September 16, 2021

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

Corral Ranch Development Company
c/o Howard Kunstle
1830 Coyote Point Drive
Colorado Springs, CO 80904

APPROVED
Engineering Department
10/21/2021 11:40:57 AM
dsdnijkamp
EPC Planning & Community
Development Department

Attn: Mr. Dave Jones

Re: Gravel Roadway Recommendations – Hoofprint Road and Solberg Court
The Reserve at Corral Ranch, Filing No. 3
El Paso County, Colorado

Dear Mr. Jones:

As requested, Entech Engineering, Inc. obtained samples of the roadway subgrade soils from the proposed roadway sections at the above referenced subdivision. Laboratory testing was performed in order to determine the support characteristics of the soil. This letter presents the results of the laboratory testing and gravel recommendations for the roadway.

Project Description

The project will consist of gravel sections for Hoofprint Road and Solberg Court located in The Reserve at Corral Ranch, Filing No. 3 subdivision. A Subsurface Soil Investigation and laboratory testing were performed to determine the support characteristics for the site subgrade soils. The general layout of the roadways within the filing are presented in the Test Boring Location Map, Figure 1.

Subgrade Conditions

Seven exploratory test borings were drilled along the roadway alignment to depths of approximately 5 to 10 feet. Sieve Analysis and Atterberg Limits were performed on selected soil samples obtained from the test borings for the purpose of classification. Sieve analyses performed on the native sandy clay and very clayey sand (Soil Type 1) indicated 36 to 68 percent of the soil size particles passing the No. 200 sieve, and 30 percent passing for the clayey sand soils (Soil Type 2). Atterberg Limit Testing performed on the native sandy clay and very clayey sand resulted in Liquid Limits ranging from 31 to 42 and Plastic Indexes from 14 to 20. Atterberg Limit Testing performed on the clayey soils resulted in a Liquid Limit of 38 and a Plastic Index of 21. The subgrade soils classify as A-6 and A-7-6 (Soil Type 1) and as A-2-6 (Soil Type 2) based on the AASHTO classification system. Soil Type 1 typically provides poor roadway support and Soil Type 2 typically provides fair roadway support characteristics. The pavement section was calculated using the Type 1 testing data, as it was encountered in the majority of the test borings. Sulfate testing indicated that the soils exhibit a negligible potential for sulfate attack. Groundwater was not encountered in the test borings drilled in the filing. The subgrade was encountered at medium dense states for the sand and stiff to hard consistencies for the clay. The Test Boring Logs are presented in Appendix A.

Swell/Consolidation testing was required on the cohesive subgrade soils based on their AASHTO classification. Volume changes ranged between 1.0 and 6.1 percent. The swells are above the limit in which mitigation for expansive soils is required (below 2.0%).

California Bearing Ratio (CBR) testing was performed on a representative soil sample to determine the support characteristics of the subgrade soils. The laboratory test results are presented in Appendix B in Table 1 and are summarized as follows:

Soil Type 1 – Very Sandy Clay
CBR #1
R @ 90% = 1.0
R @ 95% = 6.0
Use R = 6.0 for design

Classification Testing

Liquid Limit	34
Plasticity Index	14
Percent Passing 200	59.9
AASHTO Classification	A-6
Group Index	6
Unified Soils Classification	CL

Typical design parameters used in the gravel section analysis for the project are as follows:

Reliability	75%
Serviceability Index	2.0
"R" Value Subgrade (Soil Type 1)	6.0

Gravel Road Design Parameters

The CBR test results were used to determine the required gravel sections for the roadway alignments. The gravel section was determined using the design criteria in the El Paso County Engineering Criteria Manual. An 18k ESAL value of 36,500 is used for rural local (Low-Volume) roads.

The gravel sections recommended is summarized as follows:

Pavement Sections – Soil Type 1
8" of Gravel

Mitigation

Mitigation for expansive soils will be required for this filing of The Reserve at Corral Bluffs based on the laboratory testing. Mitigation of the subgrade soils will consist of scarification and moisture conditioning. To provide a uniform roadway subgrade, it is recommended that the subgrade soils be scarified to a depth of 12 inches and be moisture-conditioned and recompacted. Personnel of Entech Engineering, Inc. should be on site to verify and test the conditioned and recompacted subgrade during the subgrade preparation. Density testing should be performed on all fill placed within the roadway alignments.

Roadway Construction

Prior to placement of the gravel, the subgrade should be scarified, moisture-conditioned, compacted to a minimum of 95% of its maximum Standard Proctor Dry Density, ASTM D-698 at 0 to 4 percent over optimum moisture content and proofrolled after properly compacted. Any

soft areas should be removed and replaced with suitable materials approved by Entech. The gravel placed for the roadway should be well compacted. The roads should be crowned and graded so as to prevent ponding. Special attention should be given to areas adjacent to manholes, inlet structures and valves.

If significant grading is performed, the soils at subgrade may change. Modification to the gravel sections should be evaluated after site grading is completed.

In addition to the above guidance the gravel materials, subgrade conditions, compaction of materials, testing, inspections, roadway construction methods, and recommended maintenance programs shall meet the latest version of the El Paso County Engineering Criteria Manual.

We trust that this has provided you with the information you required. The gravel sections provided are based on general site soil types. If you have any questions or need additional information, please do not hesitate to contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Reviewed by:

COLORADO LICENSED
JOSEPH COLLIN GOODE JR
23725
9/16/21
PROFESSIONAL ENGINEER

Daniel P. Stegman

Joseph C. Goode, Jr., P.E.
President

DPS/am

Entech Job No. 212172
F:\AA projects\2021\212172-Corral Eanch Dev-The Reserve at Corral Ranch Filing No 3-230-SSI\212172 gravel.doc

TABLE

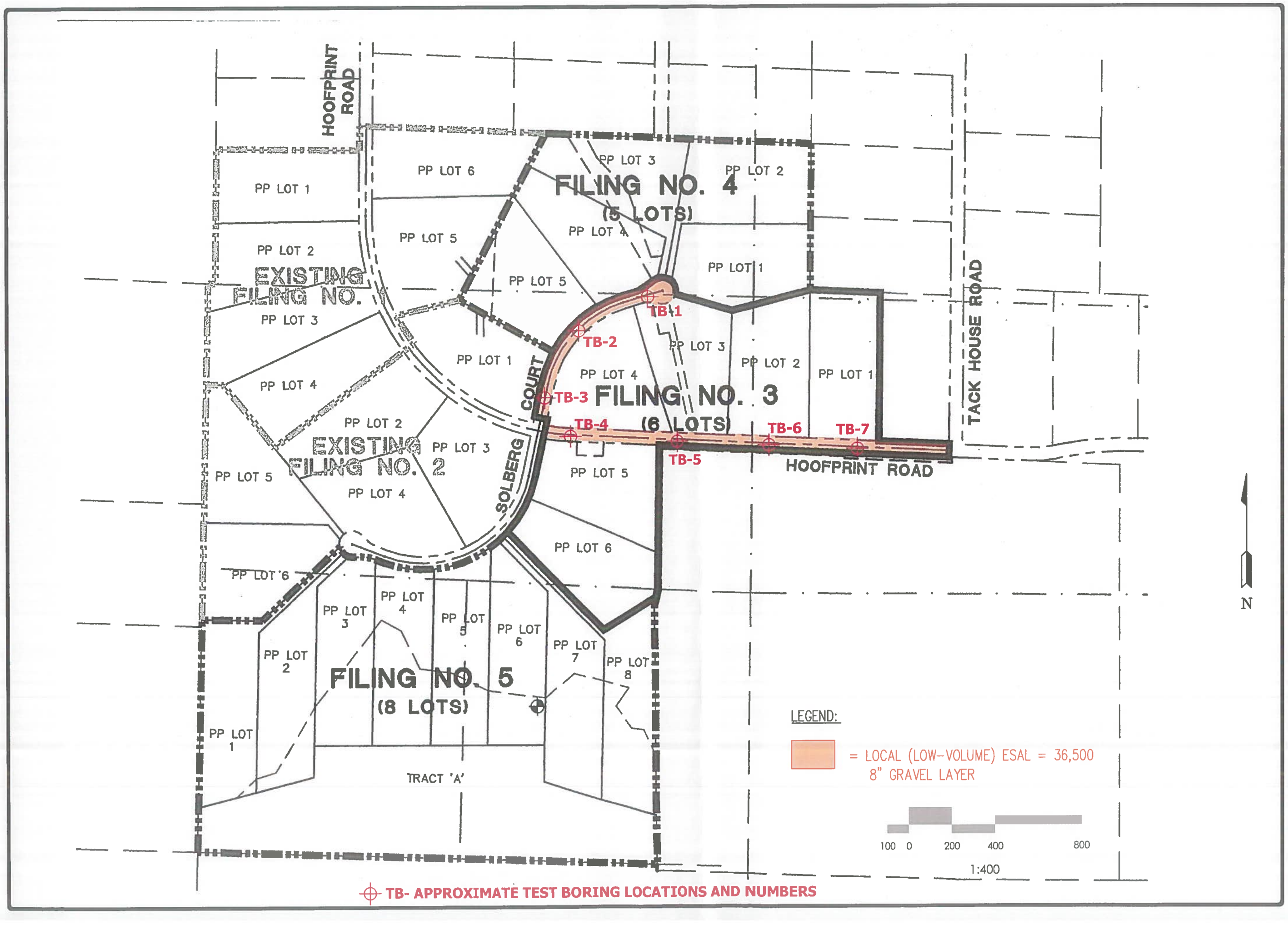
TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT CORRAL RANCH
PROJECT RESERVE AT CORRAL RANCH, F-3
JOB NO. 212172

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	AASHTO CLASS.	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1, CBR	1	0-3			59.9	34	14		A-6		CL	CLAY, VERY SANDY
1	1	1-2	8.7	96.4	63.2	31	14		A-6	2.0	CL	CLAY, SANDY
1	2	1-2	11.7	103.3	67.8	42	20		A-7-6	6.1	CL	CLAY, SANDY
1	3	1-2	7.2	95.8	62.9	35	16	0.00	A-6	1.0	CL	CLAY, SANDY
1	4	1-2	10.2	120.4	47.0	33	20		A-6	4.8	SC	SAND, VERY CLAYEY
1	5	1-2	11.2	103.0	51.8	32	15		A-6	5.5	CL	CLAY, VERY SANDY
1	6	1-2	7.0	97.7	35.8	35	19		A-6	3.6	SC	SAND, VERY CLAYEY
2	7	1-2	6.6	110.8	30.3	38	21		A-2-6	4.8	SC	SAND, CLAYEY

FIGURE



REVISION	BY

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

TEST BORING LOCATION MAP
THE RESERVE AT CORRAL RANCH F#3
EL PASO COUNTY, COLORADO
FOR: CORRAL RANCH DEV. CO. C/O HOWARD KUNSTLE

DRAWN	JAC
CHECKED	DPS
DATE	09/16/21
SCALE	1:400
JOB NO.	3121172
FIGURE No.	1

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 8/13/2021
Job # 212172

REMARKS

DRY TO 10', 8/13/21

CLAY, SANDY, TAN, STIFF TO VERY STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			24	7.5	1
5			44	10.3	1
10			30	9.7	1
15					
20					

TEST BORING NO. 2
DATE DRILLED 8/13/2021
CLIENT CORRAL RANCH
LOCATION RESERVE AT CORRAL RANCH, F-3

REMARKS

DRY TO 5', 8/13/21

CLAY, SANDY, TAN, STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			24	8.5	1
5			16	8.0	1
10					
15					
20					

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/14/21

JOB NO.: 212172
FIG NO.: A- 1

TEST BORING NO. 3
DATE DRILLED 8/13/2021
Job # 212172

REMARKS

DRY TO 5', 8/13/21

CLAY, SANDY, TAN, STIFF TO VERY STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			27	5.2	1
5			36	5.7	1
10					
15					
20					

TEST BORING NO. 4
DATE DRILLED 8/13/2021
CLIENT CORRAL RANCH
LOCATION RESERVE AT CORRAL RANCH, F-3

REMARKS

DRY TO 10', 8/13/21

SAND, VERY CLAYEY, FINE GRAINED, TAN, MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			18	8.9	1
5			26	4.9	1
10			24	5.2	1
15					
20					

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED: DS	DATE: 9/14/21

JOB NO.: 212172
FIG NO.: A- 2

TEST BORING NO. 5
DATE DRILLED 8/13/2021
Job # 212172

REMARKS

DRY TO 5', 8/13/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	CLAY, VERY SANDY, BROWN, STIFF TO FIRM, MOIST				
			19	7.5	1
5			10	9.0	1
10					
15					
20					

TEST BORING NO. 6
DATE DRILLED 8/13/2021
CLIENT CORRAL RANCH
LOCATION RESERVE AT CORRAL RANCH, F-3

REMARKS

DRY TO 5', 8/13/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, VERY CLAYEY, FINE GRAINED, TAN, DENSE, MOIST				
			36	5.8	1
5			30	4.6	1
10					
15					
20					

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED: JS	DATE: 9/14/21

JOB NO.: 212172
FIG NO.: A- 3

TEST BORING NO. 7
DATE DRILLED 8/13/2021
Job # 212172

REMARKS

DRY TO 5', 8/13/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, CLAYEY, FINE TO MEDIUM GRAINED, TAN, DENSE TO MEDIUM DENSE, MOIST		32	4.6	2
5			21	5.6	2
10					
15					
20					

TEST BORING NO.
DATE DRILLED
CLIENT CORRAL RANCH
LOCATION RESERVE AT CORRAL RANCH, F-3

REMARKS

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5					
10					
15					
20					

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

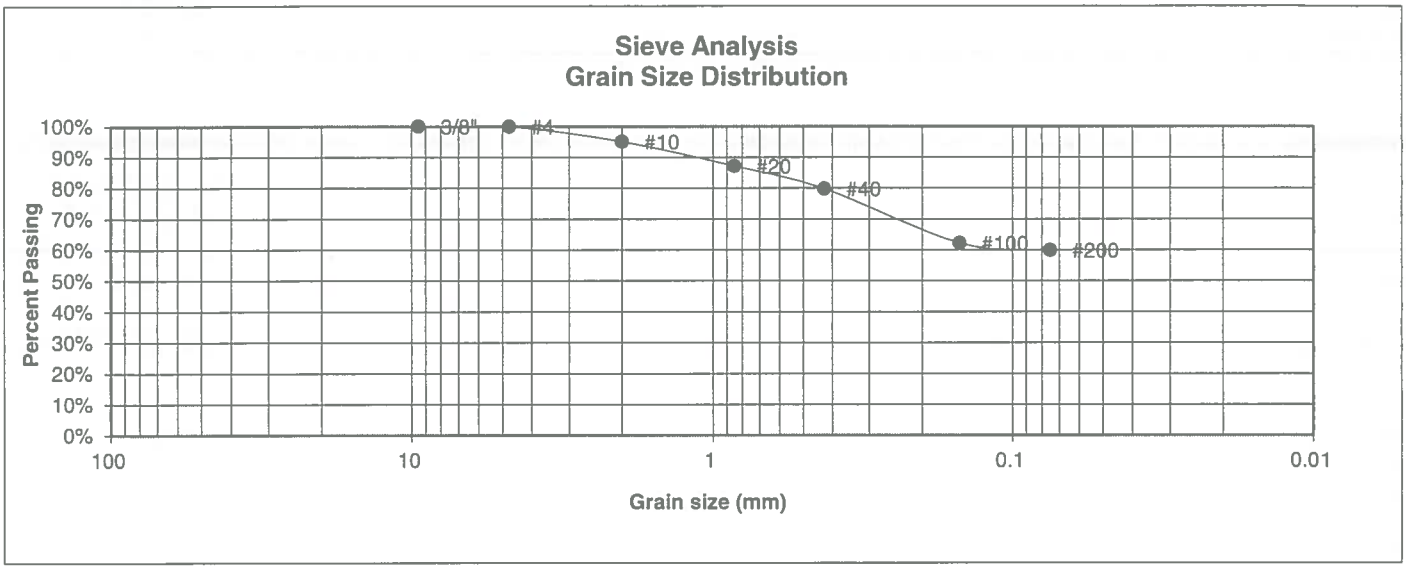
TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/14/21

JOB NO.: 212172
FIG NO.: A- 4

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	CL	CLIENT	CORRAL RANCH
SOIL TYPE #	1, CBR	PROJECT	RESERVE AT CORRAL RANCH, F-3
TEST BORING #	1	JOB NO.	212172
DEPTH (FT)	0-3	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	6



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.9%
10	95.0%
20	87.1%
40	79.8%
100	62.2%
200	59.9%

Atterberg Limits	
Plastic Limit	19
Liquid Limit	34
Plastic Index	14

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

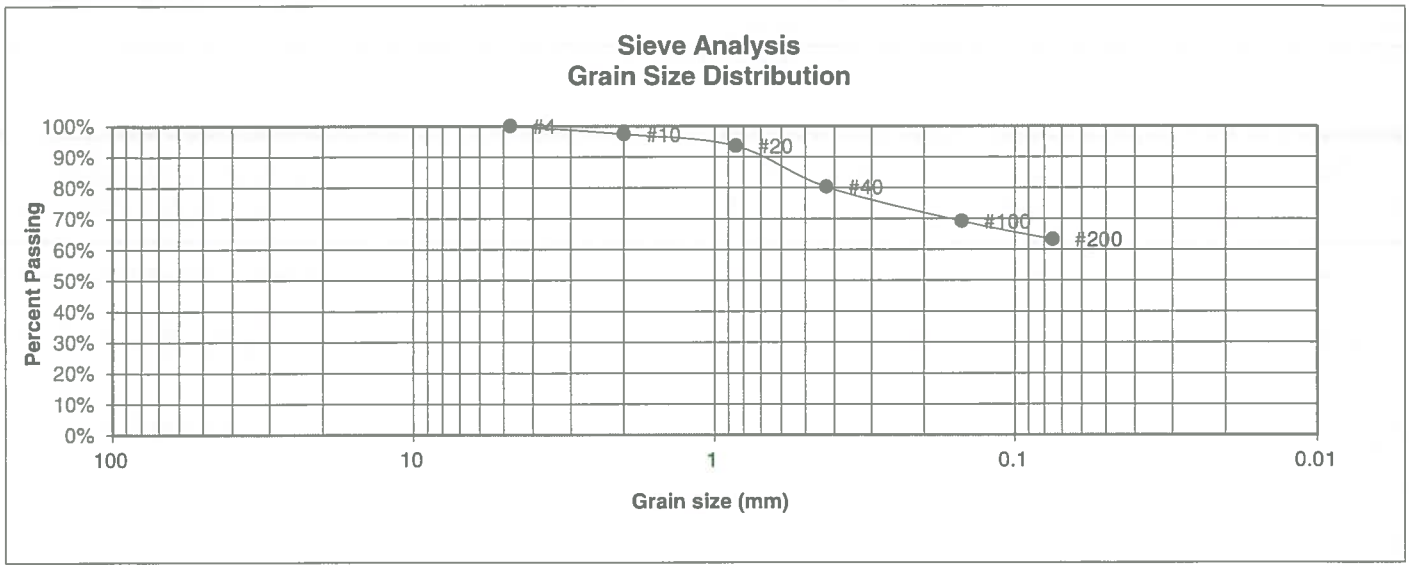
ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/9/21

JOB NO.: 212172
FIG NO.: B-1

UNIFIED CLASSIFICATION	CL	CLIENT	CORRAL RANCH
SOIL TYPE #	1	PROJECT	RESERVE AT CORRAL RANCH, F-3
TEST BORING #	1	JOB NO.	212172
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	6



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	97.4%
20	93.6%
40	80.3%
100	69.2%
200	63.2%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	31
Plastic Index	14

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

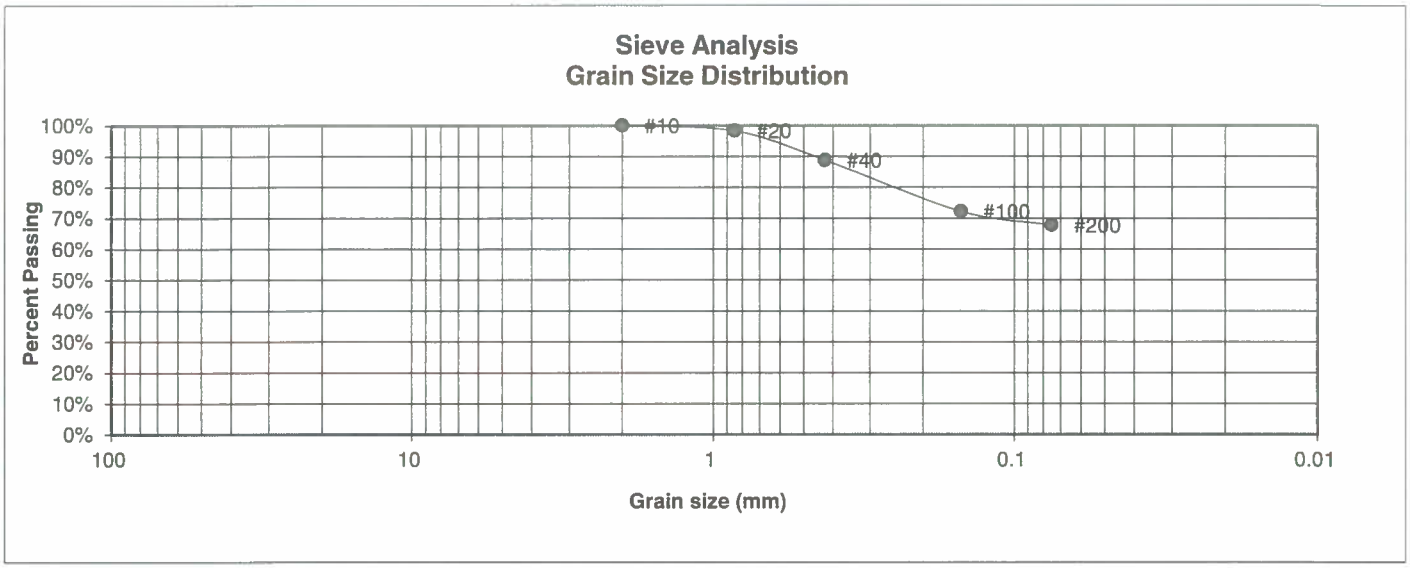
ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/9/21

JOB NO.: 212172
FIG NO.: B-2

UNIFIED CLASSIFICATION	CL	CLIENT	CORRAL RANCH
SOIL TYPE #	1	PROJECT	RESERVE AT CORRAL RANCH, F-3
TEST BORING #	2	JOB NO.	212172
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-7-6	GROUP INDEX	12



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	98.3%
40	88.8%
100	72.2%
200	67.8%

Atterberg Limits	
Plastic Limit	22
Liquid Limit	42
Plastic Index	20

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

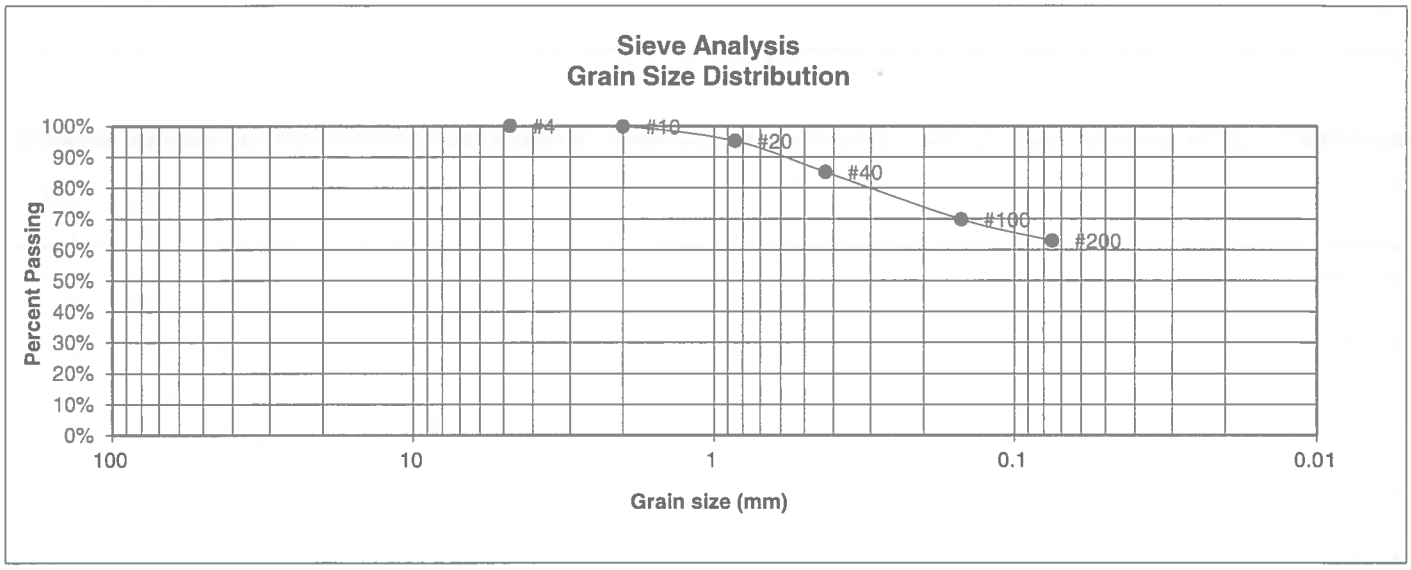
ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DJ	9/9/21

JOB NO.: 212172
FIG NO.: B-3

UNIFIED CLASSIFICATION	CL	CLIENT	CORRAL RANCH
SOIL TYPE #	1	PROJECT	RESERVE AT CORRAL RANCH, F-3
TEST BORING #	3	JOB NO.	212172
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	8



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.8%
20	95.1%
40	85.1%
100	69.7%
200	62.9%

Atterberg Limits	
Plastic Limit	19
Liquid Limit	35
Plastic Index	16

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

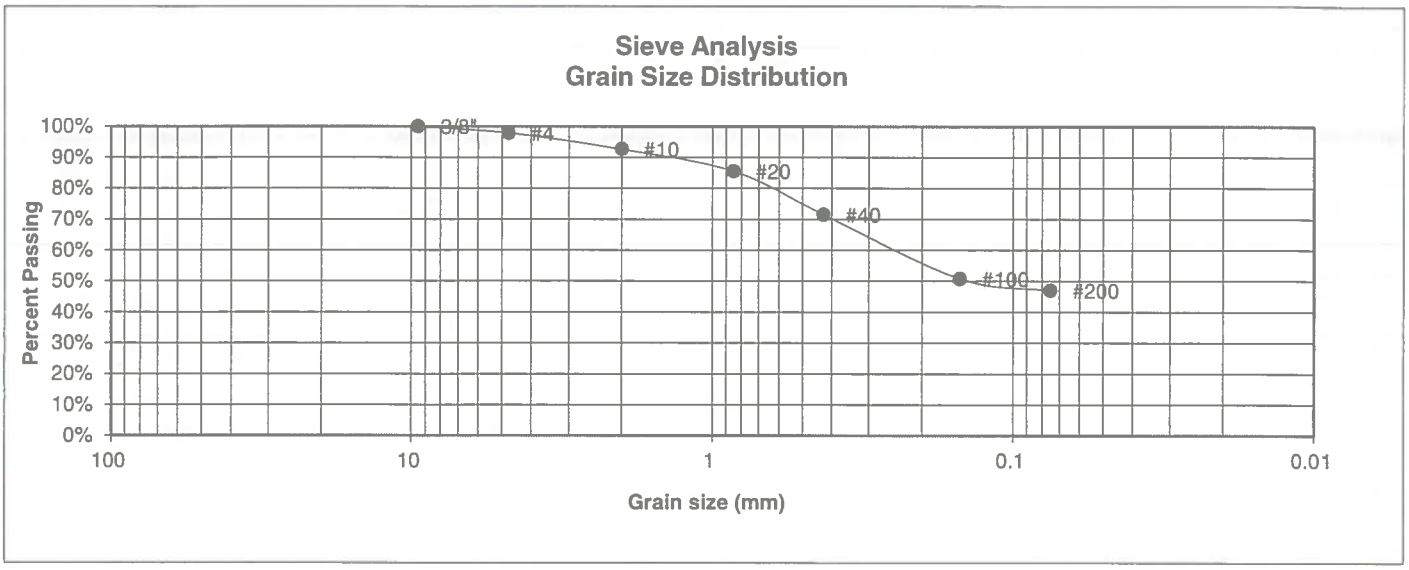
ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: DS	DATE: 9/9/21

JOB NO.: 212172
FIG NO.: B-4

UNIFIED CLASSIFICATION	SC	CLIENT	CORRAL RANCH
SOIL TYPE #	1	PROJECT	RESERVE AT CORRAL RANCH, F-3
TEST BORING #	4	JOB NO.	212172
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	5



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.8%
10	92.6%
20	85.5%
40	71.5%
100	50.8%
200	47.0%

Atterberg Limits	
Plastic Limit	13
Liquid Limit	33
Plastic Index	20

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

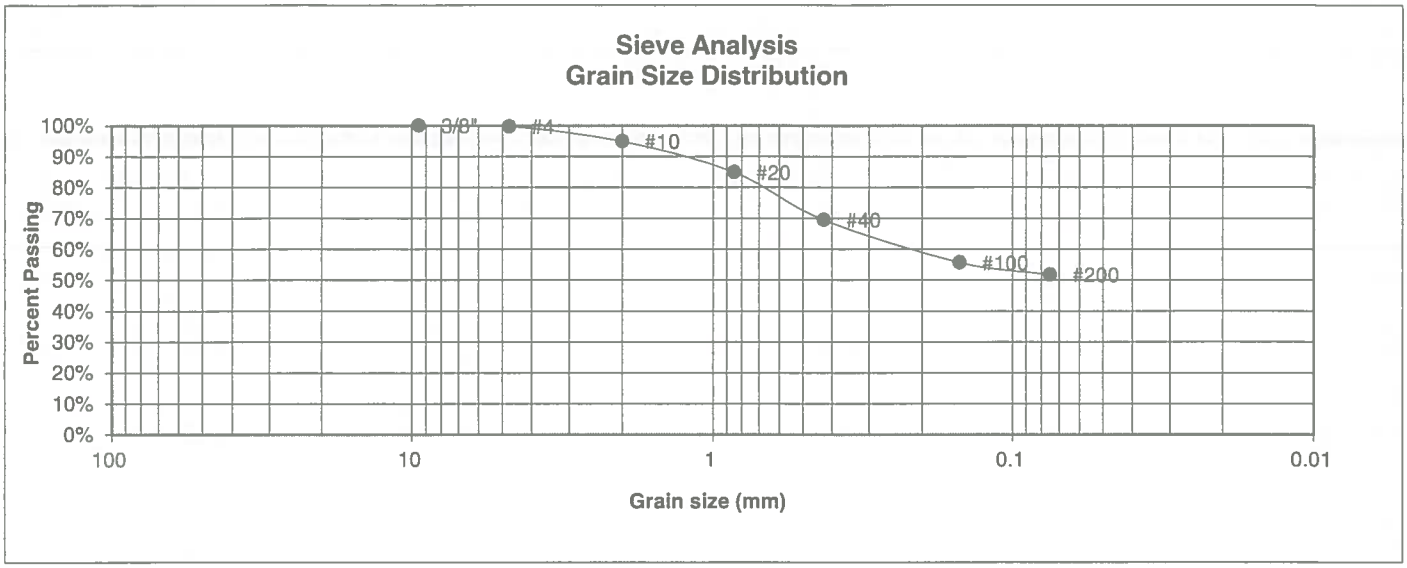
ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: DS	DATE: 9/9/21

JOB NO.: 212172
FIG NO.: B-5

UNIFIED CLASSIFICATION	CL	CLIENT	CORRAL RANCH
SOIL TYPE #	1	PROJECT	RESERVE AT CORRAL RANCH, F-3
TEST BORING #	5	JOB NO.	212172
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	5



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.7%
10	94.9%
20	84.9%
40	69.5%
100	55.7%
200	51.8%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	32
Plastic Index	15

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

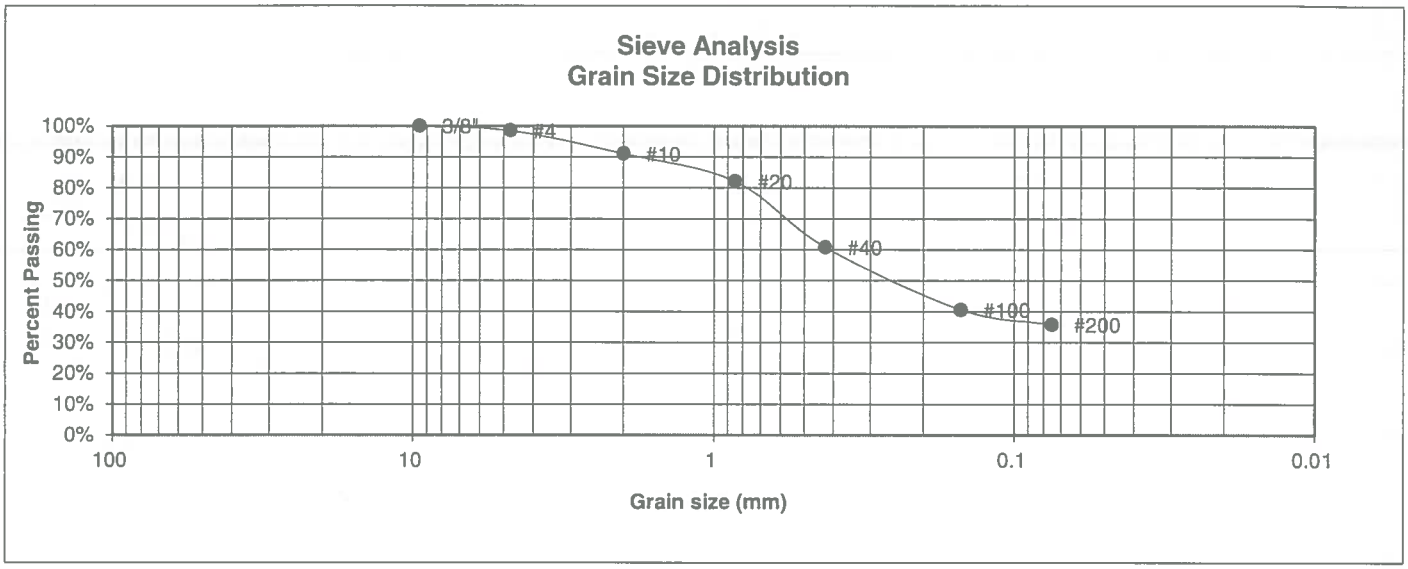
ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DJ	9/9/21

JOB NO.: 212172
FIG NO.: B-6

UNIFIED CLASSIFICATION	SC	CLIENT	CORRAL RANCH
SOIL TYPE #	1	PROJECT	RESERVE AT CORRAL RANCH, F-3
TEST BORING #	6	JOB NO.	212172
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	2



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.5%
10	91.0%
20	82.1%
40	60.8%
100	40.6%
200	35.8%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	35
Plastic Index	19

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

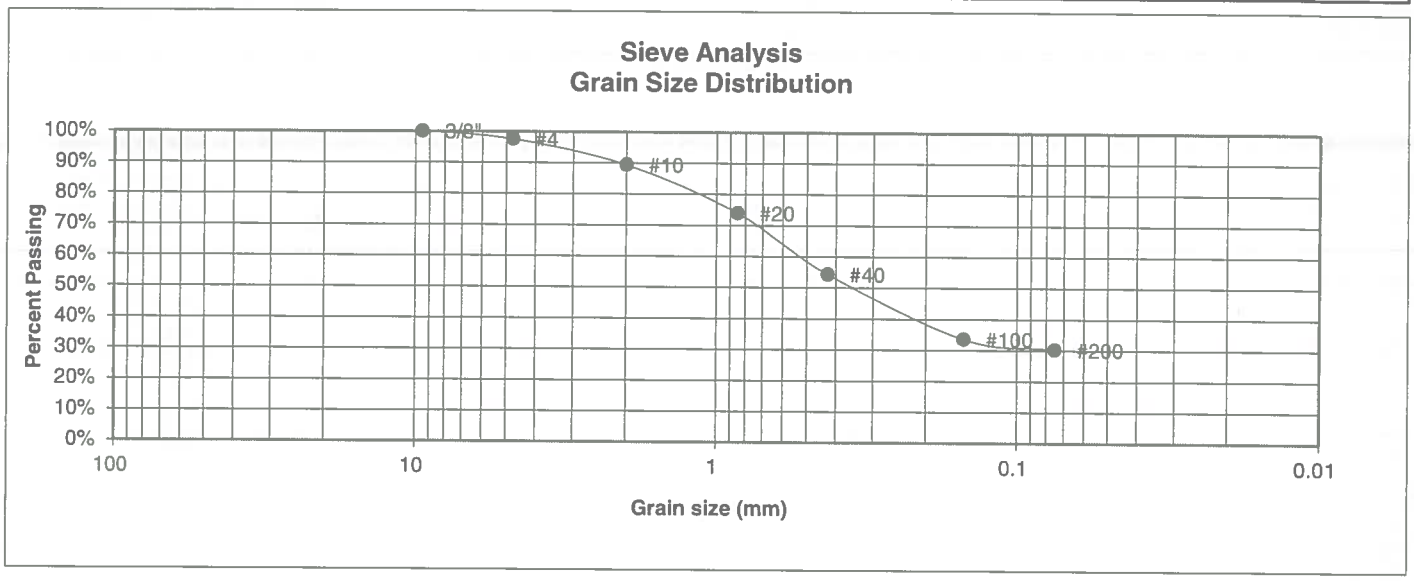
ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/9/21

JOB NO.: 212172
FIG NO.: B-7

UNIFIED CLASSIFICATION	SC	CLIENT	CORRAL RANCH
SOIL TYPE #	2	PROJECT	RESERVE AT CORRAL RANCH, F-3
TEST BORING #	7	JOB NO.	212172
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-6	GROUP INDEX	2



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.6%
10	89.4%
20	74.0%
40	54.3%
100	33.6%
200	30.3%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	38
Plastic Index	21

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

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

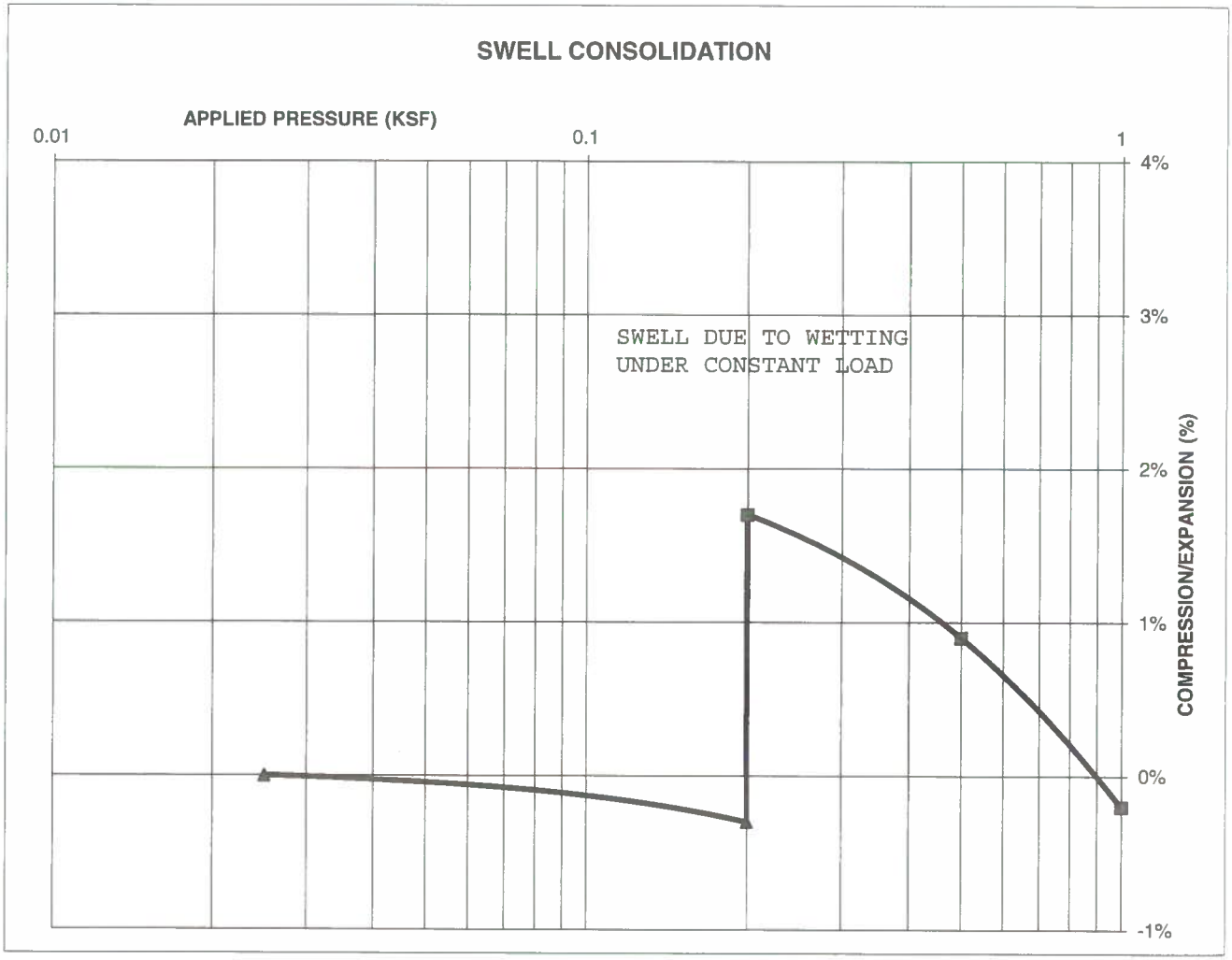
DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/9/21

JOB NO.: 212172
FIG NO.: B-8

CONSOLIDATION TEST RESULTS

TEST BORING #	1	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			96
NATURAL MOISTURE CONTENT			8.7%
SWELL/CONSOLIDATION (%)			2.0%

JOB NO. 212172
CLIENT CORRAL RANCH
PROJECT RESERVE AT CORRAL RANCH, F-3



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

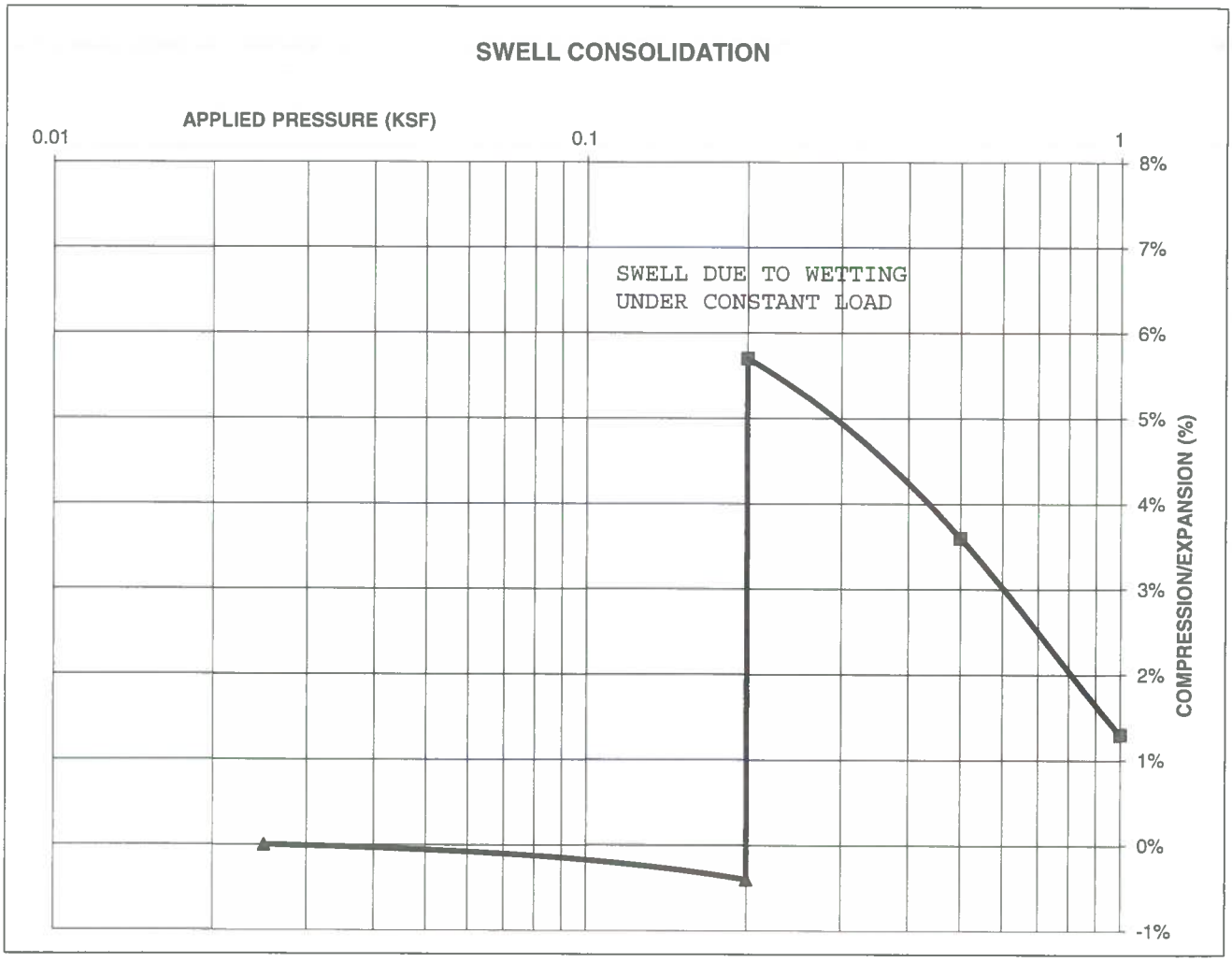
DRAWN:	DATE:	CHECKED: DS	DATE: 9/9/21

JOB NO.: 212172
FIG NO.: B-9

CONSOLIDATION TEST RESULTS

TEST BORING #	2	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			103
NATURAL MOISTURE CONTENT			11.7%
SWELL/CONSOLIDATION (%)			6.1%

JOB NO. 212172
CLIENT CORRAL RANCH
PROJECT RESERVE AT CORRAL RANCH, F-3



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

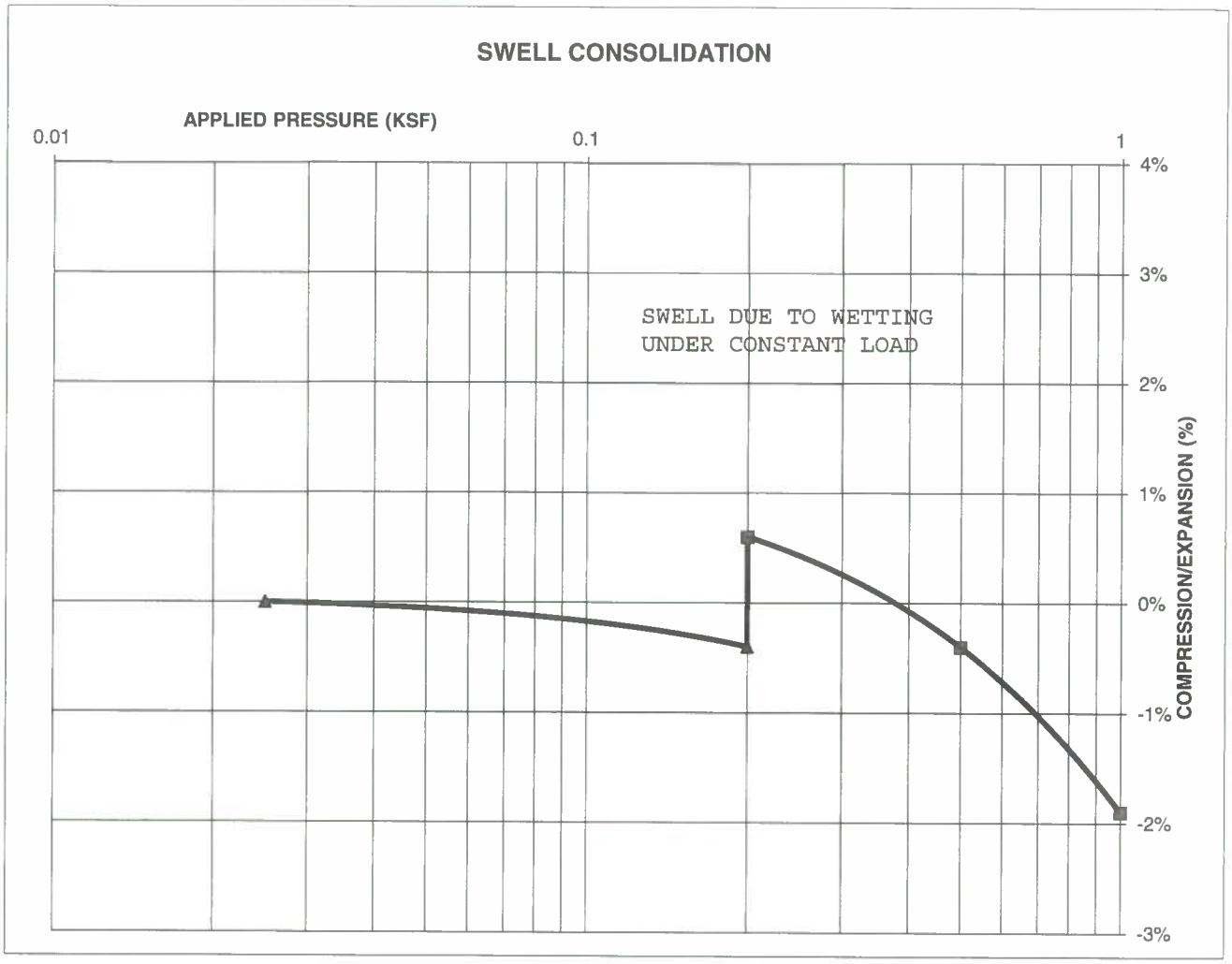
DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/9/21

JOB NO.: 212172
FIG NO.: B-10

CONSOLIDATION TEST RESULTS

TEST BORING #	3	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			96
NATURAL MOISTURE CONTENT			7.2%
SWELL/CONSOLIDATION (%)			1.0%

JOB NO. 212172
CLIENT CORRAL RANCH
PROJECT RESERVE AT CORRAL RANCH, F-3



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

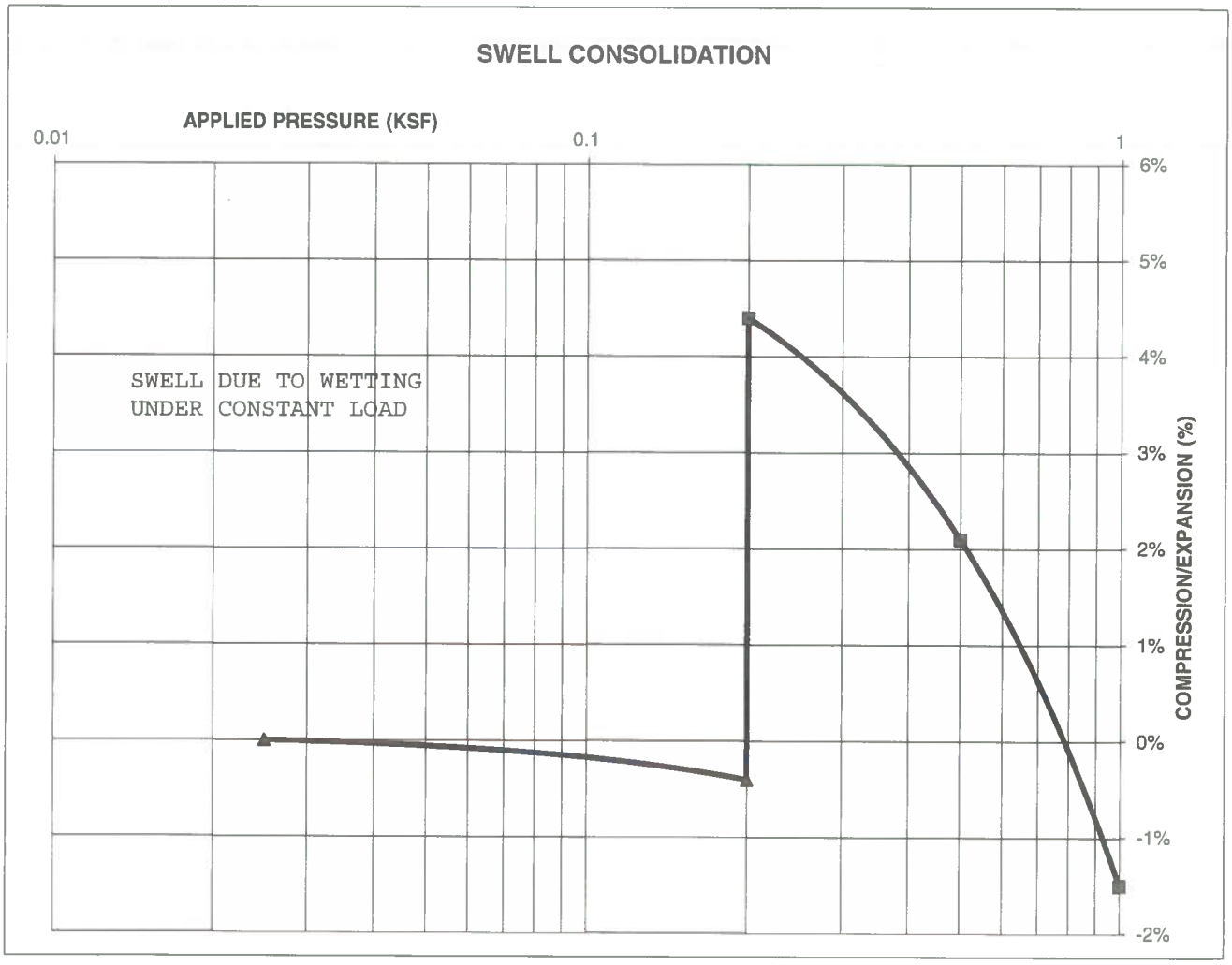
DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/9/21

JOB NO.: 212172
FIG NO.: B-11

CONSOLIDATION TEST RESULTS

TEST BORING #	4	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			120
NATURAL MOISTURE CONTENT			10.2%
SWELL/CONSOLIDATION (%)			4.8%

JOB NO. 212172
CLIENT CORRAL RANCH
PROJECT RESERVE AT CORRAL RANCH, F-3



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

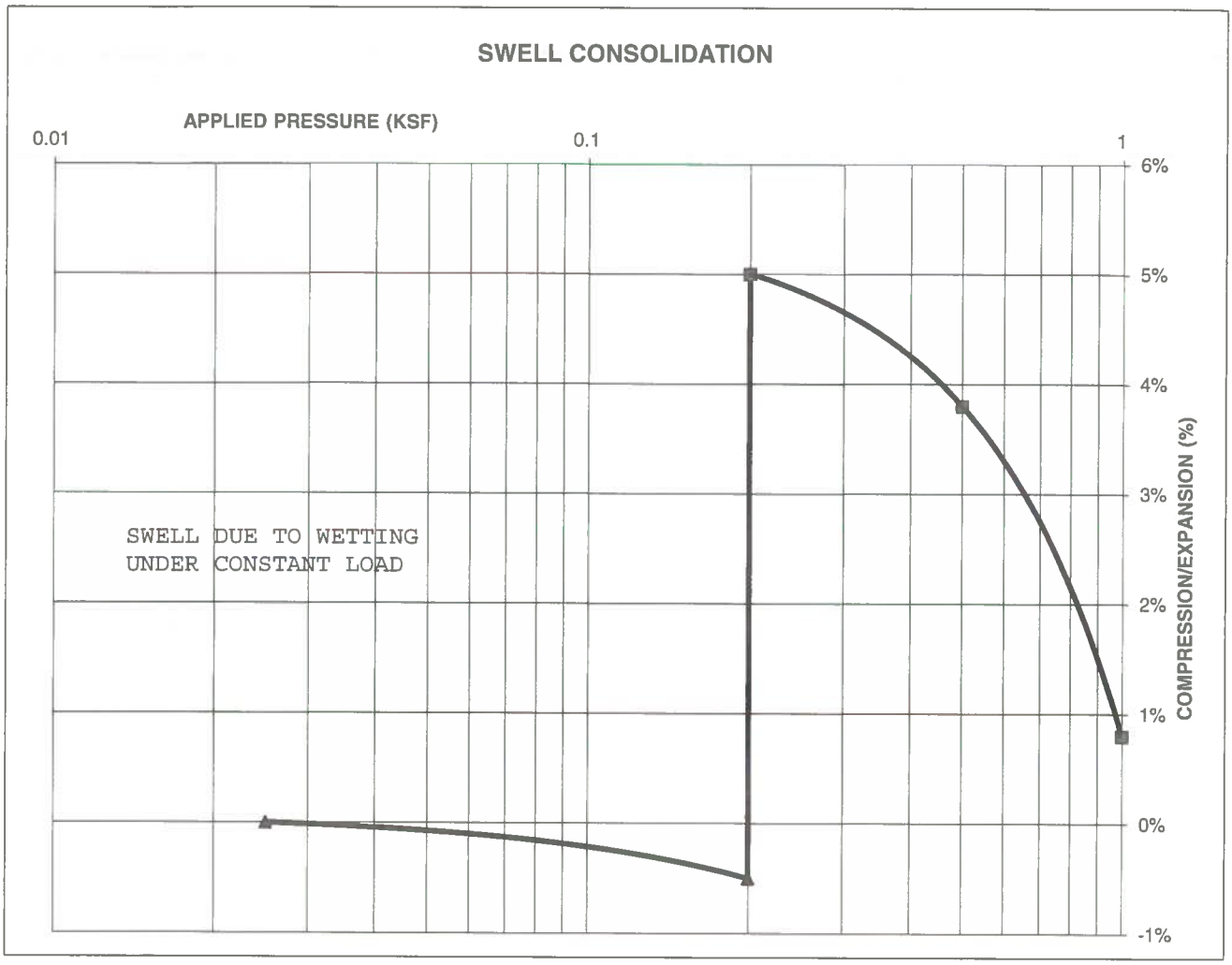
DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/9/21

JOB NO.: 212172
FIG NO.: B-12

CONSOLIDATION TEST RESULTS

TEST BORING #	5	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			103
NATURAL MOISTURE CONTENT			11.2%
SWELL/CONSOLIDATION (%)			5.5%

JOB NO. 212172
CLIENT CORRAL RANCH
PROJECT RESERVE AT CORRAL RANCH, F-3



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

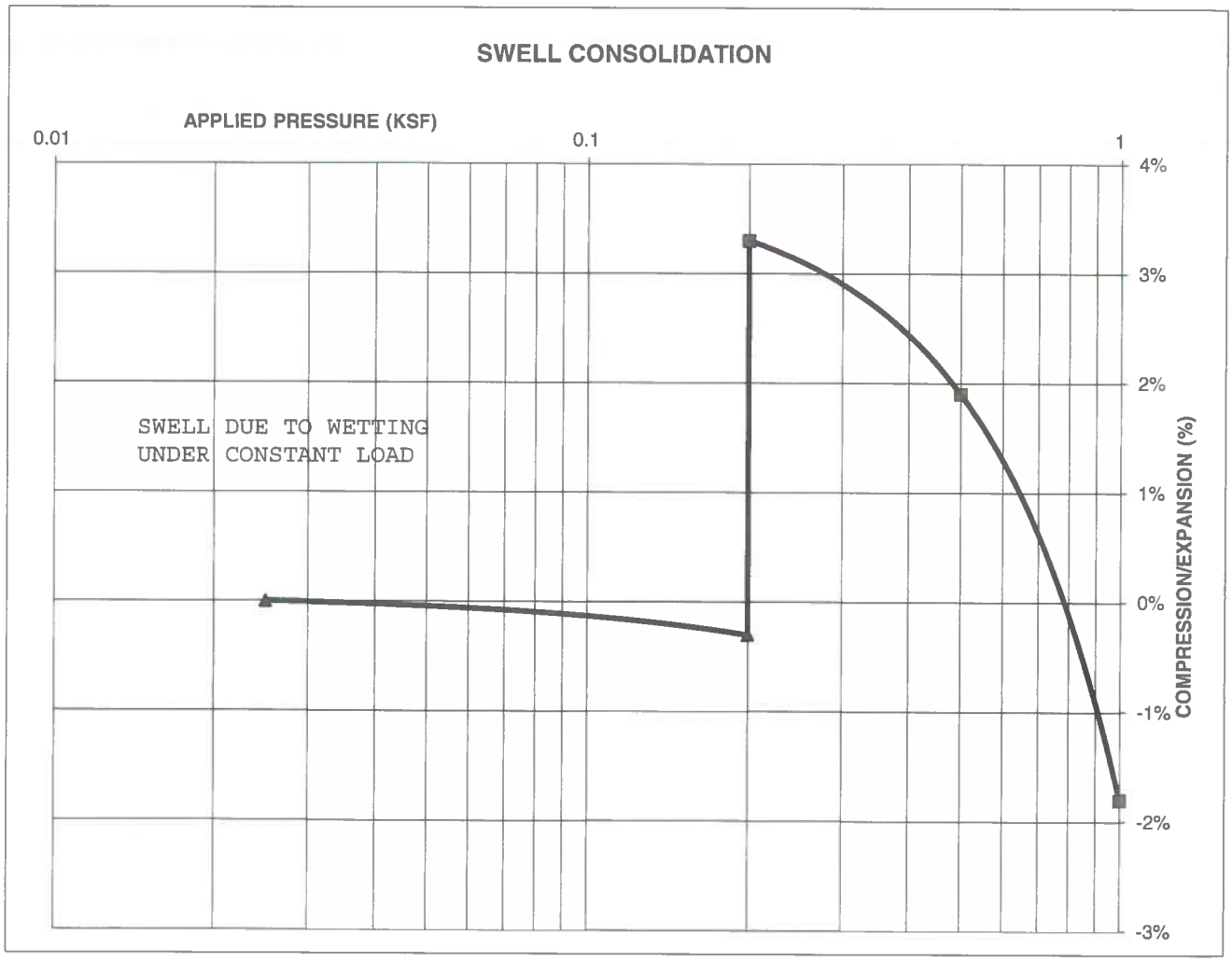
DRAWN:	DATE:	CHECKED: DS	DATE: 9/9/21

JOB NO.: 212172
FIG NO.: B-13

CONSOLIDATION TEST RESULTS

TEST BORING #	6	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			98
NATURAL MOISTURE CONTENT			7.0%
SWELL/CONSOLIDATION (%)			3.6%

JOB NO. 212172
CLIENT CORRAL RANCH
PROJECT RESERVE AT CORRAL RANCH, F-3



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

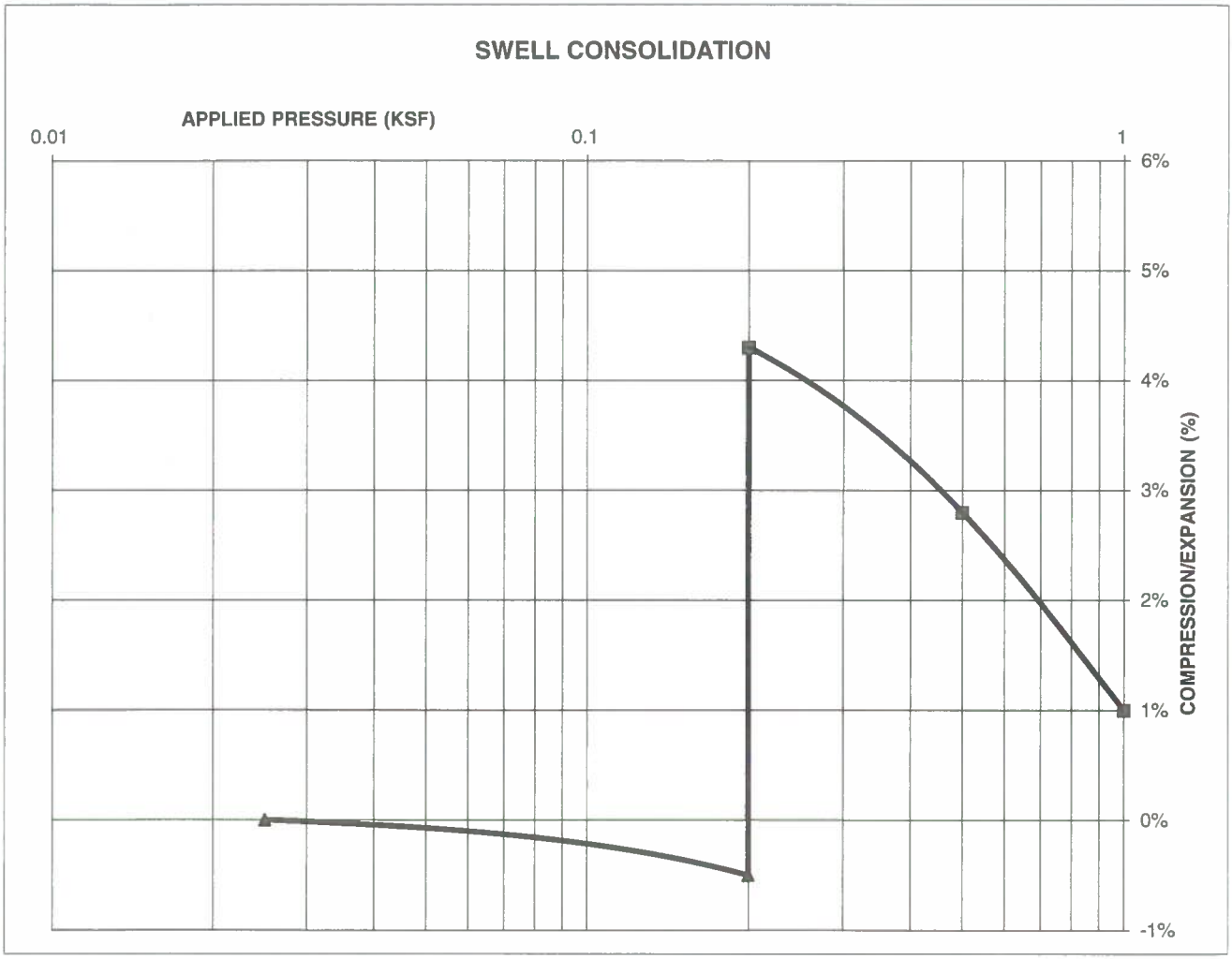
DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/9/21

JOB NO.: 212172
FIG NO.: B-14

CONSOLIDATION TEST RESULTS

TEST BORING #	7	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			111
NATURAL MOISTURE CONTENT			6.6%
SWELL/CONSOLIDATION (%)			4.8%

JOB NO. 212172
CLIENT CORRAL RANCH
PROJECT RESERVE AT CORRAL RANCH, F-3



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/9/6

JOB NO.: 212172
FIG NO.: B-15

CLIENT	CORRAL RANCH	JOB NO.	212172
PROJECT	RESERVE AT CORRAL RANCH, F-3	DATE	9/2/2021
LOCATION	RESERVE AT CORRAL RANCH, F-3	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-3	1-2	1	CL	0.00

QC BLANK PASS

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

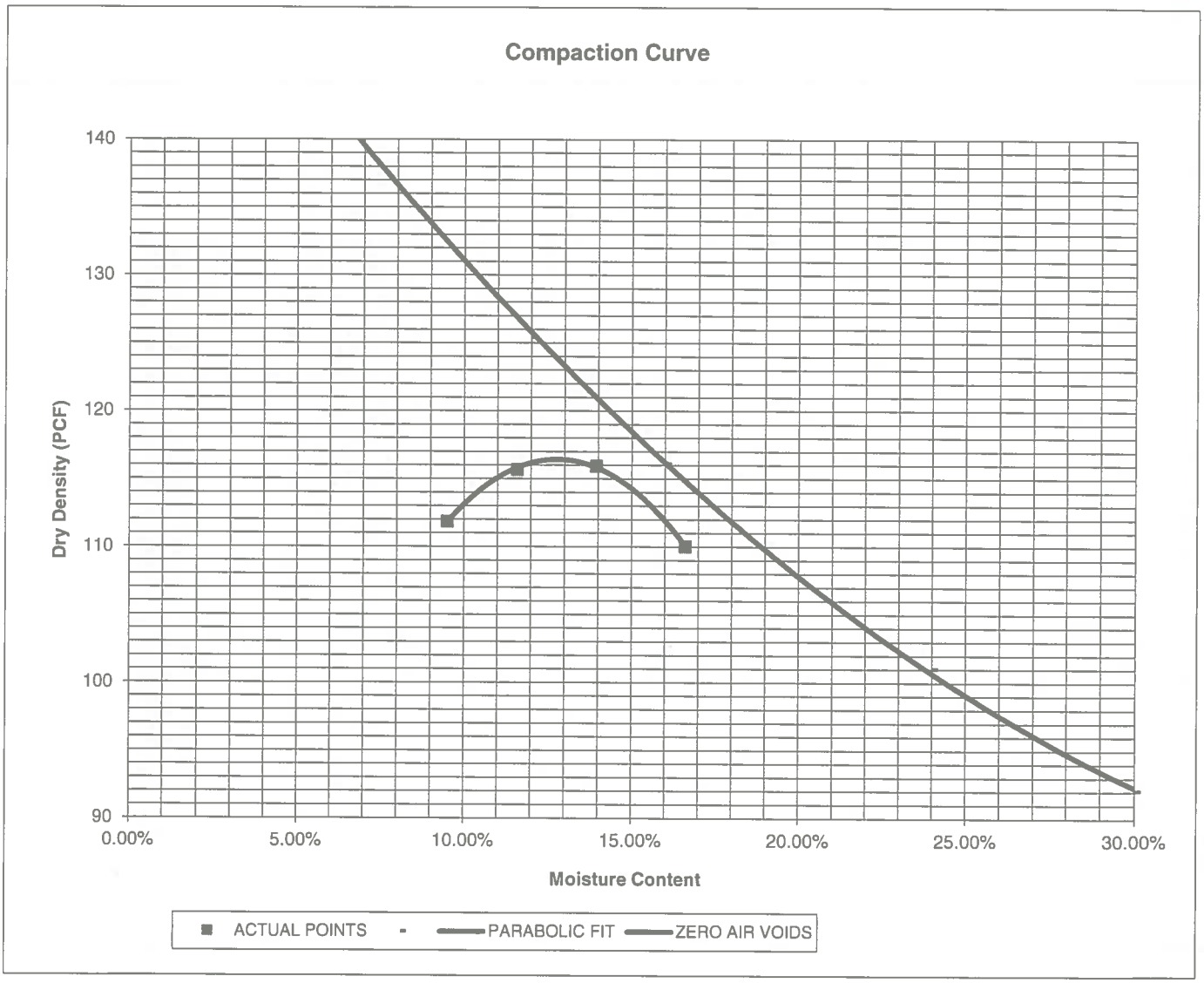
LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/9/21

JOB NO.: 212172
FIG NO.: B-16

PROJECT	RESERVE AT CORRAL RANCH, F-3	CLIENT	CORRAL RANCH
SAMPLE LOCATION	TB-1 @ 0-3'	JOB NO.	212172
SOIL DESCRIPTION	CLAY, VERY SANDY, BROWN	DATE	09/02/21

IDENTIFICATION	CL	COMPACTION TEST #	1
TEST DESIGNATION / METHOD	ASTM D-698-A	TEST BY	BL
MAXIMUM DRY DENSITY (PCF)	116.2	OPTIMUM MOISTURE	12.9%



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

MOISTURE DENSITY RELATION

DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/9/21

JOB NO.: 212172

FIG NO.: B-17

CBR TEST LOAD DATA

JOB NO: 212172
CLIENT: CORRAL RANCH
PROJECT: RESERVE AT CORRAL RANCH, F-3
SOIL TYPE: 1

PISTON DIAMETER (cm)	PISTON AREA (in^2)
4.958	2.993

PENETRATION DEPTH (INCHES)	10 BLOWS MOLD # 1 LOAD(LBS) (LBS)	STRESS (PSI)	25 BLOWS MOLD # 2 LOAD(LBS) (LBS)	STRESS (PSI)	56 BLOWS MOLD # 3 LOAD(LBS) (LBS)	STRESS (PSI)
0.000	0	0.00	0	0.00	0	0.00
0.025	32	10.69	40	13.37	35	11.70
0.050	35	11.70	45	15.04	58	19.38
0.075	38	12.70	50	16.71	68	22.72
0.100	38	12.70	53	17.71	86	28.74
0.125	42	14.04	60	20.05	95	31.75
0.150	48	16.04	73	24.39	103	34.42
0.175	52	17.38	75	25.06	113	37.76
0.200	52	17.38	76	25.40	116	38.76
0.300	53	17.71	85	28.40	143	47.79
0.400	58	19.38	101	33.75	166	55.47
0.500	65	21.72	115	38.43	191	63.83

FINAL MOISTURE CONTENT

	MOLD #	1	MOLD #	2	MOLD #	3
CAN #		352		341		347
WT. CAN		6.73		6.97		6.83
WT. CAN+WET		173.93		160.49		180.41
WT. CAN+DRY		135.43		127.36		148.73
WT. H20		38.5		33.13		31.68
WT. DRY SOIL		128.7		120.39		141.9
MOISTURE CONTENT		29.91%		27.52%		22.33%

WET DENSITY (PCF)		118.8	122.8	128.9
DRY DENSITY (PCF)		105.2	108.8	114.2
BEARING RATIO		1.27	1.77	2.87
90% OF DRY DENSITY	104.6			
95% OF DRY DENSITY	110.4			

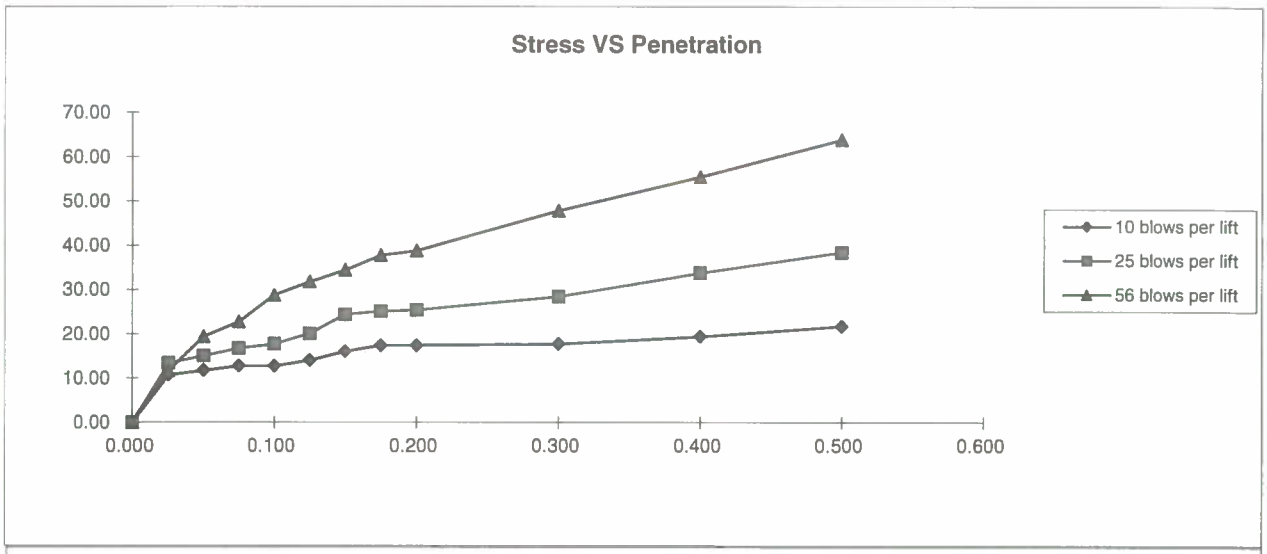
BEARING RATIO AT 90% OF MAX	1.18	~ R VALUE	1
BEARING RATIO AT 95% OF MAX	2.10	~ R VALUE	6

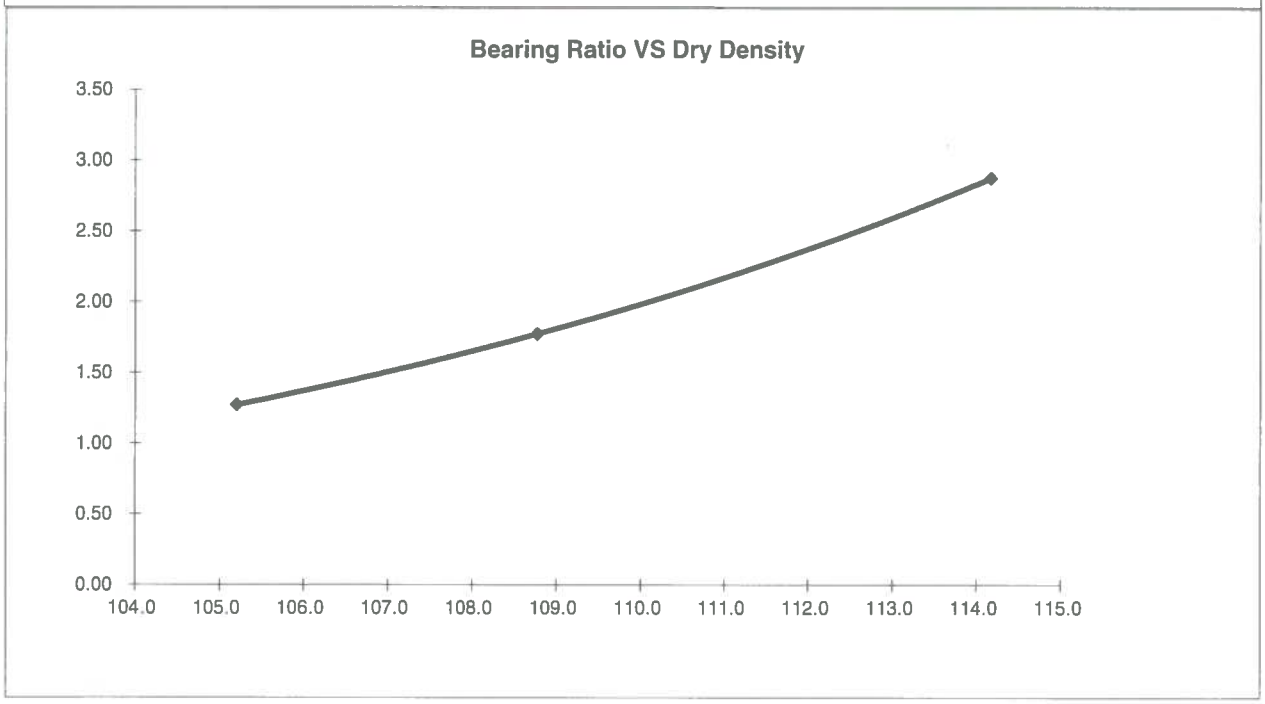
ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

CBR TEST DATA

DRAWN:	DATE:	CHECKED:	DATE:
		DJ	9/9/21

JOB NO.: 212172
FIG NO.: B-18





BEARING RATIO AT 90% OF MAX	1.18	~ R VALUE	1.00
BEARING RATIO AT 95% OF MAX	2.10	~ R VALUE	6.00

JOB NO: 212172
SOIL TYPE: 1

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

CALIFORNIA BEARING RATIO

DRAWN:	DATE:	CHECKED:	DATE:
		DS.	9/9/21

JOB NO.: 212172
FIG NO.: B-19

CTL | THOMPSON INCORPORATED

September 30, 2021

Pioneer Sand Company, Inc.
5000 Northpark Drive
Colorado Springs, Colorado 80907

Attention: Mr. Jason Ulmer

Subject: Gradation Analysis, and -200 Wash
Solberg Mix 66% Pit Run and 33% Pea Gravel – Solberg Quarry
Colorado Springs, Colorado
Project No. CS14925.001-400

Gentlemen:

As requested, we performed a gradation analysis, and -200 wash on a sample of Solberg Mix material from the Solberg Quarry submitted on September 20, 2021. Testing was performed in accordance with applicable ASTM Standards. The test results are presented below:

Sieve Size	Percent Passing
3/4"	100
1/2"	100
3/8"	94
No. 4	66
No. 8	51
No. 16	34
No. 30	21
No. 50	12
No. 100	7
No. 200	4.6
Moisture%:	3.3
Date Sampled:	09/20/2021

If we can be of further service, please call.

Very truly yours,

CTL | THOMPSON, INC.

Mark Coppeak
Senior Engineering Technician

MC:vc
Via Email: jason.ulmer@pioneerco.com; daniel.colwell@pioneerco.com; sbishop@pioneerco.com