

GEOTECHNICAL ENGINEERING
 CONSTRUCTION MATERIALS
 ENGINEERING & TESTING
 SOILS • ASPHALT • CONCRETE

November 9, 2021

Urban Civil, LLC 190 South Seguin Ave. New Braunfels, Texas 78130

Attention: Nancy Turner

#### SUBJECT: SUBSURFACE EXPLORATION, LABORATORY TESTING PROGRAM AND PAVEMENT EVALUATION FOR THE PROPOSED HERITAGE OAKS SUBDIVISION ROADWAYS SCHERTZ, TEXAS RETL Project No.: G221509

Dear Ms. Turner,

In accordance with our agreement, we have conducted a subsurface exploration and pavement evaluation for the above referenced project. The results of this exploration, together with our recommendations, are to be found in the accompanying report, an electronic copy of which is being transmitted herewith. RETL will provide up to two (2) versions of this report in hard copy at the request of the client.

Often, because of design and construction details that occur on a project, questions arise concerning soil conditions and Rock Engineering and Testing Laboratory, Inc. (RETL), would be pleased to continue its role as the Geotechnical Engineer during project implementation.

RETL also has great interest in providing materials testing and observation services during the construction phase of this project. If you will advise us of the appropriate time to discuss these engineering services, we will be pleased to meet with you at your convenience.

Sincerely,

Kyle D. Hammock, P.E. Vice President - San Antonio

ROCK ENGINEERING & TESTING LABORATORY, INC. www.rocktesting.com

6817 LEOPARD STREET • CORPUS CHRISTI, TEXAS 78409-1703 OFFICE: (361) 883-4555 • FAX: (361) 883-4711 10856 VANDALE ST. SAN ANTONIO, TEXAS 78216-3625 OFFICE: (210) 495-8000 • FAX: (210) 495-8015 SUBSURFACE EXPLORATION, LABORATORY TESTING PROGRAM, AND PAVEMENT EVALUATION FOR THE PROPOSED HERITAGE OAKS SUBDIVISION ROADWAYS SCHERTZ, TEXAS

**RETL PROJECT NUMBER: G221509** 

**PREPARED FOR:** 

URBAN CIVIL, LLC 190 SOUTH SEGUIN AVE. NEW BRAUNFELS, TEXAS 78130

**NOVEMBER 9, 2021** 

**PREPARED BY:** 

ROCK ENGINEERING AND TESTING LABORATORY, INC. 10856 VANDALE ST. SAN ANTONIO, TEXAS 78216 PHONE: (210) 495-8000; FAX: (210) 495-8015

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J.R. Eichelberger, III, P.E. Senior Project Engineer





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#### **INTRODUCTION**

This report presents the results of a subsurface exploration and pavement evaluation for the proposed Heritage Oaks Subdivision Roadways to be constructed in Schertz, Texas. This study was conducted for Urban Civil, LLC.

#### Authorization

The work for this project was performed in accordance with RETL Proposal Number SGP062421A dated July 2, 2021. The proposal contained a scope of work, lump sum fee and limitations. The proposal was approved and signed by Nancy Turner on July 9, 2021 and returned to RETL via email. The client delayed the start of the project to allow for site clearing to provide access for the drill rig.

#### Purpose and Scope

The purpose of this exploration was to evaluate the soil and rock conditions at the site and to provide pavement recommendations suitable for the proposed subdivision roadways.

The scope of the exploration and evaluation included the subsurface exploration, field and laboratory testing, engineering analysis and evaluation of the subsurface soil and rock, provision of pavement recommendations, and preparation of this report.

The scope of services did not include an environmental assessment. Any statements in this report, or on the boring logs, regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of the client.

#### <u>General</u>

The exploration and analysis of the subsurface conditions reported herein are considered sufficient in detail and scope to form a reasonable basis for the pavement design. The recommendations submitted for the proposed project are based on the available subsurface information and the preliminary design details provided by the client. If the civil engineer requires additional soil parameters to complete the pavement design, RETL will provide the requested information as a supplement to this report.

The Geotechnical Engineer states that the findings, recommendations, specifications or professional advice contained herein, have been presented after being prepared in a manner consistent with the level of care and skill ordinarily exercised by reputable members of the Geotechnical Engineer's profession practicing contemporaneously under similar conditions in the locality of the project. RETL operates in general accordance with "Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction", (ASTM D3740). No other representations are expressed or implied, and no warranty or guarantee is included or intended.

#### FIELD EXPLORATION

#### <u>Scope</u>

The field exploration was completed to evaluate the engineering characteristics of the pavement materials and included a reconnaissance of the project site, drilling the test borings, and recovering disturbed split spoon and relatively undisturbed Shelby tube samples.

A total of ten (10) borings were performed at the site and were drilled to a depth of 10feet below the existing ground surface within the proposed new subdivision roadway alignment. RETL determined the number, depth, and general location of the borings and staked the borings in the field. RETL performed the boring operations. Bulk samples of subgrade were also collected at boring locations B-4, B-7, and B-9. Upon completion of the drilling operations and obtaining the groundwater observations, the bore holes were backfilled with excavated soil and the site cleaned as required. A Boring Location Plan is provided in the Appendix of this report.

#### Drilling and Sampling Procedures

The borings were performed using a drilling rig equipped with a rotary head and solid flight auger drilling methods were used to advance the boreholes to their desired depths. Disturbed samples were obtained employing split-barrel sampling procedures in general accordance with the procedures for "*Penetration Test and Split-Barrel Sampling of Soils*" (ASTM D1586). Relatively undisturbed soil samples were obtained using thinwall tube sampling procedures in accordance with the procedures for "*Thin Walled Tube Sampling of Soils*" (ASTM D1587).

The samples were classified in the field, placed in plastic bags, marked according to their boring number, depth, and any other pertinent field data, stored in special containers and delivered to the laboratory for testing.

#### Field Tests and Measurements

**Penetration Tests** - During the sampling procedures, standard penetration tests (SPT) were performed to obtain the standard penetration value of the soil. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer falling 30 inches required to advance the split-barrel sampler 1-foot into the soil. The sampler is lowered to the bottom of the previously cleaned drill hole and advanced by blows from the hammer. The number of blows is recorded for each of three successive 6-inch penetrations. The "N" value is obtained by adding the second and third 6-inch increment number of blows. The results of standard penetration tests indicate the relative density of cohesionless soils and comparative consistency of cohesive soils, thereby providing a basis for estimating the relative strength and compressibility of the soil profile components.

**Water Level Observations** - Water level observations were obtained during the test boring operations and are noted on the boring logs provided in the Appendix. The amount of water in open boreholes largely depends on the permeability of the soil and rock encountered at the boring locations. In relatively pervious soils, such as sandy soils, the indicated depths are usually reliable groundwater levels. In relatively impervious soils, a suitable estimate of the groundwater depth may not be possible, even after several days of observation. Seasonal variations, temperature, land-use, proximity to a body of water, and recent rainfall conditions may influence the depth to the groundwater.

**Ground Surface Elevations** - Ground surface elevations were not provided at the boring locations. All depths referred to in this report are reported from the actual ground surface elevations at the boring locations during the time of our field investigation.

## LABORATORY TESTING PROGRAM

In addition to the field investigation, a laboratory-testing program was conducted to determine additional pertinent engineering characteristics of the subgrade materials necessary in developing the pavement recommendations for the roadways.

The laboratory-testing program included supplementary visual classification (ASTM D2487) on all samples. In addition, selected samples were subjected water content tests (ASTM D2216), Atterberg limits tests (ASTM D4318), percent material finer than the #200 sieve tests (ASTM D1140), moisture density relationship tests (ASTM D698), California Bearing Ratio (CBR) tests (ASTM D1883), pH tests (ASTM D4972), lime series (TEX Method 121E), and sulfate content determination (TEX Method 145E). Estimated soil strengths were obtained in the field using a hand penetrometer.

All phases of the laboratory-testing program were conducted in general accordance with applicable ASTM or TxDOT Specifications. The results of these tests are to be found in this report or on the accompanying boring logs provided in the Appendix.

# SUBSURFACE CONDITIONS

#### <u>General</u>

The types of subsurface materials encountered in the test borings have been visually classified and are described in detail on the boring logs. The results of the standard penetration tests, strength tests, water level observations, and laboratory tests are presented on the boring logs in numerical form.

Representative samples of the soils were placed in polyethylene bags and are now stored in the laboratory for further analysis, if desired. Unless notified to the contrary, all samples will be disposed of 3 months after issuance of this report.

The stratification of the soil and rock, as shown on the boring logs, represents the soil and rock conditions at the actual boring locations. Variations may occur between, or beyond, the boring locations. Lines of demarcation represent the approximate boundary between different soil and rock types, but the transition may be gradual, or not clearly defined. It should be noted that, whereby the test borings were drilled and sampled by experienced technicians, it is sometimes difficult to record changes in stratification within narrow limits. In the absence of foreign substances, it is also difficult to distinguish between discolored soils and clean soil fill.

#### Seismic Site Class

The field investigation did not include a 100-foot deep boring, therefore, the soil properties are not known in sufficient detail to determine the Site Class per ASCE 7 Chapter 20. This section states that where site-specific data are not available to a depth of 100-feet, appropriate soil and rock properties are permitted to be estimated by the registered design professional preparing the soil investigation report based on known geologic conditions. This site has firm to hard clay soils and very hard weathered limestone and competent limestone materials extending to the 10-foot depth. Table 20.3-1 Site Class Definitions of ASCE 7 Chapter 20, indicates that Site Class D materials should have soil undrained shear strengths between 1,000 and 2,000 psf and standard penetration resistances between 15 and 50 blows per foot. The on-site soils extending to the 10-foot depth have strengths similar to Site Class D materials; therefore, RETL recommends that Site Class D, "stiff soil profile" be assumed.

#### **Generalized Soil and Rock Conditions**

The subsurface conditions at the project site generally consist of fat clays (CH), fat clays with gravel, clayey sands, weathered limestone, and competent limestone rock which extend to the boring termination depths of 10-feet. The fat clay soils are high to very high in plasticity with tested plasticity indices (PI) ranging from 38 to 53 and the clayey sand and weathered limestone materials are low to moderate in plasticity with tested plasticity indices (PI) of 10 to 22. Standard Penetration values (N) of the fat clays ranged from 6 to 32 blows per foot and hand penetrometer readings that ranged from 2.0 to greater than 4.5 tsf indicating the fat clay soils are firm to hard in consistency. Standard Penetration values (N) of the clayey sands ranged from 25 to 63 blows per foot indicating the clayey sand soils are very stiff to hard in consistency. Standard Penetration Values (N) of the weathered limestone and limestone rock ranged from 72 blows for 11-inches of penetration to 50 blows for refusal. It is important to note that possible lean clay fill materials were encountered in the upper 4-feet of boring B-10.

#### Sulfate Test Results

The sulfate test results on representative subgrade samples are provided in the following table:

UPPER CLAY SUBGRADE SULFATE TEST RESULTS			
Boring No. Sulfate (ppm)			
B-4 (Bulk)	160		
B-7 (Bulk)	Negligible		
B-9 (Bulk)	40		

The TxDOT Technical Memorandum for treatment of soils containing sulfates with lime indicates the following risk levels:

SULFATE RISK LEVELS		
Sulfate (ppm) Risk		
<3,000	Low	
3,000-5,000	Moderate	
5,000-8,000	Moderate to High	
>8,000	High and Unacceptable	

The sulfate concentrations indicate the subgrade soils at the site are in a low risk level of using lime as a treatment method.

## Lime Series and pH Test Results

The lime series and pH test results on the bulk subgrade samples are provided in the following tables:

BORING B-4 BULK SUBGRADE SAMPLE LIME SERIES AND pH TEST RESULTS		
% Lime	LL / PI	рН
0	69 / 43	7.8
2	42 / 12	11.8
4	41 / 8	12.3
6	41 / 8	12.4
8	41 / 8	12.4
10	41 / 8	12.5

BORING B-7 BULK SUBGRADE SAMPLE LIME SERIES AND pH TEST RESULTS		
% Lime	LL / PI	рН
0	63 / 38	7.8
2	44 / 14	12.3
4	42 / 9	12.4
6	42 / 9	12.4
8	42 / 8	12.4
10	41 / 7	12.4

BORING B-9 BULK SUBGRADE SAMPLE LIME SERIES AND pH TEST RESULTS		
% Lime	LL / PI	рН
0	70 / 45	7.8
2	50 / 17	12.3
4	50 / 13	12.4
6	49 / 11	12.5
8	50 / 11	12.5
10	49 / 11	12.5

Where: LL = Liquid Limit (%) PI = Plasticity Index

# The results indicate the subgrade soils should be treated with 6-percent lime to consistently reduce the plasticity index (PI) and pH to acceptable levels.

# Groundwater Observations

Groundwater was not encountered in the borings during the drilling operations and the borings were dry upon completion of the drilling. It should be noted that water levels in open boreholes may require anywhere from several hours to several days to stabilize depending on the permeability of the soils and that groundwater levels at this site may be subject to seasonal conditions, recent rainfall, drought, or temperature effects.

# PAVEMENT RECOMMENDATIONS

It is understood that new subdivision roadways with a total approximate length of 8,000 LF and an emergency access road with an approximate length of 1,300 LF utilizing flexible pavements will be constructed for Heritage Oaks Subdivision. In designing the proposed pavements, the existing subgrade conditions must be considered together with the expected traffic use and loading conditions.

The conditions that influence pavement design can be summarized as follows:

- 1. Bearing values of the subgrade. These values can be represented by a California Bearing Ratio (CBR) for the design of flexible asphalt pavements.
- 2. Vehicular traffic, in terms of the number and frequency of vehicles and their range of axle loads.
- 3. Probable increase in vehicular use over the life of the pavement.

4. The availability of suitable materials to be used in the construction of the pavement and their relative costs.

Specific laboratory testing to define the subgrade strength (i.e. CBR/K values) has been performed for this analysis. Based upon the CBR test results, the plasticity indices, and strengths of the clay subgrade soils, a CBR value 2.0 has been selected for the clays. However, in some areas it is anticipated that the subgrade will consist of weathered or competent limestone rock with a minimum estimated CBR of 8.0. The rock subgrade design section should only be used when all of the overburden clay

has been removed and the intact weathered limestone or competent limestone is exposed. Clean, on-site milled limestone screenings may be utilized as embankment fill in the rock subgrade areas and utilize the rock subgrade design pavement section. It is anticipated that the actual subgrade type may vary within a roadway alignment. In streets where both clay and rock subgrade is present, the pavement section should transition linearly from the edge of the rock subgrade over a minimum distance of 100feet to the clay subgrade pavement section. Additionally, the pavement sections should have a minimum length of 500-feet between transition zones.

We have evaluated the proposed new subdivision roadways using the City of Schertz Design Specifications: Section 3 – Street Requirements. The residential area will be classified as "Local Type Street/Fire Lane" streets and the Wiederstein Road extension will be classified as a "Collector" street. The required AASHTO 18-kip ESAL for a "Local Type Street/Fire Lane" street is 100,000 and for a "Collector" street is 1,000,000 in accordance with the City of Schertz Design Specifications.

AASHTO PAVEMENT DESIGN PARAMETER	DESIGN VALUE
Local Street Reliability (R)	70%
Collector Street Reliability (R)	90%
Overall Deviation	0.45
Initial Serviceability	4.2
Local Street Terminal Serviceability	2.0
Collector Street Terminal Serviceability	2.5
Subgrade Design CBR	2.0 (clay) or 8.0 (rock)
Design Life	20 years

RETL used the following pavement design parameters for the flexible pavement design:

The following lime treated subgrade, limestone base, and hot mix asphaltic concrete layer coefficients were selected for the pavement design:

Pavement Constituent	Layer Coefficient (α)
Lime Stabilized Subgrade	0.08
New Crushed Limestone Base (TxDOT Item 247 Type A, Grade 1-2)	0.14
Type D HMAC	0.44

The recommended hot mixed asphaltic concrete (HMAC) pavement sections are provided in the following tables:

LOCAL TYPE STREET/FIRE LANE (CLAY SUBGRADE) MINIMUM 18-kip ESAL VALUE = 100,000 AASHTO MINIMUM STRUCTURAL NUMBER = 2.5		
Pavement Constituent	Option 1	Option 2
HMAC Type C or D	3"	3"
HMAC Type B		
Crushed Limestone Base	6"	8"
Lime Stabilized Subgrade		6"
Moisture Conditioned Subgrade	6"	
TENSAR Geogrid	TX-5	
AASHTO Structural No.	2.95	2.92
Calculated 18-kip ESAL	132,600	121,800

LOCAL TYPE A STREET/FIRE LANE (ROCK SUBGRADE) MINIMUM 18-kip ESAL VALUE = 100,000 AASHTO MINIMUM STRUCTURAL NUMBER = 2.5			
Pavement Constituent Option 3*			
HMAC Type C or D	3"		
Crushed Limestone Base	9"		
TENSAR Geogrid			
Rock Subgrade	Yes		
AASHTO Structural No.	2.58		
Calculated 18-kip ESAL 493,300			

The pavement section thicknesses for Option 3 are governed by the City of Schertz criteria that the HMAC surface course have a minimum thickness of 3-inches and that the pavement section have a minimum AASHTO Structural Number of 2.5

COLLECTOR (CLAY SUBGRADE) MINIMUM 18-kip ESAL VALUE = 1,000,000 AASHTO MINIMUM STRUCTURAL NUMBER = 2.9		
Pavement Constituent	Option 4	Option 5
HMAC Type C or D	3"	3"
HMAC Type B	4"	4"
Crushed Limestone Base	8"	10"
Lime Stabilized Subgrade		8"
Moisture Conditioned Subgrade	6"	
TENSAR Geogrid	TX-5	
AASHTO Structural No.	4.81	4.88
Calculated 18-kip ESAL	1,067,800	1,169,600

COLLECTOR (ROCK SUBGRADE) MINIMUM 18-kip ESAL VALUE = 1,000,000 AASHTO MINIMUM STRUCTURAL NUMBER = 2.9		
Pavement Constituent	Option 6	Option 7
HMAC Type C or D	3"	3"
HMAC Type B	6"	
Crushed Limestone Base		15"
Rock Subgrade	Yes	Yes
AASHTO Structural No.	3.60	3.42
Calculated 18-kip ESAL	1,470,000	1,074,000

# Subgrade and Embankment

After all surface organics and deleterious materials have been removed and the desired subgrade elevation has been achieved, the upper 6-inches of exposed subgrade soils should be compacted to a minimum density of 95-percent of the maximum dry unit weight of the subgrade soils as determined by TEX 114E and at or above the optimum moisture content. Any embankment fill required to achieve the final subgrade elevation shall be placed in maximum 8-inch loose lifts and compacted as specified above. Subgrade consisting of consisting of intact weathered limestone or limestone rock will not require scarification or compaction testing.

#### Lime Stabilized Subgrade

Lime placement and mixing operations should be performed in accordance with TXDOT ITEM 260 *"LIME TREATMENT (ROAD MIXED)."* Lime stabilization of the clay subgrade soils is recommended to reduce the effect of soil heave on the pavements. Lime shall be properly mixed at a minimum rate of 6-percent of the maximum dry unit weight of the raw subgrade soils as determined by the standard Proctor (TEX 114-E). This percentage equates to approximately 27 pounds per square yard per 6-inch treatment depth and approximately 36 pounds per square yard per 8-inch treatment depth.

After proper curing time, usually 48 to 72 hours, the lime stabilized soils should be remixed and compacted to a minimum density of 95-percent of the maximum dry unit weight of the lime stabilized subgrade soils as determined by a standard Proctor test (TEX 114-E) and at, or above, the optimum moisture content.

### <u>Geogrid</u>

Geogrid should be Tensar TX-5 and should be overlapped in accordance with the manufacturer's recommendations. Geogrid will significantly improve the long-term performance of the pavements and reduce cracking.

#### Limestone Base

Base materials should meet the requirements set forth in the Texas Department of Transportation (TxDOT) 2014 Standard Specifications for Construction of Highways, Streets and Bridges; Item 247, Type A, Grade 1-2. The base material should be placed in maximum 8-inch thick loose lifts and compacted to a minimum density of 95-percent of the maximum dry density as determined by TEX 113E. The moisture content of the base materials should be maintained within 2-percentage points of the optimum moisture content.

#### Hot Mix Asphalt

Asphalt concrete should meet the requirements set forth in TxDOT Item 340 or 341, Type B, C, or D. The Type C and D asphaltic concrete should be compacted to 91.5 to 96.3-percent of the maximum theoretical specific gravity of the mixture determined according to test method TEX 227-F. Pavement cores should be tested for density according to test method TEX 207-F.

#### <u>Drainage</u>

Proper drainage is very important to achieve the desired performance from flexible asphaltic concrete pavements. RETL has assumed that good drainage will be incorporated into the project and the pavements will be fast draining and puddle free. Low or flat areas in asphalt pavements allow standing water and quick deterioration of the pavement primarily due to saturation of the underlying pavement materials and subgrade soils.

It should be noted that groundwater and/or saturated soils with free water may be encountered during construction. These areas will have to be remediated on a case by case basis with the installation of drain systems and piping to collect and remove the water from the pavement areas. A minimum of 1-percent slope in the pavement surface is recommended. Additionally, RETL recommends that full depths curbs (extending through all base materials and into the subgrade soils) be constructed along the exterior alignment of the pavement.

#### **GENERAL COMMENTS**

If significant changes are made in the character or location of the proposed project, a consultation should be arranged to review any changes with respect to the prevailing soil conditions. At that time, it may be necessary to submit supplementary recommendations.

It is recommended that the services of RETL be engaged to test and evaluate the subgrade soils in the pavement areas prior to placing pavement constituents in order to verify that the bearing soils are consistent with those encountered in the borings. RETL cannot accept any responsibility for any conditions that deviate from those described in this report, nor for the performance of the pavements if not engaged to also provide construction observation and testing for this project. If it is required for RETL to accept any liability, then RETL must agree with the plans and perform such observation during construction as we recommend.

All sheeting, shoring and bracing of trenches, pits and excavations should be made the responsibility of the contractor and should comply with all current and applicable local, state and federal safety codes, regulations and practices, including the Occupational Safety and Health Administration.

# APPENDIX

# **BORING LOCATION PLAN**

NO SCALE BORING LOCATIONS ARE APPROXIMATE



November 9, 2021 Urban Civil, LLC RETL Project No.: G221509 HERITAGE OAKS SUBDIVISION ROADWAYS Schertz, Texas



ROCK ENGINEERING AND TESTING LABORATORY, INC. 10856 VANDALE STREET SAN ANTONIO, TEXAS 78216 (210) 495-8000

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SOIL SYMBOL	DЕРТН (FT)	SAMPLE NUMBER	SAMPLES	NS/SNO	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DE	COMPRESSIV STRENGTH (TONS/SQ FT)	MINUS NO. 200	SURFACE ELEVATION: N/A
sol	DEF	SAI	SAN	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ FT	MO	LL	PL	PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MIN	DESCRIPTION OF STRATUM
			M									
		SPT S-1	X	N= 6	31	68	23	45			91	FAT CLAY, dark brown, moist, firm. (CH)
	- 1		M									
			H									
	- 2	1										
	- 3	SPT S-2	W	N= 12	27							Some co chove stiff
		S-2	Μ	N= 12	21							Same as above, stiff.
	- 4	-										
	- 5	SH S-3		P= 4.0	30	78	25	53			95	Same as above, very stiff. (CH)
		0-0										
	- 6	4										
	- 7	SH		P= 3.0	33							FAT CLAY, dark brown, moist, very stiff.
		S-4		. 0.0								<b>PATCEAI</b> , dark blown, moist, very sun.
	- 8 -											
	0											
		SH		-								
	- 9	SH S-5		P= 3.0	28							Same as above.
	- 10 -	1										Boring termianted at a depth of 10-feet.
51												
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					(%				-		(%	
SOIL SYMBOL	(FT)	SAMPLE NUMBER	S	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Q:: TONS/SQ FT	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Groundwater was not encountered during the drilling operations and the boring was dry upon the completion of the drilling operations.
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soll	DEF	SAN	SAN/	Z Z Z Z Z	MOI	LL	PL	PI	POL	STR (TOI	MIM	DESCRIPTION OF STRATUM
	- 1 -	SPT S-1	M	N= 50/5"	9						18	WEATHERED LIMESTONE light brown, dry, very hard.
	- 2 -	SPT S-2		N= 50/1"	8							LIMESTONE, light brown, dry, very hard.
	N= 50/0" 8											Same as above.
	- 7 -	SPT S-4	$\mathbb{N}$	N= 50/0"	9							Same as above.
	- 9 -	SPT S-5		N= 50/0"								LIMESTONE, light brown, dry, very hard.
				RD PENET CONE PE								Boring termianted at a depth of 10-feet.         REMARKS:         Boring location determined by RETL. Drilling operations performed by RETL.         GPS Coordinates: N 29 58258° W -98 28798°
				CONE PE PENETRO						DEX	GPS Coordinates: N 29.58258°, W -98.28798°	

Client: Urban Coki, LLC         Rock Engineering & Teeling Luboratory, Inc.         Client: Urban Coki, LLC         Rock Engineering & Teeling Luboratory, Inc.         Send Engineering & Teeling Luboratory, Inc.         Send Engineering & Teeling Luboratory, Inc.         Send Engineering & Teeling Coke, Study History, Inc.         PROJECT: Herbage Oaks Study History, Inc.         PROJECT: Herbage Oaks, Inc.         PROJECT: H										LC	)G O	FΒ	ORING 03 SHEET 1 of 1
Nome         Nome         Solution         Nome         Solution         And the book income           1			NG &	>									
Sam Antrono, Trans. 782:16 Tex: 210-499-8015         IDCATION: Schertz, 12483 NUMBER: G221509         PIELD DATA       LABORATORY DATA         ORILID: 10/11/2021         ORILID: Mathematical and approximation of the dilling operations and the boring was dry upon the completion of the dilling operations and the boring was dry upon the completion of the dilling operations and the boring was dry upon the completion of the dilling operations and the boring was dry upon the completion of the dilling operations and the boring was dry upon the completion of the dilling operations and the boring was dry upon the completion of the dilling operations and the boring was dry upon the completion of the dilling operations and the boring was dry upon the completion of the dilling operations and the boring was dry upon the completion of the dilling operations and the boring was dry upon the completion of the dilling operations and the boring was dry upon the completion of the dilling operations.         SURFACE ELEVATION: N/A DESCRIPTION OF STRATUM         OLAY dark brown.         WEAD OF 10 OF STRATUM         CLAY dark brown.         SURFACE ELEVATION: N/A DESCRIPTION OF STRATUM         OLAY dark brown.         SURFACE ELEVATION: MATHEMA brown.         SURFACE ELEVATION: N/A DESCRIPTION OF STRATUM         CLAY dark brown.         SURFACE ELEVATION: N/A Sector of the dilling operations.         SURFACE EL		GINEER		E.S.					esting	Laborat	ory, Inc.		PROJECT: Heritage Oaks Subdivision Roadways
Fax: 210-495-8015         TOTAL 1: OLD TO DATA         LABORATORY DATA         DATE(S) DRILLED: 10/11/2021           FIELD DATA         LABORATORY DATA         Salid Flight Augur/Ar Rolary           1 <t< td=""><td></td><td><b>X</b>:7</td><td>III</td><td></td><td>🖌 🏷 Sar</td><td>n Anto</td><td>nio, Te</td><td>xas 78</td><td>216</td><td></td><td></td><td></td><td>LOCATION: Schertz, Texas</td></t<>		<b>X</b> :7	III		🖌 🏷 Sar	n Anto	nio, Te	xas 78	216				LOCATION: Schertz, Texas
View         DATE(S) DRILLED: 10/11/2021           FIELD DATA         LABORATORY DATA           ATTERREGIO         DITULING METHOD(S): Said Flight Auger/Air Rotary           Said Flight Auger/Air Rotary           Suid Flight Auger/Air Rotary		4BORAS		ъP	RATE Tel Fax	ephon c 210	e: 210 -495-8	-495-8 015	80000				NUMBER: G221509
FIELD DATA       LABORATORY DATA         000000000000000000000000000000000000		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	er m	<u>)</u>				0.0					DATE(S) DRILLED: 10/11/2021
OBSULT     ATTERBERG     ATTERBERG     Solid Flight Auger/Air Rotary       1		FIE		)AT	A		LABO	ORAT	OR	/ DAT	A		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $													Solid Flight Auger/Air Rotary
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $			BER		⊢ ⊢	TNC	LÉ	TIMI	⊻ ∠		ш		dry upon the completion of the drilling operations.
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		- 1	S-1	M	N= 5-50/5"	22	31	24	13			43	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				Ц									
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		5	SPT	X	N= 50/1"	7							LIMESTONE, light brown, dry, very hard.
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$ \begin{array}{c} 3 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 8 \\ 8 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 8 \\ 8 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 8 \\ 8 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 8 \\ 8 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 8 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 8 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 8 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 10 \\ 10 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 10 \\ 10 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 10 \\ 10 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 10 \\ 10 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 10 \\ 10 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \end{array} \begin{array}{c} 3 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ $		- 5	SPT	W	N= 50/0"	6							Same as above
$\begin{bmatrix} 7 & 3 \\ 8 & 4 \\ - & 8 \\ - & 8 \\ - & 9 \\ - & 5 \\ - $			5-3	$\mathbb{N}$									
Same as above. $Same as above.$		- 6	-	Н									
Same as above. $Same as above.$				H									
Same as above. Same as above. Same as above. N= 50/0" 4 N= 50/0" 4 LIMESTONE, light brown, dry, very hard. Boring termianted at a depth of 10-feet.		- 7	SPT	M									
9     SPT S-5     N= 50/0"     4       10     10   Boring termianted at a depth of 10-feet.				M	N= 50/0"	4							Same as above.
Image: Second		- 8 -	_	$\square$									
Image: Second				Ц									
Image: Second		- 0		М									
Boring termianted at a depth of 10-reet.		9	SPT	X	N= 50/0"	4							LIMESTONE, light brown, dry, very hard.
Boring termianted at a depth of 10-reet.		10		$\mathbb{N}$									
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX P - POCKET PENETROMETER RESISTANCE		- 10 ·	1										Boring termianted at a depth of 10-feet.
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX P - POCKET PENETROMETER RESISTANCE       REMARKS: Boring location determined by RETL. Drilling operations performed by RETL. GPS Coordinates: N 29.58424°, W -98.28947°	21												
Monopoly       N - STANDARD PENETRATION TEST RESISTANCE         Qc - STATIC CONE PENETROMETER TEST INDEX         P - POCKET PENETROMETER RESISTANCE	11/9/												
N - STANDARD PENETRATION TEST RESISTANCE         Qc - STATIC CONE PENETROMETER TEST INDEX         P - POCKET PENETROMETER RESISTANCE	GDT												
N - STANDARD PENETRATION TEST RESISTANCE         Qc - STATIC CONE PENETROMETER TEST INDEX         P - POCKET PENETROMETER RESISTANCE	ЦЦ.												
N - STANDARD PENETRATION TEST RESISTANCE       REMARKS:         Qc - STATIC CONE PENETROMETER TEST INDEX       Boring location determined by RETL. Drilling operations performed by RETL.         P - POCKET PENETROMETER RESISTANCE       PS Coordinates: N 29.58424°, W -98.28947°	OCK												
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX P - POCKET PENETROMETER RESISTANCE Results and the second determined by RETL. Drilling operations performed by RETL. GPS Coordinates: N 29.58424°, W -98.28947°	PJ R												
ON - STANDARD PENETRATION TEST RESISTANCE       REMARKS:         Qc - STATIC CONE PENETROMETER TEST INDEX       Boring location determined by RETL. Drilling operations performed by RETL.         P - POCKET PENETROMETER RESISTANCE       REMARKS:	GS.G												
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	OF	Qc - S	ТАТ	IC	CONE PE	NET	ROM	ETEF	R TE	ST IN			
	LOG	г - PC		-						NCE			

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		NG &	>									CLIENT: Urban Civil, LLC	
	GINEER		ES			ineerin Indale :		esting I	Laborat	ory, Inc.		PROJECT: Heritage Oaks Subdivision Roadways	
	₹:{	111		🔇 🌒 Sar	n Antoi	nio, Te	xas 78	216				LOCATION: Schertz, Texas	
	ABORAT		AP	ORATE Tele	ephone	e: 210 -495-8	-495-8 015	80000				NUMBER: G221509	
	No.	PA IN	/		1							DATE(S) DRILLED: 10/19/2021	
	FIE	LD D	AT	A		LABO	DRAT	OR	/ DAT	A		DRILLING METHOD(S):	
							TERB					Air Rotary	
					(%)				-		(%)	GROUNDWATER INFORMATION:	
		~			ENT		L				SIEVE (%)	Groundwater was not encountered during the drilling operations and the boring	j was
		ABEI			LNO:	μμ	LIMI	Τ	<u>ک</u> ۲	E C	200 SI	dry upon the completion of the drilling operations.	
МВО	FT)	NN	s	SQ FI SQ FI SQ FI	RE O		STIC	TICI	VSIT VCU.	ESSI TH Q FT			
- SYI	DЕРТН (FT)	SAMPLE NUMBER	SAMPLES	S/SNC	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DEN NDS	COMPRESSIV STRENGTH (TONS/SQ FT)	MINUS NO.	SURFACE ELEVATION: N/A	
SOIL SYMBOL	DEP	SAN	SAN	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ FT	MOI		PL	PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MIN	DESCRIPTION OF STRATUM	
			Ì										
	- 1 -	SH S-1		P= 2.0	27	67	25	42			SANDY FAT CLAY, dark brown, moist, stiff. (CH)		
	- 2 -	1											
	- 3 -	SH S-2		P= 2.0	30							Same as above, dark brown to brown.	
	- 4 -	-							+				
	- 5 -	SH S-3		P= 4.5	23							GRAVELLY FAT CLAY, brown, moist, very stiff.	
		3-3										,,,,,,	
	- 6 -												
	Ū												
	- 7 -		М										
	,	SPT S-4	X	N= 18	20	58	20	38			69	Same as above, brown to light brown. (CH)	
			$\mathbb{N}$										
	- 8 -	1	Π										
			$\square$										
	- 9 -	SPT S-5	IV.	N= 50/5"	3						20	WEATHERED LIMESTONE light brown, dry, very hard. (14%	
		5-5	$\wedge$									gravel)	
	- 10 -	1	H									Boring termianted at a depth of 10-feet.	
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11/3/2													
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	N - ST	AND	)AF	RD PENET	RAT	ION .	TEST	r RES	SISTA	NCE		REMARKS:	
				CONE PE						DEX		Boring location determined by RETL. Drilling operations performed by RETL. GPS Coordinates: N 29.58482°, W -98.29204°	
	r - PC	JUKE	- 1	PENETRO	ו ⊐ועוע	EKF		SIAN	ICE				

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	VEER	NG &	TE	Roc	k Eng	ineerin	g & Te	esting l	_aborate	ory, Inc.		CLIENT: Urban Civil, LLC PROJECT: Heritage Oaks Subdivision Roadways	
	Meiler		T	108 Sar	56 Va Antor	ndale \$ nio, Te	Street xas 78	216				LOCATION: Schertz, Texas	
	ABORAT.		OBE	ORATE Tele	ephone : 210-	e: 210 495-8	-495-8 015	0000				NUMBER: G221509	
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		<i>"</i>									DATE(S) DRILLED: 10/19/2021	
	FIEI	LD D	A1	A					DAT.	A		DRILLING METHOD(S): Air Rotary	
					(9		TERBE				(		
					MOISTURE CONTENT (%)						SIEVE (%)	GROUNDWATER INFORMATION: Groundwater was not encountered during the drilling operations and the boring was	
		BER			NTE	⊨	MIT	∠ IND	<sub>⊢</sub>		) SIE	dry upon the completion of the drilling operations.	
1BOL	Æ	NUM	~	AFT AFT SAFT SAFT	KE CO		псг	TICIT	SITY CU.F	SSIV TH 2 FT)	MINUS NO. 200		
SOIL SYMBOL	DЕРТН (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	STUF	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	SURFACE ELEVATION: N/A		
SOI	DEP	SAN	SAN	N: BI P: 10 D: 12 O: 1 O: 1	IOW	LL	PL	PI	DRY POL	CON STR (TOI	DESCRIPTION OF STRATUM		
			M										
	- 1 -	SPT S-1	Ň	N= 7	35	69	26	43			FAT CLAY, dark brown, moist, firm. (CH)		
			$\square$										
	- 2 -	-											
	- 3 -	SPT	M	N= 19	29								
		S-2	$\mathbb{N}$	IN- 19	29							Same as above, with gravel, brown, very stiff.	
	- 4 -		H										
			$\square$										
	- 5 -	SPT S-3	¥	 N= 32	9	60	20	40			51	GRAVELLY FAT CLAY, with calcareous material, brown, moist,	
			$\mathbb{N}$									hard. (CH)	
	- 6 -												
	- 7 -		M										
	-	SPT S-4	Ň	N= 22-50/5"	4						31	WEATHERED LIMESTONE light brown, dry, very hard. (38%	
	- 8 -	-	Ц									gravel)	
	- 9 -	SPT	M	N- 20 50/4"	2								
		SPT S-5	$\wedge$	N= 38-50/1"	3							Same as above.	
	- 10 -	-	H									Boring termianted at a depth of 10-feet.	
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1011													
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												DEMADIZO:	
				RD PENET								REMARKS: Boring location determined by RETL. Drilling operations performed by RETL.	
				PENETRC								GPS Coordinates: N 29.58616°, W -98.29181°	
í													

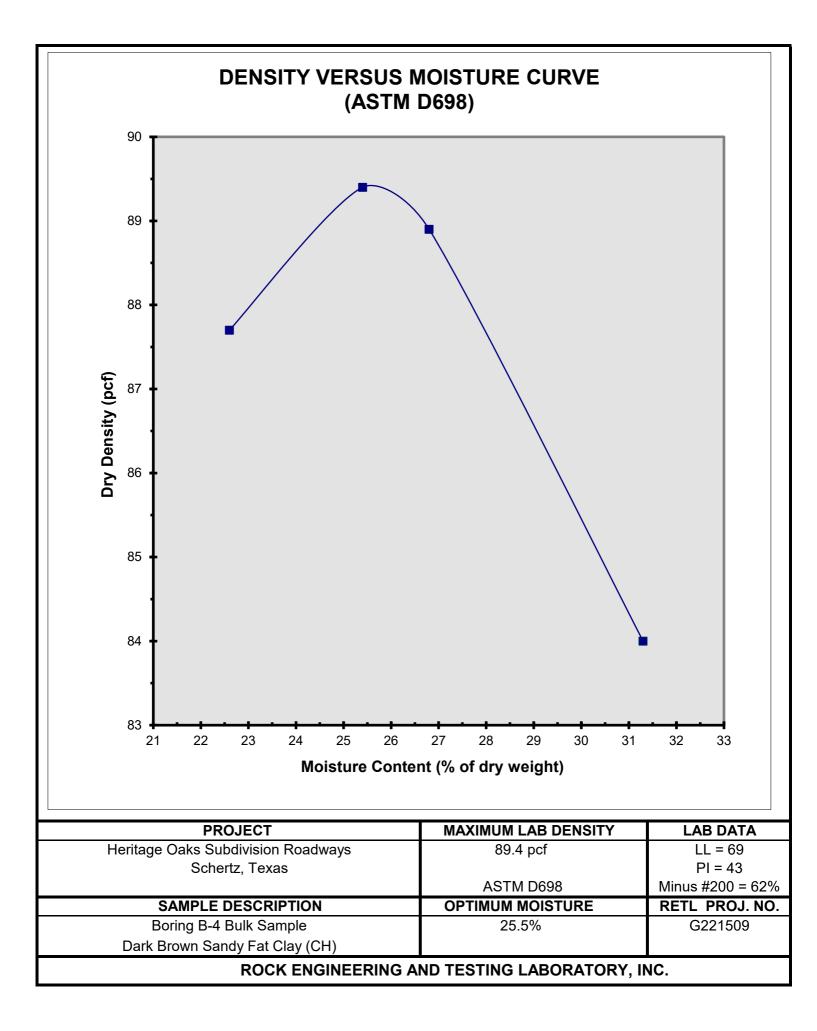
CLENT: Urban CML LCP         CLENT: Urban CML LCP         CLENT: Urban CML LCP         PROJECT: Herbage Oaks Subdivision Roadways         CLENT: Urban CML LCP         PROJECT: Herbage Oaks Subdivision Roadways         DATE         THE DATA         LABORTORY DATA         PROJECT: Herbage Oaks Subdivision Roadways         DATE (S) PRILIDE: 10/19/2021         DATE (S) PRILIDE: 10/19/2021         DRUE (S): Herbage Oaks Subdivision Roadways         Mansatter: and the boing oats of the ording operators.         UBL DATA         LABORTORY DATA         Mansatter: and the boing oats of the ording operators.         UBL DATA         ATTEMENTION         UBL DATA       LABORTORY DATA         Mansatter: and the boing oats of the ording operators.         UBL DATA       LABORTORY DATA         Mansatter: and the ording operators.         UBL DATA       Attempt to the ording operators.         UBL DATA       Attempt to the ording operators.         UBL DATA <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>LC</th><th>)G OI</th><th>FΒ</th><th>ORING 06 SHEET 1 of 1</th></t<>										LC	)G OI	FΒ	ORING 06 SHEET 1 of 1
Nome         Number         Class         Number         Number <th< td=""><td></td><td></td><td>NG P</td><td>&gt;</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CLIENT: Urban Civil, LLC</td></th<>			NG P	>									CLIENT: Urban Civil, LLC
Sam Antenion, Taxas 78216 Text: 210-496-8000 Fax: 210-496-8010         Construction         Construction         Construction           PIELD DATA         LABORATORY DATA         Attrenserved in four sectors         DRILLID: 10/19/2021         DRILLID: 10/19/2021           PIELD DATA         LABORATORY DATA         Attrenserved in four sectors         OROUNDWATER INFORMATION: Groundwater was not encountered during the dilling operations and the boring was dry upon the completion of the dilling operations and the boring was dry upon the completion of the dilling operations.           000000 1000000000000000000000000000000		GINEER		E.S.					esting	Laborat	ory, Inc.		PROJECT: Heritage Oaks Subdivision Roadways
Fax: 210-495-8015         TOTAL CLICK         DATE (S) DRILLED: 10/19/2021           FIELD DATA         LABORATORY DATA         DATE(S) DRILLED: 10/19/2021           Field DATA         ATTERBERG LIMITS         ATTERBERG LIMITS         Control of the dilling operations and the boring was dry upon the completion of the dilling operations.           United Difference         State Stat		<b>X</b> R	1TI		Sar	n Antor	nio. Te	xas 78	216				LOCATION: Schertz, Texas
View         DATE(S) DRILLED: 10/19/2021           FIELD DATA         LABORATORY DATA         DIRULING METHOD(S): Ar Folary           View         State         AtterRefere         State		4BORAN		aP	RATE Tel Fax	ephone c: 210	e: 210 -495-8	-495-8 015	80000				NUMBER: G221509
FIELD DATA       LABORATORY DATA         000000000000000000000000000000000000		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		0				0.0					DATE(S) DRILLED: 10/19/2021
Air Rotary     Air Rotary       Air Rotary       Air Rotary       Air Rotary       Air Rotary       GROUNDWATER INFORMATION: Groundwater was not encounted during operations and the boring was dry upon the completion of the dilling operations.       I bit of the dilling operations and the boring was dry upon the completion of the dilling operations.       I bit of the dilling operations.		FIE		)AT	A		LABO	ORAT	OR	/ DAT	A		
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$						LN I			DEX			Ш Л	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			BER		⊢ ⊢	INC	Ħ	TIMI	⊻ ∠		щ	0 SII	dry upon the completion of the drilling operations.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	BOL	F	NUN		SOFT SOFT	О Ш				SITY CU.F	SSIV TH 2 FT)	0.20	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	SYN	Н Н	LE L		S/SNC	TUF	gull	LAS	LAS'	NDS/	PRE NG1 S/SC	N N	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	SOIL	DEP1	SAM	SAMI		NOIS				NR V	STRE TON	NIN	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			0,	$\mathbf{h}$	ZEFO	-						~	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			SPT	₩		40	0.4	0.1	40			04	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		- 1 ·	S-1	M	N= 5-50/5"	18	34	24	10			31	WEATHERED LIMESTONE light brown, moist, very hard.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				Ц									
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		- 2 -											
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				Ц									
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		- 3 -	 	М									
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		5	SPT	X	N= 50/4"	9							Same as above, dry.
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10     Image: Second seco		- 8 -		Ц									
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Boring termianted at a depth of 10-reet.		0	SPT	X	N= 50/1"	10							Same as above.
Boring termianted at a depth of 10-reet.		10		$\mathbb{N}$									
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX P - POCKET PENETROMETER RESISTANCE		- 10 -		Π									Boring termianted at a depth of 10-feet.
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX P - POCKET PENETROMETER RESISTANCE       REMARKS: Boring location determined by RETL. Drilling operations performed by RETL. GPS Coordinates: N 29.58689°, W -98.29014°	/21												
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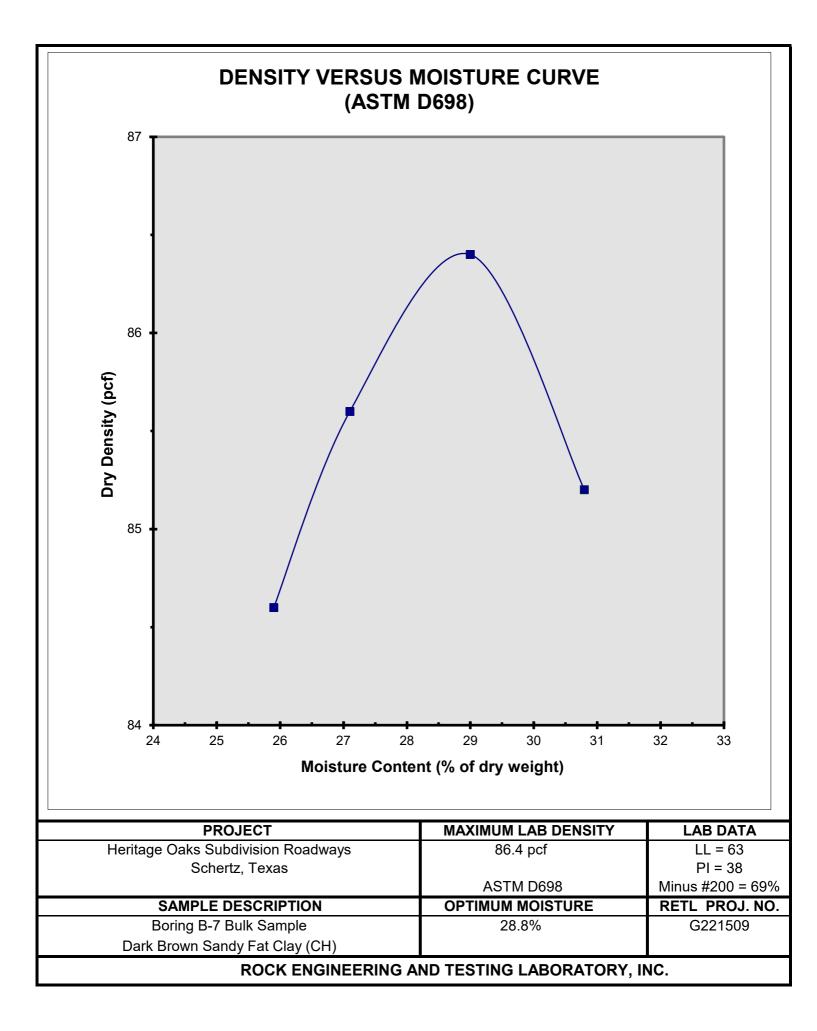
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		NG &	>									CLIENT: Urban Civil, LLC			
	CINEER		E.S.	Roo	ck Eng	ineerin ndale :	ig & Te	esting I	Laborate	ory, Inc.		PROJECT: Heritage Oaks Subdivision Roadways			
	₹:T	1T)		🕻 🌨 📏 Sar	n Antor	nio, Te	xas 78	216				LOCATION: Schertz, Texas			
	4BORA		22	ORATE Tel Fax	ephone : 210-	e: 210 -495-8	-495-8 015	0000				NUMBER: G221509			
	~	87 IN	<u>_</u>				0.0					DATE(S) DRILLED: 10/11/2021			
	FIF		ΤΑ	-Α		I ABC	RAT	OR)	DAT.	Α		DRILLING METHOD(S):			
							TERBE					Air Rotary			
					(%			S	-		(%				
SOL	0	SAMPLE NUMBER			MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	200 SIEVE (%)	GROUNDWATER INFORMATION: Groundwater was not encountered during the drilling operations and the boring was dry upon the completion of the drilling operations.			
SOIL SYMBOL	DЕРТН (FT)	и И И И И И	LES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ FT	URE		ASTI	ASTI	ENS DS/C	COMPRESSIV STRENGTH (TONS/SQ FT)	MINUS NO.				
OIL S	ΕΡΤ	AMP	SAMPLES	TON TON	ISIO					DMP IREN ONS	SUNI	SURFACE ELEVATION: N/A			
ы С	Ö	ŝ	\% \	/ ≍ŭ≓ŏ	Σ	LL	PL	PI	Ξŭ	ыч	Σ	DESCRIPTION OF STRATUM			
	- 1 -	SPT S-1	X	N= 5	34	68	25	43			89	FAT CLAY, dark brown, moist, frim. (CH)			
			$\parallel$												
	- 3		М												
	Ū	SPT S-2	Ň	N= 50/3"	13						28	LIMESTONE, light brown, moist, very hard.			
	4		$\mathbb{N}$												
			$\square$												
	- 5	SPT S-3	Ŋ	N= 50/0"	5							LIMESTONE, light brown, dry, very hard.			
		3-3	Μ												
	- 6	-	Н												
			Н												
	- 7	SPT	M												
		S-4	Ŵ	N= 50/1"	6							Same as above.			
	- 8	4	$\square$												
	- 9 -		М												
	9	SPT S-5	X	N= 50/1"	9							Same as above.			
			$\mathbb{N}$												
	- 10	1										Boring termianted at a depth of 10-feet.			
5															
11/9/:															
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OF BORING G221509 LOGS.GPJ ROCK ETL.GDT 11/8/21															
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g 62															
		-^		סר הרגורי	-0 ^ -			- הרי				REMARKS:			
н В				RD PENET CONE PE								Boring location determined by RETL. Drilling operations performed by RETL. GPS Coordinates: N 29.58642°, W -98.28866°			
				PENETRO								Ci C Coordinatos, 14 20.00072 , 44 -30.20000			
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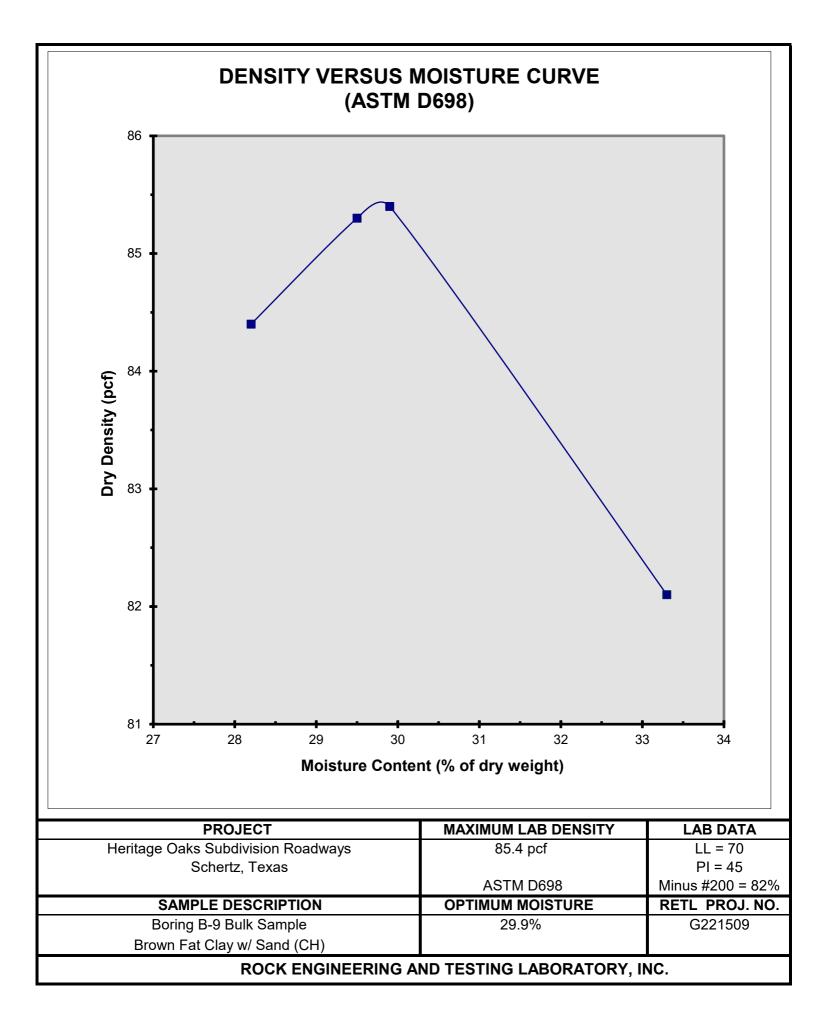
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	EER	NG &	T.E.	Ro	ck Ena	ineerin	iq & Te	estina I	_aborat	ory, Inc.		CLIENT: Urban Civil, LLC PROJECT: Heritage Oaks Subdivision Roadways	
	Memle			108	356 Va	ndale		-	Laborat	ory, mo.		LOCATION: Schertz, Texas	
	ABORA			Tel	ephone	e: 210 -495-8	-495-8	0000				NUMBER: G221509	
	SORATO!	êr In	coh		. 210-	-400-0	010					DATE(S) DRILLED: 10/11/2021	
	FIE		)A1	ГА		LABC	DRAT	ORY	DAT	A		DRILLING METHOD(S):	
					~	AT	TERBE				_	Air Rotary	
					MOISTURE CONTENT (%)						SIEVE (%)	GROUNDWATER INFORMATION:	
		ËR			NTEN	<b>-</b>	ШŢ	PLASTICITY INDEX			SIEV	Groundwater was not encountered during the drilling operations and the boring was dry upon the completion of the drilling operations.	
BOL	<u>د</u>	IUME			СО Ш		IC LIN	ICITY	SU.FT	SSIVE H FT)	. 200		
SYM	ОЕРТН (FT)	SAMPLE NUMBER	SILES	S/SNC	TUR	LIQUID LIMIT	PLASTIC LIMIT	LAST	DENS	COMPRESSIV STRENGTH (TONS/SQ FT)	MINUS NO.		
SOIL SYMBOL	DEP1	SAM	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT QC: TONS/SQ FT	MOIS		 PL	 PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINU	SURFACE ELEVATION: N/A DESCRIPTION OF STRATUM	
			M	/									
		SPT S-1	Ň	N= 40	14					CLAYEY SAND, dark brown, moist, hard.			
	+ 1 -		M										
	- 2 -												
	- 3 -		. M										
	-	SPT S-2	Ň	N= 50/4"	7					WEATHERED LIMESTONE light brown, dry, very hard.			
H	4 -	-	Ц										
			$\mathbb{H}$										
	- 5 -	SPT	· M	N= 50/0"	3								
	-	S-3	A	N- 50/0	3							LIMESTONE, light brown, dry, very hard.	
	6 -	-	Н										
H	-												
	- 7 -	SPT S-4	Y	N= 50/0"	2							Same as above.	
	-	5-4	M										
	- 8 -												
			$\square$										
	- 9 -	SPT S-5	Ň	N= 50/0"	3							Same as above.	
	- - 10 -		$\square$										
	10											Boring termianted at a depth of 10-feet.	
17101													
5													
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	N - STANDARD PENETRATION TEST RESISTANCE												
	Qc - S	TAT	IC	CONE PE	NET	ROM	ETEF	R TES	ST INI			Boring location determined by RETL. Drilling operations performed by RETL. GPS Coordinates: N 29.58506°, W -98.28788°	
	P - PC	CKE	ΞT	PENETRO	DMET	ER F	RESIS	STAN	ICE				
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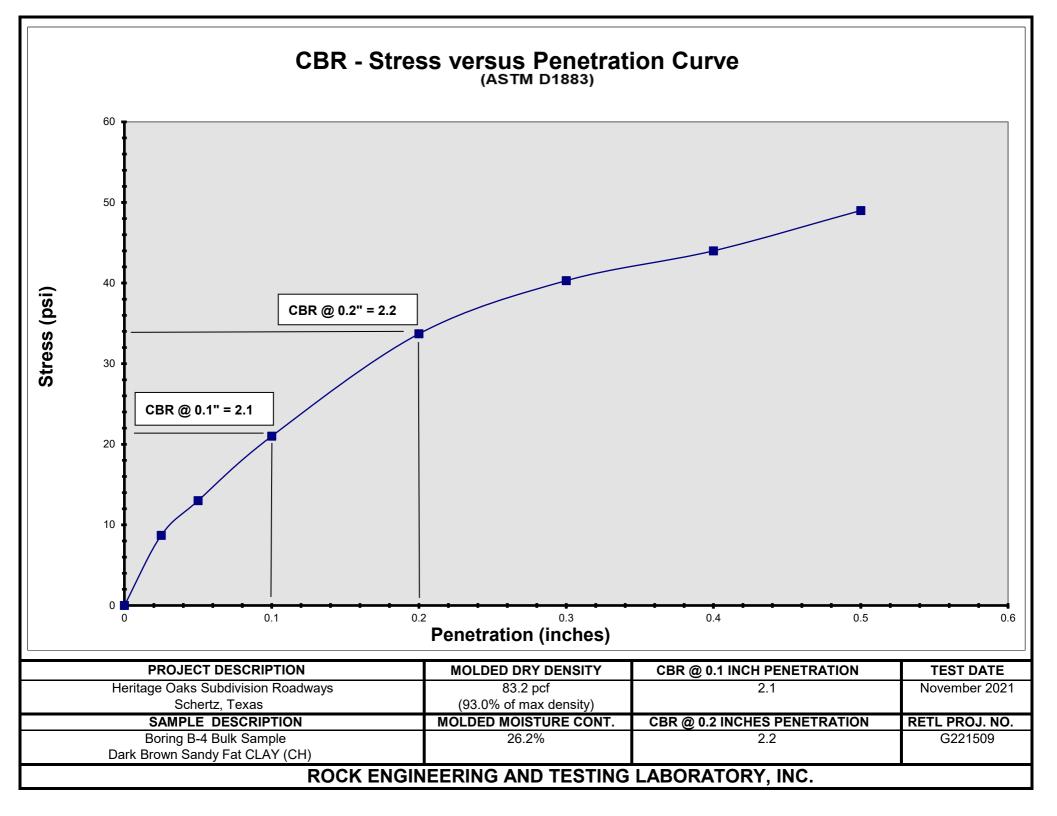
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	ERI	NG &	TE	N Por	k Eng	incorin	a & Te	etina l	aborati	ory, Inc.		CLIENT: Urban Civil, LLC PROJECT: Heritage Oaks Subdivision Roadways		
	Meinler			108	856 Va	ndale \$	Street			ory, inc.		LOCATION: Schertz, Texas		
	1801		J	ATEL Tele	ephone	nio, Te e: 210	-495-8	216 0000				NUMBER: G221509		
	RATO	8) IN	CORP	Fax	: 210	-495-8	015					DATE(S) DRILLED: 10/08/2021		
			<u>лт</u>	· ^					DAT.	٨		DRILLING METHOD(S):		
						AT	TERBE	ERG				Solid Flight Auger		
					MOISTURE CONTENT (%)				1		SIEVE (%)	GROUNDWATER INFORMATION:		
		ER			ATEN	L	١٢	PLASTICITY INDEX			SIEV	Groundwater was not encountered during the drilling operations and the boring was dry upon the completion of the drilling operations.		
ğ		UMB			CO	LIQUID LIMIT	PLASTIC LIMIT	CITY	U.FT	SIVE + FT)	200			
YME	н (FT	и П	ВЩ	NS/F S/SQ S/SQ VS/SQ	URE	nın	ASTI	ASTI	ENS DS/C	RES: IGTH	MINUS NO.			
SOIL SYMBOL	DЕРТН (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	OIST	-			DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	SURFACE ELEVATION: N/A			
о С	DE	Ś	\v} \	, ≍ ≓ ∺ Q	ž	LL	PL	PI	Бй	ы́ю́Е	DESCRIPTION OF STRATUM			
	- 1 -	SH		P= 4.5+	20	58	19	39			SANDY FAT CLAY (possible fill), brown, moist, very stiff. (CH)			
		S-1		1 4.0	20		10				SANDT FAT CLAT (DOSSIBLE IIII), DIOWIT, MOIST, VELY SUIT. (CH)			
	0													
	- 2 -	]												
		SH												
	- 3 -	S-2		P= 4.5+	24						FAT CLAY, dark brown, moist, very stiff.			
	- 4 -	-												
	- 5 -	SH S-3		P= 4.5+	23							Same as above.		
	- 6 -	-												
	- 7 -	SH		P= 4.5+	25	75	22	53			95			
	'	S-4		F = 4.5+	25	15	~~	55			90	Same as above. (CH)		
	- 8 -	1												
		0.1												
	- 9 -	SH S-5		P= 3.5	30							FAT CLAY, dark brown, moist, very stiff.		
	- 10 -	-										Boring termianted at a depth of 10-feet.		
1917														
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		L			I							REMARKS:		
				RD PENET CONE PE								Boring location determined by RETL. Drilling operations performed by RETL.		
				CONE PE								GPS Coordinates: N 29.58202°, W -98.29100°		
3														

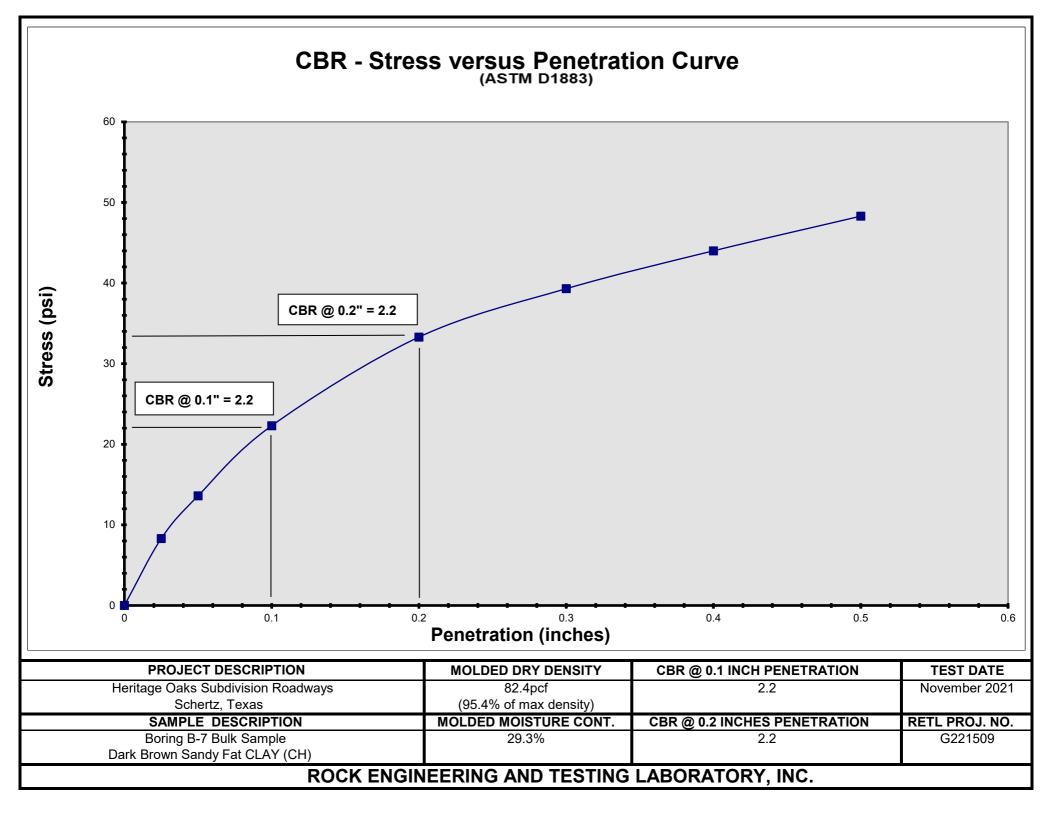
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		NG P										CLIENT: Urban Civil, LLC			
	<b>IGINEER</b>		ES			ineerin ndale \$		sting	Laborate	ory, Inc.		PROJECT: Heritage Oaks Subdivision Roadways			
	<b>∛:</b> {	III		🔇 伦 Sar	n Antor	nio, Te	xas 78	216				LOCATION: Schertz, Texas			
	BORAT		RP			e: 210 -495-8		0000				NUMBER: G221509			
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	PA 114										DATE(S) DRILLED: 10/08/2021			
	FIE		AT	Ā		LABC	ORAT	OR	DAT.	A		DRILLING METHOD(S):			
							TERB					Solid Flight Auger			
					(%)				-		(%)	GROUNDWATER INFORMATION:			
SOIL SYMBOL	FT)	SAMPLE NUMBER	S	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Q:: TONS/SQ FT	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION. Groundwater was not encountered during the drilling operations and the boring was dry upon the completion of the drilling operations.			
S	DЕРТН (FT)	APLE	SAMPLES	NS/SNO	STU		PLAS	PLA	DEI NDE	APRI ENG NS/S	US N	SURFACE ELEVATION: N/A			
SOIL	DEP	SAN	SAN	N H H H H H H H H H H H H H H H H H H H	MOI		PL	PI	POL	STR (TO	MIM	DESCRIPTION OF STRATUM			
	- 1 -	SPT S-1		N= 14	23	37	18	19			66				
	- 3 ·	SPT S-2	M	N= 7	25						73	<u>LEAN CLAY WITH GRAVEL (possible fill)</u> , dark brown, moist, firm.			
	- 5 -	SPT S-3	X	N= 25	11							<u>CLAYEY SAND</u> , with weathered limestone, light brown, moist, very stiff.			
	- 7 - SPT S-4 N= 63 6 37 15 22										21	Same as above, dry, hard.			
	8 9 SPT S-5 N= 50/5" 6											WEATHERED LIMESTONE light brown, dry, very hard.			
				RD PENET								Boring termianted at a depth of 10-feet. REMARKS: Boring location determined by RETL. Drilling operations performed by RETL.			
				CONE PE PENETRC						DEX		GPS Coordinates: N 29.58360°, W -98.29225°			

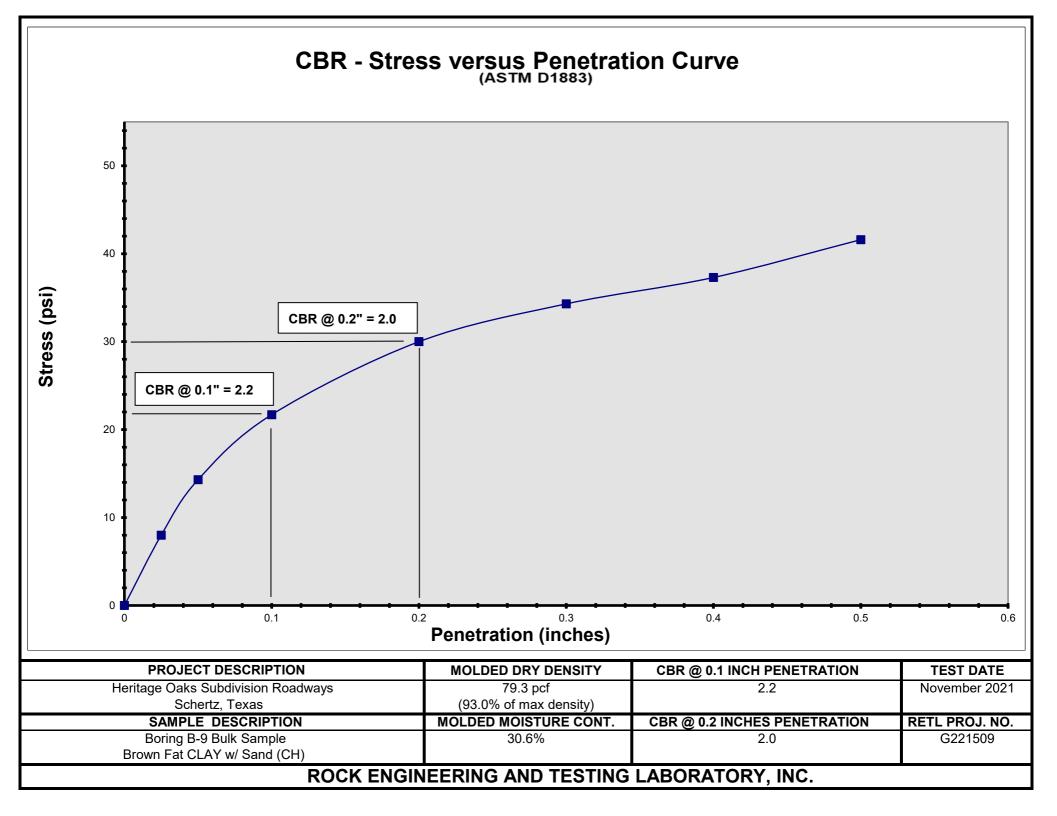














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		KEY TO	SOIL CLASSIFICATION AND S	YMBOLS									
UNIFIE	D SOIL CLASS	IFICATION SYSTE	M		RACTERIZING SOIL								
MAJOR DIVISIONS	SYMBOL		NAME	511	RUCTURE								
	GW	Well Graded Gra or no fines	vels or Gravel-Sand mixtures, litt	le SLICKENSIDED - havin that are slick and glos	g inclined planes of weakness sy in appearance								
GRAVEL AND GRAVELLY	GP	Poorly Graded G or no fines	ravels or Gravel-Sand mixtures, I	ittle FISSURED - containing filled with fine sand or vertical	shrinkage cracks, frequently silt; usually more or less								
SOILS	GM O	Silty Gravels, Gra	avel-Sand-Silt mixtures	varying color and textu	) - composed of thin layers of ire, usually grading from sand								
COARSE GRAINED	GC	Clayey Gravels, (	Gravel-Sand-Clay Mixtures		oils which break into small								
SOILS	SW	Well Graded Sar fines	nds or Gravelly Sands, little or no		Irying ning appreciable quantities of								
SAND AND	SP	Poorly Graded Sa fines	ands or Gravelly Sands, little or n		nerally nodular g wide range in grain sizes								
SANDY SOILS SM Silty Sands, Sand-Silt Mixtures and substantial amounts of all intermediate partic sizes POORLY GRADED - predominantly of one grain si													
SC Clayey Sands, Sand-Clay mixtures uniformly graded) or having a rasome intermediate size missing													
SILTS	ML	Inorganic Silts ar or Clayey fine Sa	nd very fine Sands, Rock Flour, S inds or Clayey Silts	Silty									
AND CLAYS LL < 50	CL		of low to medium plasticity, Grave lys, Silty Clays, Lean Clays		FOR TEST DATA								
	OL	Organic Silts and	l Organic Silt-Clays of low plastic	ity (Initial	idwater Level Reading)								
	МН	Inorganic Silts, N Sandy or Silty so	licaceous or Diatomaceous fine ils, Elastic Silts	(Final	ldwater Level Reading) y Tube Sample								
SILTS AND CLAYS LL > 50	СН	Inorganic Clays o	of high plasticity, Fat Clays		Samples								
	ОН	Organic Clays of Silts	medium to high plasticity, Organ		Sample								
		Limestone		Rock (	Core								
NON USCS MATERIALS		Marl/Claystone		Texas	Cone Penetrometer								
		Sandstone		🥂 — Grab S	Sample								
		TERMS	DESCRIBING CONSISTENCY (	OF SOIL									
COARSE GRAINED SOILS FINE GRAINED SOILS													
DESCRIPTIVE TERM	STAN	BLOWS/FT. DARD PEN. TEST	DESCRIPTIVE TERM	NO. BLOWS/FT. STANDARD PEN. TEST	UNCONFINED COMPRESSION TONS PER SQ. FT.								
Very Loose Loose Medium Dense Very Dense		0 - 4 4 - 10 10 - 30 30 - 50 over 50	Very Soft Soft Firm Stiff Very Stiff Hard	< 2         < 0.25           2 - 4         0.25 - 0.50           4 - 8         0.50 - 1.00           8 - 15         1.00 - 2.00           15 - 30         2.00 - 4.00           over 30         over 4.00									
		Field Classific	ation for "Consistency" of Fine G	rained Soils is determined with	a 0.25" diameter penetrometer								