

ARKANSAS DEPARTMENT OF TRANSPORTATION



SUBSURFACE INVESTIGATION

STATE JOB NO. 040965

FEDERAL AID PROJECT NO. STATE JOB

SEBASTIAN CO. AREA HEADQUARTERS (GREENWOOD) (S)

STATE HIGHWAY NEW SECTION NEW

IN SEBASTIAN COUNTY

The information contained herein was obtained by the Department for design and estimating purposes only. It is being furnished with the express understanding that said information does not constitute a part of the Proposal or Contract and represents only the best knowledge of the Department as to the location, character and depth of the materials encountered. The information is only included and made available so that bidders may have access to subsurface information obtained by the Department and is not intended to be a substitute for personal investigation, interpretation and judgment of the bidder. The bidder should be cognizant of the possibility that conditions affecting the cost and/or quantities of work to be performed may differ from those indicated herein.



December 23, 2024

TO: Mr. Deric Wyatt, State Maintenance Engineer
SUBJECT: Foundation and Subgrade Recommendations
Sebastian Co. Area Headquarters (Greenwood) (S)
Job No. 040965
Sebastian County

Submitted herein are the foundation and subgrade recommendations developed for the new Sebastian County Area Headquarters (AHQ). It is understood the new area headquarters includes an AHQ building, salt storage building, brine plant, miscellaneous storage building, covered wash bay, fuel station, and an employee parking lot.

Foundation loads and floor loads are not provided, but these loads are anticipated to be light. A site grading plan for the AHQ building, provided by Facilities Management, is included in Attachment A. With a finished floor elevation of 557.67 feet above mean sea level, site grading will include up to 1.5 feet of cut and up to 6 feet of fill. The deepest anticipated cut will be in the northwest AHQ building corner and the deepest anticipated fill will be in the southeast AHQ building corner.

Field Investigation A subsurface investigation was requested by ARDOT Maintenance Division personnel on August 5, 2024. Three borings were drilled, with two borings (Borings 1 and 2) performed in the AHQ building footprint and one boring (Boring 3) performed in the planned salt storage building area. The approximate locations of the borings are presented in the Plan of Borings included in Attachment B.

The borings were advanced with a track-mounted Acker Renegade rotary drill rig using a combination of hollow-stem auger and diamond core methods. The boring logs are also included in Attachment B, following the Plan of Borings. A legend is included with the boring logs to interpret/explain the symbols, terms, and conventions used on the logs. Standard Penetration Tests (SPT) were conducted in accordance with ASTM D1586 for field testing and soil sampling. Liners were not used inside the standard split-barrel samplers. The drill rig hammer correction factor is shown on the logs.

The number of blows required to drive the standard split-barrel sampler for each 6-inch increment of the total 18-inch drive depth are shown on the logs. SPT N-values are defined as the total number of blows required to advance the split barrel the final 12 inches. The SPT N-values indicated on the logs are raw (uncorrected) blow counts as measured in the field.

Core samples of bedrock were retrieved by using NQ3-size triple-tube core barrels (rock core diameter of 1-3/4 inches and hole diameter of 3 inches). For each core run, Rock Quality Designation (RQD) was determined in the field by a logger and further evaluated by a licensed Professional Geologist (PG). RQD, expressed in percent, is defined as the sum of the intact core pieces that are 4 inches and longer, divided by the total length of the core run. The RQD of each core run is indicated on each corresponding log. Core pictures are also included in Attachment B. Groundwater observations were noted on the logs.



Laboratory Testing All samples were brought to the Materials Division laboratory for further evaluation and testing. Soil samples were tested to evaluate index and engineering properties and to verify soil type and classification. Lab tests were performed on representative soil samples to determine moisture content, Atterberg limits, and gradation. Tested soils were classified by a licensed PG in accordance with both USCS and AASHTO soil classification systems.

These test results are plotted or indicated on the logs using appropriate denotation (symbols in accordance with scale, number, text, etc.). Table 1 lists the laboratory tests; their corresponding ASTM and AASHTO test methods, and respective denotation on logs.

Table 1: Summary of Laboratory Tests and Methods

Laboratory Test	ASTM	AASHTO	Denotation on Logs
Moisture Content	D2216	T 265	Solid Circle Symbol (●)
Grain Size Distribution	D6913	T 88	Whole Number in the "Percent Passing No. 200 Sieve" Column (e.g., 12)
Atterberg Limits	D4318	T 89	Plus symbol (+) on the Right for Liquid Limit
		T 90	Plus symbol (+) on the Left for Plastic Limit

Site Conditions The new AHQ is planned in a field on the south side of Route 10 between Greenwood and Hackett. During field evaluation, it was apparent that the planned locations could have been mined for coal in the past. A possible abandoned mine shaft was observed just to the south of the proposed salt dome location. The site terrain slopes down from the north to the south. Representative site pictures are included in Attachment C.

Site Geology This project is located over the mapped outcrop of the Pennsylvanian-aged McAlester Formation and is just south of where the McAlester Formation contacts the underlying Pennsylvanian-aged Hartshorne Formation. According to the Office of the State Geologist's Stratigraphic Summary, the McAlester Formation consists of several hundred feet of shale with thin sandstone and coal. There are two named coal units in this formation, the Lower Hartshorne Coal (occurring just above the base) and the Upper Hartshorne Coal. The unit ranges from about 500 to 2,300 feet in thickness.

According to maps acquired from the Arkansas Geological Commission Information Circular 20-F, the Lower Hartshorne Coal was mined at the proposed project location in the past. Abandoned strip mines and at least one mine shaft can be observed in the field and in Google Earth Imagery. The borings revealed differential subsurface conditions across the jobsite, and it appears that the planned location for the AHQ building might overlie a backfilled strip mine. Based on geologic maps and satellite imagery, it appears that most of any subsurface mining (not strip mining) that took place at this location would have likely been located just south of the planned building locations. Any mining that took place directly below the planned building locations would have likely been strip mining that was backfilled. Because the location and the stability of any subsurface mines and strip mines in this area are uncertain, differential subsurface conditions across the project location should be anticipated, and it is possible that more mines exist here but were not observed.



Seismic Conditions Based on the results of the borings and the surface geology of the area, a Seismic Site Class C (Very Dense Soil Profile) is considered suitable for the site in accordance with the criteria of the International Building Code (IBC). The liquefaction potential of the overburden soils encountered within the exploration depths of the borings is considered low.

Subsurface Conditions The borings indicate the overburden soils are highly variable. Much of the ground is covered with existing fill comprised of loose to very dense silty sand with variable amounts of rock fragments (see Borings 2 and 3). The on-site fill encountered in the borings extends to depths of up to 5 feet and exhibits variable compaction and compressibility.

The natural overburden soils are comprised of medium stiff to very stiff sandy lean clay and medium dense to very dense silty sand with rock fragments. The natural soils exhibit low plasticity, moderate to high shear strength/relative density, and low compressibility. These soils are stable and suitable to support the light foundation loads.

The overburden soils extend to depths of 7.5 feet to 12.5 feet and are underlain by highly weathered to slightly weathered sandstone. Rock quality of the bedrock increases with depth. Below depths of 15 feet to 19 feet, the bedrock is competent and is comprised of slightly weathered to unweathered sandstone and shale.

Site Preparation It is understood site grading will include up to 1.5 feet of cut and up to 6 feet of fill in the AHQ building area. In addition, the on-site soils exhibit high variability in soil type, depth, shear strength, density, compaction, and compressibility. **After completing the required cut, and prior to any fill placement, the subgrade in the building and pavement areas must be thoroughly proof-rolled and compacted.** The existing slope should be benched to facilitate fill placement.

The fill in the building and pavement areas should be compacted to a minimum of 98 percent of the laboratory-determined maximum dry density near optimum moisture content in accordance with AASHTO T 180, Method D. If fill consists of rock fragments, a vibrating sheepsfoot or padfoot compactor should be used to facilitate breakdown of rock fragments. Fill and backfill should be placed in horizontal, nominal 6-inch to 8-inch thick loose lifts. Density and moisture of each lift of backfill and fill should be tested (minimum one test per lift) and approved prior to placing subsequent lifts.

Shallow Footings A shallow footing foundation system is suitable to support the light structural loads of the AHQ and salt storage buildings. Footings founded as recommended may be designed based on maximum net allowable bearing pressures of 1500 and 2000 psf for continuous and individual footings, respectively. These recommended allowable bearing pressures include a minimum factor of safety of 2.5. Total settlement of footings founded as recommended should be less than 1 inch. Differential settlement may be estimated as about one-half of the total settlement value.

Uplift of footings will be resisted by the weight of the structure and the foundation units. Lateral forces will be countered by sliding resistance at the footing bottom. Resistance to sliding may be evaluated using an ultimate friction ($\tan\delta$) value of 0.35 for concrete footings on compacted fill or proof-rolled natural soil bearing stratum.



Continuous footings should have a minimum width of 18 inches. Individual footings should have a minimum dimension of 24 inches and should be placed below the minimum frost depth.

Floor/Bottom Slabs Slab-on-grade construction will be suitable for the building floor/bottom slabs. Subgrade preparation must include thorough proof-rolling of the subgrade. It is recommended that the floor slabs be supported by a 6-inch-thick, clean crushed stone or gravel layer placed on the properly prepared subgrade. Suitable materials for this use include Mineral Aggregate (Class 3) complying with 2014 ARDOT Standard Specifications Sub-Section 403.01 or Coarse Aggregate complying with Sub-Section 802.02(c) for Class S concrete. The granular layer should be densified with vibrating equipment prior to floor slab construction. Impervious sheeting should be placed between the slab and granular layer to act as a moisture barrier.

Pavements. The subgrade should be prepared as recommended in the Site Preparation section of this report. A design resilient modulus value (M_r) of 3000 psi is recommended for pavement design. Detailed pavement sections should be designed based on the recommended design M_r value, specific traffic data, and other relevant considerations. However, the following minimum pavement sections are recommended:

- 3 inches of ACHM Surface Course (ARDOT Standard Specifications Section 407, $\frac{1}{2}$ " $N_{des} = 60$) placed over 9 inches of Crushed Stone Base (ARDOT Standard Specifications Section 303, Class 7)

or:

- 6 inches of Portland Cement Concrete (ARDOT Standard Specifications Section 501) placed over 6 inches of Crushed Stone Base (ARDOT Standard Specifications Section 303, Class 7)

It is recommended that pavements in the trash dumpster areas be a minimum of 6-inch-thick concrete underlain by at least 6 inches of compacted aggregate base. The concrete area should be large enough to accommodate both the dumpster and service vehicles. In addition, a heavier pavement section should be designed for the route to the dumpster areas.

A handwritten signature in blue ink that reads 'Paul Tinsley'.

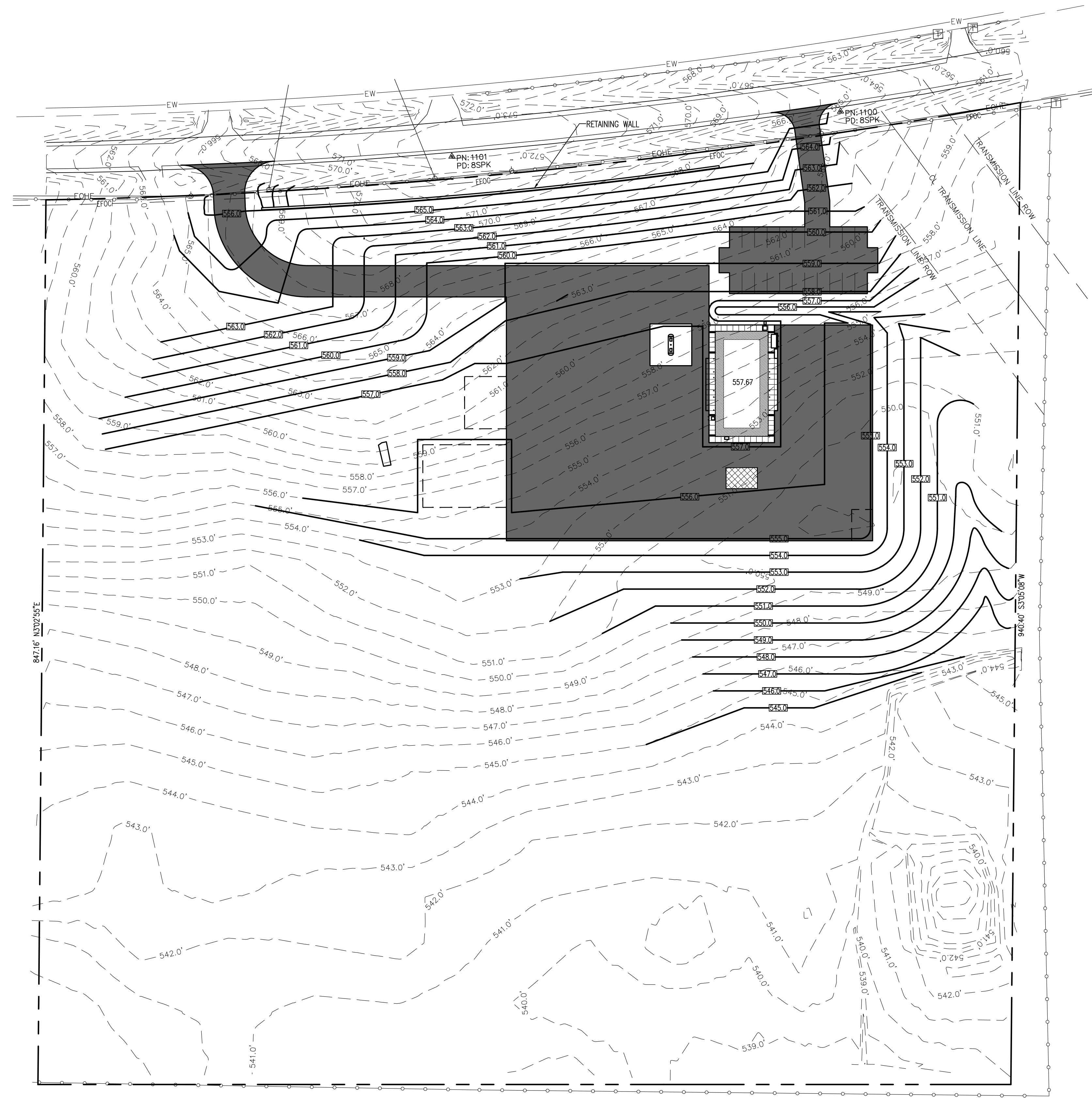
Paul Tinsley
Materials Engineer

RPT:yz:mlg:mbb:pwc
Attachments

Attachment A



DATE: OCT. 16, 2024
JOB NO: ??????????
DRAWN BY: K.C.
REVISIONS:



SITE LEGEND

- 100— EXISTING CONTOURS
- 100— NEW CONTOURS
- — — SILT FENCE



Attachment B

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
6	AR			
JOB NO.		040965		
PLAN OF BORINGS				



PLAN OF BORINGS	
SEBASTIAN CO. AREA HEADQUARTERS (GREENWOOD) (S) SEBASTIAN COUNTY	
JOB NO. 040965	SHEET 1/1

**ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. 1
PAGE 1 OF 1

JOB NO. 040965 Sebastian County
JOB NAME: Sebastian Co. Area Headquarters (Greenwood) (S)

DATE: October 29, 2024
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: Acker 1

STATION:
LOCATION: SE Corner of Proposed Building Location
LOGGED BY: Brad McCollum

HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 30.1

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)										PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
					PL	10	20	30	40	50	60	70	LL					
			SURFACE ELEVATION:															
5			Moist, Medium Stiff, Reddish Brown Sandy Lean Clay	- CL											66	4 3-3		
			Moist, Stiff, Reddish Brown Sandy Lean Clay	- CL											63	4 5-8		
10			Moist, Medium Dense, Reddish Brown Sandy Silt	- ML											62	7 8-8		
			Moist, Very Stiff, Reddish Brown Sandy Silty Clay	- CL-ML											61	5 7-9		
15			SANDSTONE - Weathered with Highly Weathered Seams and Layers, Cemented, Frequent Fractures, Brown and Gray													35 (1")	80	58
			The soil in this zone likely washed away during drilling and there was no sample recovery														52	18
20			SANDSTONE WITH OCCASIONAL TO FREQUENT SHALE PARTINGS AND SEAMS - Slightly Weathered, Well Cemented, Occasional Fractures, Gray	-													100	80
25			SHALE WITH INTERBEDDED SANDSTONE - Unweathered, Hard, Gray														98	98
30			Boring Terminated															
35																		

REMARKS: Lat: 35.193632, Long: -94.359915

**ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SECTION**

BORING NO. 2
PAGE 1 OF 1

JOB NO. 040965 Sebastian County
JOB NAME: Sebastian Co. Area Headquarters (Greenwood) (S)

DATE: October 29, 2024
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: Acker 1

STATION:
LOCATION: NW Corner of Proposed Building Location
LOGGED BY: Brad McCollum

HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 24.8

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)											PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D	
					PL	10	20	30	40	50	60	70	LL							
			SURFACE ELEVATION:																	
5		X	Dry, Very Dense, Brown Silty Sand with Some Rock Fragments (Completely Weathered Sandstone)	SM	•												32	14 35-45		
		X	Dry, Very Dense, Brown Silty Sand with Rock Fragments (Completely Weathered Sandstone)	SM	•												43	45 (11")		
10		X	SANDSTONE - Slightly Weathered with Highly Weathered Seams and Layers, Cemented, Frequent Fractures, Brown and Gray															65 (7")	77	20
15		X	SANDSTONE WITH OCCASIONAL SHALE SEAMS AND LAYERS - Slightly Weathered with Weathered Seams and Layers, Cemented, Occasional Fractures, Gray																86	30
20		X	SANDSTONE WITH INTERBEDDED SHALE - Unweathered, Well Cemented, Gray																100	100
25		X	SHALE WITH INTERBEDDED SANDSTONE - Unweathered, Medium Hard, Gray																100	100
30			Boring Terminated																	
35																				

REMARKS: Lat: 35.193900, Long: -94.360046

**ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SECTION**

BORING NO. 3
PAGE 1 OF 1

JOB NO. 040965 Sebastian County
JOB NAME: Sebastian Co. Area Headquarters (Greenwood) (S)

DATE: October 29, 2024
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: Acker 1

STATION:
LOCATION: Proposed Salt Dome Location
LOGGED BY: Brad McCollum

HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 29.9

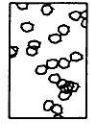
DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)						PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
					PL					LL				
			SURFACE ELEVATION:											
5			Fill Soil Consisting of Dry, Loose, Gray Siltstone/Shale Fragments								4 3-3			
			Moist, Medium Stiff, Reddish Brown Sandy Lean Clay	CL							61 3 4-3			
			Moist, Very Stiff, Reddish Brown Sandy Lean Clay	CL							65 4 5-15			
10			SANDSTONE								20 (5")			
15			SANDSTONE - Slightly Weathered with Highly Weathered Seams and Layers, Well Cemented, Frequent Fractures, Brown									62	0	
20			SANDSTONE WITH FREQUENT SHALE PARTINGS AND SEAMS - Slightly Weathered to Unweathered, Well Cemented, Frequent Fractures, Gray									98	62	
25			SANDSTONE WITH INTERBEDDED SHALE - Unweatherd, Well Cemented, Frequent Fractures, Gray									100	70	
30			SHALE WITH OCCASIONAL SANDSTONE PARTINGS AND SEAMS - Unweathered, Medium Hard, Gray SHALE - Unweathered, Medium Hard, Gray									100	98	
			Boring Terminated											
35														

REMARKS: Lat: 35.193564, Long: -94.361073

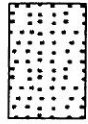
LEGEND

SOIL TYPES

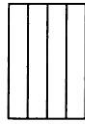
(SHOWN IN SYMBOL COLUMN)
(PREDOMINANT TYPE SHOWN HEAVY)



GRAVEL



SAND



SILT



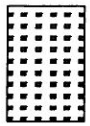
CLAY



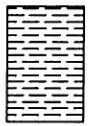
ORGANIC
MATTER

ROCK TYPES

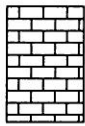
(SHOWN IN SYMBOL COLUMN)



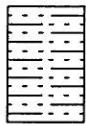
SANDSTONE



SHALE
or
SILTSTONE



LIMESTONE
or
DOLOMITE



ALTERNATING
LAYERS of
SHALE and
SANDSTONE



OTHER

SAMPLER TYPES

(SHOWN IN SAMPLE COLUMN)

SHELBY TUBE



UNDISTURBED
SAMPLE
RECOVERY

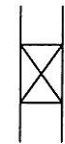


DISTURBED
SAMPLE
RECOVERY

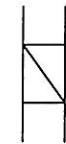


NO
RECOVERY

SPLIT SPOON

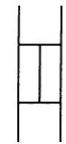


SAMPLE
RECOVERY



NO
RECOVERY

ROCK CORING



% RECOVERY
INDICATED ON LOGS

TERMS DESCRIBING CONSISTENCY OR CONDITION

GRANULAR SOIL		CLAY		CLAY-SHALE		SHALE	
*N' Value	Density	*N' Value	Consistency	*N' Value	Consistency	*N' Value	Consistency
0-4	Very Loose	0-1	Very Soft	0-1	Very Soft		
5-10	Loose	2-4	Soft	2-4	Soft	31-60	Soft
11-30	Medium Dense	5-8	Medium Stiff	5-8	Medium Stiff	Over 60	
31-50	Dense	9-15	Stiff	9-15	Stiff	More than 2'	
Over 50	Very Dense	16-30	Very Stiff	16-30	Very Stiff	Penetration	
		31-60	Hard	31-60	Hard	in 60 Blows: Medium Hard	
		Over 60	Very Hard	Over 60	Very Hard	Less than 2'	
						Penetration	
						in 60 Blows: Hard	

1. Ground water elevations indicated on boring logs represent ground water elevations at date or time shown on boring log. Absence of water surface implies that no ground water data is available but does not necessarily mean that ground water will not be encountered at locations or within the vertical reaches of these borings.
2. Borings represent subsurface conditions at their respective locations for their respective depths. Variations in conditions between or adjacent to boring locations may be encountered.
3. Terms used for describing soils according to their texture or grain size distribution are in accordance with the Unified Soil Classification System.

Standard Penetration Test – Driving a 2.0" O.D., 1-3/8" I.D. sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and performing the test are recorded for each 6 inches of penetration on the drill log. The field "N" Value (N_f) can be obtained by

adding the bottom two numbers for example: $\frac{6}{8-9} \Rightarrow 8+9 = 17 \text{blows/ft}$. The "N" Value corrected to 60%

efficiency (N_{60}) can be obtained by multiplying N_f by the hammer correction factor published on the boring log.



ROCK CORE PHOTO

Job No.:040965

Job Name: District 4 Area Headquarters



040965 B1
Southeast Corner of AHQ
Depth: 12.6 - 20.1



ROCK CORE PHOTO

Job No.:040965

Job Name: District 4 Area Headquarters



040965 B1
Southeast Corner of AHQ
Depth: 20.1 - 30.1



ROCK CORE PHOTO

Job No.:040965

Job Name: District 4 Area Headquarters



040965 B2
Northwest Corner of AHQ
Depth: 7.6 – 14.8



ROCK CORE PHOTO

Job No.:040965

Job Name: District 4 Area Headquarters



040965 B2
Northwest Corner of AHQ
Depth: 14.8 - 24.8



ROCK CORE PHOTO

Job No.:040965

Job Name: District 4 Area Headquarters



040965 B3
Salt Dome Location
Depth: 10.4 – 19.9

Attachment C



SITE PICTURES

Job No.: 040965

Job Name: Sebastian County Area Headquarters



Looking south at proposed salt dome location (November 2024).

SITE PICTURES

Job No.: 040965

Job Name: Sebastian County Area Headquarters



Looking south at abandoned coal shaft entry (November 2024)

SITE PICTURES

Job No.: 040965

Job Name: Sebastian County Area Headquarters



Looking south into abandoned coal shaft just south of proposed salt dome location (November 2024)



SITE PICTURES

Job No.: 040965

Job Name: Sebastian County Area Headquarters



Looking south at proposed storage building location (November 2024)

SITE PICTURES

Job No.: 040965

Job Name: Sebastian County Area Headquarters



Looking west at southeast corner of proposed AHQ building location (November 2024)



SITE PICTURES

Job No.: 040965

Job Name: Sebastian County Area Headquarters



Piles of dark soil located across the project location (November 2024)