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

A UES Company

April 18, 2023

Aspire Development
211 N Loop 1604E, Ste. 179
San Antonio Texas 78232

Attention: Danny Blue

SUBJECT: **PRELIMINARY SUBSURFACE EXPLORATION, LABORATORY TESTING PROGRAM, AND GEOTECHNICAL DISCUSSION FOR THE PROPOSED STEUBING TRACT HUEBNER ROAD SAN ANTONIO, TEXAS ROCK Project Number: G223187**

Dear Mr. Blue,

Introduction

In accordance with our agreement, Rock Engineering & Testing Laboratory, Inc. (ROCK) (Texas Professional Engineering Firm #2101) has performed Geotechnical Engineering Services for the above referenced project. The results of our services are presented in the accompanying letter report, an electronic copy of which is being transmitted herewith.

Authorization

The work for this project was performed in accordance with ROCK Proposal No. SGP030823A dated March 8, 2023. The proposal contained a scope of work, fee, and limitations. The proposal was approved and signed by Carson Trainer on March 9, 2023 and returned to ROCK via email.

Purpose and Scope

The purpose of this study was to provide preliminary geotechnical information for the proposed tract which is being considered for a future residential development. The scope of this study included a subsurface exploration, field and laboratory testing, evaluation of the subsurface soils, and preparation of this letter report.

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

General

The results of the field and laboratory testing services reported herein are considered sufficient in detail and scope for a preliminary geotechnical investigation and to evaluate possible foundation and pavement alternatives. Project details were provided to ROCK by the client.

The Geotechnical Engineer states that the findings 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. ROCK operates in 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

The field exploration, completed in order to evaluate the engineering characteristics of the subsurface materials, included a reconnaissance of the project site, drilling the test borings and recovering disturbed and relatively undisturbed samples of the subsurface materials encountered at the test boring locations. ROCK performed five (5) borings at the site to a depth of 20-feet.

During the sample recovery operations, the soils encountered were classified and recorded on Logs of Boring in accordance with "*Standard Guide for Field Logging of Subsurface Exploration of Soil and Rock*", (ASTM D5434). Upon completion of the drilling operations and obtaining the groundwater observations, the boreholes were backfilled with excavated soil and the site cleaned as required.

The borings were performed using a drilling rig equipped with a rotary head and air rotary drilling methods were used to advance the boreholes to the termination depth. 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). The samples obtained were classified in the field, placed in plastic bags, marked according to boring number, depth and any other pertinent field data, stored in special containers, and delivered to the laboratory for testing.

Water level observations were obtained during the test boring operations. Water level observations are noted on the Logs of Boring attached. The amount of water in an open borehole largely depends on the permeability of the subsurface materials encountered at the boring locations.

The ground surface elevations at the boring locations were not provided. The depths referred to in this report are measured from the existing ground surface elevations at the boring locations during the time of our field investigation.

Laboratory Testing Program

A laboratory-testing program was conducted to supplement the information obtained during the field exploration in order to provide additional pertinent engineering characteristics of the subsurface materials encountered.

The laboratory-testing program included supplementary visual classification (ASTM D2487) and water content tests (ASTM D2216) on samples obtained. In addition, selected samples were subjected to Atterberg limits tests (ASTM D4318), percent material finer than the #200 sieve tests (ASTM D1140), a moisture density relationship test (ASTM D698), a California Bearing Ratio (CBR) test (ASTM D1883), pH tests (ASTM D4972), lime series (TEX Method 121E), and sulfate content determinations (TEX Method 145E). The laboratory-testing program was conducted in general accordance with applicable ASTM and TEX Specifications. The results of the laboratory testing are included on the attached Logs of Boring and laboratory test reports.

Soil and Rock Conditions

The soil and rock conditions at the project site generally consist of an upper stratum of fat clay soils underlain by limestone with chert that extends to the boring termination depths of 20-feet. The upper fat clay soils are very high in plasticity with tested plasticity index (PI) values ranging from 42 to 48. For all of the explored locations, these upper fat clay soils are relatively thin and range in thickness between 6-inches to approximately 1-foot. The underlying limestone is very hard, with SPT “N”-values in excess of 50 blows per foot of penetration.

Detailed descriptions of the soils and rock encountered at the boring locations are provided on the Logs of Boring attached. Representative samples of the soils and rock were placed in polyethylene bags and are now stored in the laboratory for further analysis, if desired. Unless notified to the contrary, the samples will be disposed of three months after issuance of this report.

The stratification of the soil and rock, as shown on the Logs of Boring, 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 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.

Groundwater Observations

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

Project Description

Based on the information provided to ROCK, it is understood that the subject site is being considered as a possible fit for a future residential development. The residential structures will likely utilize slab on grade type foundations and the roadways will be designed in accordance with City of San Antonio requirements.

PVR Discussion

The upper natural fat clay soils above the limestone at this site are very high in plasticity. **The maximum calculated total potential vertical rise (PVR) at the boring locations for slab on grade type construction is less than 1-inch.** The PVR was calculated using the Texas Department of Transportation Method TEX-124E and into account the depth of active zone, estimated to extend to the top of the limestone, and the Atterberg limits test results of the soils encountered within the active zone.

It is important to note that the PVR values provided herein were calculated using the Texas Department of Transportation Method TEX-124E and represent the vertical rise that can be experienced by relatively dry subsoils subjected to increases in soil moisture content resulting from capillary effects or rainwater. The TEX-124E method is widely used in Texas for predicting expansive soil movements and has been found to be reasonably accurate for moisture variations resulting from normal seasonal and climatic controlled conditions (environmental conditions). The actual movement of the subsoils is dependent upon their change in moisture content.

Conditions that allow the soils to become saturated or significantly exceed typical moisture variations resulting from environmental conditions or exceed the dry and wet boundary conditions established by the TEX-124E method, such as poor drainage, broken utilities, and variations in subsurface groundwater sources, may result in higher magnitudes of moisture related soil movements than calculated by the PVR method provided herein.

It is anticipated that when completely inundated with water and allowed to become saturated, which would likely be the case if proper drainage around the structure is not provided or if a broken plumbing line was to occur, the subgrade soils could swell 2 or more times than the magnitude estimated by the TEX-124E PVR represented herein and as indicated by the one dimensional swell tests presented on the Logs of Boring. Differential vertical movements may occur over a distance equal to the depth of the active zone and can potentially be equal to the expected total movements.

Geotechnical Discussion

The type and depth of a foundation suitable for a given structure depends on several factors including the subsurface conditions, the function of the structure and the loads it will carry. Ultimately the acceptable performance criteria with respect to allowable vertical and differential movements should be agreed upon between the Owner, the Structural Engineer, the Builder and the Architect. Similarly, a suitable pavement system is dependent on the subsurface conditions, vehicle frequency and corresponding axle loads, increase in vehicular use over the life of the pavement, and the anticipated pavement life cycle and level of performance deemed acceptable by the Developer and Civil Engineer.

The soil and groundwater design considerations affecting the choice of foundation type and pavement section constituent thicknesses for this at this site, based on a review of the soil boring information and engineering characteristics determined by the field testing and laboratory test results, are outlined below:

- The strengths of the upper soil and deeper rock subsurface materials encountered at the boring locations are suitable to support shallow slab-on-grade foundation systems.
- The natural clay soils encountered within the active zone at this site are very high in plasticity and range in thickness between 6-inches to approximately 1-foot, resulting in TEX-124E calculated PVR value of less than 1-inch at the boring locations.
- Groundwater, at the time of our field investigation, appears to be located deeper than 20-feet below the existing grades.
- Conventional slab-on-grade foundations appear suitable for use at this site to support residential structures.
- Vegetation, roots, objectionable materials and the dark brown clay topsoil materials should initially be stripped from the surface. Additional excavation should be performed within the foundation footprint areas where required to allow the placement of a minimum of 12-inches of select fill below the floor slabs.
- A bulk subgrade sample was tested to have a sulfate content of less than 100 ppm which indicates that the soils are in a low risk level of using lime as a stabilization method in accordance with the TxDOT Technical Memorandum.
- Lime series and pH test results indicate that 4 to 6-percent lime will be required to reduce the plasticity index (PI) and increase the pH to acceptable levels.
- Specific laboratory testing to define the subgrade strength (i.e. CBR/K values) has been performed. Based upon the CRR test results and the plasticity indices and strengths of the natural subgrade soils, a CBR value 2.0 has been selected for the fat clays. However, the upper clays are only 6-inches to 1-foot in thickness, and it is anticipated that the subgrade will be limestone rock or cut limestone embankment materials with a minimum CBR of 5.0.
- We have evaluated the proposed new roadways considering as a City of San Antonio “Local A Without Bus Traffic” street. **The required AASHTO 18-kip ESAL for a “Local A Without Bus Traffic” street is 100,000.** The preliminary hot mixed asphaltic concrete (HMAC) pavement section is provided in the following table:

"LOCAL A WITHOUT BUS TRAFFIC STREET" (Required AASHTO 18-KIP ESAL = 100,000)	
Hot Mix Asphaltic Concrete	2"
Crushed Limestone Base Material (TxDOT Item 247 Type A; Gr. 2)	10"
Calculated AASHTO 18-kip ESAL	105,000

General Comments

It is recommended that the services of ROCK be engaged to perform a more comprehensive final geotechnical investigation once the type and location of the specific structures and roadways have been selected. ROCK cannot accept any responsibility for any conditions that deviate from those described in this report, nor for the performance of the foundation or pavements if not engaged to also provide the final geotechnical investigation and construction observation and testing. If it is required for ROCK to accept any liability, then ROCK must agree with the plans and perform such observation during construction as we recommend.

Closing

If there are any questions or if we can be of further assistance, please contact our office.

Sincerely,

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

Attachments:

Boring Location Plan
Logs of Boring B-1 through B-5
Key to Soil Classifications
Moisture-Density Relationship Test Result
CBR Test Result

BORING LOCATION PLAN

NO SCALE
LOCATIONS ARE APPROXIMATE

April 18, 2023
Aspire Development
ROCK Project No.: G223187

STEUBING TRACT
Huebner Road
San Antonio, Texas

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

LOG OF BORING B-1

Rock Engineering & Testing Laboratory LLC
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: Aspire Development
PROJECT: Steubing Tract
LOCATION: Huebner Rd; San Antonio, TX
NUMBER: G223187
DATE(S) DRILLED: 03/28/2023

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater was not encountered during the drilling operations and the boring was dry upon completion of the drilling operations.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		SPT S-1		N=13-50/1"	30	80	32	48			84	**FAT CLAY WITH GRAVEL**, dark brown, moist, very hard. (CH)
		SPT S-2		N=50/1"	6						45	**LIMESTONE**, with chert, light gray, dry, very hard.
	5	SPT S-3		N=50/1"	3							Same as above.
		SPT S-4		N=50/1"	3							Same as above.
		SPT S-5		N=50/1"	1							**LIMESTONE**, with chert, light gray, dry, very hard.
	10											
		SPT S-6		N=50/1"	3							Same as above.
	15											
		SPT S-7		N=50/1"	1							Same as above.
	20											Boring terminated at a depth of 20-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by ROCK. Drilling operations performed by ROCK.
GPS Coordinates: N 29.626935°, W -98.486581°

LOG OF BORING B-2

Rock Engineering & Testing Laboratory LLC
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: Aspire Development
PROJECT: Steubing Tract
LOCATION: Huebner Rd; San Antonio, TX
NUMBER: G223187
DATE(S) DRILLED: 03/28/2023

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater was not encountered during the drilling operations and the boring was dry upon completion of the drilling operations.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		SPT S-1		N=20-50/1"	13	71	28	43			50	**GRAVELLY FAT CLAY**, dark brown, moist, very hard. (CH)
		SPT S-2		N=50/2"	5							**LIMESTONE**, with chert, light gray, dry, very hard.
	5	SPT S-3		N=50/1"	4							Same as above.
		SPT S-4		N=50/2"	2							Same as above.
		SPT S-5		N=50/1"	1							**LIMESTONE**, with chert, light gray, dry, very hard.
	10											
		SPT S-6		N=50/1"	1							Same as above.
	15											
		SPT S-7		N=50/1"	2							Same as above.
	20											Boring terminated at a depth of 20-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by ROCK. Drilling operations performed by ROCK.
GPS Coordinates: N 29.629164°, W -98.485794°

LOG OF BORING B-3

Rock Engineering & Testing Laboratory LLC
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: Aspire Development
PROJECT: Steubing Tract
LOCATION: Huebner Rd; San Antonio, TX
NUMBER: G223187
DATE(S) DRILLED: 03/28/2023

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater was not encountered during the drilling operations and the boring was dry upon completion of the drilling operations.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		SPT S-1		N=7-50/4"	31	78	30	48			84	**FAT CLAY WITH GRAVEL**, dark brown, moist, very hard. (CH)
		SPT S-2		N=50/3"	4						26	**LIMESTONE**, with chert, light gray, dry, very hard.
	5	SPT S-3		N=50/2"	3							Same as above.
		SPT S-4		N=50/2"	4							Same as above.
		SPT S-5		N=50/1"	1							**LIMESTONE**, with chert, light gray, dry, very hard.
	10											
		SPT S-6		N=50/1"	1							Same as above.
	15											
		SPT S-7		N=50/1"	0							Same as above.
	20											Boring terminated at a depth of 20-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by ROCK. Drilling operations performed by ROCK.
GPS Coordinates: N 29.628260°, W -98.485355°

LOG OF BORING B-4

Rock Engineering & Testing Laboratory LLC
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

A UES COMPANY

CLIENT: Aspire Development
PROJECT: Steubing Tract
LOCATION: Huebner Rd; San Antonio, TX
NUMBER: G223187
DATE(S) DRILLED: 03/28/2023

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater was not encountered during the drilling operations and the boring was dry upon completion of the drilling operations.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
					13	71	29	42				**GRAVELLY FAT CLAY**, dark brown, moist, stiff.
		SPT S-1		N=12-50/3"								
		SPT S-2		N=50/2"	1							**LIMESTONE**, with chert, light gray, dry, very hard.
	5	SPT S-3		N=50/2"	0							Same as above.
		SPT S-4		N=50/2"	1							Same as above.
		SPT S-5		N=50/1"	2							**LIMESTONE**, with chert, light gray, dry, very hard.
	10											
		SPT S-6		N=50/1"	1							Same as above.
	15											
		SPT S-7		N=50/1"	1							Same as above.
	20											Boring terminated at a depth of 20-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by ROCK. Drilling operations performed by ROCK.
GPS Coordinates: N 29.628919°, W -98.484661°

LOG OF BORING B-5

Rock Engineering & Testing Laboratory LLC
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

A UES COMPANY

CLIENT: Aspire Development
PROJECT: Steubing Tract
LOCATION: Huebner Rd; San Antonio, TX
NUMBER: G223187
DATE(S) DRILLED: 03/28/2023

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater was not encountered during the drilling operations and the boring was dry upon completion of the drilling operations.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		SPT S-1		N=15-50/2"	8						45	**GRAVELLY FAT CLAY**, dark brown.
		SPT S-2		N=50/2"	5							**LIMESTONE**, with chert, light gray, dry, very hard.
	5	SPT S-3		N=50/1"	1							Same as above.
		SPT S-4		N=50/1"	1							Same as above.
		SPT S-5		N=50/1"	0							**LIMESTONE**, with chert, light gray, dry, very hard.
	10											
		SPT S-6		N=50/1"	1							Same as above.
	15											
		SPT S-7		N=50/1"	1							Same as above.
	20											Boring terminated at a depth of 20-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by ROCK. Drilling operations performed by ROCK.
GPS Coordinates: N 29.627284°, W -98.485028°

LOG_OF_BORING G223213 LOGS.GPJ ROCK_ETL.GDT 4/13/23

Engineering & Testing Laboratory, LLC

Rock Engineering & Testing Laboratory
10856 Vandale Street
San Antonio, TX 78216
Telephone: 210-495-8000

KEY TO SOIL CLASSIFICATION AND SYMBOLS

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL	NAME
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well Graded Gravels or Gravel-Sand mixtures, little or no fines
		GP	Poorly Graded Gravels or Gravel-Sand mixtures, little or no fines
		GM	Silty Gravels, Gravel-Sand-Silt mixtures
		GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	SAND AND SANDY SOILS	SW	Well Graded Sands or Gravelly Sands, little or no fines
		SP	Poorly Graded Sands or Gravelly Sands, little or no fines
		SM	Silty Sands, Sand-Silt Mixtures
		SC	Clayey Sands, Sand-Clay mixtures
	SILTS AND CLAYS LL < 50	ML	Inorganic Silts and very fine Sands, Rock Flour, Silty or Clayey fine Sands or Clayey Silts
		CL	Inorganic Clays of low to medium plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
		OL	Organic Silts and Organic Silt-Clays of low plasticity
	SILTS AND CLAYS LL > 50	MH	Inorganic Silts, Micaceous or Diatomaceous fine Sandy or Silty soils, Elastic Silts
		CH	Inorganic Clays of high plasticity, Fat Clays
		OH	Organic Clays of medium to high plasticity, Organic Silts
NON USCS MATERIALS			Limestone
			Marl/Claystone
			Sandstone

TERMS CHARACTERIZING SOIL STRUCTURE

SLICKENSIDED - having inclined planes of weakness that are slick and glossy in appearance

FISSURED - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical

LAMINATED (VARVED) - composed of thin layers of varying color and texture, usually grading from sand or silt at the bottom to clay at the top

CRUMBLY - cohesive soils which break into small blocks or crumbs on drying

CALCAREOUS - containing appreciable quantities of calcium carbonate, generally nodular

WELL GRADED - having wide range in grain sizes and substantial amounts of all intermediate particle sizes

POORLY GRADED - predominantly of one grain size uniformly graded) or having a range of sizes with some intermediate size missing (gap or skip graded)

SYMBOLS FOR TEST DATA

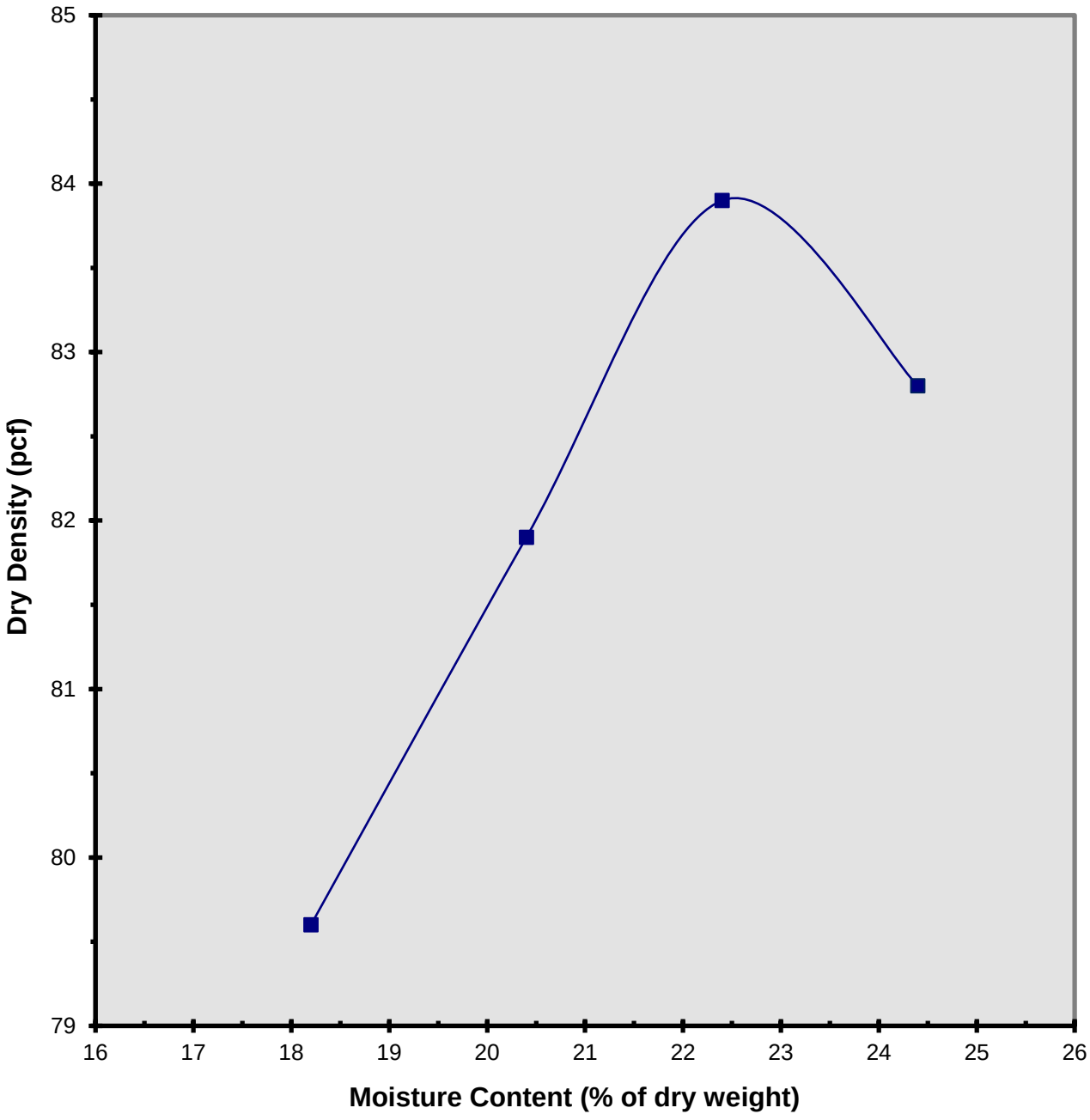
- Groundwater Level (Initial Reading)
- Groundwater Level (Final Reading)
- Shelby Tube Sample
- SPT Samples
- Auger Sample
- Rock Core
- Texas Cone Penetrometer
- Grab Sample

TERMS DESCRIBING CONSISTENCY OF SOIL

COARSE GRAINED SOILS		FINE GRAINED SOILS		
DESCRIPTIVE TERM	NO. BLOWS/FT. STANDARD PEN. TEST	DESCRIPTIVE TERM	NO. BLOWS/FT. STANDARD PEN. TEST	UNCONFINED COMPRESSION TONS PER SQ. FT.
Very Loose	0 - 4	Very Soft	< 2	< 0.25
Loose	4 - 10	Soft	2 - 4	0.25 - 0.50
Medium	10 - 30	Firm	4 - 8	0.50 - 1.00
Dense	30 - 50	Stiff	8 - 15	1.00 - 2.00
Very Dense	over 50	Very Stiff	15 - 30	2.00 - 4.00
		Hard	over 30	over 4.00

Field Classification for "Consistency" of Fine Grained Soils is determined with a 0.25" diameter penetrometer

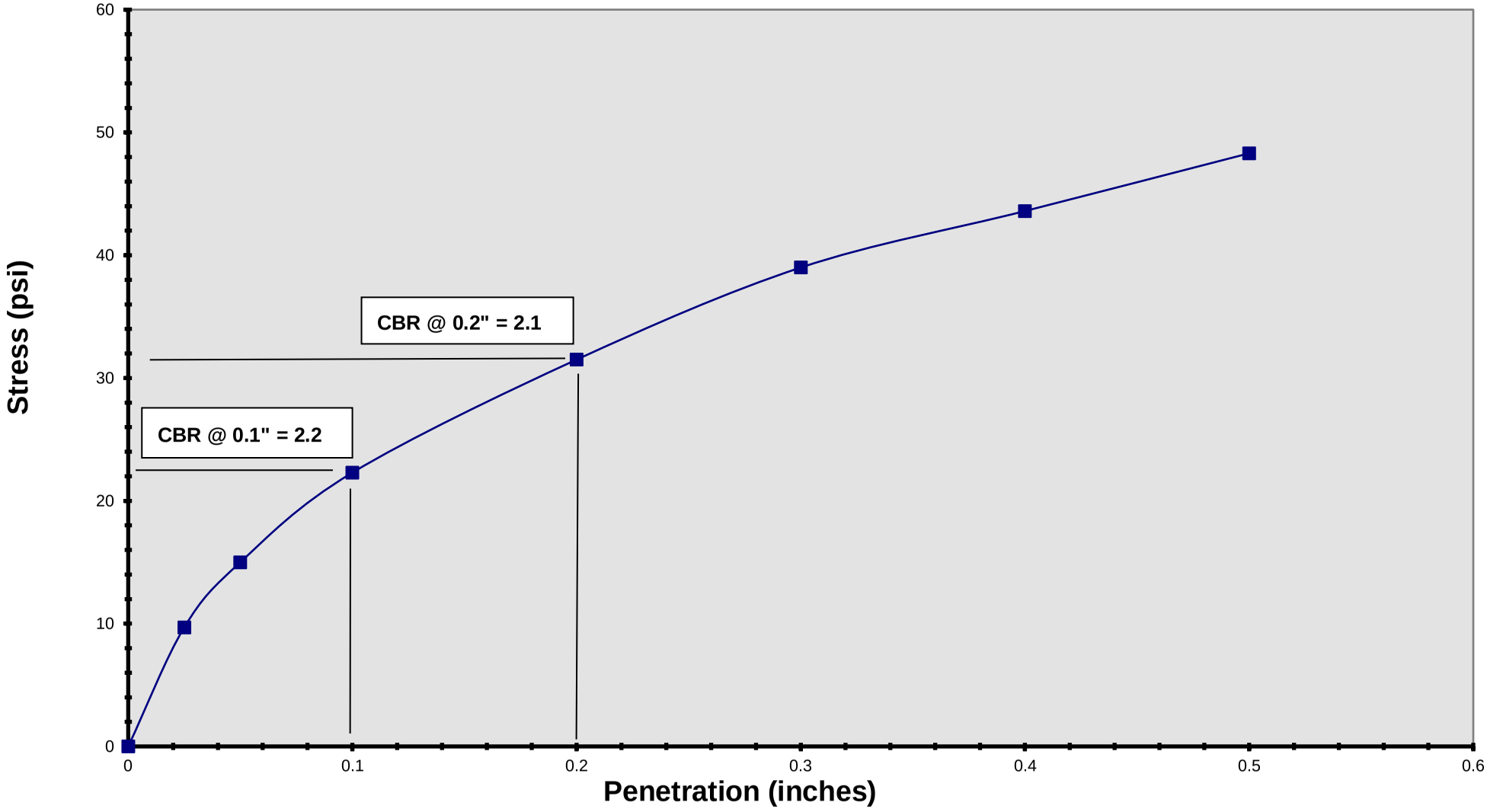
DENSITY VERSUS MOISTURE CURVE
(ASTM D698)



PROJECT	MAXIMUM LAB DENSITY	LAB DATA
Steubing Tract San Antonio, Texas	84.0pcf ASTM D698	LL = 57 PI = 34 Minus #200 = 85%
SAMPLE DESCRIPTION	**OPTIMUM MOISTURE**	**RETL PROJ. NO.**
Boring B-3 Bulk Sample Dark Brown Fat CLAY with Gravel (CH)	24.6%	G223187

ROCK ENGINEERING AND TESTING LABORATORY, LLC

CBR - Stress versus Penetration Curve
(ASTM D1883)



PROJECT DESCRIPTION	MOLDED DRY DENSITY	CBR @ 0.1 INCH PENETRATION	TEST DATE
Steubing Tract San Antonio, Texas	77.6 pcf (92.4% of max density)	2.2	April 2023
SAMPLE DESCRIPTION	**MOLDED MOISTURE CONT.**	**CBR @ 0.2 INCHES PENETRATION**	**RETL PROJ. NO.**
Boring B-3 Bulk Sample Dark Brown Fat CLAY w/ Gravel (CH)	25.2%	2.1	G223187

ROCK ENGINEERING AND TESTING LABORATORY, LLC