texas 76033
Attention: Mr. Barry Hipp

Re: Geotechnical Exploration
New Concessions Building
Wheat Middle School
Woodward Avenue
& North Colonial Drive
Cleburne, Texas
ALPHA Report No. W140346

Attached is the report of the geotechnical exploration performed for the project referenced above. This study was authorized by Mr. Barry Hipp on February 26, 2014 and performed in accordance with ALPHA Proposal No. 39889 dated February 19, 2014.

This report contains results of field explorations and laboratory testing and an engineering interpretation of these with respect to available project characteristics. The results and analyses were used to develop recommendations to aid design and construction of foundations.

ALPHA TESTING, INC. appreciates the opportunity to be of service on this project. If we can be of further assistance, such as providing materials testing services during construction, please contact our office.

Sincerely,

ALPHA TESTING, INC.

Brian J. Hoyt, P.E.
Geotechnical Department Manager

Mark L. McKay, P.E.
Senior Geotechnical Engineer

STATE OF TEXAS
BRIAN J. HOYT
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LICENSED
PROFESSIONAL ENGINEER
March 21, 2014

BJH/MLM/jck
Copies: (1 - PDF) Client

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On

ALPHA REPORT NO. W140346

1.0 PURPOSE AND SCOPE

The purpose of this geotechnical exploration is for ALPHA TESTING, INC. ("ALPHA") to evaluate for the "Client" some of the physical and engineering properties of subsurface materials at a selected location on the subject site with respect to formulation of appropriate geotechnical design parameters for the proposed construction. The field exploration was accomplished by drilling a single test boring at a selected location. Engineering analyses were performed from results of the field exploration and results of laboratory tests performed on representative samples.

Also included are general comments pertaining to reasonably anticipated construction problems and recommendations concerning earthwork and quality control testing during construction. This information can be used to evaluate subsurface conditions and to aid in ascertaining construction meets project specifications.

Recommendations provided in this report were developed from information obtained in a test boring depicting subsurface conditions only at the specific boring location and at the particular time designated on the boring log. Subsurface conditions at other locations may differ from those observed at the boring location, and subsurface conditions at the boring location may vary at different times of the year. The scope of work may not fully define the variability of subsurface materials and conditions that are present on the site.

The nature and extent of variations may not become evident until construction. If significant variations then appear evident, our office should be contacted to re-evaluate our recommendations after performing on-site observations and possibly other tests.

2.0 PROJECT CHARACTERISTICS

It is proposed to construct a new concessions building at the Wheat Middle School campus about 860 ft north of Woodward Avenue and about 300 ft east of North Colonial Drive in Cleburne, Texas. A drawing illustrating the general outline of the property is provided as Figure 1, the Boring Location Plan, in the Appendix of this report. At the time the field exploration was performed, the site was an open grassy area. Cursory visual observations indicate the site is relatively level.

The new concessions building is expected to create light loads to be carried by the foundation. We understand it is intended to support the new structure using a slab-on-grade foundation with post-construction seasonal movements of less than about 1 inch. Grading plans were not provided for this study. For the purpose of our analysis, we have assumed maximum cuts and fills of about 2 ft to achieve final grade in the building pad area.

3.0 FIELD EXPLORATION

Subsurface conditions on the site were explored by drilling a single test boring in general accordance with ASTM D 420 to a depth of about 25 ft using standard rotary drilling equipment. The approximate location of the boring is shown on the Boring Location Plan, Figure 1, enclosed in the Appendix of this report. Details of drilling and sampling operations are briefly summarized in Methods of Field Exploration, Section A-1 of the Appendix.

Subsurface types encountered during the field exploration are presented on the Log of Boring sheet (boring log) included in the Appendix of this report. The boring log contains our Field Technician's and Engineer's interpretation of conditions believed to exist between actual samples retrieved. Therefore, the boring log contains both factual and interpretive information. Lines delineating subsurface strata on the boring log are approximate and the actual transition between strata may be gradual.

4.0 LABORATORY TESTS

Selected samples of the subsurface materials were tested in the laboratory to evaluate their engineering properties as a basis in providing recommendations for foundation design and earthwork construction. A brief description of testing procedures used in the laboratory can be found in Methods of Laboratory Testing, Section B-1 of the Appendix. Individual test results are presented on the Log of Boring sheet enclosed in the Appendix.

5.0 GENERAL SUBSURFACE CONDITIONS

Based on geological atlas maps available from the Bureau of Economic Geology, published by The University of Texas at Austin, this site lies within the Grayson Marl and Main Street Limestone undivided formation. The Grayson Marl and Main Street Limestone undivided formation generally consist of interbedded marl and limestone. Residual soils associated with this formation generally consist of clay soils with moderate to very high shrink/swell potential.

Subsurface conditions encountered in the boring generally consisted of about 4 ft of clay underlain by limestone which extended to the 25 ft termination depth of the boring. More detailed stratigraphic information is presented on the Log of Boring sheet attached to this report.

The subsurface materials encountered in the boring are considered relatively impermeable and are expected to have a slow response to water movement. Therefore, several days of observation would be required to evaluate actual groundwater levels within the depths explored. Also, the groundwater level at the site is anticipated to fluctuate seasonally depending on the amount of rainfall, prevailing weather conditions and subsurface drainage characteristics.

No free groundwater was encountered on drilling tools during drilling or in the borehole immediately upon completion of drilling. However, it is common to encounter seasonal groundwater from natural fractures within the clayey matrix, at the soil/rock (limestone) interface and from fractures in the rock, particularly during or after periods of precipitation. If more detailed groundwater information is required, monitoring wells or piezometers can be installed.

Further details concerning subsurface materials and conditions encountered can be obtained from the boring log provided in the Appendix of this report.

6.0 DESIGN RECOMMENDATIONS

The following design recommendations were developed on the basis of the previously described Project Characteristics (Section 2.0) and General Subsurface Conditions (Section 5.0). If project criteria should change, including the building location on the site our office should conduct a review to determine if modifications to the recommendations are required. Further, it is recommended our office be provided with a copy of the final plans and specifications for review prior to construction.

Design criteria given in this report were developed assuming the floor slab is constructed within about 2 ft of existing grade. Cutting and filling on the site other than discussed can alter the recommended foundation design parameters. Therefore, it is recommended our office be contacted before performing other cutting and filling on site to verify appropriate design parameters are utilized for final foundation design.

A slab foundation can be utilized for support of the proposed building provided some movement of the foundation is acceptable. Subgrade improvement will be required to reduce seasonal movements to the desired level of 1 inch. If foundation movement is not acceptable, it will be necessary to support the building on drilled pier foundations. We would be pleased to discuss drilled piers if desired.

6.1 Potential Seasonal Movements and Subgrade Improvement

Our findings indicate a slab-on-grade foundation constructed at the proposed finished floor elevation with onsite soils could experience soil-related potential movements of up to about 3 inches due to shrinking and swelling of active clays.

This potential seasonal movement was estimated in general accordance with methods outlined by Texas Department of Transportation (TxDOT) Test Method Tex-124-E and engineering judgment and experience. Estimated movements were calculated assuming the moisture content of the in-situ soil within the normal zone of seasonal moisture content change varies between a "dry" condition and a "wet" condition as defined by Tex-124-E. Also, it was assumed a 1 psi surcharge load from the floor slabs acts on the subgrade soils. Movements exceeding those predicted above could occur if positive drainage of surface water is not maintained or if soils are subject to an outside water source, such as leakage from a utility line or subsurface moisture migration from off-site locations.

We understand it is desired to reduce the movements of the slab foundation to about 1 inch. Potential movements of the slab-foundation could be reduced to about 1 inch by placing a minimum 1 ft of select non-expansive material beneath the slab above the top surface of moisture conditioned soils extending to the top surface of limestone. Moisture conditioning techniques are discussed in more detail below in Section 6.1.1 below.

Please note; limestone was encountered to a depth of about 4 ft in the boring. However, the depth to limestone could be greater in other areas of the building pad. If the depth to limestone exceeds 8 ft, our office should be contacted to revise our recommendations.

6.1.1 Subgrade Improvement Utilizing Moisture Conditioning

Movement of the slab foundation could be reduced to about 1 inch by placing at least 1 ft of non-expansive material between the bottom of the slab and the top surface of moisture-conditioned extending to the top surface of limestone. Non-expansive material could consist of flexible base material or select fill as discussed in Section 7.3

Moisture-conditioning consists of over-excavating the site soils, then processing and compacting the specified minimum thickness of soil at a *"target"* moisture content approximated to be at least 5 percentage points above the material's optimum moisture content as determined by the standard Proctor method (ASTM D 698). Some of the soils with a lower plasticity index could require compaction at a moisture content closer to optimum. The moisture-conditioned soil, free of debris and any rock fragment greater than 4 inches, should be placed in about 8-inch thick loose lifts and compacted to a dry density of 93 to 97 percent of standard Proctor maximum dry density. Moisture conditioning of the on-site soil should extend throughout the entire building pad area and at least 5 ft beyond the perimeter of the building. In entrance areas, the moisture conditioning process should extend at least 10 ft beyond the perimeter of the building. However, non-expansive material should not extend beyond the building limits. If flatwork or paving is not planned adjacent to the structure (i.e. above the moisture-conditioned soils), a moisture barrier consisting of a minimum of 10 mil plastic sheeting with 8 to12 inches of soil cover should be provided above the moisture-conditioned soils. Moisture-conditioned soils should be maintained in a moist condition prior to placement of the required thickness of non-expansive material, flatwork or plastic sheeting.

The resulting estimated potential seasonal movements (about 1 inch) were calculated assuming the moisture content of the moisture-conditioned soil varies between the *"target"* moisture content and the "wet" condition as defined by methods outlined in TxDOT Test Method Tex-124-E.

Please note, it is the intent of the moisture-conditioning process described above to reduce the free swell potential of the moisture-conditioned soil to 1 percent or less. Additional laboratory tests (i.e., standard Proctors, absorption swell tests, etc.) should be conducted during construction to verify the *"target"* moisture content for moisture-conditioning (estimated at 5 percentage points above the material's optimum moisture content as defined by ASTM D 698) is sufficient to reduce the free swell potential of the processed soil to 1 percent or less. In addition, it is recommended samples of the moisture-conditioned material be routinely obtained during construction to verify the free swell of the improved material is 1 percent or less.

Installation of moisture-conditioned clays should be monitored and tested on a full-time basis by a representative of ALPHA TESTING, INC., to verify the soils tested were placed with the proper lift thickness, moisture content, and degree of compaction.

6.2 Slab-on-Grade Foundation

The slab foundation should be designed with exterior and interior grade beams adequate to provide sufficient rigidity to the foundation system. A net allowable soil bearing pressure of 1.5 kips per sq ft may be used for design of all grade beams bearing on non-expansive select material as described above in Section 6.1 of this report. Grade beams should bear a minimum depth of 12 inches below final grade and should have a minimum width of 10 inches.

To reduce cracking as normal movements occur in foundation soils, all grade beams and floor slabs should be adequately reinforced with steel. It is common to experience some minor cosmetic distress to structures with slab-on-grade foundation systems due to normal ground movements. A properly designed and constructed moisture barrier should be placed between the slab and subgrade soils to retard moisture migration through the slabs.

6.3 Post-Tensioning Institute, Design of Post-Tensioned Slab-on-Grade

Provided below is information for the design of post-tensioned, slab-on-grade foundation. Design parameters provided below were evaluated based on the conditions encountered in the borings and using information and correlations published by PTI Third Edition and VOLFLO 1.5 computer program provided by Geostructural Tool Kit, Inc. (GTI).

TABLE A
PTI Design Parameters
Potential Seasonal Movement = 1 inch
(After Subgrade Treatment as Described in Section 6.1 Above)

	EDGE LIFT	CENTER LIFT
Edge Moisture Distance, ft (e_m)	4.3	8.5
Differential Soil Movement, inches (y_m)	1.2 (swell)	0.9 (shrink)

The following parameters were used as input for the VOLFLO 1.5 computer program:

Thornthwaite Moisture Index (I_m):	10
Constant Suction:	3.6 pF
Variations of Suction:	
Wettest:	3.0 pF
Dryest:	4.5 pF
K_o Wetting	0.67
K_o Drying	0.33
Soil Fabric Factor:	1.1
Depth to Constant Suction (ft)	up to 10 ft

6.4 Exterior Flatwork

Exterior flatwork supported within 2 ft of existing grade could be subjected to potential seasonal movements of up to about 3 inches as described in Section 6.1. In areas where flatwork movement is critical (such as, but not limited to, main entrances), subgrade improvement as discussed in Section 6.1 can be considered to reduce the potential soil movement.

6.5 Seismic Considerations

The Site Class for seismic design is based on several factors that include soil profile (soil or rock), shear wave velocity, and strength, averaged over a depth of 100 ft. Since our boring did not extend to 100-foot depths, we based our determinations on the assumption that the subsurface materials below the bottom of the boring were similar to those encountered at the termination depth. Based on Section 1613.3.2 of the 2012 International Building Code and Table 20.3-1 in the 2010 ASCE-7, we recommend using Site Class C (very dense soil and soft rock) for seismic design at this site.

6.6 Drainage and Other Considerations

Adequate drainage should be provided to reduce seasonal variations in the moisture content of foundation soils. All pavement and sidewalks within 5 ft of the structure should be sloped away from the building to prevent ponding of water around the building. Final grades within 5 ft of the structure should be adjusted to slope away from the structure at a minimum slope of 2 percent. **Maintaining positive surface drainage throughout the life of the structure is essential.**

In areas with pavement or sidewalks adjacent to the new structure, a positive seal must be maintained between the structure and the pavement or sidewalk to minimize seepage of water into the underlying supporting soils. Post-construction movement of pavement and flatwork is common. Normal maintenance should include examination of all joints in paving and sidewalks, etc. as well as resealing where necessary.

Several factors relate to civil and architectural design and/or maintenance, which can significantly affect future movements of the foundation and floor slab system:

1. Preferably, a complete system of gutters and downspouts should carry runoff water a minimum of 5 feet from the completed structure.

2. Large trees and shrubs should not be allowed closer to the foundation than a horizontal distance equal to roughly one-half of their mature height due to their significant moisture demand upon maturing.

3. Moisture conditions should be maintained "constant" around the edge of the slab. Ponding of water in planters, in unpaved areas, and around joints in paving and sidewalks can cause slab movements beyond those predicted in this report.

4. Planter box structures placed adjacent to the building should be provided with a means to assure concentrations of water are not available to the subsoil stratigraphy.

Trench backfill for utilities should be properly placed and compacted as outlined in Section 7.3 of this report and in accordance with requirements of local City standards. Since granular bedding backfill is used for most utility lines, the backfilled trench should not become a conduit and allow access for surface or subsurface water to travel toward the new structures. Concrete cut-off collars or clay plugs should be provided where utility lines cross building lines to prevent water from traveling in the trench backfill and entering beneath the structures.

7.0 <u>GENERAL CONSTRUCTION PROCEDURES AND RECOMMENDATIONS</u>

Variations in subsurface conditions could be encountered during construction. To permit correlation between test boring data and actual subsurface conditions encountered during construction, it is recommended a registered Professional Engineering firm be retained to observe construction procedures and materials.

Some construction problems, particularly degree or magnitude, cannot be anticipated until the course of construction. The recommendations offered in the following paragraphs are intended not to limit or preclude other conceivable solutions, but rather to provide our observations based on our experience and understanding of the project characteristics and subsurface conditions encountered in the boring.

7.1 <u>Site Preparation and Grading</u>

Limestone was encountered within 4 ft of the ground surface in the boring and we expect limestone could be encountered during general excavation at this site. From our experience, this limestone can be hard and may be difficult to excavate. Rock excavation methods (including, but not limited to rock teeth, rippers, jack hammers, or sawcutting) may be required to remove the limestone. Crushing equipment may be required to process this limestone if it is desired to use this material as compacted fill on the site. The contractor selected should have experience with excavation in hard limestone.

All areas supporting slab foundations, flatwork and areas to receive new fill should be properly prepared.

> After completion of the necessary stripping, clearing, and excavating, and prior to placing any required fill, the exposed soil subgrade should be carefully evaluated by probing and testing. Any undesirable material (organic material, wet, soft, or loose soil) still in place should be removed. Prior to placement of any fill, the exposed soil subgrade should then be scarified to a minimum depth of 6 inches and recompacted as outlined in Section 7.3.
>
> The exposed soil subgrade should be further evaluated by proof-rolling with a heavy pneumatic tired roller, loaded dump truck or similar equipment weighing approximately 20 tons to check for pockets of soft or loose material hidden beneath a thin crust of possibly better soil. Any undesirable material (organic material, wet, soft, or loose soil) exposed from the proof roll should be removed and replaced with well-compacted material as outlined in Section 7.3. Proof-rolling procedures should be observed routinely by a Professional Engineer or his designated representative.
>
> Prior to placement of any fill, the exposed soil subgrade should then be scarified to a minimum depth of 6 inches and recompacted as outlined in Section 7.3.

If fill is to be placed on existing slopes (natural or constructed) steeper than six horizontal to one vertical (6:1), the fill materials should be benched into the existing slopes in such a manner as to provide a minimum bench width of five (5) feet. This should provide a good contact between the existing soils and new fill materials, reduce potential sliding planes and allow relatively horizontal lift placements.

Slope stability analysis of embankments (natural or constructed) and global stability analysis for retaining walls was not within the scope of this study.

The contractor is responsible for designing any excavation slopes, temporary sheeting or shoring. Design of these structures should include any imposed surface surcharges. Construction site safety is the sole responsibility of the contractor, who shall also be solely responsible for the means, methods and sequencing of construction operations. The contractor should also be aware that slope height, slope inclination or excavation depths (including utility trench excavations) should in no case exceed those specified in local, state and/or federal safety regulations, such as OSHA Health and Safety Standard for Excavations, 29 CFR Part 1926, or successor regulations. Stockpiles should be placed well away from the edge of the excavation and their heights should be controlled so they do not surcharge the sides of the excavation. Surface drainage should be carefully controlled to prevent flow of water over the slopes and/or into the excavations.

Construction slopes should be closely observed for signs of mass movement, including tension cracks near the crest or bulging at the toe. If potential stability problems are observed, a geotechnical engineer should be contacted immediately. Shoring, bracing or underpinning required for the project (if any) should be designed by a professional engineer registered in the State of Texas.

Due to the nature of the clay soils found near the surface at some of the borings, traffic of heavy equipment (including heavy compaction equipment) may create pumping and general deterioration of shallow soils. Therefore, some construction difficulties should be anticipated during periods when these soils are saturated.

7.2 Foundation Excavations

All foundation excavations should be monitored to verify foundations bear on suitable material. The bearing stratum exposed in the base of all foundation excavations should be protected against any detrimental change in conditions. Surface runoff water should be drained away from excavations and not allowed to collect. All concrete for foundations should be placed as soon as practical after the excavation is made.

Prolonged exposure of the bearing surface to air or water will result in changes in strength and compressibility of the bearing stratum. Therefore, if delays occur, excavations should be slightly deepened and cleaned, in order to provide a fresh bearing surface.

7.3 Fill Compaction

Materials used as select, non-expansive material should have a liquid limit less than 35, a plasticity index (PI) not less than about 4 nor greater than 15 and contain no more than 0.5 percent fibrous organic materials, by weight. All select material should contain no deleterious material and should be compacted to a dry density of at least 95 percent standard Proctor maximum dry density (ASTM D 698) and within the range of 1 percentage point below to 3 percentage points above the material's optimum moisture content. (*Note: The plasticity index and liquid limit of material used as select, non-expansive material should be routinely verified during placement using laboratory tests. Visual observation and classification should not be relied upon to confirm the material to be used as select, non-expansive material satisfies the above plasticity index and liquid limit criteria*.)

Flexible base used as non-expansive fill in the building pad should consist of material meeting the requirements of TxDOT Standard Specifications Item 247, Type A, B, C, or D, Grade 1, 2 or 3. The flexible base should be compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D 698) and within the range of 2 percentage points below to 2 percentage points above the material's optimum moisture content.

The recommendations below pertain to fill placement for general site grading outside the building pad areas. All fill placed in the building pads should conform to the requirements in Section 6.1.1 of this report, above.

Clay soils with a plasticity index equal to or greater than 25 should be compacted to a dry density between 93 and 98 percent of standard Proctor maximum dry density (ASTM D 698). The compacted moisture content of the clays during placement should be within the range of 2 to 6 percentage points above optimum. Clay fill should be processed and the largest particle or clod should be less than 6 inches prior to compaction.

In cases where either mass fills or utility lines are more than 10 ft deep, the fill/backfill below 10 ft should be compacted to at least 100 percent of standard Proctor maximum dry density (ASTM D-698) and within 2 percentage points of the material's optimum moisture content. The portion of the fill/backfill shallower than 10 ft should be compacted as outlined above.

Compaction should be accomplished by placing fill in about 8-inch thick loose lifts and compacting each lift to at least the specified minimum dry density. Field density and moisture content tests should be performed on each lift.

7.4 <u>Groundwater</u>

Groundwater was not encountered in the boring. However, from our experience shallow groundwater seepage could be encountered in excavations for foundations or other general excavations on the site. The risk of seepage increases with depth of excavation and during or after periods of precipitation. Standard sump pits and pumping may be adequate to control seepage on a local basis.

In any areas where cuts are made to establish final grades for the building pads, attention should be given to possible seasonal water seepage that could occur through natural cracks and fissures in the newly exposed stratigraphy. Also, seasonal seepage could occur where limestone is exposed in excavations and slopes or is near the final site grade. In these areas, subsurface drains may be required to intercept seasonal groundwater seepage. The need for these or other de-watering devices on the building pad should be carefully addressed during construction. Our office could be contacted to visually observe the final grades to evaluate the need for such drains.

8.0 LIMITATIONS

Professional services provided in this geotechnical exploration were performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. The scope of services provided herein does not include an environmental assessment of the site or investigation for the presence or absence of hazardous materials in the soil, surface water or groundwater. ALPHA, upon written request, can be retained to provide these services.

ALPHA TESTING, INC. is not responsible for conclusions, opinions or recommendations made by others based on this data. Information contained in this report is intended for the exclusive use of the Client (and their designated design representatives), and is related solely to design of the specific structures outlined in Section 2.0. No party other than the Client (and their designated design representatives) shall use or rely upon this report in any manner whatsoever unless such party shall have obtained ALPHA's written acceptance of such intended use. Any such third party using this report after obtaining ALPHA's written acceptance shall be bound by the limitations and limitations of liability contained herein, including ALPHA's liability being limited to the fee paid to it for this report. Recommendations presented in this report should not be used for design of any other structures except those specifically described in this report. In all areas of this report in which ALPHA may provide additional services if requested to do so in writing, it is presumed that such requests have not been made if not evidenced by a written document accepted by ALPHA. Further, subsurface conditions can change with passage of time. Recommendations contained herein are not considered applicable for an extended period of time after the completion date of this report. It is recommended our office be contacted for a review of the contents of this report for construction commencing more than one (1) year after completion of this report. Non-compliance with any of these requirements by the Client or anyone else shall release ALPHA from any liability resulting from the use of, or reliance upon, this report.

Recommendations provided in this report are based on our understanding of information provided by the Client about characteristics of the project. If the Client notes any deviation from the facts about project characteristics, our office should be contacted immediately since this may materially alter the recommendations. Further, ALPHA TESTING, INC. is not responsible for damages resulting from workmanship of designers or contractors. It is recommended the Owner retain qualified personnel, such as a Geotechnical Engineering firm, to verify construction is performed in accordance with plans and specifications.

APPENDIX

A-1 METHODS OF FIELD EXPLORATION

Using standard rotary drilling equipment, a single test boring was performed for this geotechnical exploration at the approximate location shown on the Boring Location Plan, Figure 1. The test boring location was staked by either pacing or taping and estimating right angles from landmarks which could be identified in the field and as shown on the site plan provided during this study. The location of the test boring shown on the Boring Location Plan is considered accurate only to the degree implied by the methods used to define it.

Relatively undisturbed samples of the cohesive subsurface materials were obtained by hydraulically pressing 3-inch O.D. thin-wall sampling tubes into the underlying soils at selected depths (ASTM D 1587). These samples were removed from the sampling tubes in the field and examined visually. One representative portion of each sample was sealed in a plastic bag for use in future visual examinations and possible testing in the laboratory.

A modified version of the Texas Cone Penetration (TCP) test was completed in the field to determine the apparent in-place strength characteristics of the rock type materials. A 3-inch diameter steel cone driven by a 170-pound hammer dropped 24 inches is the basis for TxDOT strength correlations. In this case, ALPHA TESTING, INC. has modified the procedure by using a 140-pound hammer dropping 30-inches for completion of the field test. Depending on the resistance (strength) of the materials, either the number of blows of the hammer required to provide 12 inches of penetration, or the inches of penetration of the cone due to 100 blows of the hammer are recorded on the field log and are shown on the Log of Boring sheet as “TX Cone” (reference TxDOT Test Method TEX 132-E, as modified).

The boring log is included in the Appendix of this report. The log shows a visual description of subsurface strata encountered in the boring using the Unified Soil Classification System. Sampling information, pertinent field data, and field observations are also included. The subsurface samples will be retained in the laboratory for at least 30 days and then discarded unless the Client requests otherwise.

GEOTECHNICAL EXPLORATION
NEW CONCESSIONS BUILDING
WHEAT MIDDLE SCHOOL
WOODWARD AVE & N. COLONIAL DR
CLEBURNE, TEXAS
ALPHA PROJECT NO. W140436
MARCH 21, 2014

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BORING LOCATION PLAN

FIGURE 1

B-1 METHODS OF LABORATORY TESTING

Representative samples were evaluated and classified by a qualified member of the Geotechnical Division and the boring logs were edited as necessary. To aid in classifying the subsurface materials and to determine the general engineering characteristics, natural moisture content tests (ASTM D 2216) and Atterberg-limit tests (ASTM D 4318) were performed on selected samples. In addition, pocket-penetrometer tests were conducted on selected soil samples to evaluate the soil shear strength. Results of all laboratory tests described above are provided on either the accompanying Log of Boring sheet.

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LOG OF BORING NO.: 1

PROJECT NO.: W140346

Client: Cleburne ISD
Project: New Concessions Building
Start Date: 3/12/2014 **End Date:** 3/12/2014
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: Cleburne, Texas
Surface Elevation:
West:
North:
Hammer Drop (lbs / in): 140 / 30

GROUND WATER OBSERVATIONS
On Rods (ft): NONE
After Drilling (ft): DRY
After ____ Hours (ft):

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft,in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		Brown CLAY											
						4.5+				19			
						4.5+				19	62	18	44
		4.0											
5		Tan LIMESTONE with clay seams and layers			100/ 3"								
10					100/ 6.5"								
		- clay layer from 10' to 11'											
15					100/ 1.5"								
20					100/ 1.5"								
25		25.0			100/ 1.25"								
		TEST BORING TERMINATED AT 25 FT											
30													

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KEY TO SOIL SYMBOLS AND CLASSIFICATIONS

SOIL & ROCK SYMBOLS

(CH), High Plasticity CLAY
(CL), Low Plasticity CLAY
(SC), CLAYEY SAND
(SP), Poorly Graded SAND
(SW), Well Graded SAND
(SM), SILTY SAND
(ML), SILT
(MH), Elastic SILT
LIMESTONE
SHALE / MARL
SANDSTONE
(GP), Poorly Graded GRAVEL
(GW), Well Graded GRAVEL
(GC), CLAYEY GRAVEL
(GM), SILTY GRAVEL
(OL), ORGANIC SILT
(OH), ORGANIC CLAY
FILL

SAMPLING SYMBOLS

SHELBY TUBE (3" OD except where noted otherwise)
SPLIT SPOON (2" OD except where noted otherwise)
AUGER SAMPLE
TEXAS CONE PENETRATION
ROCK CORE (2" ID except where noted otherwise)

RELATIVE DENSITY OF COHESIONLESS SOILS (blows/ft)

VERY LOOSE	0 TO 4
LOOSE	5 TO 10
MEDIUM	11 TO 30
DENSE	31 TO 50
VERY DENSE	OVER 50

SHEAR STRENGTH OF COHESIVE SOILS (tsf)

VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
FIRM	0.50 TO 1.00
STIFF	1.00 TO 2.00
VERY STIFF	2.00 TO 4.00
HARD	OVER 4.00

RELATIVE DEGREE OF PLASTICITY (PI)

LOW	4 TO 15
MEDIUM	16 TO 25
HIGH	26 TO 35
VERY HIGH	OVER 35

RELATIVE PROPORTIONS (%)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

PARTICLE SIZE IDENTIFICATION (DIAMETER)

BOULDERS	8.0" OR LARGER
COBBLES	3.0" TO 8.0"
COARSE GRAVEL	0.75" TO 3.0"
FINE GRAVEL	5.0 mm TO 3.0"
COURSE SAND	2.0 mm TO 5.0 mm
MEDIUM SAND	0.4 mm TO 5.0 mm
FINE SAND	0.07 mm TO 0.4 mm
SILT	0.002 mm TO 0.07 mm
CLAY	LESS THAN 0.002 mm