October 26, 2020

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
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SR Land, LLC
20 Boulder Crescent, 2nd Floor
Colorado Springs, CO 80903

Attn: Chaz Collins

Re: Pavement Recommendations
Branding Iron at Sterling Ranch, Filing No. 2
El Paso County, Colorado

Dear Mr. Collins:

As requested, Entech Engineering, Inc. has obtained samples of the pavement subgrade soils for the roadways at the above referenced subdivisions. Laboratory testing to determine the pavement support characteristics of the soils was performed. This letter presents the results of the laboratory testing and pavement recommendations for these roadways.

Project Description

The project will consist of paving of the roadways within the above noted subdivision. This design is valid for Sprague Way, Misty Lake Court, Whitefish Way, Mosby Way, Lodge Grass Way and Yellowtail Way in the Branding Iron at Sterling Ranch, Filing No. 2 Subdivision, in El Paso County, Colorado. Subsurface Soil Investigation and laboratory testing were performed to determine the pavement support characteristics of the soils. The filing layout and the locations of the test borings are shown on the Test Boring Location Map, Figure 1.

Subgrade Conditions

Nine exploratory test borings were drilled in the roadways to depths of 5 to 10 feet. The Boring Logs are presented in Appendix A. Sieve Analysis and Atterberg Limit testing were performed on soil samples obtained from the test borings for the purpose of classification. Sieve analyses performed indicated the percent passing the No. 200 sieve for the Type 1 soils at subgrade depth ranged from approximately 14 to 30 percent. Atterberg Limit Tests performed on the Type 1 samples resulted in Liquid Limits ranging from 26 to 36 and no value with Plastic Indexes ranging from 8 to 20 and non-plastic. Soil Type 1 was predominantly exposed in the subgrade of the roadways in our test borings. Soil Type 2 was encountered in the subgrade in one test boring. The Type 2 clay fill and Type 4 claystone soils were encountered at grade in test borings 9 and just beneath the subgrade depth in Test Boring 5. These soils will require overexcavation or penetration and replacement with granular soils. Soil Type 1 consisted of silty to clayey sand fill, which classified as A-1-b, A-2-4, and A-2-6 soils based on the AASHTO classification system, which typically provide good support characteristics. The remainder of the soils consisted of sandy clay fill (CL), silty sandstone (SM-SW, SM), and sandy claystone (CL). Groundwater was not encountered in the test borings. Water-soluble sulfate tests indicate a negligible potential for sulfate attack.

One subgrade soil type was determined for pavement support from field investigation and laboratory testing (Soil Type 1). The Type 2 and 4 soils can be penetrated or overexcavated and replaced with on-site granular soils to provide similar support characteristics as the site sand (Soil Type 1), if encountered at roadway subgrade. The clay soils were only encountered at grade in Test Boring No. 9.

Swell testing was performed on the subgrade soils. Swell/Consolidation Tests conducted on the soils exhibited volume change ranging from 0.5 to 3.1 percent with a consolidation of 0.4 percent. A majority of the soils are below the levels in which mitigation is required. Mitigation of expansive soil is required where the Type 2 soils are located at subgrade depth (Test Boring No. 9). Mitigation of highly expansive near-surface claystone may be required in the area of Test Boring No. 5, if the claystone is encountered less than 1 foot below grade. Areas requiring mitigation will be field determined during final road grading. Mitigation recommendations will follow. Laboratory test results are presented in Appendix B and are summarized on Table 1.

California Bearing Ratio (CBR) testing was performed on a representative sample of the subgrade soils to determine the support characteristic of the soils for the roadway sections. The results of the CBR testing are presented in Appendix B and summarized as follows:

Soil Type 1 – Clayey Sand

R @ 90% = 71.0
R @ 95% = 83.0
Use R = 50.0 for design

Classification Testing

Liquid Limit	36
Plasticity Index	20
Percent Passing 200	29.7
AASHTO Classification	A-2-6
Group Index	1
Unified Soils Classification	SC

Pavement Design

The CBR testing was used to determine pavement sections for this site. The pavement sections were determined utilizing the El Paso County "Pavement Design Criteria and Report". Misty Lake Court and Sprague Way classify as low volume urban local roads, which use an 18K ESAL value of 36,500 to determine the pavement sections. Whitefish Way, Mosby Way, Lodge Grass Way and Yellowtail Way classify as urban local roads, which used an 18K ESAL value of 292,000 for design. Pavement sections for asphalt over aggregate base course and asphalt over recycled concrete base course sections are provided. Design parameters used in the pavement analysis are as follows:

Reliability	80%
Serviceability Index	2.0
Resilient Modulus (Soil Type 1)	13,168 psi
"R" Value Subgrade (Soil Type 1)	50
Structural Coefficients:	
Hot Bituminous Pavement	0.44
Aggregate Base Course	0.11
Recycled Concrete Base Course	0.11

Pavement calculations are attached in Appendix C. Pavement sections recommended for the site are summarized as follows:

Pavement Sections – Misty Lake Court and Sprague Way

Low Volume Urban Local Road
Soil Type 1, R = 50.0

Alternatives	Asphalt (in) **	Aggregate Base Course (in)	Recycled Conc. (in)
1 – Asphalt Over Base Course	3.0*	4.0*	-
2 – Asphalt Over Recycled Concrete	3.0*	-	4.0*

Pavement Sections – Whitefish Way, Mosby Way, Lodge Grass Way, and Yellowtail Way

Urban Local Road
Soil Type 1, R = 50.0

Alternatives	Asphalt (in) **	Aggregate Base Course (in)	Recycled Conc. (in)
1 – Asphalt Over Base Course	3.5	8.0*	-
2 – Asphalt Over Recycled Concrete	3.5	-	8.0*

* Minimum sections required per the El Paso County "Pavement Design Criteria and Report".

Mitigation

Mitigation for expansive soils will not be required for a majority of this filing based on the laboratory testing. The swell test results for the Type 2 soils in Test Boring No. 9 will require mitigation. Mitigation for isolated areas of subgrade soils consisting of shallow occurring claystone (Soil Type 4) may be required in the area of Test Boring No. 5. To provide a uniform roadway subgrade it is recommended that 1.5 feet of Soil Type 2 or 4 be removed and replaced with Soil Type 1, where determined to be necessary. The estimated transitions for

overexcavation or removals are shown in Figure 1. The actual transitions should be field determined. Personnel of Entech Engineering, Inc. should be on site to verify the locations and approximate depths of overexcavation, if required, and the subgrade soils compacted in these areas during the subgrade preparation. Density testing should be performed on all fill placed within these roadway subgrade areas.

Roadway Construction - Asphalt on Base Course or Recycled Concrete Alternatives

Prior to placement of the asphalt, the subgrade should be scarified, moisture-conditioned, compacted to a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 at ± 2% of optimum moisture content and proofrolled after properly compacted. Any loose or soft areas should be removed and replaced with suitable materials approved by Entech. Base course materials should be compacted to a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 at ± 2% of optimum moisture content. 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 pavement sections should be evaluated after site grading is completed.

In addition to the above guidance, the asphalt, recycled concrete, subgrade conditions, compaction of materials and roadway construction methods shall meet the El Paso County specifications.

We trust that 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.

Daniel P. Stegman

SCC/bs

Encl.

Entech Job No. 202000
AAprojects/2020/202000 pr_r2

COLORADO LICENSED
MARK HOWARD HAUSCHILD
35140
10/28/2020
PROFESSIONAL ENGINEER

Reviewed by:

Mark H. Hauschild, P.E.
Senior Engineer

TABLE

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT SR LAND, LLC
PROJECT BRANDING IRON
JOB NO. 202000

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	7	0-3	7.9	125.9	29.7	36	20		A-2-6	0.7	SC	FILL, SAND, CLAYEY
1	8	0-3			24.1						SC	FILL, SAND, CLAYEY
1	1	1-2			24.5	26	8	<0.01	A-2-4		SC	FILL, SAND, CLAYEY
1	2	1-2			24.3	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	3	1-2			19.1	NV	NP	0.00	A-1-b		SM	FILL, SAND, SILTY
1	4	1-2	6.9	119.5	26.0	33	17		A-2-6	0.5	SC	FILL, SAND, CLAYEY
1	6	1-2			13.5	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	7	1-2	14.6	113.2	29.8	34	12	<0.01	A-2-6	-0.4	SC	FILL, SAND, CLAYEY
1	8	1-2			25.6	28	10		A-2-4		SC	FILL, SAND, CLAYEY
2	9	1-2	16.6	111.8	63.1	42	25	0.00	A-7-6	3.1	CL	FILL, CLAY, SANDY
3	1	10			10.7	NV	NP		A-1-b		SM-SW	SANDSTONE, SLIGHTLY SILTY
3	2	5			15.0	NV	NP	<0.01	A-1-b		SM	SANDSTONE, SILTY
3	3	5			13.0	NV	NP		A-1-b		SM	SANDSTONE, SILTY
3	4	5			18.3	NV	NP	<0.01	A-1-b		SM	SANDSTONE, SILTY
3	5	10			15.4	NV	NP		A-1-b		SM	SANDSTONE, SILTY
3	6	5			21.4	NV	NP		A-2-4		SM	SANDSTONE, SILTY
4	9	5			45.0	36	18		A-6		SM	SANDSTONE, VERY CLAYEY
4	5	1-2	14.2	111.7	68.6	36	18	0.00	A-6	1.4	CL	CLAYSTONE, SANDY
4	8	10	17.3	111.9	76.2	39	16	<0.01	A-6	6.5	CL	CLAYSTONE, SANDY

FIGURE

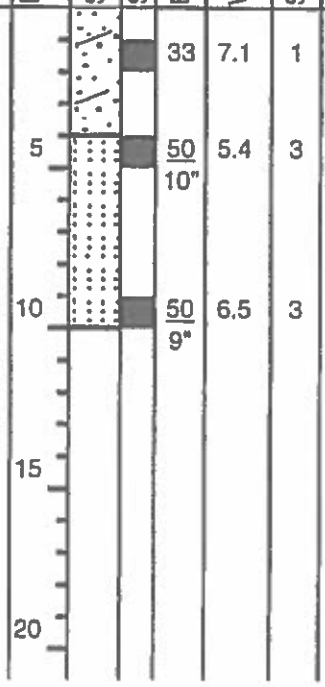
APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 9/18/2020
Job # 202000

REMARKS

DRY TO 10', 9/18/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-4', SAND, CLAYEY, FINE TO COARSE GRAINED, BROWN, DENSE, MOIST			33	7.1	1
SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST			50/10"	5.4	3
			50/9"	6.5	3

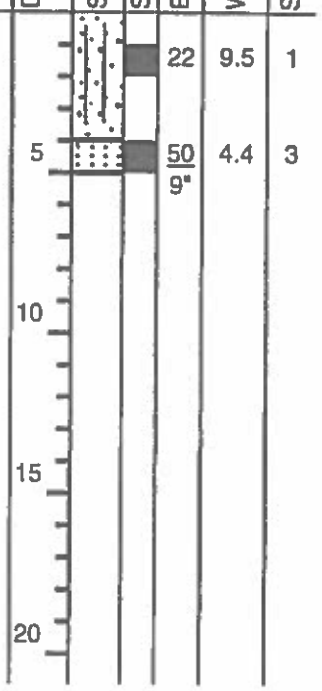


TEST BORING NO. 2
DATE DRILLED 9/18/2020
CLIENT SR LAND, LLC
LOCATION BRANDING IRON

REMARKS

DRY TO 5', 9/18/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-4', SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST			22	9.5	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST			50/9"	4.4	3



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TEST BORING LOG

DRAWN.	DATE	CHECKED:	DATE:
			10/1/20

JOB NO 202000
FIG NO. A- 1

TEST BORING NO. 3
DATE DRILLED 9/18/2020
Job # 202000

REMARKS

DRY TO 5', 9/18/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-2', SAND, SILTY, FINE TO COARSE GRAINED, BROWN, VERY DENSE, MOIST			50	5.1	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, BROWN, VERY DENSE, MOIST			50/6"	7.1	3
5					
10					
15					
20					

TEST BORING NO. 4
DATE DRILLED 9/18/2020
CLIENT SR LAND, LLC
LOCATION BRANDING IRON

REMARKS

DRY TO 5', 9/18/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-4', SAND, CLAYEY, FINE TO COARSE GRAINED, BROWN, DENSE, MOIST			19	7.5	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, DENSE, MOIST			46	5.5	3
5					
10					
15					
20					

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TEST BORING LOG

DRAWN	DATE	CHECKED:	DATE:
			10/11/20

JOB NO. 202000
FIG NO. A- 2

TEST BORING NO. 5
DATE DRILLED 9/18/2020
Job # 202000

REMARKS

DRY TO 10', 9/18/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
					1	FILL 0-1', SAND, SILTY, BROWN
			50/11"	13.1	4	CLAYSTONE, SANDY, GREEN BROWN, HARD, MOIST
5			50/6"	8.3	3	SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST
10			50/6"	9.0	3	
15						
20						

TEST BORING NO. 6
DATE DRILLED 9/18/2020
CLIENT SR LAND, LLC
LOCATION BRANDING IRON

REMARKS

DRY TO 5', 9/18/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			21	2.0	1	FILL 0-4', SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, DRY
5			50	5.2	3	SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST
10						
15						
20						

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TEST BORING LOG

DRAWN	DATE	CHECKED	DATE
			10/1/20

JOB NO. 202000
FIG NO. A- 3

TEST BORING NO. 7
DATE DRILLED 9/18/2020
Job # 202000

REMARKS

DRY TO 5', 9/18/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			12	16.6	1	FILL 0-5', SAND, CLAYEY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST
5			10	12.3	1	
10						
15						
20						

TEST BORING NO. 8
DATE DRILLED 9/18/2020
CLIENT SR LAND, LLC
LOCATION BRANDING IRON

REMARKS

DRY TO 10', 9/18/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			29	6.5	1	FILL 0-8', SAND, CLAYEY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST
5			28	6.0	1	
10			46	17.2	4	WEATHERED CLAYSTONE, SANDY, GREEN BROWN, VERY STIFF, MOIST
15						
20						

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TEST BORING LOG

DRAWN:	DATE	CHECKED:	DATE:
			10/1/20

JOB NO 202000
FIG NO A-4

TEST BORING NO. 9
DATE DRILLED 9/18/2020
Job # 202000

TEST BORING NO.
DATE DRILLED
CLIENT SR LAND, LLC
LOCATION BRANDING IRON

REMARKS

DRY TO 5', 9/18/20

REMARKS

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	Description
			20	16.1	2	FILL 0-2', CLAY, SANDY, BROWN, STIFF, MOIST
						SANDSTONE, VERY CLAYEY, FINE TO COARSE GRAINED,
5			50 8"	9.2	4	GREEN BROWN, VERY DENSE, MOIST
10						
15						
20						

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

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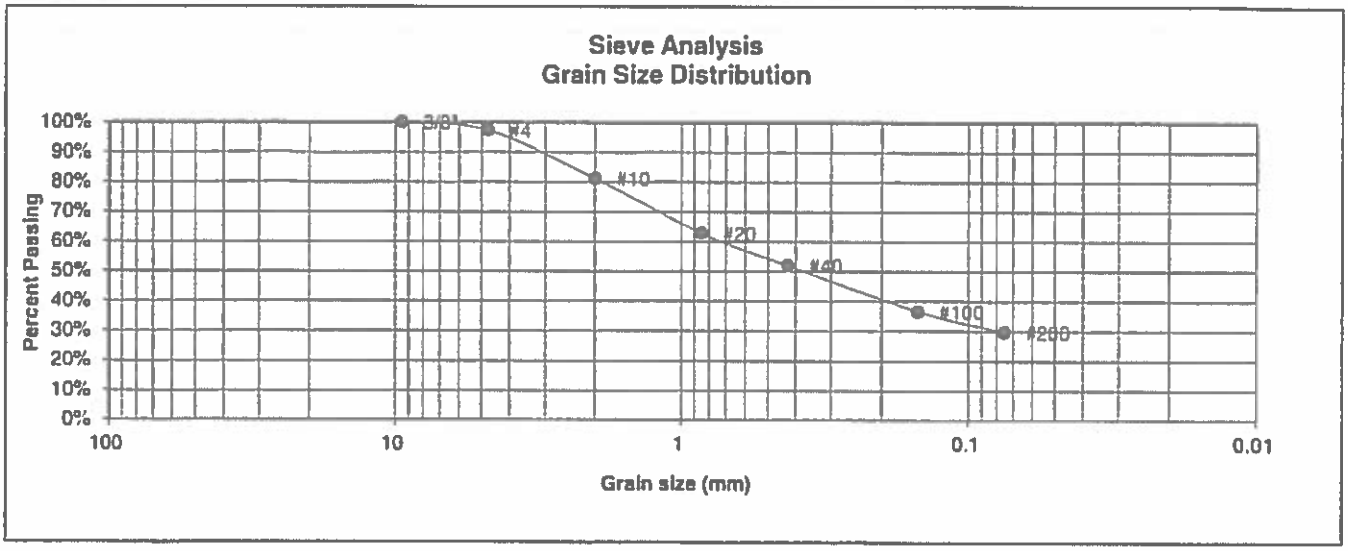
TEST BORING LOG

DRAWN:	DATE	CHECKED:	DATE:
			10/1/20

JOB NO 202000
FIG NO A- 5

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	SC	CLIENT	SR LAND, LLC
SOIL TYPE #	1, CBR	PROJECT	BRANDING IRON
TEST BORING #	7	JOB NO.	202000
DEPTH (FT)	0-3	TEST BY	BL
AASHTO CLASSIFICATION	A-2-6	GROUP INDEX	1



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.3%
10	81.1%
20	62.8%
40	52.0%
100	36.6%
200	29.7%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	36
Plastic Index	20

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

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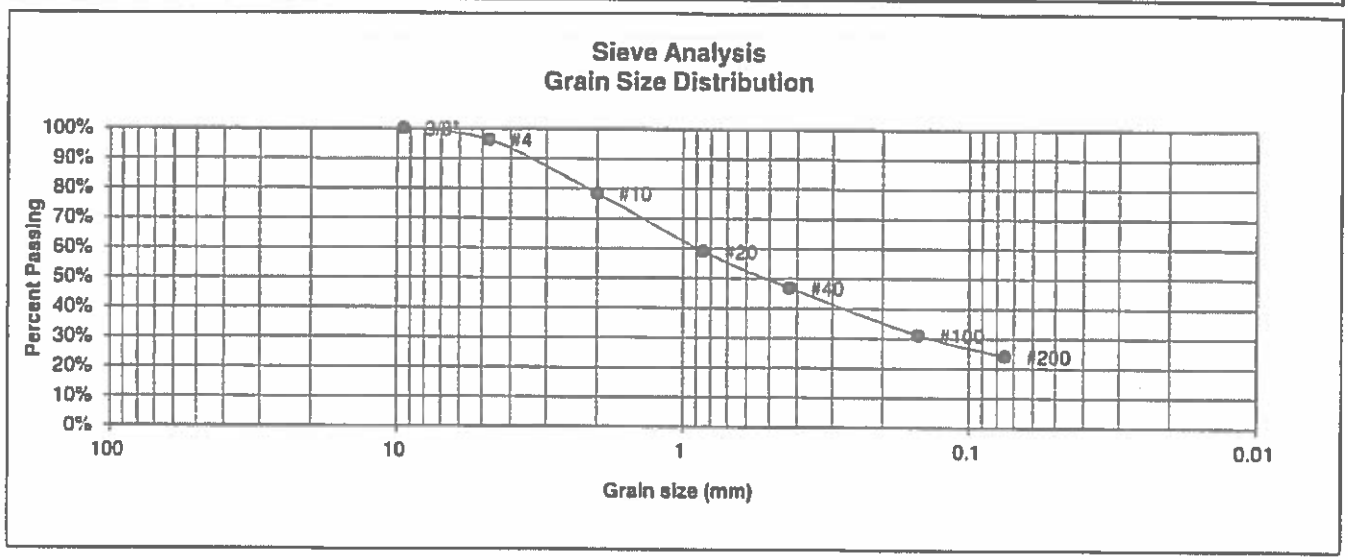
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
			10/1/20

JOB NO. 202000
FIG NO. B-1

UNIFIED CLASSIFICATION	SC	CLIENT	SR LAND, LLC
SOIL TYPE #	1	PROJECT	BRANDING IRON
TEST BORING #	8	JOB NO.	202000
DEPTH (FT)	0-3	TEST BY	BL
AASHTO CLASSIFICATION		GROUP INDEX	



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.4%
10	78.4%
20	59.1%
40	46.9%
100	31.1%
200	24.1%

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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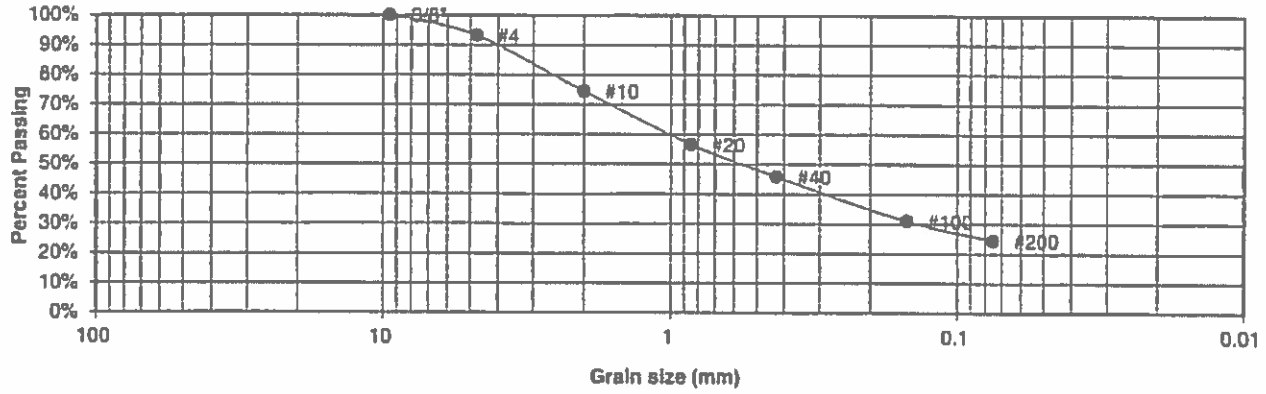
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LH	10/1/20

JOB NO
202000
FIG NO
B-2

UNIFIED CLASSIFICATION	SC	CLIENT	SR LAND, LLC
SOIL TYPE #	1	PROJECT	BRANDING IRON
TEST BORING #	1	JOB NO.	202000
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	93.2%
10	74.5%
20	56.7%
40	45.9%
100	31.0%
200	24.5%

Atterberg Limits

Plastic Limit	18
Liquid Limit	26
Plastic Index	8

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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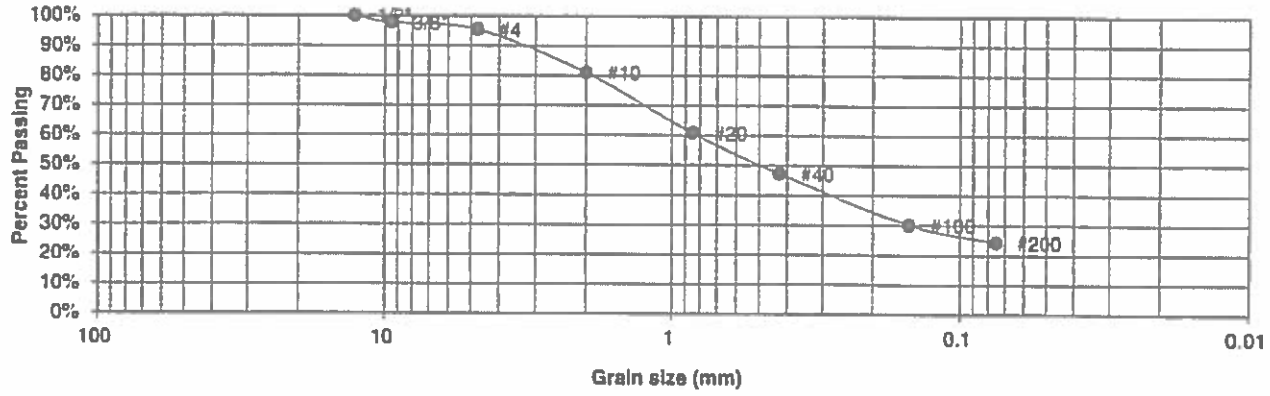
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
			10/1/20

JOB NO
202000
FIG NO
B-3

UNIFIED CLASSIFICATION	SM	CLIENT	SR LAND, LLC
SOIL TYPE #	1	PROJECT	BRANDING IRON
TEST BORING #	2	JOB NO.	202000
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.6%
4	95.4%
10	81.0%
20	60.8%
40	47.2%
100	30.1%
200	24.3%

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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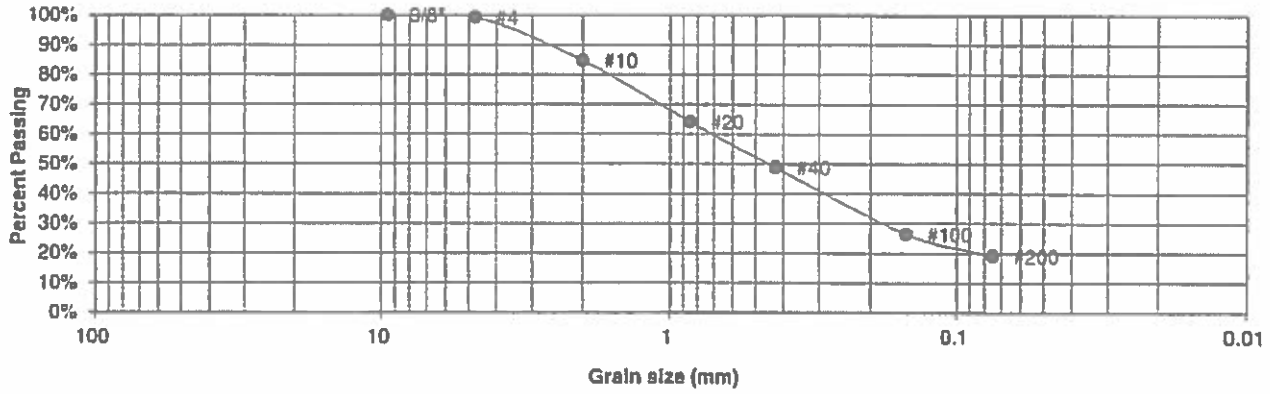
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
			10/17/20

JOB NO 202000
FIG NO

UNIFIED CLASSIFICATION	SM	CLIENT	SR LAND, LLC
SOIL TYPE #	1	PROJECT	BRANDING IRON
TEST BORING #	3	JOB NO.	202000
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	#VALUE!

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.3%
10	84.8%
20	64.2%
40	48.8%
100	26.4%
200	19.1%

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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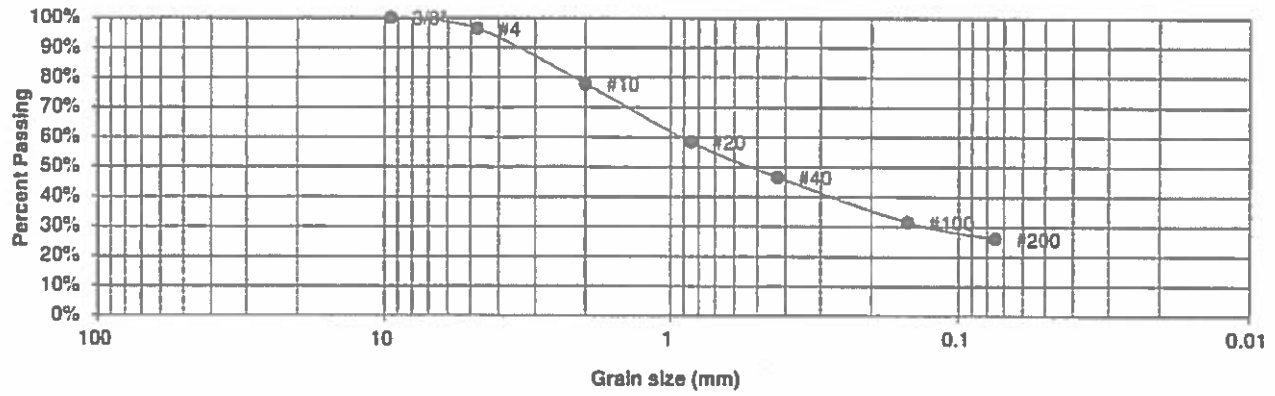
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED:	DATE
			10/1/20

JOB NO
202000
FIG NO
B-5

UNIFIED CLASSIFICATION	SC	CLIENT	SR LAND, LLC
SOIL TYPE #	1	PROJECT	BRANDING IRON
TEST BORING #	4	JOB NO.	202000
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-6	GROUP INDEX	1

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.4%
10	77.8%
20	58.4%
40	46.6%
100	31.5%
200	26.0%

Atterberg Limits

Plastic Limit	16
Liquid Limit	33
Plastic Index	17

Swell

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

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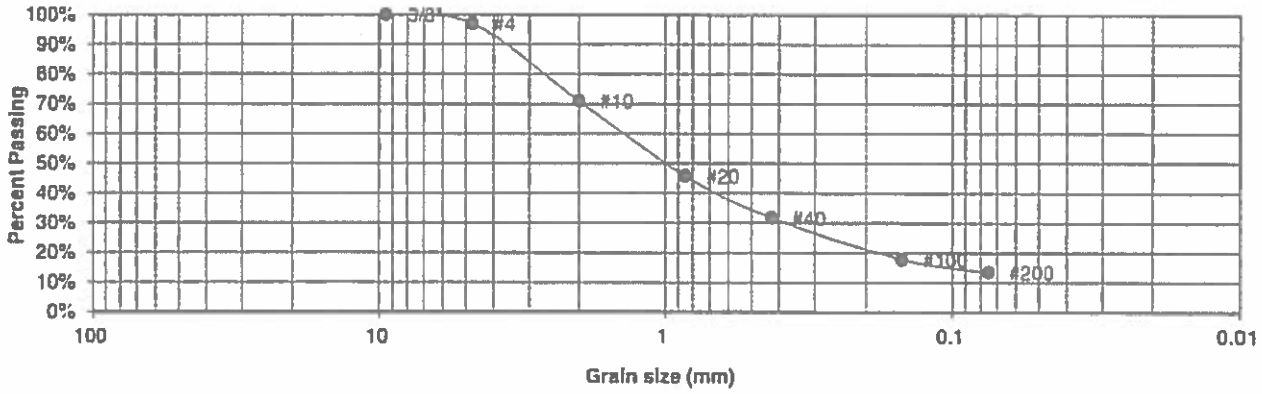
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE:
			10/1/20

JOB NO 202000
FIG NO B-6

UNIFIED CLASSIFICATION	SM	CLIENT	SR LAND, LLC
SOIL TYPE #	1	PROJECT	BRANDING IRON
TEST BORING #	6	JOB NO.	202000
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.0%
10	70.9%
20	45.8%
40	31.8%
100	17.8%
200	13.5%

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

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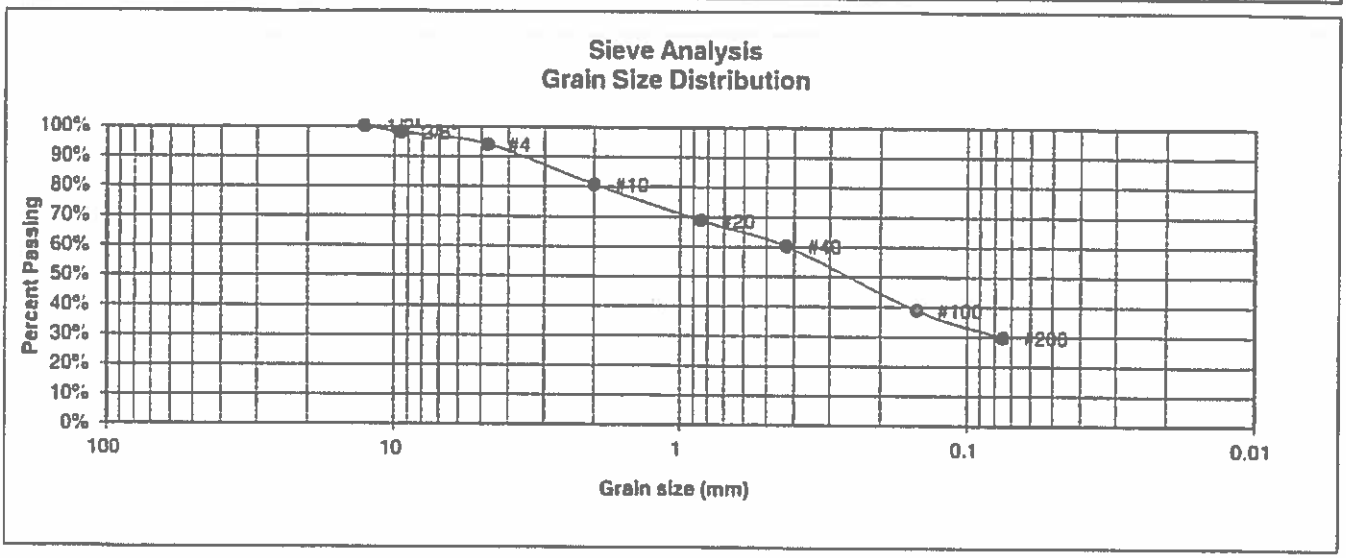
JOB NO
202000
FIG NO
B-7

UNIFIED CLASSIFICATION	SC	CLIENT	SR LAND, LLC
SOIL TYPE #	1	PROJECT	BRANDING IRON
TEST BORING #	7	JOB NO.	202000
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-6	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.0%
4	94.1%
10	80.8%
20	68.8%
40	60.3%
100	38.9%
200	29.8%

Atterberg Limits	
Plastic Limit	22
Liquid Limit	34
Plastic Index	12

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

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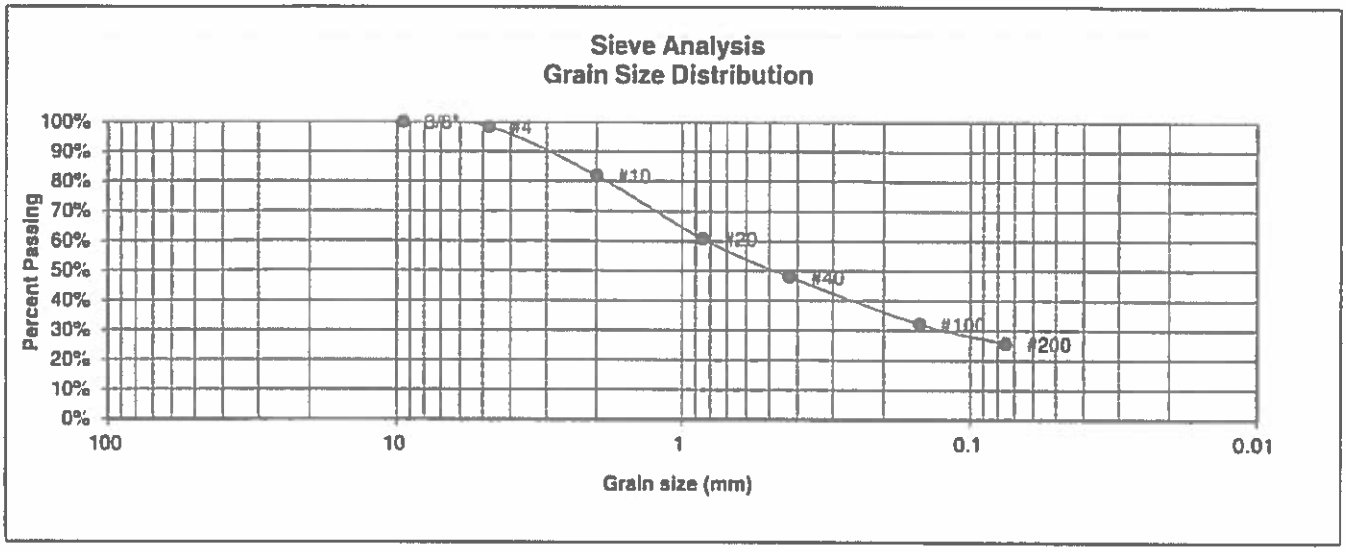
DRAWN	DATE	CHECKED	DATE
			10/1/20

JOB NO 202000
FIG NO B-8

UNIFIED CLASSIFICATION	SC	CLIENT	SR LAND, LLC
SOIL TYPE #	1	PROJECT	BRANDING IRON
TEST BORING #	8	JOB NO.	202000
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.3%
10	81.9%
20	60.8%
40	48.0%
100	32.2%
200	25.6%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	28
Plastic Index	10

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

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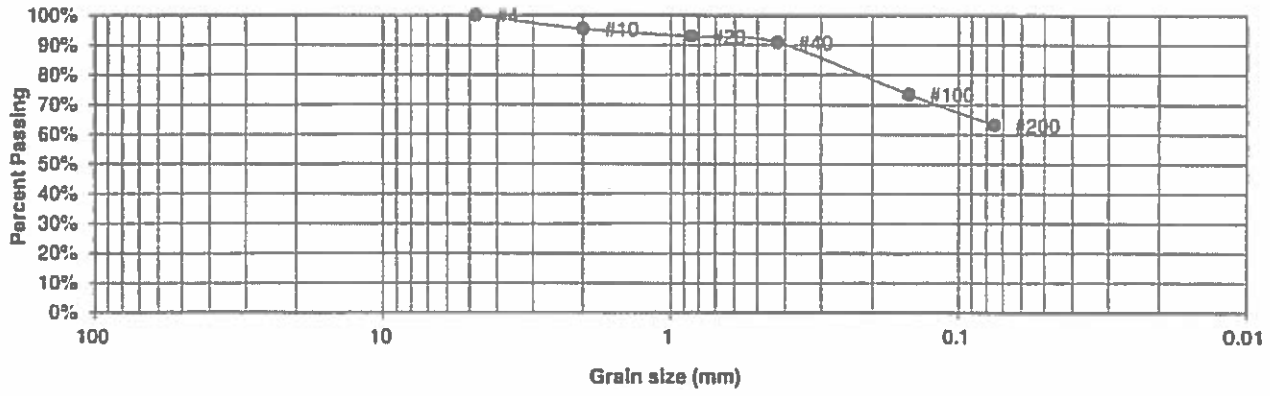
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			10/1/20

JOB NO
202000
FIG NO.
B-9

UNIFIED CLASSIFICATION	CL	CLIENT	SR LAND, LLC
SOIL TYPE #	2	PROJECT	BRANDING IRON
TEST BORING #	9	JOB NO.	202000
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-7-6	GROUP INDEX	13

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	95.4%
20	93.0%
40	90.9%
100	73.5%
200	63.1%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	42
Plastic Index	25

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

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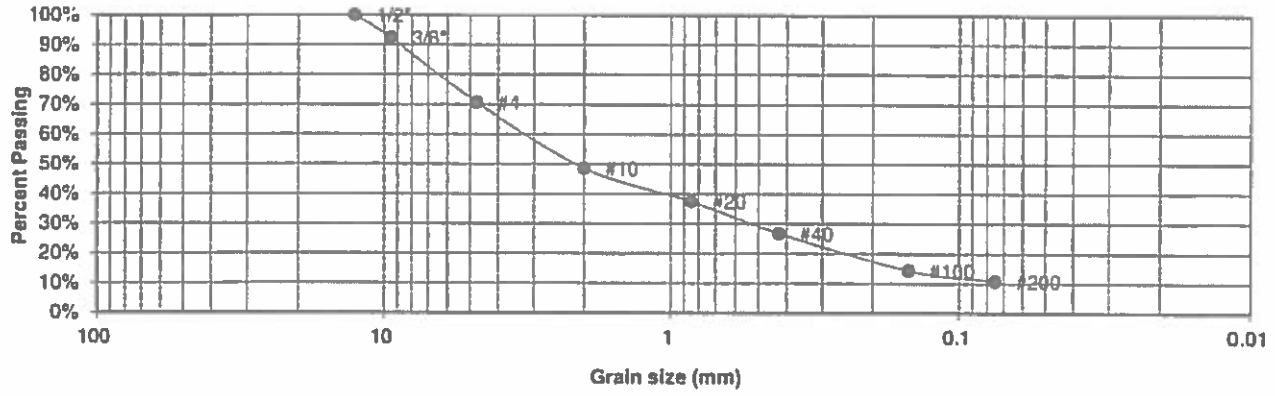
LABORATORY TEST RESULTS

DRAWN	DATE.	CHECKED:	DATE
		DS	10/21/12

JOB NO
202000
FIG NO
B-16

UNIFIED CLASSIFICATION	SM-SW	CLIENT	SR LAND, LLC
SOIL TYPE #	3	PROJECT	BRANDING IRON
TEST BORING #	1	JOB NO.	202000
DEPTH (FT)	10	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	92.3%
4	70.7%
10	48.5%
20	37.5%
40	26.8%
100	14.3%
200	10.7%

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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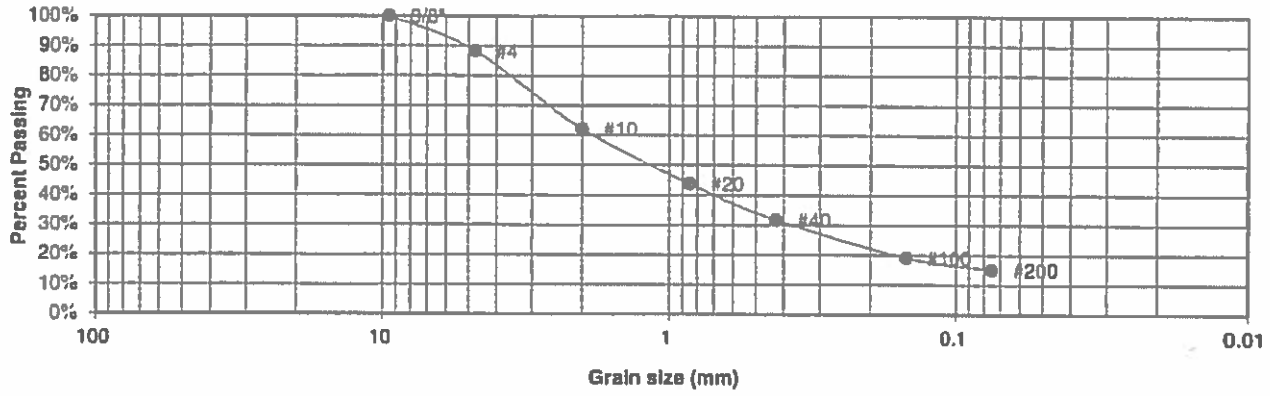
LABORATORY TEST RESULTS

DRAWN:	DATE	CHECKED:	DATE
			10/1/20

JOB NO
202000
FIG NO
B-11

UNIFIED CLASSIFICATION	SM	CLIENT	SR LAND, LLC
SOIL TYPE #	3	PROJECT	BRANDING IRON
TEST BORING #	2	JOB NO.	202000
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	88.3%
10	62.2%
20	43.9%
40	31.8%
100	19.1%
200	15.0%

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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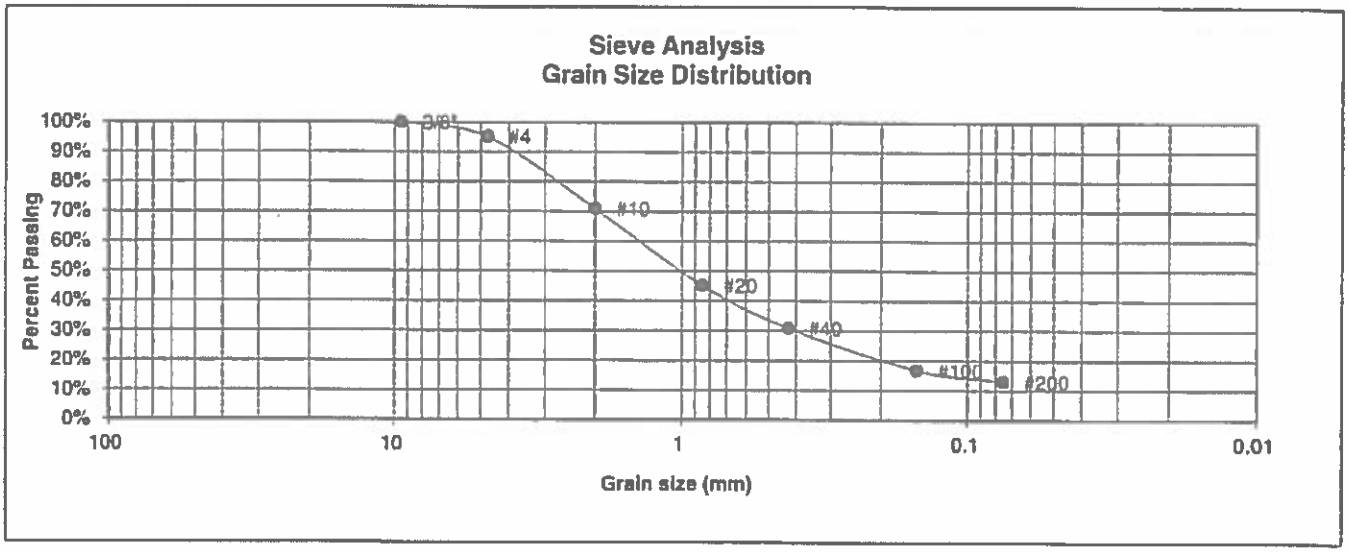
LABORATORY TEST RESULTS

DRAWN:	DATE	CHECKED:	DATE:
		h	10/1/20

JOB NO. 202000
FIG NO. B-12

UNIFIED CLASSIFICATION	SM	CLIENT	SR LAND, LLC
SOIL TYPE #	3	PROJECT	BRANDING IRON
TEST BORING #	3	JOB NO.	202000
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.1%
10	70.9%
20	45.2%
40	30.8%
100	16.8%
200	13.0%

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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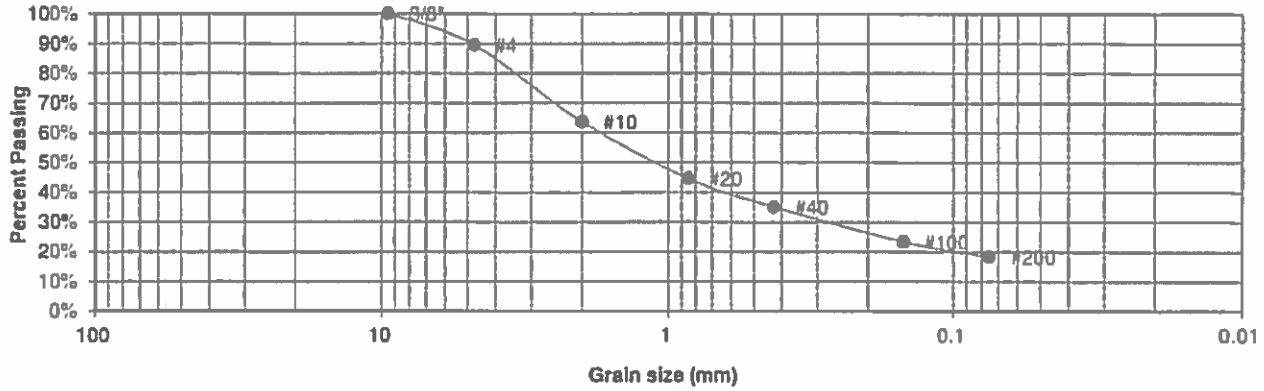
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED:	DATE:
			10/1/20

JOB NO
202000
FIG NO
B-13

UNIFIED CLASSIFICATION	SM	CLIENT	SR LAND, LLC
SOIL TYPE #	3	PROJECT	BRANDING IRON
TEST BORING #	4	JOB NO.	202000
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	89.6%
10	63.7%
20	44.6%
40	35.1%
100	23.3%
200	18.3%

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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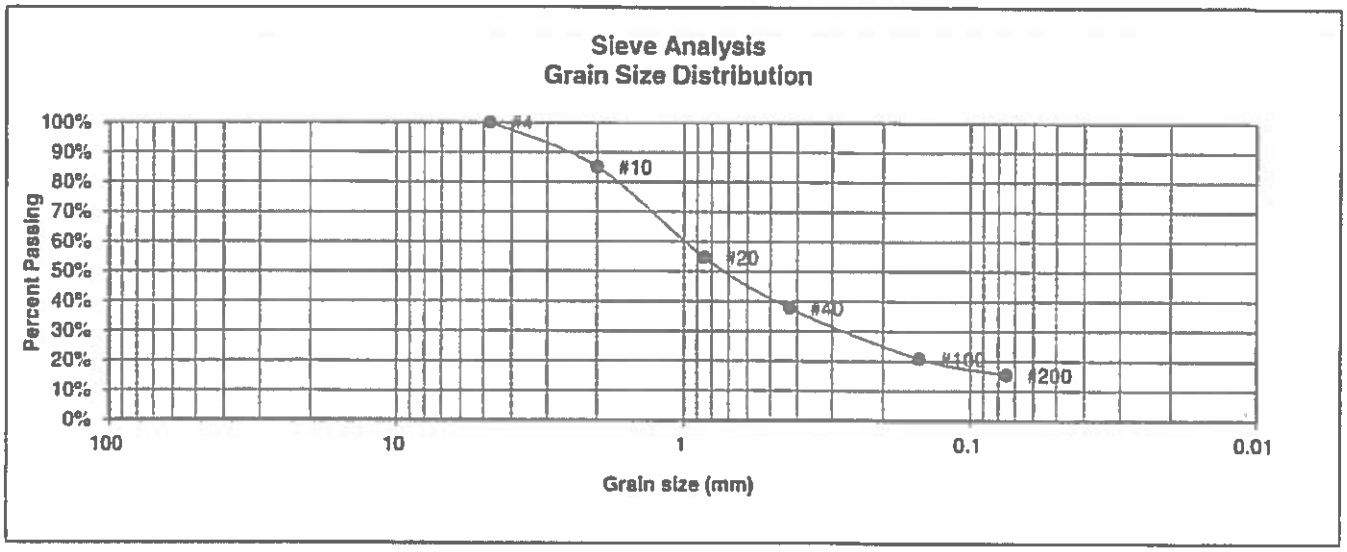
LABORATORY TEST RESULTS

DRAWN:	DATE	CHECKED:	DATE:
			10/1/20

JOB NO
202000
FIG NO
B-M

UNIFIED CLASSIFICATION	SM	CLIENT	SR LAND, LLC
SOIL TYPE #	3	PROJECT	BRANDING IRON
TEST BORING #	5	JOB NO.	202000
DEPTH (FT)	10	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	85.1%
20	54.7%
40	37.7%
100	20.8%
200	15.4%

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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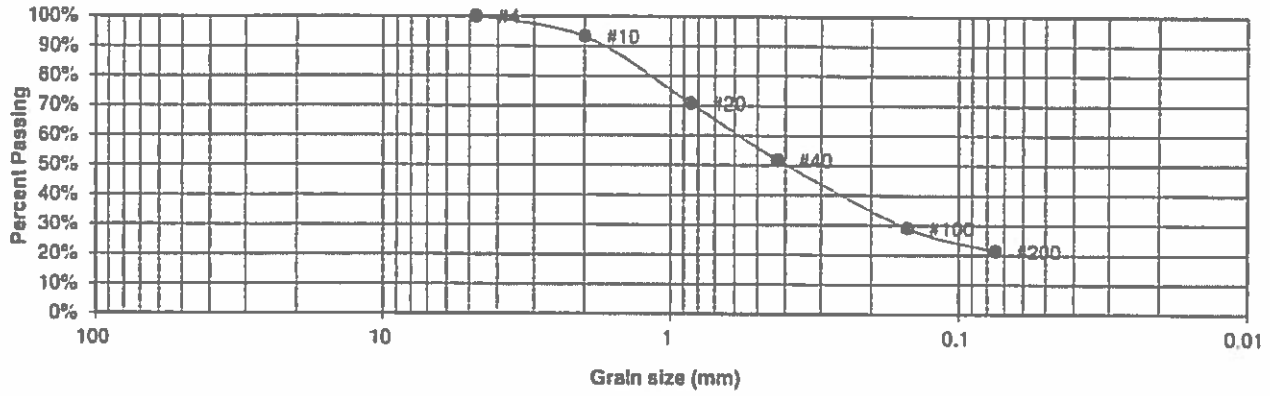
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
			10/1/20

JOB NO
202000
FIG NO
B-15

UNIFIED CLASSIFICATION	SM	CLIENT	SR LAND, LLC
SOIL TYPE #	3	PROJECT	BRANDING IRON
TEST BORING #	6	JOB NO.	202000
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	93.3%
20	70.8%
40	51.8%
100	29.0%
200	21.4%

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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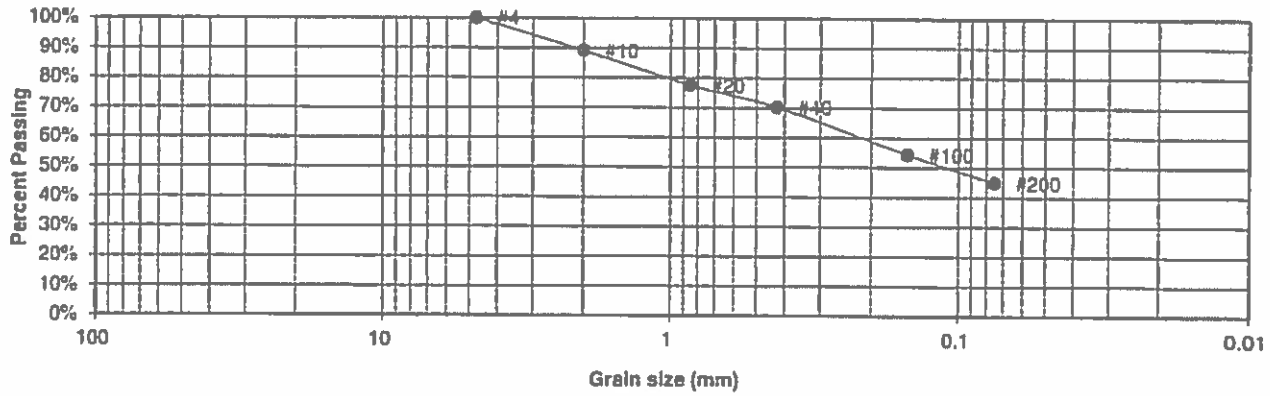
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED:	DATE:
			10/1/20

JOB NO. 202000
FIG NO. B-16

UNIFIED CLASSIFICATION	SM	CLIENT	SR LAND, LLC
SOIL TYPE #	4	PROJECT	BRANDING IRON
TEST BORING #	9	JOB NO.	202000
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	4

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	89.1%
20	77.5%
40	70.3%
100	54.4%
200	45.0%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	36
Plastic Index	18

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

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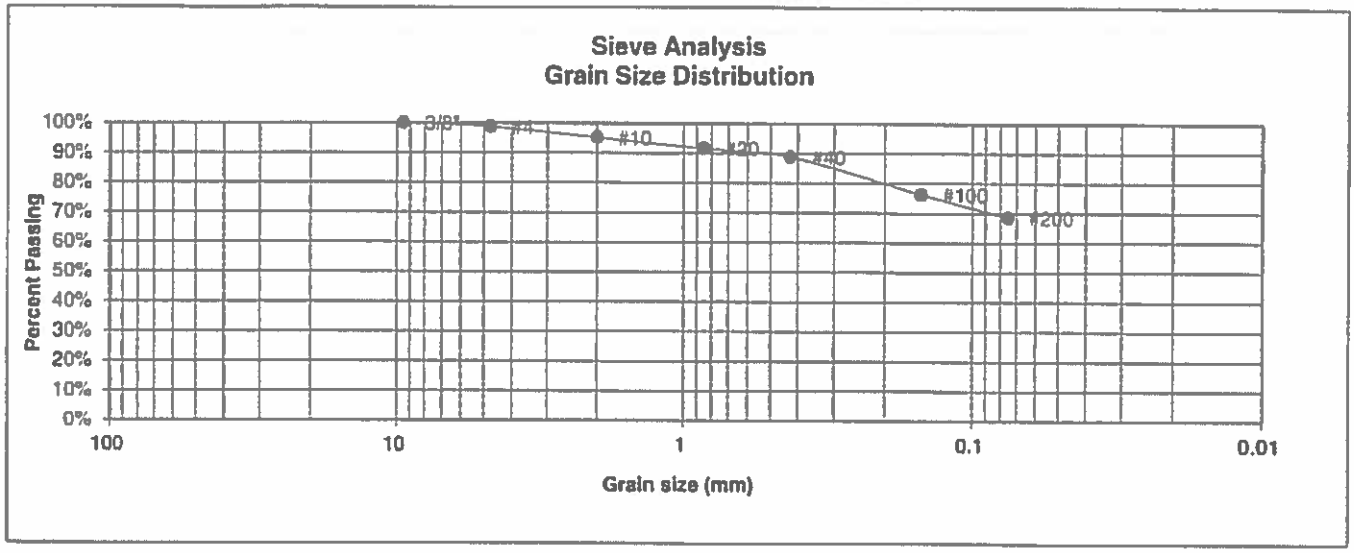
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			10/1/20

JOB NO
202000
FG NO
B-17

UNIFIED CLASSIFICATION	CL	CLIENT	SR LAND, LLC
SOIL TYPE #	4	PROJECT	BRANDING IRON
TEST BORING #	5	JOB NO.	202000
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	10



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.7%
10	95.2%
20	91.6%
40	88.8%
100	76.3%
200	68.6%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	36
Plastic Index	18

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

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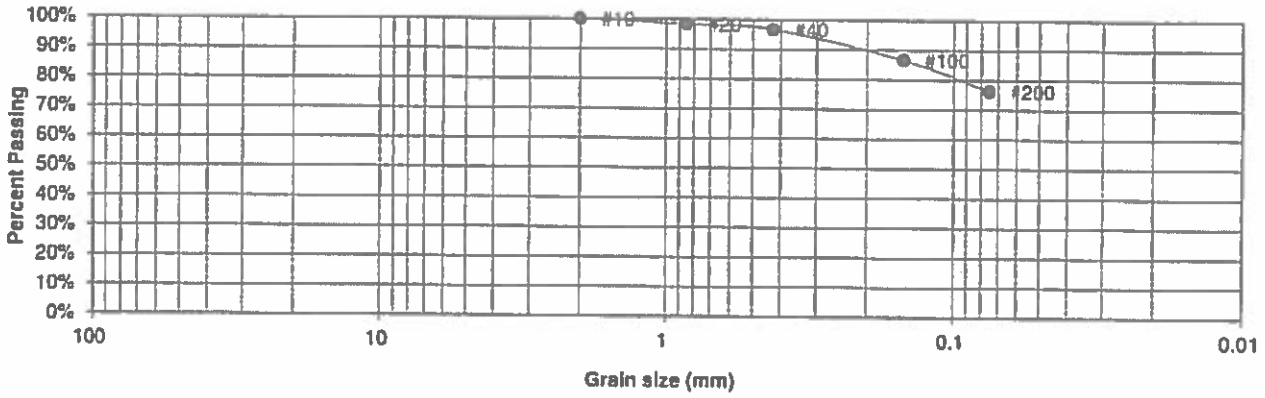
LABORATORY TEST RESULTS

DRAWN	DATE.	CHECKED	DATE
			10/1/20

JOB NO
202000
FIG NO
B-16

UNIFIED CLASSIFICATION	CL	CLIENT	SR LAND, LLC
SOIL TYPE #	4	PROJECT	BRANDING IRON
TEST BORING #	8	JOB NO.	202000
DEPTH (FT)	10	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	12

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	98.4%
40	96.7%
100	86.7%
200	76.2%

Atterberg Limits

Plastic Limit	23
Liquid Limit	39
Plastic Index	16

Swell

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

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LABORATORY TEST RESULTS

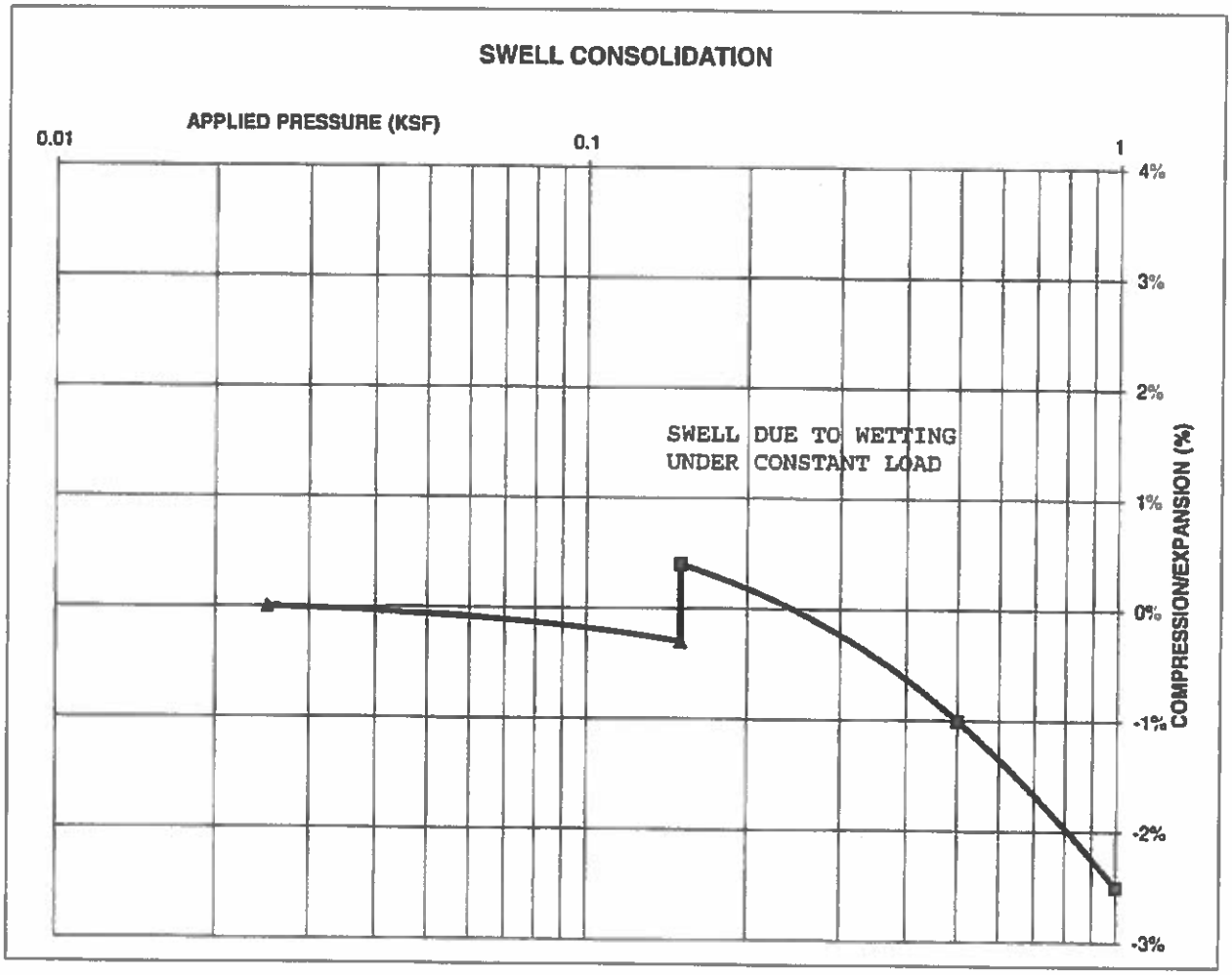
DRAWN	DATE	CHECKED	DATE
			10/1/20

JOB NO 202000
FIG NO B-19

CONSOLIDATION TEST RESULTS

TEST BORING #	7	DEPTH(ft)	0-3
DESCRIPTION	SC	SOIL TYPE	1, CBR
NATURAL UNIT DRY WEIGHT (PCF)			126
NATURAL MOISTURE CONTENT			7.9%
SWELL/CONSOLIDATION (%)			0.7%

JOB NO. 202000
CLIENT SR LAND, LLC
PROJECT BRANDING IRON



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SWELL CONSOLIDATION
TEST RESULTS

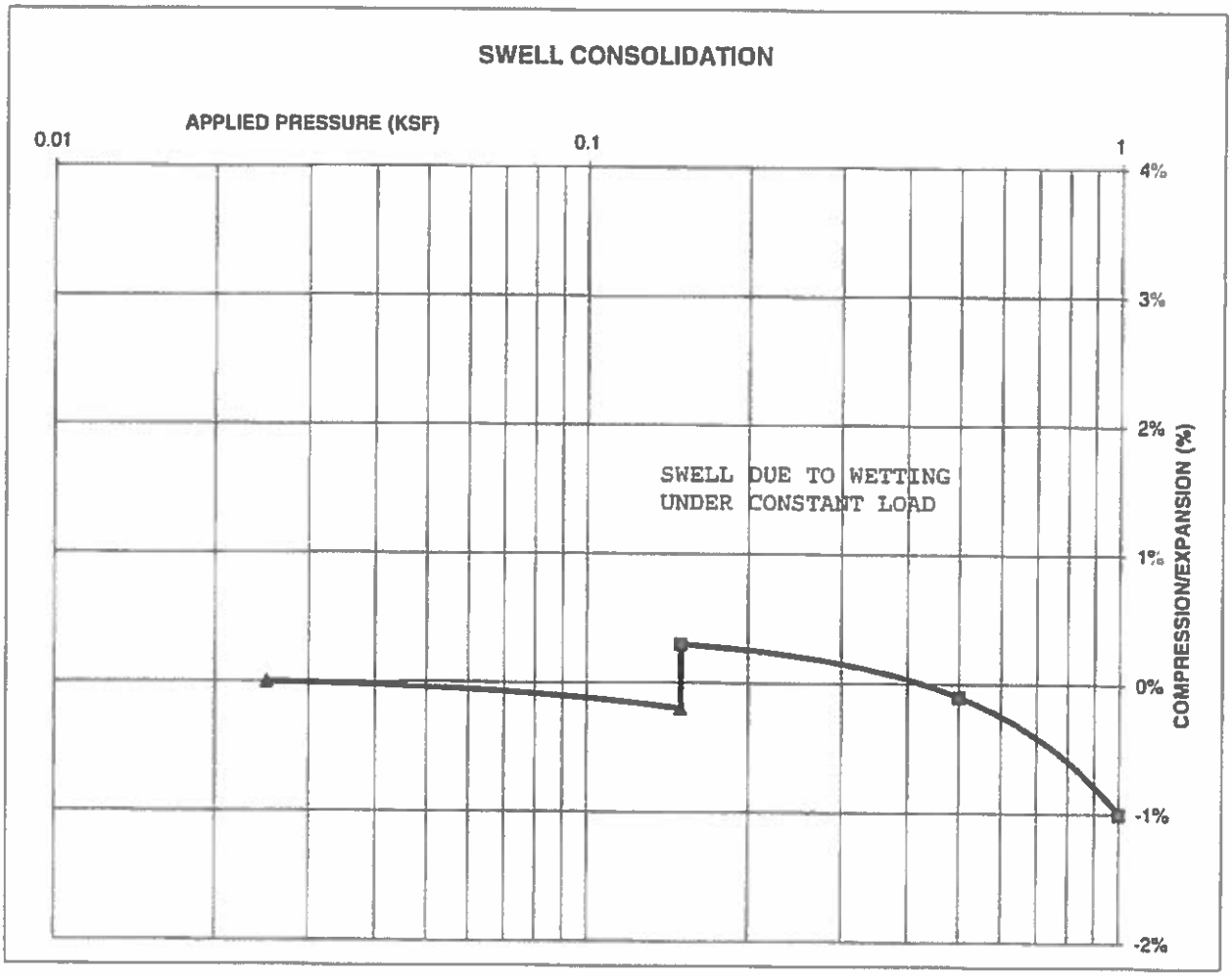
DRAWN:	DATE:	CHECKED:	DATE:
		DS	10/19/20

JOB NO 202000
FIG NO B-2a

CONSOLIDATION TEST RESULTS

TEST BORING #	4	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			120
NATURAL MOISTURE CONTENT			6.9%
SWELL/CONSOLIDATION (%)			0.5%

JOB NO. 202000
CLIENT SR LAND, LLC
PROJECT BRANDING IRON



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SWELL CONSOLIDATION
TEST RESULTS

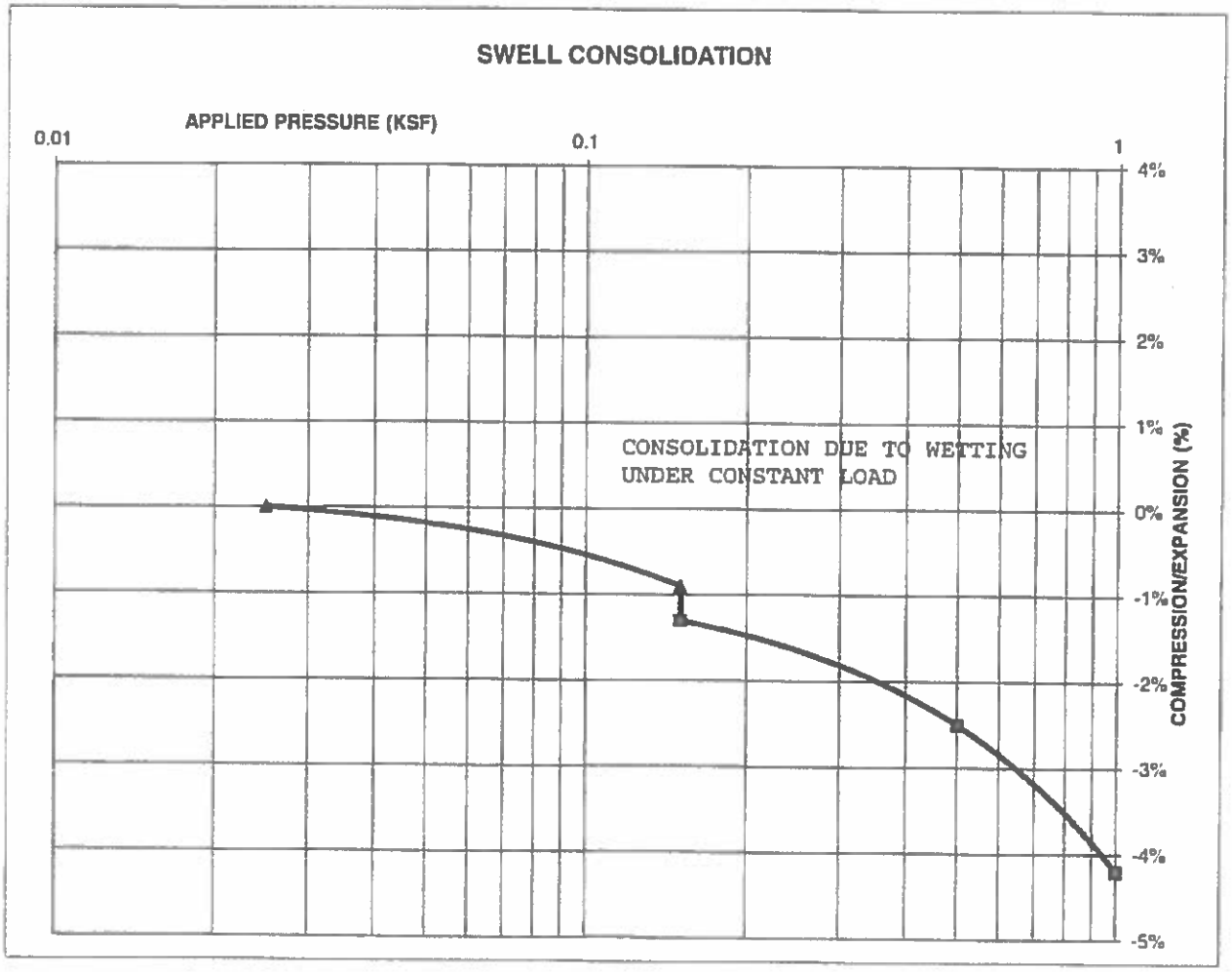
DRAWN	DATE	CHECKED	DATE
		DJ	10/14/20

JOB NO 202000
FIG NO. B-21

CONSOLIDATION TEST RESULTS

TEST BORING #	5	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			113
NATURAL MOISTURE CONTENT			14.6%
SWELL/CONSOLIDATION (%)			-0.4%

JOB NO. 202000
CLIENT SR LAND, LLC
PROJECT BRANDING IRON



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SWELL CONSOLIDATION
TEST RESULTS

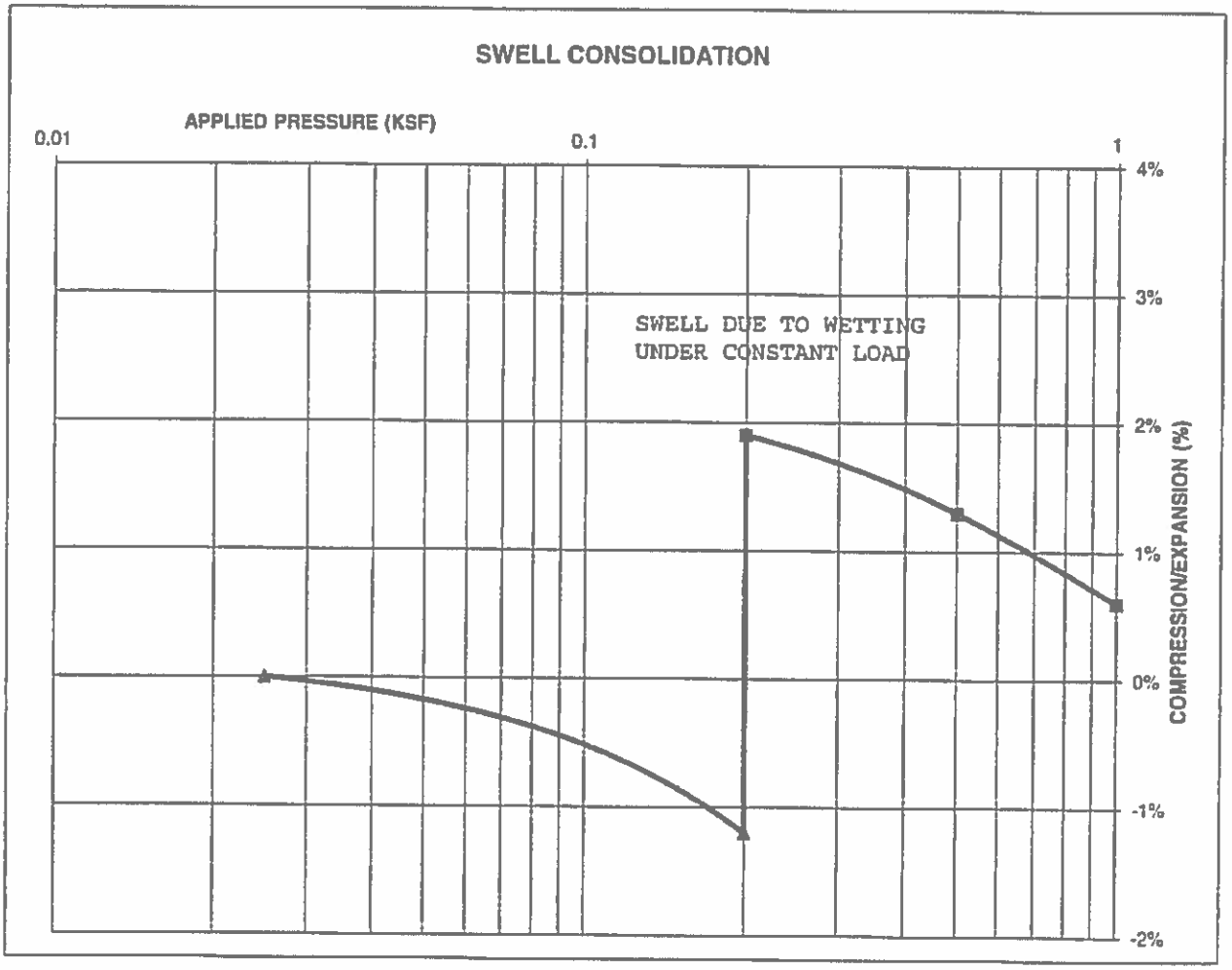
DRAWN:	DATE	CHECKED:	DATE:
		DS	10/14/20

JOB NO. 202000
FIG NO. B-22

CONSOLIDATION TEST RESULTS

TEST BORING #	9	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			112
NATURAL MOISTURE CONTENT			16.6%
SWELL/CONSOLIDATION (%)			3.1%

JOB NO. 202000
CLIENT SR LAND, LLC
PROJECT BRANDING IRON



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COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

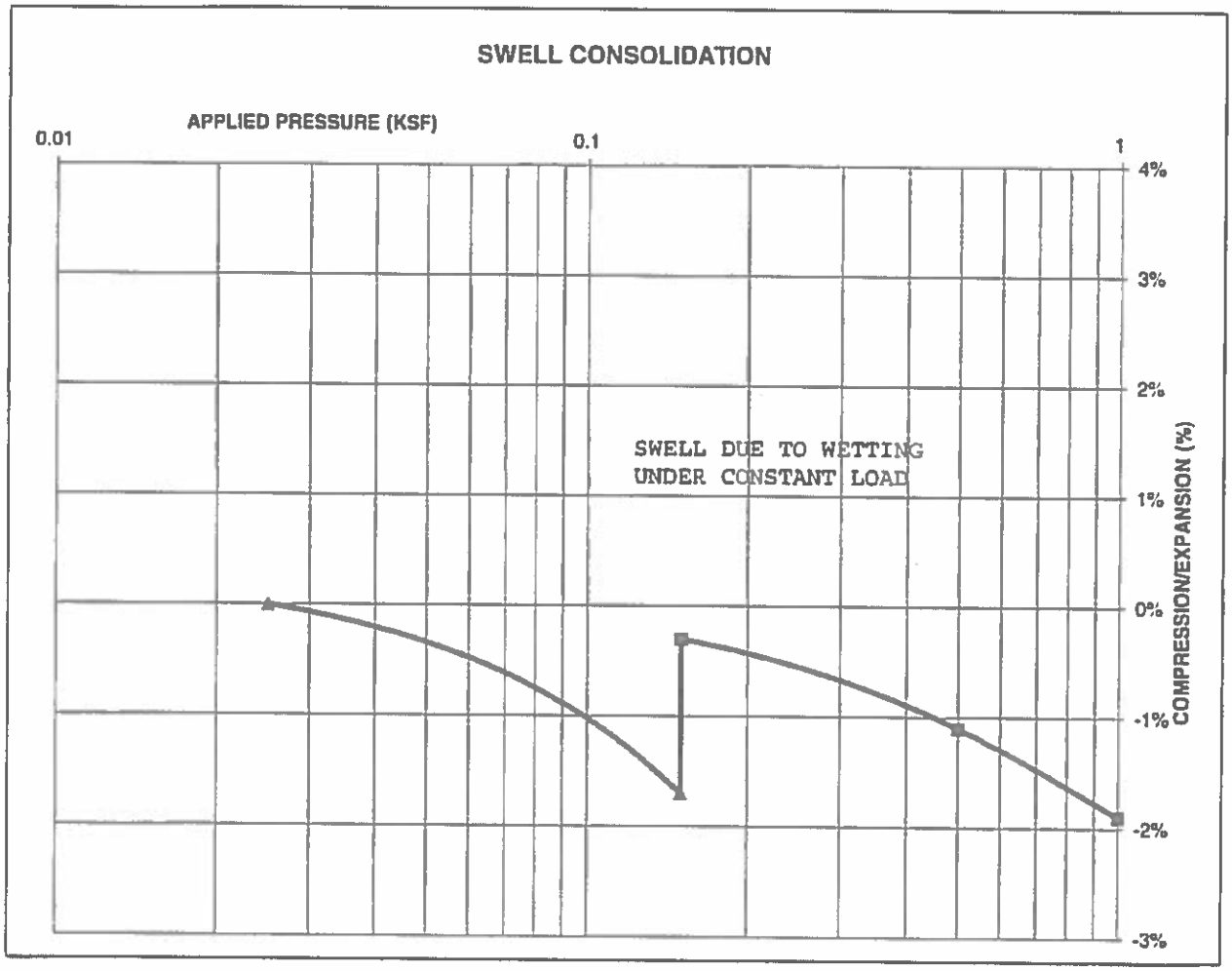
DRAWN	DATE	CHECKED	DATE
			10/1/20

JOB NO 202000
FIG NO B-23

CONSOLIDATION TEST RESULTS

TEST BORING #	7	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			112
NATURAL MOISTURE CONTENT			14.2%
SWELL/CONSOLIDATION (%)			1.4%

JOB NO. 202000
CLIENT SR LAND, LLC
PROJECT BRANDING IRON



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COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

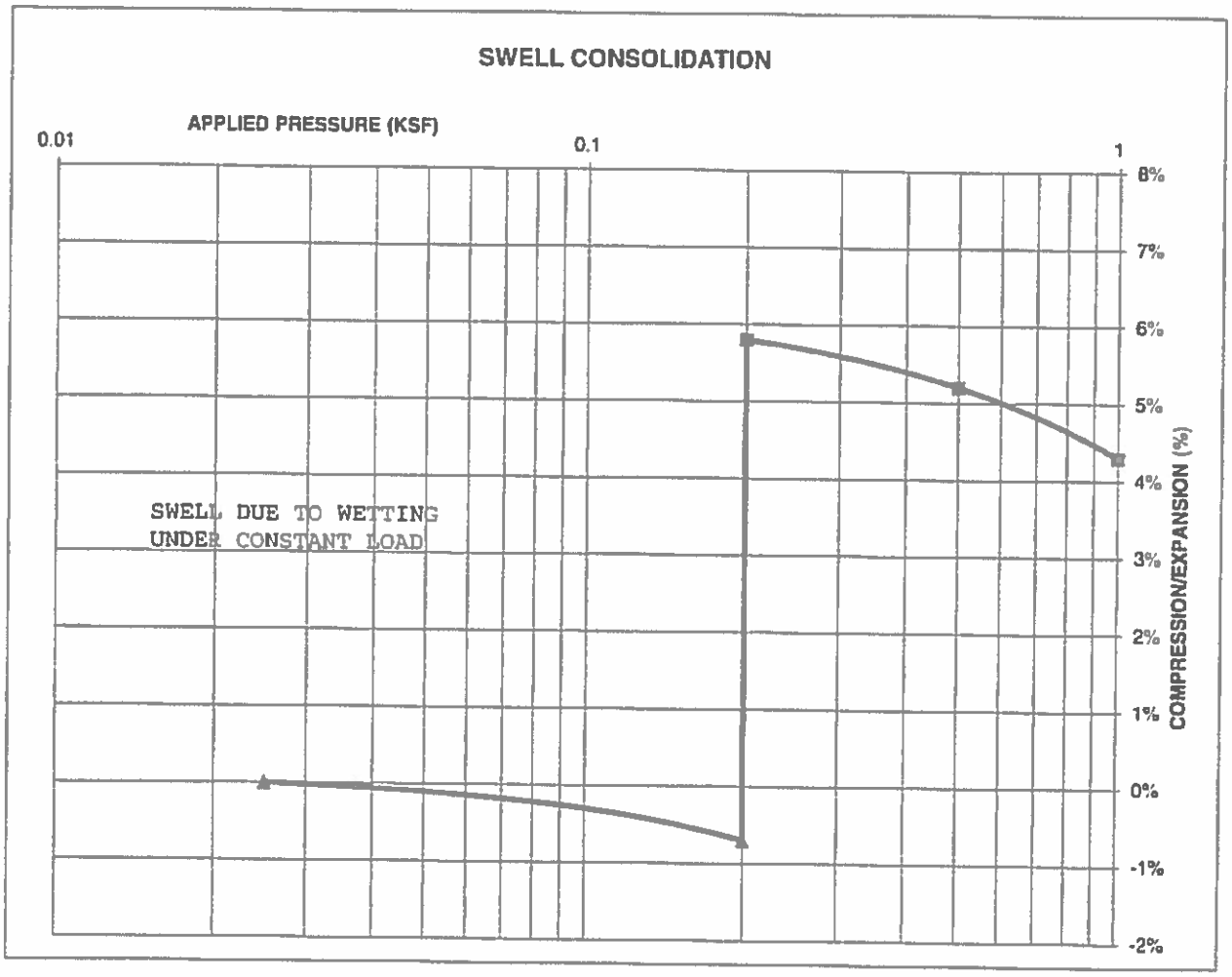
DRAWN	DATE:	CHECKED:	DATE:
		JS	10/14/20

JOB NO 202000
FG NO

CONSOLIDATION TEST RESULTS

TEST BORING #	8	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			112
NATURAL MOISTURE CONTENT			17.3%
SWELL/CONSOLIDATION (%)			6.5%

JOB NO. 202000
CLIENT SR LAND, LLC
PROJECT BRANDING IRON



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

SWELL CONSOLIDATION
TEST RESULTS

DRAWN	DATE	CHECKED	DATE
			10/1/20

JOB NO 202000
FIG NO B-25

CLIENT	SR LAND, LLC	JOB NO.	202000
PROJECT	BRANDING IRON	DATE	9/23/2020
LOCATION	BRANDING IRON	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	1-2	1	SC	<0.01
TB-2	5	3	SM	<0.01
TB-3	1-2	1	SM	0.00
TB-4	5	3	SM	<0.01
TB-5	1-2	4	CL	0.00
TB-7	1-2	1	SC	<0.01
TB-8	10	4	CL	<0.01
TB-9	1-2	2	CL	0.00

QC BLANK PASS

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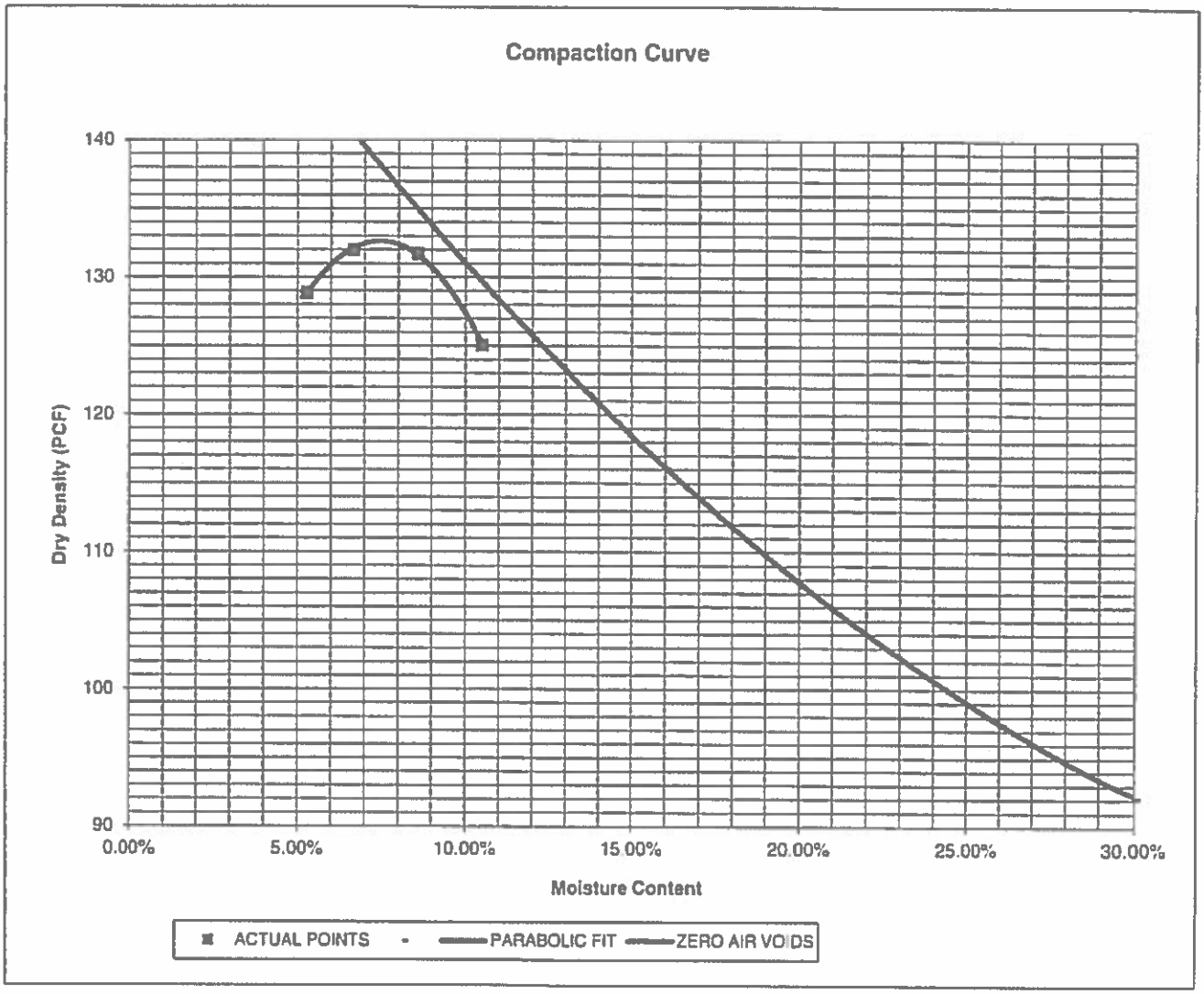
LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			10/11/20

JOB NO. 202000
FIG NO. B-2

PROJECT	BRANDING IRON	CLIENT	SR LAND, LLC
SAMPLE LOCATION	TB-7 @ 0-3'	JOB NO.	202000
SOIL DESCRIPTION	SAND, CLAYEY, BROWN	DATE	09/25/20

IDENTIFICATION	SC	COMPACTION TEST #	1
TEST DESIGNATION / METHOD	ASTM D-1557-A	TEST BY	BL
MAXIMUM DRY DENSITY (PCF)	132.7	OPTIMUM MOISTURE	7.7%



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MOISTURE DENSITY RELATION

DRAWN:	DATE:	CHECKED:	DATE:
			10/1/20

JOB NO
202000
FIG NO
B-27

CBR TEST LOAD DATA

JOB NO: 202000
CLIENT: SR LAND, LLC
PROJECT: BRANDING IRON
SOIL TYPE: I

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

PENETRATION DEPTH (INCHES)	*10 BLOWS* MOLD # 10 LOAD(LBS) (LBS)	STRESS (PSI)	*25 BLOWS* MOLD # 1 LOAD(LBS) (LBS)	STRESS (PSI)	*56 BLOWS* MOLD # 6 LOAD(LBS) (LBS)	STRESS (PSI)
0.000	0	0.00	0	0.00	0	0.00
0.025	371	123.98	602	201.17	796	266.00
0.050	512	171.09	1289	430.74	1488	497.24
0.075	726	242.61	1691	565.08	2199	734.83
0.100	998	333.50	1950	651.63	3326	1111.44
0.125	1235	412.70	2295	766.91	3914	1307.93
0.150	1574	525.98	2528	844.78	4259	1423.22
0.175	1788	597.49	2715	907.27	4634	1548.53
0.200	2011	672.01	2881	962.74	5301	1771.42
0.300	2232	745.86	3574	1194.32	6000	2005.01
0.400	2487	831.08	4077	1362.40		
0.500	2789	931.99	4623	1544.86		

FINAL MOISTURE CONTENT

	MOLD #	10	MOLD #	1	MOLD #	6
CAN #		303		307		301
WT. CAN		8.17		8.42		8.36
WT. CAN+WET		223.21		153.39		202.18
WT. CAN+DRY		195.3		138.71		185.63
WT. H20		27.91		14.68		16.55
WT. DRY SOIL		187.13		130.29		177.27
MOISTURE CONTENT		14.91%		11.27%		9.34%
WET DENSITY (PCF)		130.0		134.2		141.8
DRY DENSITY (PCF)		120.7		124.6		131.7
BEARING RATIO		33.35		65.16		111.14
90% OF DRY DENSITY	119.4					
95% OF DRY DENSITY	126.1					

BEARING RATIO AT 90% OF MAX	23.16	~ R VALUE	71
BEARING RATIO AT 95% OF MAX	74.61	~ R VALUE	83

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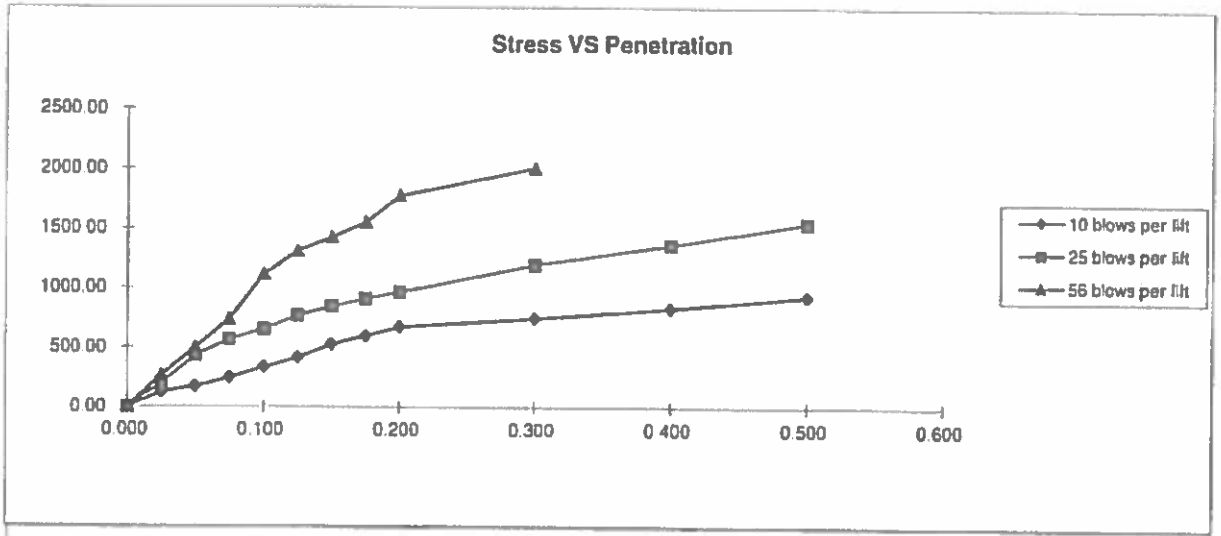
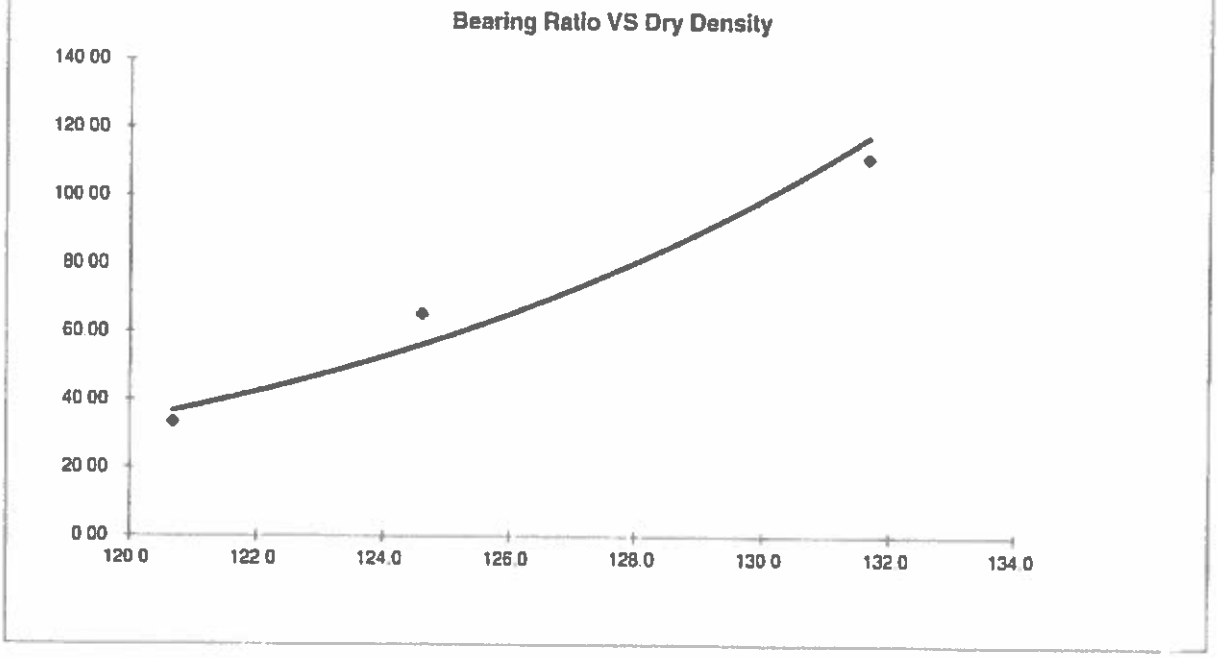
COLORADO SPRINGS, COLORADO 80907

CBR TEST DATA

DRAWN:	DATE:	CHECKED:	DATE:
			10/1/20

JOB NO 202000
FIG NO B-28





BEARING RATIO AT 90% OF MAX	23.16	~ R VALUE	71.00
BEARING RATIO AT 95% OF MAX	74.61	~ R VALUE	83.00

JOB NO: 202000
SOIL TYPE: 1

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CALIFORNIA BEARING RATIO

DRAWN	DATE	CHECKED:	DATE
			10/1/20

JOB NO 202000
FIG NO B-29

APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

BRANDING IRON AT STERLING RANCH F2 - URBAN LOCAL LOW VOLUME
MISTY LAKE COURT AND SPRAGUE WAY
SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
Hveem Stabilometer (R Value) Results:	R =	50
Standard Deviation	S_o =	0.44
Loss in Serviceability	Δpsi =	2.0
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	13168

Weighted Structural Number (WSN): → WSN = 1.47

DESIGN TABLES AND EQUATIONS

$S_1 = [(R - 5) / 11.29] + 3$

$M_R = 10^{[(S_1 + 18.72) / 6.24]}$

$k = M_R / 19.4$

Where:

M_R = resilient modulus (psi)

S_1 = the soil support value

R = R-value obtained from the Hveem stabilometer

CBR = California Bearing Ratio

Reliability (%)	Z_R (z-statistic)
80	-0.84
85	-1.04
90	-1.28
93	-1.48
94	-1.56
95	-1.65
96	-1.75
97	-1.88
98	-2.05
99	-2.33
99.9	-3.09
99.99	-3.75

$$\log_{10}W_{18} = Z_R * S_O + 9.36*\log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2 - 1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32*\log_{10}M_R - 8.07$$

Left	Right	Difference
4.58	4.58	0.0

Job No. 202000
Fig. No. C-1

DESIGN CALCULATIONS

DESIGN DATA BRANDING IRON AT STERLING RANCH F2 - URBAN LOCAL LOW-VOLUME
MISTY LAKE COURT AND SPRAGUE WAY
SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	36,500
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	1.47

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.11 Strength Coefficient - Aggregate Base Course

D_1 = Depth of Asphalt (inches)
D_2 = Depth of Base Course (inches)

FOR FULL DEPTH ASPHALT SECTION (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 3.3 inches of Full Depth Asphalt
Use N/A inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = [3] inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 1.4 inches of Aggregate
Base Course, use 4.0 inches

RECOMMENDED ALTERNATIVES

1. 3.0 inches of Asphalt + 4.0 inches of Aggregate Base Course, or
2. N/A inches of Asphalt

Job No. 202000
Fig. No. C-2

DESIGN CALCULATIONS

DESIGN DATA BRANDING IRON AT STERLING RANCH F2 - URBAN LOCAL LOW VOLUME
MISTY LAKE COURT AND SPRAGUE WAY
SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	36,500
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	1.47

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.11 Strength Coefficient - Recycled Concrete

D_1 = Depth of Asphalt (inches)
D_2 = Depth of Base Course (inches)

FOR FULL DEPTH ASPHALT SECTION (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 3.3 inches of Full Depth Asphalt
Use N/A inches Full Depth

FOR ASPHALT + RECYCLED CONCRETE BASE COURSE SECTION

Asphalt Thickness (t) = [3] inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 1.4 inches of Recycled Concrete
Base Course, use 4.0 inches

RECOMMENDED ALTERNATIVES

1. 3.0 inches of Asphalt + 4.0 inches of Recycled Concrete Base Course, or
2. N/A inches of Asphalt

Job No. 202000
Fig. No. C-3

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

BRANDING IRON AT STERLING RANCH F2 - URBAN LOCAL
WHITEFISH, MOSBY, LODGE GRASS AND YELLOWTAIL WAYS
SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	292,000
Hveem Stabilometer (R Value) Results:	R =	50
Standard Deviation	S_o =	0.44
Loss in Serviceability	Δpsi =	2.0
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	13168

Weighted Structural Number (WSN): → WSN = 2.09

DESIGN TABLES AND EQUATIONS

$S_1 = [(R - 5) / 11.29] + 3$

$M_R = 10^{[(S_1 - 18.72)/6.24]}$

$k = M_R / 19.4$

Where:

M_R = resilient modulus (psi)

S_1 = the soil support value

R = R-value obtained from the Hveem stabilometer

CBR = California Bearing Ratio

Reliability (%)	Z_R (z-statistic)
80	-0.84
85	-1.04
90	-1.28
93	-1.48
94	-1.56
95	-1.65
96	-1.75
97	-1.88
98	-2.05
99	-2.33
99.9	-3.09
99.99	-3.75

$$\log_{10}W_{18} = Z_R * S_O + 9.36*\log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2 - 1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32*\log_{10}M_R - 8.07$$

Left	Right	Difference
5.47	5.46	0.0

Job No. 202000
Fig. No. C-4

DESIGN CALCULATIONS

DESIGN DATA BRANDING IRON AT STERLING RANCH F2 - URBAN LOCAL
WHITEFISH, MOSBY, LODGE GRASS AND YELLOWTAIL WAYS
SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	292,000
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	2.09

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.11 Strength Coefficient - Aggregate Base Course

D_1 = Depth of Asphalt (inches)
D_2 = Depth of Base Course (inches)

FOR FULL DEPTH ASPHALT SECTION (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1 =$ 4.7 inches of Full Depth Asphalt
Use N/A inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = [3.5] inches
$D_2 = ((WSN) - (t)(C_1))/C_2 =$ 5.0 inches of Aggregate
Base Course, use 8.0

RECOMMENDED ALTERNATIVES

1. 3.5 inches of Asphalt + 8.0 inches of Aggregate Base Course, or
2. N/A inches of Asphalt

Job No. 202000
Fig. No. C-5

DESIGN CALCULATIONS

DESIGN DATA BRANDING IRON AT STERLING RANCH F2 - URBAN LOCAL
WHITEFISH, MOSBY, LODGE GRASS AND YELLOWTAIL WAYS
SOIL TYPE I

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	292,000
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	2.09

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.11 Strength Coefficient - Recycled Concrete

D_1 = Depth of Asphalt (inches)
D_2 = Depth of Base Course (inches)

FOR FULL DEPTH ASPHALT SECTION (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 4.7 inches of Full Depth Asphalt
Use N/A inches Full Depth

FOR ASPHALT + RECYCLED CONCRETE BASE COURSE SECTION

Asphalt Thickness (t) = [3.5] inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 5.0 inches of Recycled Concrete
Base Course, use 8.0 inches

RECOMMENDED ALTERNATIVES

1. 3.5 inches of Asphalt + 8.0 inches of Recycled Concrete Base Course, or
2. N/A inches of Asphalt

Job No. 202000
Fig. No. C-6