May 21, 2025
Kleinfelder Project No.: 26000483.001A

Mr. Robert Frank, PE
City of Tulsa Public Works Department
175 E 2nd St. S, Suite 1300
Tulsa, OK 74103

Subject: **Report for Geotechnical Drilling and Laboratory Testing Services**
Proposed Jack and Bore Construction
TMUA ES 2025-09
E. Pine Street and N. 71st E. Avenue
Tulsa, Oklahoma

Dear Mr. Frank:

Kleinfelder has completed the authorized geotechnical drilling and laboratory testing services for the above-referenced project. Per your request, Kleinfelder conducted the fieldwork by drilling two soil test borings (B-1 and B-2) on May 9, 2025. The borings were located in the field by a Kleinfelder engineer using a hand-held Global Positioning System (GPS) with an accuracy of approximately 15 feet. The general site location and the approximate boring locations are shown in Figure 1, Exploration Location Plan and Vicinity Map.

FIELD EXPLORATION PROGRAM

Both borings were terminated at 15 feet below the existing ground surface. Due to utility conflicts at the originally requested locations, boring B-1 was offset 15 feet to the south and boring B-2 was offset 30 feet to the north.

The borings were drilled with a CME-55 rotary drill rig using solid stem augers. Representative soil samples were obtained by a combination of Shelby tubes and split-barrel sampling procedures (ASTM D1586), which utilizes a standard 2-inch O.D. split-barrel sampler that is driven into the bottom of the boring with a 140-pound auto-hammer (75% efficiency) falling 30 inches. The SPT N-value, recorded on the boring logs, is the number of blows required to drive the split-barrel sampler the final 12 inches of the 18-inch sampling interval. The Shelby tube sampling procedure was conducted in general accordance with ASTM D1587, utilizes a thin-walled, steel tube with a sharp cutting edge that is pushed hydraulically into the bottom of the borings to obtain relatively undisturbed samples of cohesive or moderately cohesive soils.

Samples were collected at five feet intervals to the termination depth of the borings. Soil samples were sealed and returned to our laboratory for further examination and classification. Borings were backfilled and the pavement was patched in accordance with the appropriate Oklahoma Water Resources Board (OWRB) Regulations.

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Field logs included visual classification of the materials encountered during drilling, as well as drilling characteristics. Stratification boundaries indicated on the boring logs are based on observations during our fieldwork, an extrapolation of information obtained by examining samples from the borings, and comparisons of soils with similar engineering characteristics. Locations of these boundaries are approximate, and the transitions between material types may be gradual rather than clearly defined. The boring logs are presented in Attachment A.

LABORATORY TESTING PROGRAM

Laboratory tests, including sieve analyses, Atterberg limit, moisture contents, and unconfined compression tests were performed on selected samples in general accordance with applicable standards. In addition, soil samples were visually classified in accordance with the Unified Soil Classification System (USCS). All the lab results are presented in Table B-1 in Attachment B.

GROUNDWATER OBSERVATIONS

Groundwater observations were made and recorded during and after drilling operations, respectively. The results of the groundwater observations are summarized in Table 1.

Table 1. Groundwater Summary

Borings	Groundwater Depth During Drilling (ft.)	Groundwater Depth 30-min After Drilling (ft.)
B-1	Not Encountered	Not Encountered
B-2	6	9

The materials encountered in the test borings have a wide range of permeabilities and observations over an extended period of time through the use of piezometers or cased borings would be required to better define current groundwater conditions. Piezometers were not installed at the site during this subsurface exploration. Fluctuations of groundwater levels can occur due to seasonal variations in the amount of rainfall, runoff, river/creek level, and other factors not evident at the time the borings were performed. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

SUBSURFACE CONDITIONS

Based on the laboratory tests, visual, and textural observations, the overburden soils generally consisted of clay with varying amounts of sand, and sand with varying amounts of clay and gravel. Clayey soils of medium stiff to stiff consistency were observed in both the borings, along with the presence of loose sandy soil in B-2 boring. Weathered shale bedrock was encountered at 8.5 feet below existing grade in both of the borings and continued to the termination depth of the borings. The shale bedrock encountered was moderately strong to very strong. The subsurface materials are summarized in Table 2.

Table 2. Summary of Subsurface Materials					
Boring	**Surface Condition**	**Overburden Soil**	**Depth to Weathered Shale(ft.)**	**Depth to Competent Shale(ft.)**	**Termination Depth (ft.)**
B-1	Grass	Lean and Fat Clay	8.5	13	15
B-2	Gravel	Clayey Sand and Lean Clay	8.5	14.5	15

EXCAVATION

It is anticipated that excavation will be in the overburden sandy and clayey soils and underlaying shale bedrock. Excavations into the overburden soils should be possible with conventional excavation equipment. Existing bedrock was drilled through with solid stem augers and practical auger refusal was not encountered. However, excavation into the weathered shale is likely to be difficult. It is the contractor's responsibility to carefully review our boring logs and determine the appropriate excavation methods for construction.

Temporary dewatering such as pumping from gravel lined sumps or other methods will be required to remove water from deeper excavations if groundwater levels are elevated at the time of construction. An assessment of the impact of the planned method of dewatering on stability of the excavation side slopes and potential for subsidence should be included as part of the design of any required dewatering and excavation systems. Dewatering analysis was not scoped as part of this work.

Excavation slope should be inclined in accordance with OSHA Standard Number 1926 Subpart P App B, Sloping and Benching. Excavations deeper than 20 feet will require a registered professional engineer to design the protection. Overburden soils (sand, gravel, and soils below underwater) will require flatter excavation slopes. Actual slope classification must be performed by the contractor's competent person based on the conditions encountered and slope inclinations selected accordingly. Design of slope protection was not scoped as part of this work.

LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions, and on the date, the services are provided. Our conclusions and opinions are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

The report may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two years from the date of this report. The work performed was based on project information provided by the Client.

CLOSING

We appreciate the opportunity to be of service to you on this project. Please call us if you have any questions concerning the information presented in this letter.

Sincerely,

KLEINFELDER, INC.
Certificate of Authorization #7292, Expires 6/30/25

Venkatesh Kasaraneni
Staff Professional I

Shiyun (Simon) Wang, PE
Program Manager

Attachments:

- Figure 1 – Exploration Location Plan and Vicinity Map
- Attachment A – Field Exploration Program
- Attachment B – Laboratory Testing Results
- Attachment C - GBA Document

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Attachments

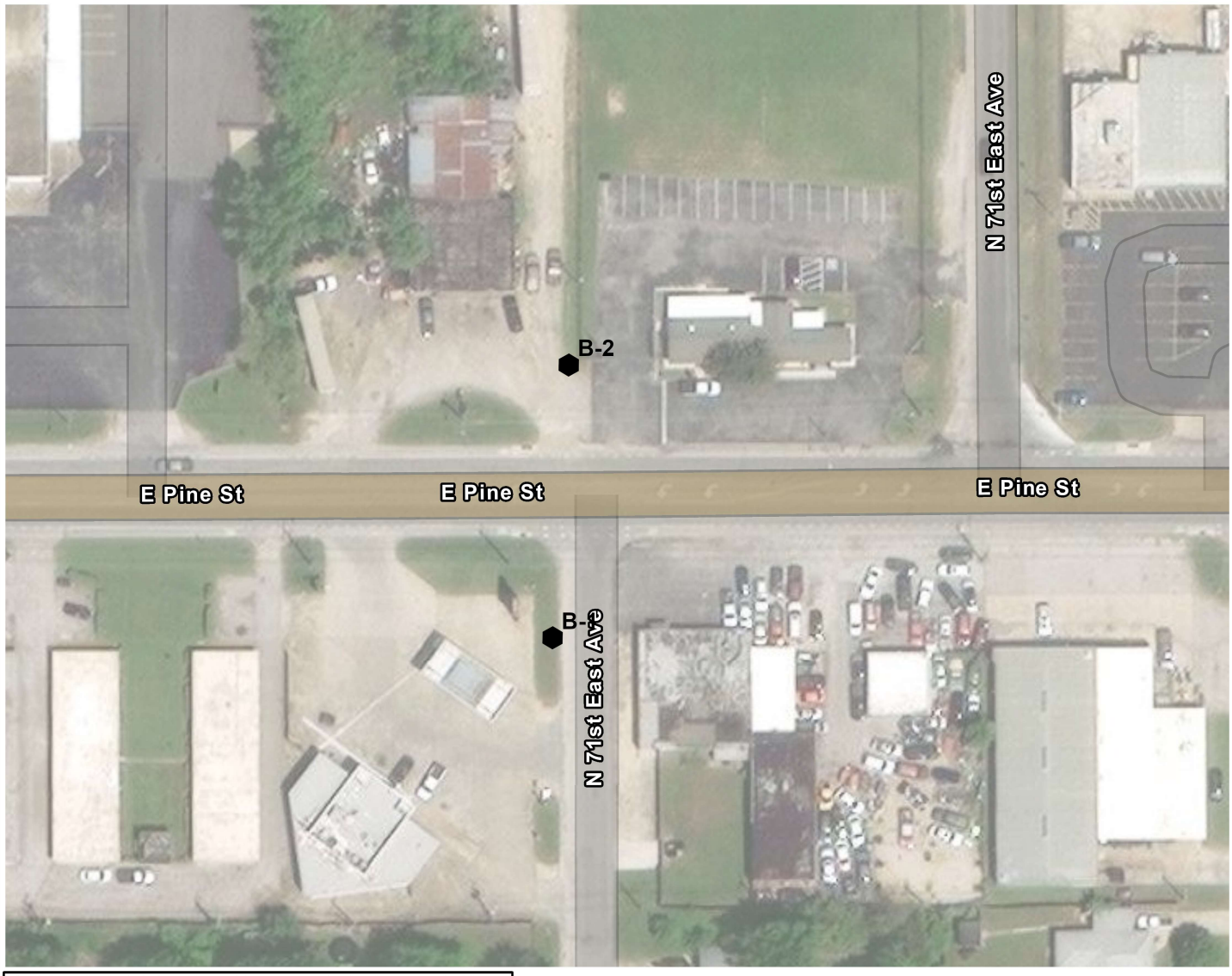
LEGEND

SOIL BORING

NOTES:
1. BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS COMPILED BY ESRI PRODUCTS.
2. COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE OKLAHOMA NORTH FIPS 3501

VICINITY MAP

NOT TO SCALE



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0 80 160

1" = 80 SCALE IN FEET

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DATE:	05-16-2025

EXPLORATION LOCATION PLAN AND VICINITY MAP

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E. Pine Street at N. 71St E. Avenue
Tulsa, OK

FIGURE

1

GIS FILE PATH: \\azrgisstorp03\working_clients_Automated_Exploration Plans\26000483.001A_TMUAES202509_20250518_vkasaraneni\APRX\
GIS FILE NAME: gINT_20250518_1849_vk
PLOTTED: 5/19/2025 11:32 AM BY: VKASARANENI

DRILLING METHOD/SAMPLER TYPE GRAPHICS

SOLID STEM AUGER

STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

SHELBY TUBE

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after stabilizing period)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Solid lines separating strata on the logs represent approximate boundaries only, dashed lines are inferred or extrapolated boundaries. Actual transitions may be gradual or differ from those represented.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System (ASTM D2488/D2487) designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., CL-ML, GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS

C_u - Coefficients of Uniformity
C_C - Coefficients of Curvature
WOH - Weight of Hammer
WOR - Weight of Rod

REFERENCES

1. American Society for Testing and Materials (ASTM), 2011, ASTM D2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System).

UNIFIED SOIL CLASSIFICATION SYSTEM[1]

COARSE GRAINED SOILS (More than 50% retained on No. 200 Sieve)	**GRAVELS** (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVEL WITH <5% FINES	**GW**	WELL-GRADED GRAVEL, WELL-GRADED GRAVEL WITH SAND
			GP	POORLY GRADED GRAVEL, POORLY GRADED GRAVEL WITH SAND
		GRAVELS WITH 5% TO 12% FINES	**GW-GM**	WELL-GRADED GRAVEL WITH SILT, WELL-GRADED GRAVEL WITH SILT AND SAND
			GW-GC	WELL-GRADED GRAVEL WITH CLAY (OR SILTY CLAY), WELL-GRADED GRAVEL WITH CLAY AND SAND (OR SILT CLAY AND SAND)
			GP-GM	POORLY GRADED GRAVEL WITH SILT, POORLY GRADED GRAVEL WITH SILT AND SAND
			GP-GC	POORLY GRADED GRAVEL WITH CLAY (OR SILTY CLAY), POORLY GRADED GRAVEL WITH CLAY AND (OR SILTY CLAY AND SAND)
		GRAVELS WITH > 12% FINES	**GM**	SILTY GRAVEL, SILTY GRAVEL WITH SAND
			GC	CLAYEY GRAVEL, CLAYEY GRAVEL WITH SAND
			GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL WITH SAND
	SANDS (50% or more of coarse fraction passes the No. 4 Sieve)	CLEAN SANDS WITH <5% FINES	**SW**	WELL-GRADED SAND, WELL-GRADED SAND WITH GRAVEL
			SP	POORLY GRADED SAND, POORLY GRADED SAND WITH GRAVEL
		SANDS WITH 5% TO 12% FINES	**SW-SM**	WELL-GRADED SAND WITH SILT, WELL-GRADED SAND WITH SILT AND GRAVEL
			SW-SC	WELL-GRADED SAND WITH CLAY (OR SILTY CLAY), WELL-GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
			SP-SM	POORLY GRADED SAND WITH SILT, POORLY GRADED SAND WITH SILT AND GRAVEL
			SP-SC	POORLY GRADED SAND WITH CLAY, POORLY GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
		SANDS WITH > 12% FINES	**SM**	SILTY SAND, SILTY SAND WITH GRAVEL
			SC	CLAYEY SAND, CLAYEY SAND WITH GRAVEL
			SC-SM	SILTY, CLAYEY SAND, SILTY, CLAYEY SAND WITH GRAVEL
FINE GRAINED SOILS (50% or more passes the No. #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		**ML**	SILT, SILT WITH SAND, SILT WITH GRAVEL
			CL	LEAN CLAY, LEAN CLAY WITH SAND, LEAN CLAY WITH GRAVEL
			CL-ML	SILTY CLAY, SILTY CLAY WITH SAND, SILTY CLAY WITH GRAVEL
			OL	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL
	SILTS AND CLAYS (Liquid Limit 50 or greater)		**MH**	ELASTIC SILT. ELASTIC SILT WITH SAND, ELASTIC SILT WITH GRAVEL
			CH	FAT CLAY, FAT CLAY WITH SAND, FAT CLAY WITH GRAVEL
			OH	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL

NOTE: USE MATERIAL DESCRIPTION ON THE LOG TO DEFINE A GRAPHIC THAT MAY NOT BE PROVIDED ON THIS LEGEND.

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CHECKED BY:	SYW
DATE:	5/19/2025

GRAPHICS KEY

Proposed Jack and Bore Construction
TMUA ES 2025-09
E. Pine Street at N. 71St E. Avenue
Tulsa, OK

APPENDIX

A-1

GRAIN SIZE[1]

DESCRIPTION		ALTERNATIVE SIEVE DESIGNATION	STANDARD SIEVE DESIGNATION
Boulders		>12 in	300 mm
Cobbles		3 - 12 in	75 - 300 mm
Gravel	coarse	3/4 -3 in	19 - 75 mm
	fine	#4 - 3/4 in	4.75 - 19 mm
Sand	coarse	#10 - #4	2 - 4.75 mm
	medium	#40 - #10	425 µm - 2 mm
	fine	#200 - #40	75 - 425 µm
Fines		Passing #200	<75 µm

SECONDARY CONSTITUENT[1]

Term of Use	AMOUNT	
	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	5 to <15%	15 to <30%
Modifier	≥15%	≥30%

PLASTICITY[1]

DESCRIPTION	CRITERIA
Non-Plastic	A 1/8 in. (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

MOISTURE CONTENT[1]

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CONSISTENCY - COHESIVE SOIL[2, 3]

CONSISTENCY	SPT - N (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	0 - 2	PP < 0.25	<500	Thumb will penetrate soil more than 1" (25 mm)
Soft	2 - 4	0.25 ≤ PP <0.5	500 - 1,000	Thumb will penetrate soil about 1" (25 mm)
Medium Stiff	4 - 8	0.5 ≤ PP <1	1,000 - 2,000	Thumb will penetrate soil about 1/4" (6 mm)
Stiff	8 - 16	1 ≤ PP <2	2,000 - 4,000	Can be imprinted with considerable pressure from thumb
Very Stiff	16 - 32	2 ≤ PP <4	4,000 - 8,000	Thumb will not indent soil but readily indented with thumbnail
Hard	>32	4 ≤ PP	>8,000	Thumbnail will not indent soil

APPARENT DENSITY - NON-COHESIVE SOIL[2]

APPARENT DENSITY	SPT-N (# blows / ft)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	>50

STRUCTURE[1]

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. (6mm) thick, note thickness.
Laminated	Alternating layers of varying material or color with the layers less than 1/4-in. (6 mm) thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and appearance throughout

ANGULARITY[1]

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

REACTION WITH HYDROCHLORIC ACID[1]

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

CEMENTATION[1]

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or little finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

REFERENCES

1. American Society for Testing and Materials (ASTM), 2017, ASTM D2488: Standard Practice for Description and Identification of Soils (Visual Manual Procedures).
2. Terzaghi, K and Peck, R., 1948, Soil Mechanics in Engineering Practice, John Wiley & Sons, New York.
3. United States Department of the Interior Bureau of Reclamation (USBR), 1998, Earth Manual, Part I.

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SOIL DESCRIPTION KEY
(For additional tables, see ASTM D2488)

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APPENDIX
A-2

INFILLING TYPE

NAME	ABBR	NAME	ABBR
Albite	Al	Muscovite	Mus
Apatite	Ap	None	No
Biotite	Bi	Pyrite	Py
Clay	Cl	Quartz	Qz
Calcite	Ca	Sand	Sd
Chlorite	Ch	Sericite	Ser
Epidote	Ep	Silt	Si
Iron Oxide	Fe	Talc	Ta
Manganese	Mn	Unknown	Uk

Kleinfelder modified from (FHWA, 2002)

DENSITY/SPACING OF DISCONTINUITIES

DESCRIPTION	SPACING CRITERIA
Unfractured	> 6 ft. (> 1.83 meters)
Slightly Fractured	2 - 6 ft. (.061 - 1.83 meters)
Moderately Fractured	8 in - 2 ft. (203.20 - 609.60 mm.)
Highly Fractured	2 - 8 in. (50.80 - 203.30 mm.)
Intensely Fractured	< 2 in. (< 50.80 mm.)

(USACE, 1994)

BEDDING CHARACTERISTICS

TERM	Thickness (in.)	Thickness (mm.)
Very Thick Bedded	> 36	> 915
Thick Bedded	12 - 36	305 - 915
Moderately Bedded	4 - 12	102 - 305
Thin Bedded	1 - 4	25 - 102
Very Thin Bedded	0.4 - 1	10 - 25
Laminated	0.1 - 0.4	2.5 - 10
Thinly Laminated	< 0.1	< 2.5

Kleinfelder modified from (USBR, 1998)

Bedding Planes — Planes dividing the individual layers, beds, or stratigraphy of rocks.

Joint — Fracture in rock, generally more or less vertical or traverse to bedding.

Seam — Applies to bedding plane with unspecified degree of weather.

APERTURE

DESCRIPTION	CRITERIA [in.(mm.)]
Tight	< 0.04 (< 1)
Open	0.04 - 0.20 (1 - 5)
Wide	> 0.20 (> 5)

Kleinfelder modified from Rock Mass Rating Classification (Bieniawski, 1989)

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	RECOGNITION
Pit (Pitted)	Pinhole to 0.03 ft. (3/8 in.) (>1 to 10 mm.) openings
Vug (Vuggy)	Small openings (usually lined with crystals) ranging in diameter from 0.03 ft. (3/8 in.) to 0.33 ft. (4 in.) (10 to 100 mm.)
Cavity	An opening larger than 0.33 ft. (4 in.) (100 mm.), size descriptions are required, and adjectives such as small, large, etc., may be used
Honeycombed	If numerous enough that only thin walls separate individual pits or vugs, this term further describes the preceding nomenclature to indicate cell-like form
Vesicle (Vesicular)	Small openings in volcanic rocks of variable shape and size formed by entrapped gas bubbles during solidification

(USBR, 1994)

DISCONTINUITY TYPE

DESCRIPTION
Fault
Joint
Shear
Foliation
Vein
Bedding

INFILLING AMOUNT

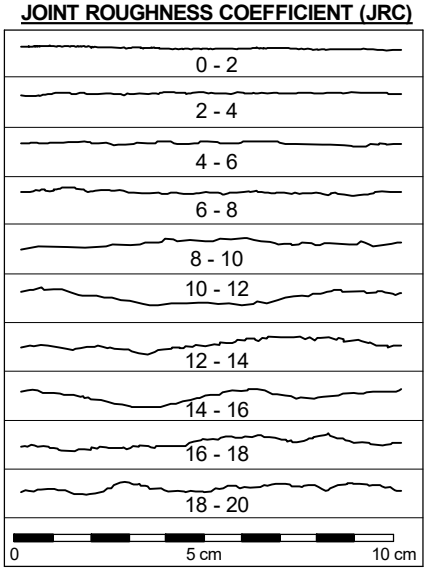
DESCRIPTION
Surface Stain
Spotty
Partially Filled
Filled
None

ROCK QUALITY DESIGNATION (RQD)

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

(Deere and Deere, 1989; ASTM D 6032)

JOINT ROUGHNESS COEFFICIENT (JRC)



(ISRM, 1978; Barton and Choubey, 1977)

RQD Rock-quality designation (RQD) Rough measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core in lengths of 10 cm. or more.

DEGREES OF WEATHERING (USACE, 1994)

DESCRIPTION	CRITERIA
Unweathered	No evidence of chemical/mechanical alternation; rings with hammer blow.
Slightly Weathered	Slight discoloration on surface; slight alteration along discontinuities; <10% rock volume altered.
Moderately Weathered	Discoloring evident; surface pitted and alteration penetration well below surface; Weathering "halos" evident; 10-50% rock altered.
Highly Weathered	Entire mass discolored; Alteration pervading most rock, some slight weathering pockets; some minerals may be leached out.
Decomposed	Rock reduced to soil with relic rock texture/structure; Generally molded and crumbled by hand.

RELATIVE HARDNESS / STRENGTH DESCRIPTIONS - FOR WEAKER SEDIMENTARY ROCKS IN COLORADO (USACE, 1994)

SPT N_{60}	HARDNESS
< 20	Very Weak to Weathered
20 - 39	Weak
40 - 49	Moderately Strong
50 - 50/6"	Strong
> 50/6"	Very Strong
This table was developed by Kleinfelder based on project experience in Colorado for shale, claystone, siltstone, poorly cemented sandstone, and other weaker sedimentary rocks.	

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CHECKED BY: SYW

DATE: 5/19/2025

ROCK DESCRIPTION KEY

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TMUA ES 2025-09
E. Pine Street at N. 71St E. Avenue
Tulsa, OK

APPENDIX

A-3

Date Begin - End:	5/19/2025	**Drilling Company:**	WSB	**BORING LOG B-1**	
Logged By:	V. Kasaraneni	**Drill Crew:**	C. Justin		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Solid Stem Auger	**Hammer Efficiency:**	75%
Weather:	69 F Sunny	**Auger Diameter:**	6 in. O.D.	**Hammer Cal. Date:**	Unknown

FIELD EXPLORATION

Latitude: 36.17688°
Longitude: -95.89794°
Location Offset: 15 feet south from proposed location
Surface Condition: Grass

Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		TOPSOIL: 6 inches												
		Lean CLAY with Sand (CL): dark gray, moist, stiff	SS-1		BC=3 4 5	18"	CL	23.7		99	75	37	19	
		Fat CLAY (CH): yellowish brown, moist, medium stiff to stiff	SS-2		BC=2 2 4	18"		23.8						
5			ST-3			20"	CH	23.0	106.2	100	87	53	27	**Unc. Comp. Str.=** q_u: 22.45 psi
		Highly Weathered SHALE: yellowish brown, moderately strong	SS-4		BC=10 19 26	18"								
10														
		SHALE interbedded with LIMESTONE: yellowish brown and light gray, very strong, highly weathered	SS-5		BC=50/5.5"	5"								
15														

The boring was terminated at approximately 13.5 ft. below ground surface. The boring was backfilled with auger cuttings and bentonite on May 19, 2025.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 6 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 9 ft. below ground surface 30 min after drilling completion.

GENERAL NOTES:
A Handheld GPS unit was used to locate the exploration with an accuracy of 15.

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PROJECT NO.:	26000483.001A
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DATE:	5/9/2025

BORING LOG B-1

Proposed Jack and Bore Construction
TMUA ES 2025-09
E. Pine Street at N. 71St E. Avenue
Tulsa, OK

BORING
B-1
PAGE: 1 of 1

Date Begin - End:	5/19/2025	**Drilling Company:**	WSB	**BORING LOG B-2**	
Logged By:	V. Kasaraneni	**Drill Crew:**	C. Justin		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger	**Hammer Efficiency:**	75%
Weather:	69 F Sunny	**Auger Diameter:**	6 in. O.D.	**Hammer Cal. Date:**	Unknown

Latitude: 36.17724°
Longitude: -95.89791°
Location Offset: 30 feet north from proposed location
Surface Condition: Gravel

Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		GRAVEL: 4 inches												
		Clayey SAND with Gravel (SC): brown to olive brown, moist, loose	SS-1		BC=2 3 4	18"	SC	17.0		72	41	36	18	
		Lean CLAY with Sand (CL): brown to olive brown, moist, stiff	ST-2			20"	CL	20.1	105.8	99	70	35	17	**Unc. Comp. Str.=** q_u: 16.26 psi
5			SS-3		BC=3 4 6	NR"								
		Highly Weathered SHALE: yellowish brown, moderately strong	SS-4		BC=8 14 30	18"								
10			SS-5		BC=20 37 50/5.5"	17"								
15		**SHALE**: yellowish brown, very strong, highly weathered												

The boring was terminated at approximately 15 ft. below ground surface. The boring was backfilled with auger cuttings and bentonite on May 19, 2025.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:
A Handheld GPS unit was used to locate the exploration with an accuracy of 15.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	26000483.001A
DRAWN BY:	VK
CHECKED BY:	SYW
DATE:	5/9/2025

BORING LOG B-2

Proposed Jack and Bore Construction
TMUA ES 2025-09
E. Pine Street at N. 71St E. Avenue
Tulsa, OK

BORING
B-2
PAGE: 1 of 1

Exploration ID	Depth (ft.)	Sample No.	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
						Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	1.5 - 3.0	SS-1	LEAN CLAY WITH SAND (CL)	23.7		100	99	75	37	18	19	
B-1	3.5 - 5.0	SS-2		23.8								
B-1	5.0 - 7.0	ST-3	FAT CLAY (CH)	23.0	106.2	100	100	87	53	26	27	**Unconfined Compressive Strength=**
												q_u: 22.45 psi
B-2	1.5 - 3.0	SS-1	CLAYEY SAND WITH GRAVEL (SC)	17.0		100	72	41	36	18	18	
B-2	3.0 - 5.0	ST-2	LEAN CLAY WITH SAND (CL)	20.1	105.8	100	99	70	35	18	17	**Unconfined Compressive Strength=**
												q_u: 16.26 psi

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = NonPlastic
NA = Not Available

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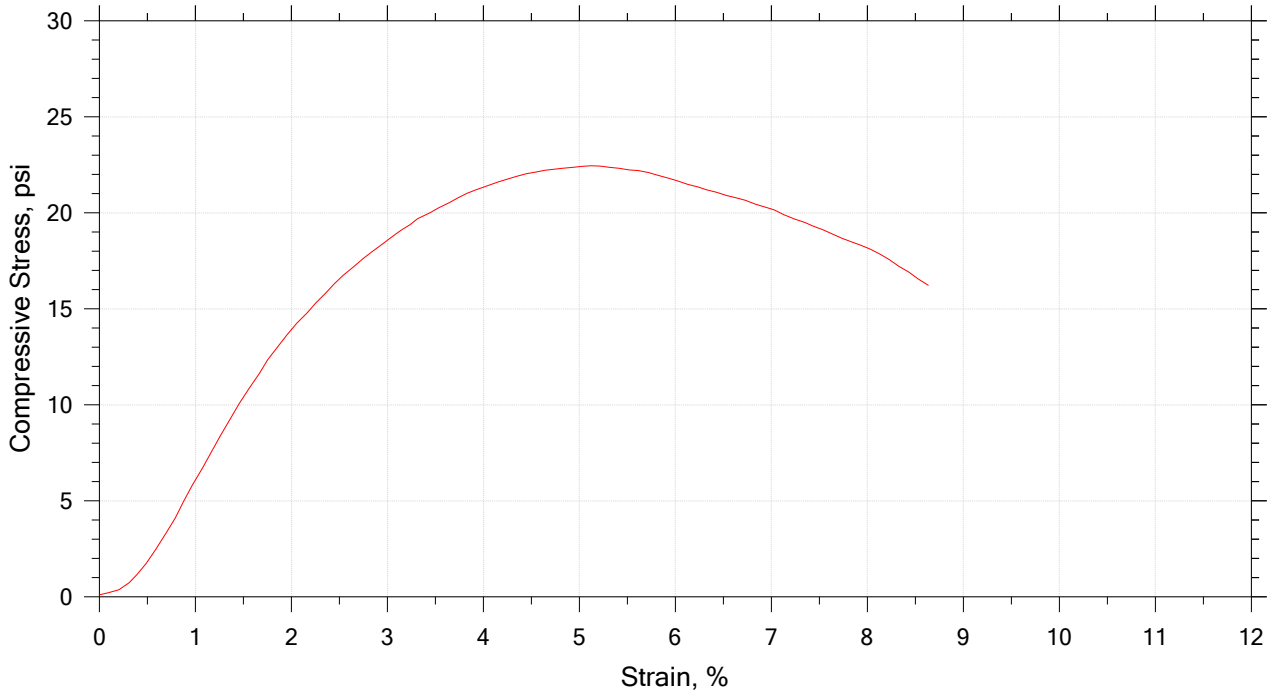
PROJECT NO.: 26000483.001A
DRAWN BY: VK
CHECKED BY: SYW
DATE: 5/19/2025

LABORATORY TEST RESULT SUMMARY

Proposed Jack and Bore Construction
TMUA ES 2025-09
E. Pine Street at N. 71St E. Avenue
Tulsa, OK

TABLE
B-1

Unconfined Compression Test



Symbol	■			
Test No.				
Initial Diameter, in	2.854			
Initial Height, in	5.609			
Water Content, %	22.98			
Dry Density, pcf	106.2			
Saturation, %	102.47			
Void Ratio	0.617			
Unconfined Compressive Strength, psi	22.45			
Undrained Shear Strength, psi	11.23			
Time to Failure, s	312.01			
Strain Rate, %/s	0.016667			
Specific Gravity (Estimated)	2.75			
Liquid Limit	53			
Plastic Limit	26			
Plasticity Index	27			

Failure Sketch			

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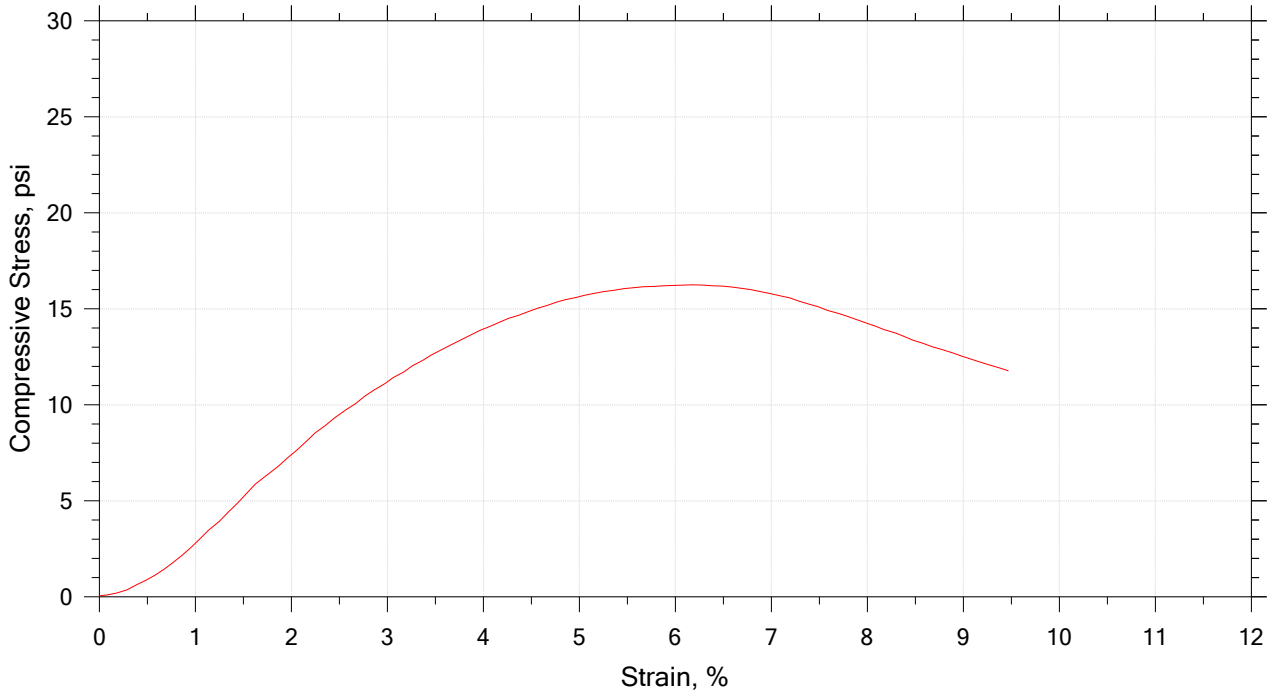
Project Name: TMUA ES 2025-09	Location: Tulsa, Oklahoma	Project Number: 26000483.001
Boring Number: B-1	Tester: SS	Checker: SYW
Sample Number: ST-3	Test Date: 5/12/2025	Depth: 5.0 - 7.0 ft
Test Number:	Preparation: Shelby Tube	Elevation: N/A
Client:	Classification: CH	Group Symbol: A-7-6(26)
Description: Fat Clay, light olive brown		
Remarks:		

Unconfined Compression Test



Symbol	■			
Test No.				
Initial Diameter, in	2.86			
Initial Height, in	5.602			
Water Content, %	20.10			
Dry Density, pcf	105.8			
Saturation, %	94.42			
Void Ratio	0.564			
Unconfined Compressive Strength, psi	16.26			
Undrained Shear Strength, psi	8.129			
Time to Failure, s	372.01			
Strain Rate, %/s	0.016667			
Specific Gravity (Estimated)	2.65			
Liquid Limit	35			
Plastic Limit	18			
Plasticity Index	17			

Failure Sketch			

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Project Name: TMUA ES 2025-09	Location: Tulsa, Oklahoma	Project Number: 26000483.001
Boring Number: B-2	Tester: SS	Checker: SYW
Sample Number: ST-2	Test Date: 5/12/2025	Depth: 3.0 - 5.0 ft
Test Number:	Preparation: Shelby Tube	Elevation: N/A
Client:	Classification: CL	Group Symbol: A-6(10)
Description: Lean Clay with Sand, brown and olive brown		
Remarks:		