January 16, 2023

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
FAX (719) 531-5238

BB Kern Designs, LLC
P.O. Box 10081
Colorado Springs, CO 80932

Attn: Bernie Kern

Re: Subsurface Soil Investigation – Gas Pumps and Canopies
4815 Yucatan Drive
Colorado Springs, Colorado
Entech Job No. 222397

Dear Mr. Kern:

Personnel of Entech Engineering, Inc. have drilled two shallow test borings for the proposed gas pumps and canopies at the address referenced above. A Vicinity Map is presented in Figure No. 1. This letter presents the results of our soils investigation, laboratory testing, and construction recommendations.

FIELD INVESTIGATION AND LABORATORY TESTING PROGRAM:

The project will consist of the construction of two canopies for gas pumps at the above referenced site. The site is currently a relatively flat paved parking lot with an existing convenience store. The subsurface conditions in the vicinity of the proposed gas pump canopies were investigated by drilling one exploratory test boring in each canopy footprint. The approximate location of the test boring is indicated on the Site Plan/Test Boring Location Map, Figure 2.

The test borings were advanced with a power-driven, continuous-flight, auger drill rig to a depth of 20 feet below the existing ground surface (bgs). Samples were obtained during drilling using the Standard Penetration Test, ASTM D-1586, utilizing a California sampler. Results of the Standard Penetration Tests are shown on the Test Boring Logs, which are presented in Appendix A.

Moisture Content, ASTM D-2216, was obtained in the laboratory for all recovered samples. Grain-Size, ASTM D-422 and Atterberg limits, ASTM D-4318 were determined on samples for the purpose of classification and to determine engineering characteristics. Sulfate Testing was also performed to evaluate the soils potential for below grade concrete degradation due to sulfate attack. Laboratory test results are presented in Appendix B.

SUBSURFACE CONDITIONS:

Two soil types were encountered during drilling. The soils consisted of Type 1: silty to slightly silty sand fill (SM-SW, SM) and Type 2: native clean to silty sand (SW). The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1 classified as silty to slightly silty sand fill (SM, SM-SW). The sand fill was encountered below a thin layer of asphalt in Testing Boring No. 1 and just off the edge of asphalt in Test Boring No. 2 and extended to depths of 6 to 8 feet bgs. Standard

Penetration Testing resulted in N-values of 5 to 10 blows per foot (bpf), indicating loose to medium dense states. Moisture content and grain size testing resulted in approximately 4 to 7 percent moisture content with 10 to 21 percent of the soil passing the No. 200 sieve. Atterberg Limits testing resulted in a liquid limit of no value and a plasticity index of non-plastic The sand fill is anticipated to exhibit low expansion potential and sulfate testing resulted in 0.02 percent soluble sulfate be weight, which indicates a negligible potential for below grade concrete degradation.

Soil Type 2 classified as native clean to silty sand (SW, SM). The native sand was encountered at depths of 6 to 8 feet extending to the termination of the test borings (20 feet). Standard Penetration Testing resulted in N-values of 7 to 24, indicating loose to medium dense states. Moisture content and grain size testing resulted in approximately 2 to 8 percent moisture content with approximately 2 percent of the soil passing the No. 200 sieve.

Fill was encountered on the site. The fill is to be considered uncontrolled and must be reworked or penetrated to underlying native soils.

Groundwater was not encountered in the boring during or at the conclusion of drilling. Groundwater is not expected to not affect foundations on this site. It should be noted that groundwater levels can change due to seasonal variations, changes in land runoff characteristics and development of nearby areas.

SPECIAL CONSIDERATIONS:

Silty sand fill was encountered in the test borings at the existing ground surface and extending to a depths of 6 to 8 feet bgs. Clean to silty native sand was encountered below the fill and extended to the termination of the test boring (20 feet). The foundation should rest on compacted structural fill or native site sands. Any uncontrolled fill if encountered should be penetrated to native materials on this site.

An allowable bearing capacity of 1500 psf is anticipated for the native sand, whereas an allowable bearing capacity of 2000 is anticipated for the structural fill. An equivalent hydrostatic fluid pressure (in the active state) of 45 pcf is recommended for this site. Excavation of the site materials should be moderate with rubber-tired equipment.

FOUNDATION TYPE:

A shallow pier foundation system or column pads bearing on recompacted onsite sand is anticipated for this site. Point load bearing pads should be sized for the allowable bearing capacity given. **This does not constitute a foundation design.** Qualified personnel should verify that building loads do not exceed the bearing value given in this letter. The bottoms of exterior foundations should be located at least 30 inches below finished grade for frost protection. A drilled pier foundation system or column pads bearing on reworked onsite sand is recommended to support the roof canopies. Drilled piers should extend beyond the fill soils encountered to the underlying native sands. Pier lengths of 8 to 10 feet are anticipated. Pier or pad reinforcing steel should be designed

based on the pier diameter and the expected maximum anticipated compressive loads. Closely spaced piers should be avoided. To avoid reduction of pier capacity, piers should be separated by a minimum of 4 pier diameters. Pier holes should be cleaned prior to placing concrete. Concrete should be placed in the pier holes shortly after they have been drilled, cleaned and observed. Personnel from Entech Engineering Inc should observe the drilling of piers and the placement of the reinforcing steel and concrete.

REINFORCING:

Reinforcing should be designed to permit foundation walls to span a minimum of 10 feet under the design load. Foundation walls retaining over 4 feet of soil should be designed to resist an equivalent fluid pressure (in the active state) of 45 pcf. Expansive soils should not be used as a foundation backfill.

FLOOR SLABS:

Floor slabs placed on uncontrolled fill should be expected to experience movement. Penetration and replacement of unsuitable soils, is recommended to minimize slab movement. Floor slabs on grade, if any should be separated from structural portions of the building and allowed to float freely. Interior partitions must be constructed in such a manner that they do not transmit floor slab movement to the roof or overlying floor. Backfill placed below floor slabs should be compacted to a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557.

DRAINAGE AND GRADING:

The ground surface must be sloped away from the canopies to provide positive drainage away from the foundation. We recommend an equivalent slope of 6 inches in the first 10 feet (5%) surrounding the structure, where possible, or as required to quickly remove surface water. Where a 5% slope cannot be achieved practically, such as around patios, at inside foundation corners, and between the building and nearby sidewalk, we believe it is desirable to establish as much slope as possible and to avoid irrigation in the area. Roof downspouts should discharge beyond the limits of backfill. We recommend providing splash blocks and downspout extensions to discharge runoff beyond the limits of backfill.

SUBDRAIN:

A subsurface drain will not be required, providing proper surface grading is maintained and the backfill is properly compacted.

BACKFILL:

Backfill should be compacted to 95% of its maximum Modified Proctor Dry Density, ASTM D-1557. Backfill must be compacted by mechanical means. No water flooding techniques of any type should be used in the compaction of backfill on this site. Expansive soils are not to be used as foundation backfill.

CONCRETE:

Type II cement is recommended for all concrete on this site. Concrete should not be placed on frozen or wet ground. Care should be taken to prevent the accumulation and ponding of water in the footing excavation prior to the placement of concrete. If standing water is present in the excavation, it should be removed by installing sumps and pumping the water away from the building area. If concrete is placed during periods of cold temperatures, the concrete must be kept from freezing. This may require covering the concrete with insulated blankets and heating to prohibit freezing.

OPEN FOUNDATION OBSERVATION:

The open foundation excavation should be observed prior to construction of the foundation in order to verify that no anomalies are present, that materials at the proper design bearing capacity have been encountered, and that no soft spots or debris are present in the foundation area.

CLOSING:

The recommendations provided in this letter are based upon the observed soil parameters, anticipated foundation loads, and accepted engineering procedures. The recommendations are intended to minimize differential movement resulting from the heaving of expansive soils or resulting from settlement induced by the application of building loads. It must be recognized that the foundation may undergo movement. In addition, concrete floor slabs may experience movement. Owners should be apprised of the soil conditions and advised to maintain good practice in the future with regard to surface and subsurface drainage, and finish work above floor slabs, etc.

We trust this has provided you with the information you required. If you have any questions or need additional information, please do not hesitate to contact us.

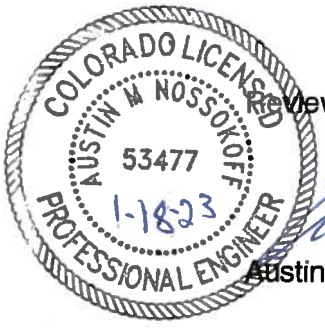
Respectfully Submitted,

ENTECH ENGINEERING, INC.

Stuart Wood

AMN/jr

Encl.
AAprojects/2022/222397 ssi – Gas Pumps and Canopies



Reviewed by:

Austin M. Nossokoff, P.E.

TABLE

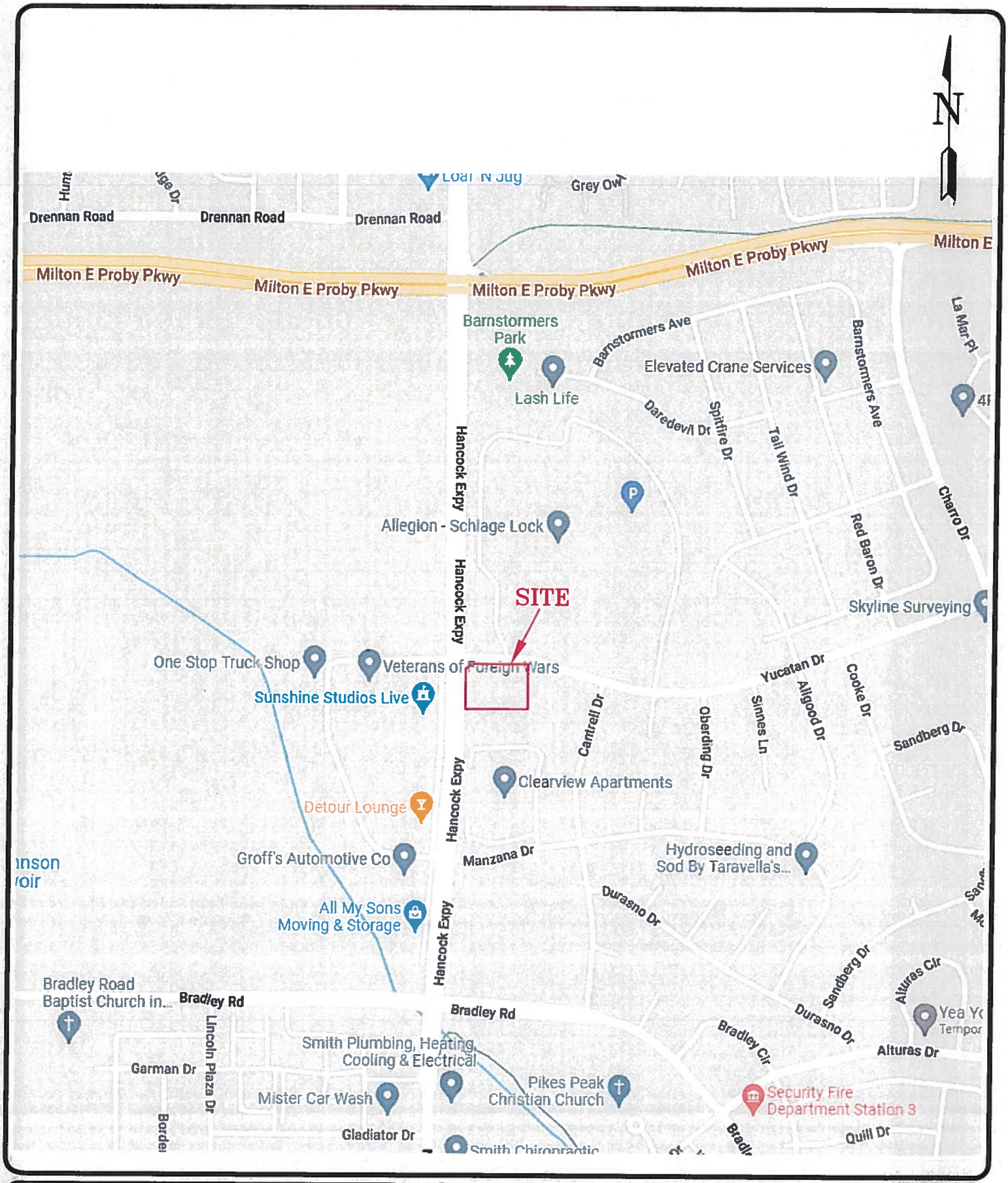
TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT BBKERN DESIGNS
PROJECT 4815 YUCATAN DRIVE
JOB NO. 222397

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	2-3			9.6						SM-SW	FILL, SAND, SLIGHTLY SILTY
1	2	5			20.5	NV	NP	0.02			SM	FILL, SAND, SILTY
2	1	10			2.2	NV	NP	0.00			SW	SAND

FIGURES



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COLORADO SPRINGS, CO. 80907 (719) 531-5599

VICINITY MAP
4815 YUCATAN DRIVE
COLORADO SPRINGS, CO
FOR: BBKern DESIGNS, LLC

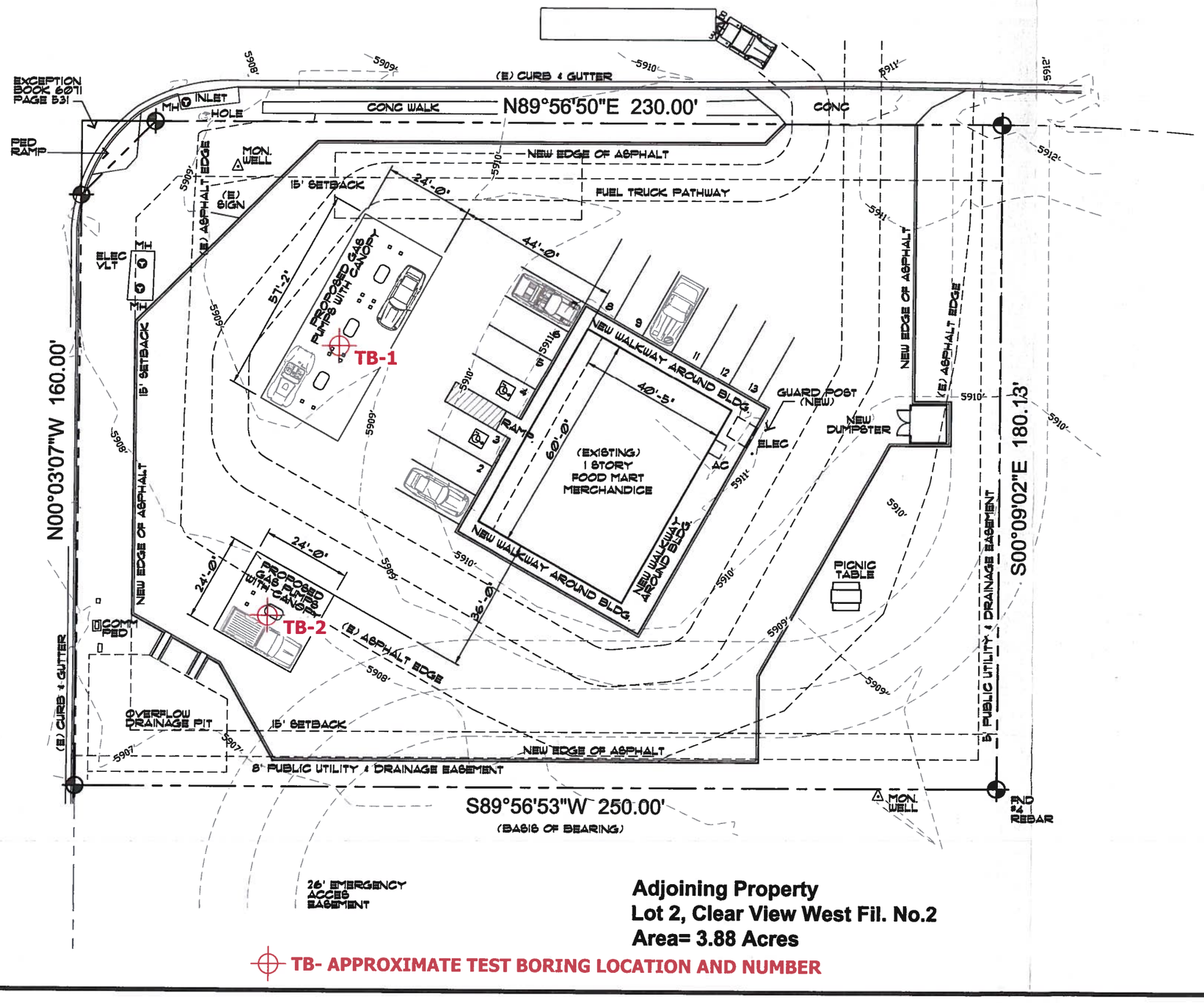
DRAWN:	DATE:	CHECKED:	DATE:
JAC	1/16/23	DPS	1-17-23

JOB NO.: 222397

FIG NO.: 1

YUCATAN DRIVE

HANCOCK EXPY



Lot 1
Clear View West
Fil. No.2
Area= 44,800 SQ.FT. +/-

Adjoining Property
Lot 2, Clear View West Fil. No.2
Area= 3.88 Acres

TB- APPROXIMATE TEST BORING LOCATION AND NUMBER

REVISION	BY

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TEST BORING LOCATION MAP
4815 YUCATAN DRIVE
COLORADO SPRINGS, CO.
FOR: BBKern DESIGN, LLC

DRAWN	JAC
CHECKED	DPS
DATE	1/16/23
SCALE	1"=30'
JOB NO.	222397
FIGURE No.	2

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 1/4/2023
Job # 222397

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 1/5/23						
3" ASPHALT, FILL 0-6', SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, BROWN, LOOSE, MOIST				8	5.9	1
	5			9	6.8	1
SAND, CLEAN TO SILTY, FINE TO COARSE GRAINED, TAN, LOOSE TO MEDIUM DENSE, MOIST	10			7	1.5	2
	15			11	4.8	2
	20			23	8.1	2

TEST BORING NO. 2
DATE DRILLED 1/4/2023
CLIENT BBKERN DESIGNS
LOCATION 4815 YUCATAN DRIVE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 1/5/23						
FILL 0-8', SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE TO LOOSE, MOIST				10	4.0	1
	5			5	6.8	1
SAND, CLEAN TO SILTY, FINE TO COARSE GRAINED, TAN, LOOSE TO MEDIUM DENSE, MOIST	10			11	4.2	2
	15			9	4.9	2
	20			24	6.7	2

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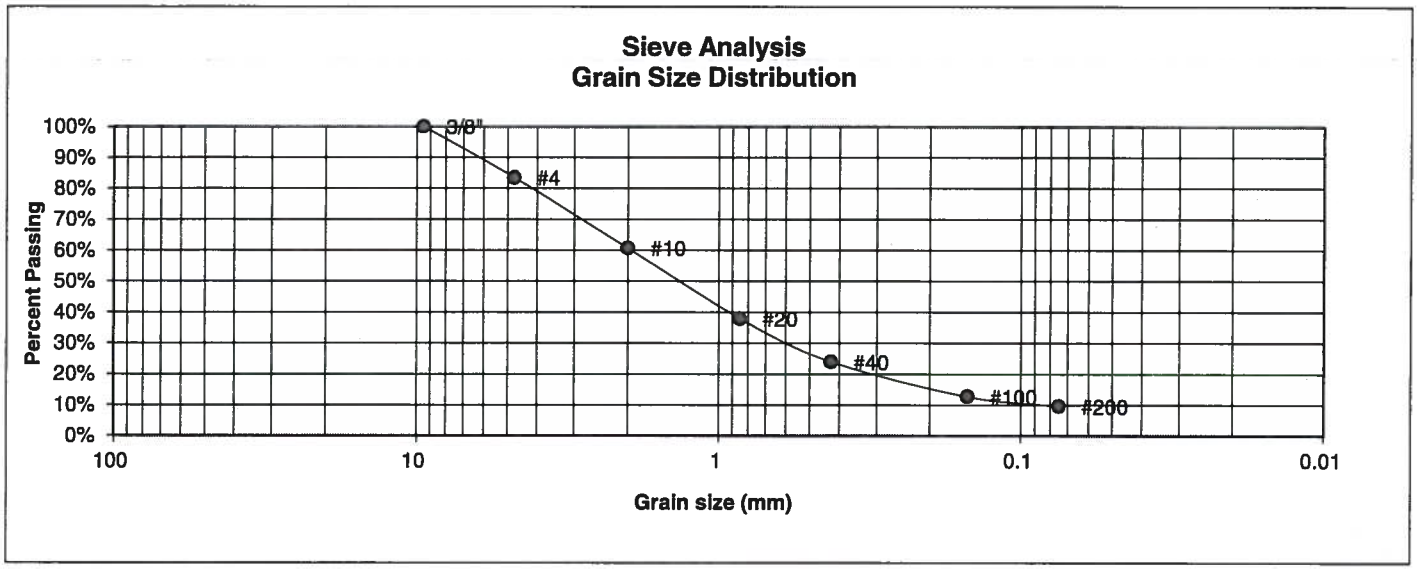
TEST BORING LOG

DRAWN:	DATE:	CHECKED: SW	DATE: 1-17-23

JOB NO.: 222397
FIG NO.: A- 1

APPENDIX B: Laboratory Testing Results

UNIFIED CLASSIFICATION	SM-SW	CLIENT	BBKERN DESIGNS
SOIL TYPE #	1	PROJECT	4815 YUCATAN DRIVE
TEST BORING #	1	JOB NO.	222397
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	83.4%
10	60.7%
20	37.9%
40	23.9%
100	12.7%
200	9.6%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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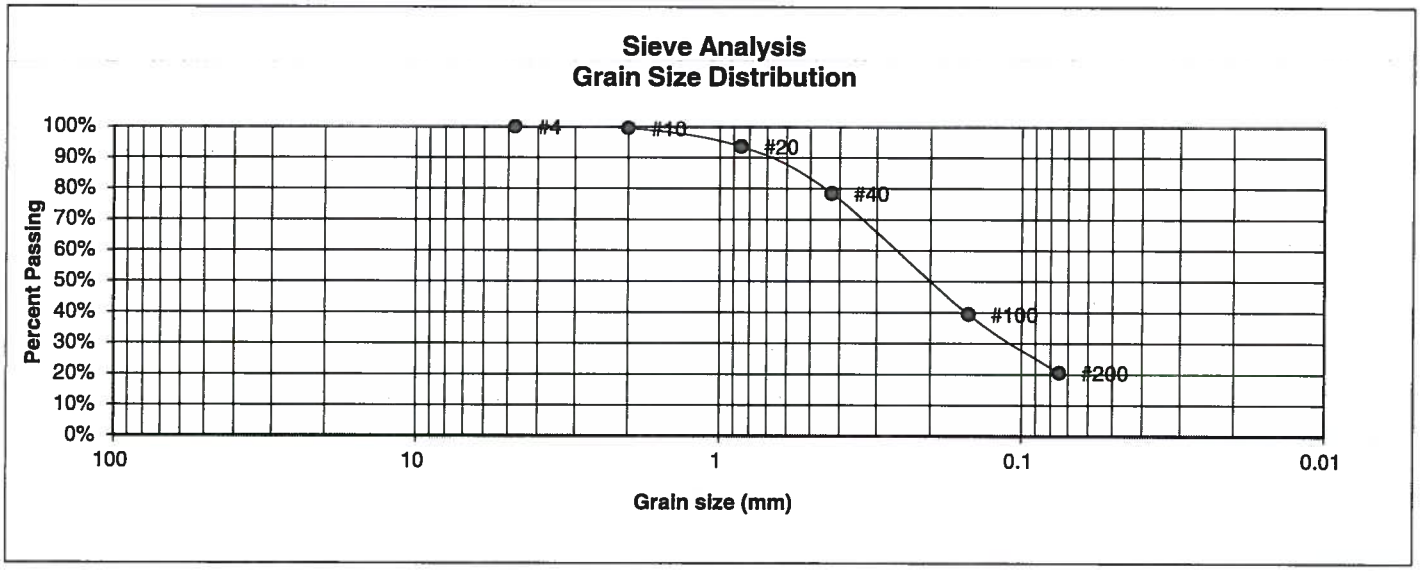
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: SW	DATE: 1-17-23

JOB NO.: 222397

FIG NO.: B-1

UNIFIED CLASSIFICATION	SM	CLIENT	BBKERN DESIGNS
SOIL TYPE #	1	PROJECT	4815 YUCATAN DRIVE
TEST BORING #	2	JOB NO.	222397
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.6%
20	93.5%
40	78.4%
100	39.4%
200	20.5%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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LABORATORY TEST RESULTS

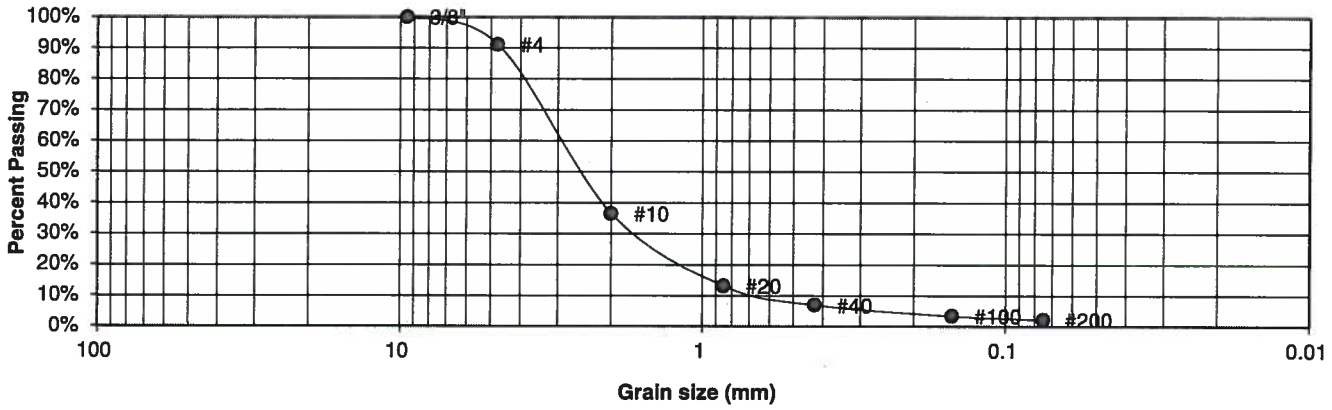
DRAWN:	DATE:	CHECKED: SW	DATE: 1-17-23

JOB NO.: 222397

FIG NO.: B-2

UNIFIED CLASSIFICATION	SW	CLIENT	BBKERN DESIGNS
SOIL TYPE #	2	PROJECT	4815 YUCATAN DRIVE
TEST BORING #	1	JOB NO.	222397
DEPTH (FT)	10	TEST BY	BL

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	91.1%
10	36.5%
20	13.2%
40	7.0%
100	3.5%
200	2.2%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: SW	DATE: 1-17-23

JOB NO.: 222397

FIG NO.: B-3

CLIENT	BBKERN DESIGNS	JOB NO.	222397
PROJECT	4815 YUCATAN DRIVE	DATE	1/10/2023
LOCATION	4815 YUCATAN DRIVE	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	10	2	SW	0.00
TB-2	5	1	SM	0.02

QC BLANK PASS

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LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		SW	1-17-23

JOB NO.: 222397

FIG NO.: B-4