

GEOTECHNICAL EXPLORATION

on

HESTER PROPERTY

11103 E. Rocky Creek Road
Fort Worth, Texas
ALPHA Report No. W152959



WHERE IT ALL BEGINS

Geotechnical Construction Materials Environmental



GEOTECHNICAL EXPLORATION

on

HESTER PROPERTY

11103 E. Rocky Creek Road
Fort Worth, Texas
ALPHA Report No. W152959

Prepared for:

7H ROCKY CREEK, LLC

PO Box 802231
Dallas, Texas 75380
Attention: Mr. Kasey Hester
January 19, 2016

Prepared By:

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

January 19, 2016

7H Rocky Creek, LLC
PO Box 802231
Dallas, Texas 75380
Attention: Mr. Kasey Hester

Re: Geotechnical Exploration
Hester Property
11103 E. Rocky Creek Road
Fort Worth, Texas
ALPHA Report No. W152959


Attached is the report of the geotechnical exploration performed for the project referenced above. This study was authorized by Mr. Kasey Hester and performed in accordance with ALPHA Proposal No. 50505 dated December 17, 2015.

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 residential 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.


Jeromi C. Kelsey, E.I.T.
Geotechnical Project Manager



January 19, 2016

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

JCK/BJH/rf
Copies: (1-PDF) Client



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ALPHA REPORT NO. W152959

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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 selected locations on the subject site with respect to formulation of appropriate geotechnical design parameters for the proposed construction. The field exploration was accomplished by securing subsurface samples from widely spaced test borings performed across the expanse of the site. 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 test borings depicting subsurface conditions only at the specific boring locations and at the particular time designated on the boring logs. Subsurface conditions at other locations may differ from those observed at the boring locations, and subsurface conditions at boring locations 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 between borings 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 residence at 11103 E. Rocky Creek Road in Fort Worth, 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 consisted of a vacant lot vegetated with a few scattered trees. cursory visual observations indicate the site is relatively level.

The new residence is expected to create light loads to be carried by the foundation. We understand it is intended to support the new structure using a post-tensioned slab-on-grade foundation designed for post-construction seasonal movements of less than about 4½ inches. Grading plans were not available at the time of this study. For the purpose of our analysis we have assumed maximum cuts and fills of about 2 ft will be required to achieve final grade in the building pad area.

3.0 FIELD EXPLORATION

Subsurface conditions on the site were explored by drilling two (2) test borings to a depth of about 20 ft each in general accordance with ASTM D 420 using standard rotary drilling equipment. The approximate location of each 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 sheets (boring logs) included in the Appendix of this report. The boring logs contain our Field Technician's and Engineer's interpretation of conditions believed to exist between actual samples retrieved. Therefore, the boring logs contain both factual and interpretive information. Lines delineating subsurface strata on the boring logs 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 Logs of Boring sheets 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, the site is situated near the mapped interface of the Washita Formation and the Kiamichi Formation. These formations generally consist of limestone with alternating clay and marl (limey shale) layers. Residual overburden soils associated with these formations generally consist of clay soils with low to high shrink-swell potential.

Subsurface conditions encountered in Borings 1 and 2 generally consisted of clay to depths of about 1 ft and 2 ft below the ground surface, respectively, underlain by limestone which extended to the 20 ft termination depth of the borings. The upper 7 ft and 5 ft of limestone encountered in Borings 1 and 2, respectively, was weathered. More detailed stratigraphic information is presented on the Log of Boring sheets attached to this report.

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

Groundwater was not encountered in the borings. However, it is common to encounter seasonal groundwater from natural fractures within the clayey matrix, at the soil/rock (limestone) interface or 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 and more detailed information concerning subsurface materials and conditions encountered can be obtained from the boring logs 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, 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 2 ft of existing grade. Cutting and filling on the site more than 2 ft 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.

6.1 Slab-on-Grade Foundations

Our findings indicate a slab foundation constructed within 2 ft of existing grade, as encountered during drilling, could experience soil-related potential seasonal movements of up to about 2 inches.

Any material used to raise the grade should consist of onsite or similar soils with a plasticity index of 40 or less. If materials with a plasticity index higher than 40 are used to raise the grade, potential movements could exceed 2 inches.

The potential seasonal movements discussed above were 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 slab 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.

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 2.0 kips per sq ft may be used for design of all grade beams bearing on undisturbed cuts in native soils, on fill placed as recommended in Section 7.3 or on limestone. Grade beams should bear a minimum depth of 18 inches below final grade and should have a minimum width of 10 inches for bearing capacity considerations.

To reduce cracking as normal movements occur in foundation soils, all grade beams and the floor slabs should be adequately reinforced with steel (conventional reinforcing steel and/or post-tension reinforcement). 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 slab.



6.2 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 Geostuctural Tool Kit, Inc. (GTI).

PTI Design Parameters
Potential Seasonal Movement = 2 inches

	EDGE LIFT	CENTER LIFT
Edge Moisture Distance (e_m), ft	4.2	8.3
Differential Soil Movement (y_m), inches	1.5 (swell)	1.0 (shrink)

6.3 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 residence should be sloped away from the building to prevent ponding of water around the foundation. 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 flat-work is common. Normal maintenance should include examination of all joints in paving and sidewalks, etc. as well as re-sealing 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.



5. *The root systems from existing trees at this site will have dried and desiccated the surrounding clay soils, resulting in soil with near-maximum swell potential. Clay soils surrounding tree root mats in areas with at-grade slabs (including but not limited to driveways, porches, patios, and sidewalks) should be removed to a minimum depth of 1 ft below the root ball. The resulting excavation should be backfilled with engineered fill as described in Section 7.3 of this report, below.*

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 municipal 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 structure. 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 structure.

7.0 GENERAL CONSTRUCTION PROCEDURES AND RECOMMENDATIONS

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 reasonably 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 borings.

7.1 Site Preparation and Grading

Limestone was encountered at depths of about 1 ft to 2 ft below the existing ground surface at the boring locations. We expect limestone will be encountered during general excavation at this site. From our experience, this limestone can be hard and could 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 or 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.



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 10 tons to check for pockets of soft or loose material hidden beneath a thin crust of possibly better soil. Proof-rolling procedures should be observed routinely by a Professional Engineer or his designated representative. 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.

Prior to placement of any fill, the exposed soil subgrade should then be scarified to a minimum depth of 6 inches and recompact 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.

Even if fill is properly compacted as recommended in Section 7.3 of this report, fills in excess of about 10 ft are still subject to settlements over time of up to about 1 to 2 percent of the total fill thickness. This should be considered when designing utility lines under pavements.

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 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

Clay soils with a plasticity index equal to or greater than 25 should be compacted to a dry density between 93 and 97 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 soils with a plasticity index below 25 should be compacted to a dry density of at least 95 percent of 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.

Clayey materials used as fill should be processed and the largest particle or clod should be less than 6 inches prior to compaction.

Processed limestone used as fill should be compacted to at least 95 percent of standard Proctor maximum dry density. The compacted moisture content of the processed limestone is not considered crucial to proper performance. However, if the material's moisture content during placement is within 3 percentage points of optimum, the compactive effort required to achieve the minimum compaction criteria may be minimized. Individual rock pieces larger than 6 inches in dimension should not be used as fill. However, if rock fill is utilized within 3 ft below the bottom of floor slabs, the maximum allowable size of individual rock pieces should be reduced to 3 inches. Processed limestone used as fill should incorporate sufficient fines to prevent the presence of voids around larger diameter rock pieces. A gradation of at least 40 percent passing a standard No. 4 sieve is recommended.

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 98 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.



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 same.

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 and 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



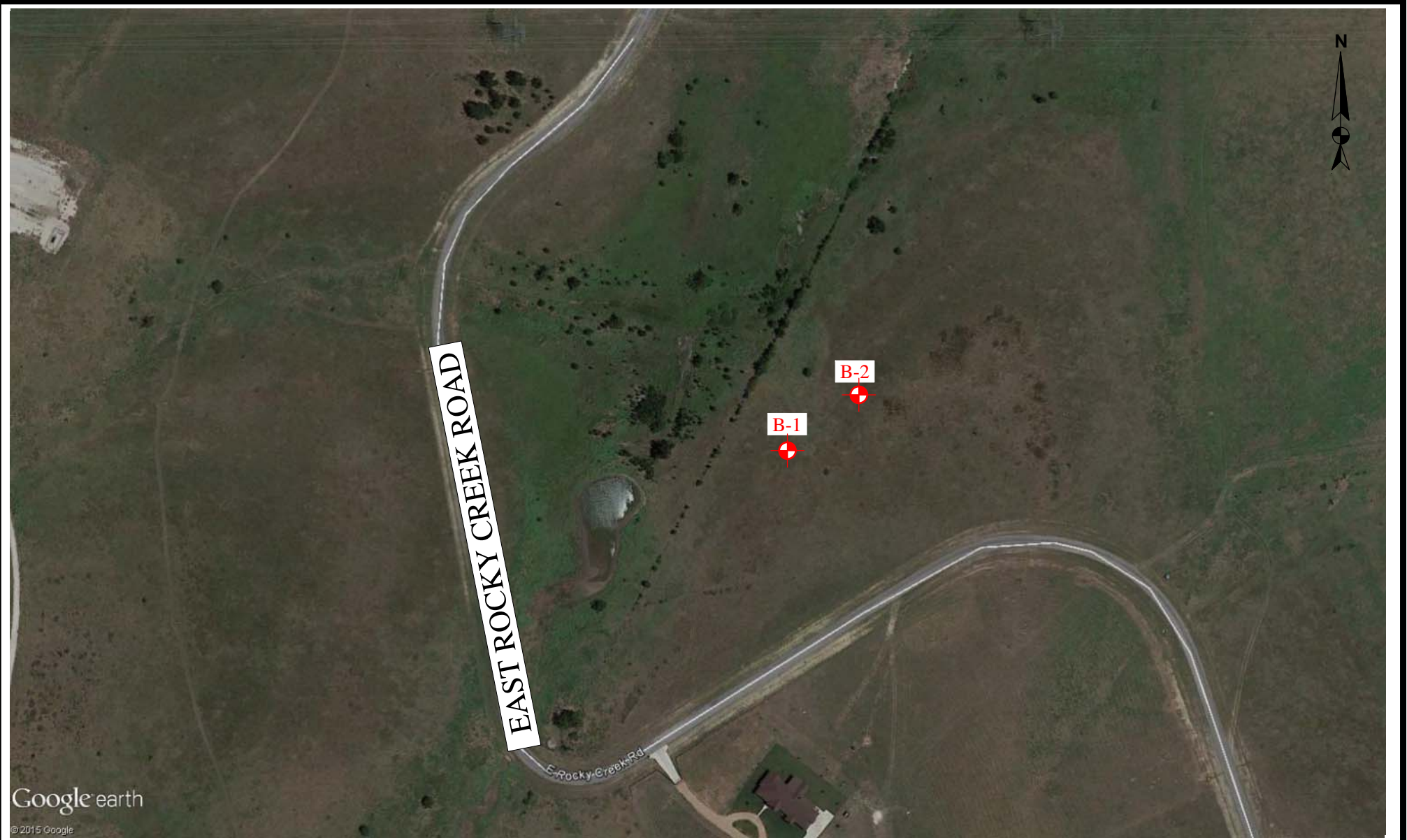
A-1 METHODS OF FIELD EXPLORATION

Using standard rotary drilling equipment, a total of two (2) test borings were performed for this geotechnical exploration at the approximate locations shown on the Boring Location Plan, Figure 1. The test boring locations were 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 locations of the test borings shown on the Boring Location Plan are considered accurate only to the degree implied by the methods used to define them.

Relatively undisturbed samples of cohesive subsurface materials were obtained by hydraulically pressing 3-inch O.D. thin-wall sampling tubes into the underlying soil at selected depths (ASTM D 1587). These samples were removed from the sampling tubes in the field and examined visually. A 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 sheets as “TX Cone” (reference TxDOT Test Method TEX 132-E, as modified).

Logs of the borings are included in the Appendix of this report. The logs show a visual description of subsurface strata encountered in the borings 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 14 days and then discarded unless the Client requests otherwise.



GEOTECHNICAL EXPLORATION
HESTER PROPERTY
11103 E. ROCKY CREEK ROAD
FORT WORTH, TEXAS
ALPHA PROJECT NO. W152959



WHERE IT ALL BEGINS

FIGURE 1

BORING LOCATION PLAN



APPROXIMATE BORING LOCATION



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 the Log of Boring sheets.





















LOG OF BORING NO.: 2
Sheet 1 of 1
PROJECT NO.: W152959

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






[illegible]

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



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