



ENTECH
ENGINEERING, INC.

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

June 8, 2022

Tech Contractors
3575 Kenyon Street, Suite 200
San Diego, California 92110

Attn: Raul Guzman

Re: Pavement Recommendations
Rolling Hills at Meridian Ranch Filing No. 3
El Paso County, Colorado

APPROVED
Engineering Department

06/22/2022 8:43:42 AM

dsdnijkamp

EPC Planning & Community
Development Department

Dear Mr. Guzman:

As requested, Entech Engineering, Inc. has obtained samples of the subgrade soils from sections of the roadways in the Rolling Hills at Meridian Ranch subdivision, Filing No. 3, in El Paso County, Colorado. Laboratory testing to determine the pavement support characteristics of the soils was performed. This letter presents the results of the laboratory testing and provides pavement recommendations for the roadways.

Project Description

The roadways in Filing No. 3 consist of sections of Crooked Hill Drive, Rolling Ranch Drive, Evening Creek Drive, Cuatro Caminos Drive, Parkland Drive, and Rex Road, along with Monument Vista Drive, Bluffpoint Drive, Coastal Hills Lane, and Crooked Bluff Drive. The site layout and the locations of the test borings, drilled at approximate 500-foot intervals, are shown on the Test Boring Location Map, Figure 1.

Subgrade Conditions

Twenty exploratory test borings were drilled in the roadways to depths of approximately 5 to 10 feet. The Boring Logs are presented in Appendix A. Sieve Analysis and Atterberg Limit testing were performed on the subgrade soil samples obtained from the test borings for the purpose of classification. Three soil types and two bedrock types were encountered in the test borings. The soils encountered at subgrade depth consisted of three general soil types; Type 1; silty to slightly silty to clayey sand fill, Type 2; native silty sand, and Type 3; native sandy clay. Soil Types 1 and 2 were grouped into one soil category, due to their similar characteristics. Soil Types 4 and 5 were bedrock and were encountered at depths below the subgrade influence zone. The Type 3 roadway soils should be penetrated or be overexcavated and replaced with Type 1 or 2 soils. This report evaluates and presents recommendations for Type 1 soils for all of the roadway sections.

Soil Type 3 should be mitigated, due to its poor subgrade support characteristics. Type 3 Soils were encountered at the anticipated subgrade depth in one boring (Test Boring No. 20). Mitigation recommendations will be provided later in this report. Sieve analyses performed on Type 1 soils indicated the percent passing the No. 200 sieve ranged from approximately 8 to 28 percent. Sieve analyses performed on Type 2 soils ranged from approximately 14 to 28 percent. Atterberg Limit Tests performed on the Type 1 soils resulted in Liquid Limits ranging from no-value to 32 and Plastic Indexes of non-plastic to 17. Atterberg Limit Tests performed on the Type 2 soils exhibited non-plastic results. Soil Types 1 and 2 consisted of silty to slightly silty to clayey sand fill and

EPC Project No. SF - 2116

native silty sand, which classified as A-2-6, A-2-4, and A-1-b soils based on the AASHTO classification system. The Type 1 and 2 soils have fair pavement support characteristics. The Type 3 clay soil encountered in Test Boring No. 20 classified as A-7-6, based on AASHTO classification system. The Type 3 soils will require mitigation. Sulfate testing indicated that the soils exhibit a negligible potential for sulfate attack. Groundwater was not encountered in the test borings.

Swell testing was performed on several samples of the site subgrade soils, based on their Plastic Indexes. Volume changes of 0.1 to 0.9 percent and consolidations of 0.1 to 1.5 percent indicated low expansion and consolidation potentials. Based on the low volume changes, mitigation, due to expansive soils, is not required. Laboratory test results are presented in Appendix B and are summarized on Table 1.

California Bearing Ratio (CBR) testing was performed on two samples of Soil Type 1 to determine the support characteristic of the subgrade soils for the roadway sections. The results of the CBR testing, are presented in Appendix B and summarized as follows:

<u>Soil Type1 – Clayey Sand Fill</u>	<u>Soil Type1 – Silty Sand Fill</u>		
<u>CBR #1</u>	<u>CBR #2</u>		
R @ 90% = 37.0	R @ 90% = 7.5		
R @ 95% = 73.0	R @ 95% = 22.0		
Use R = 50.0 for design*	Use R = 22.0 for design*		
<u>Classification Testing</u>	<u>Classification Testing</u>		
Liquid Limit	30	Liquid Limit	NV
Plasticity Index	15	Plasticity Index	NP
Percent Passing 200	27.9	Percent Passing 200	12.6
AASHTO Classification	A-2-6	AASHTO Classification	A-1-b
Group Index	1	Group Index	0
Unified Soils Classification	SC	Unified Soils Classification	SM

*Due to variable test results, all sections were designed using an R-value of 22.

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". ESAL values were obtained from the Transportation Memorandum performed by LSC Transportation Consultants, LLC dated June 29, 2011, LSC Job No. S214290. The recommended street classifications are shown in Figure No. 2. The cul-de-sac portion of Crooked Hill Drive classified as an urban local (low-volume) roadway, which used an 18k ESAL value of 36,500 for design. Crooked Hill Drive, Crooked Bluff Drive, Coastal Hills Lane, Bluffpoint Drive, Evening Creek Drive, Cuatro Caminos Drive, Parkland Drive, and Monument Vista Drive classify as urban local roads, which used an 18K ESAL value of 292,000 for design. Rex Road classifies as an urban 2-lane minor arterial, which used an 18K ESAL value of 1,971,000 for design. Pavement alternatives for asphalt over aggregate basecourse and cement stabilized subgrade sections are provided. Design parameters used in the pavement analysis are as follows:

Reliability,	
Urban Local Low Volume	80%
Urban Local	80%
Urban Arterial (2-lane Minor)	85%
Serviceability Index	
Urban Local Low Volume	2.0
Urban Local	2.0
Urban Arterial (2-lane Minor)	2.5
Resilient Modulus	5,273 psi
"R" Value Subgrade	22.0
Structural Coefficients:	
Hot Bituminous Pavement	0.44
Aggregate Basecourse	0.11
Cement Stabilized Subgrade	0.11

Pavement calculations are attached in Appendix C. Pavement sections recommended for this phase of the filing are summarized as follows:

Pavement Sections – Soil Type 1

Urban Local (low volume) – ESAL = 36,000
Crooked Hill Drive cul-de-sac

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Basecourse (in)</u>	<u>Cement Stabilized Subgrade (in.)</u>
1. Asphalt Over Basecourse	3.5	6.0	--
2. Asphalt Over Cement Subgrade	4.0	--	8.0

Urban Local – ESAL = 292,000

Crooked Hill Drive, Crooked Bluff Drive, Coastal Hills Drive, Bluffpoint Drive, Monument Vista Drive, Rolling Ridge Drive, Evening Creek Drive, Quatro Caminos Drive, and Parkland Drive

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Basecourse (in)</u>	<u>Cement Stabilized Subgrade (in.)</u>
1. Asphalt Over Basecourse	4.5	9.0	--
2. Asphalt Over Cement Subgrade	4.5	--	10.0

Urban 2-Lane Minor Arterial – ESAL = 1,971,000

Rex Road

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Basecourse (in)</u>	<u>Cement Stabilized Subgrade (in.)</u>
1. Asphalt Over Basecourse	6.0	12.0	--
2. Asphalt Over Cement Subgrade	6.0	--	12.0

Full depth sections are not allowed.

Mitigation

El Paso County criteria requires mitigation of expansive soils for roadway subgrade that have a swell of 2 percent or greater with a 150 pound per square foot surcharge. Based on the swell testing, mitigation for expansive soils will not be required on this site.

A limited area of Soil Type 3 was encountered in Test Boring No. 20 on Rex Road. Since this design was based on the Type 1 soils, the Type 3 soils should be penetrated or removed and replaced with suitable on-site Type 1 or Type 2 sand soils. A 2-foot overexcavation/replacement is recommended. The depths and extents of removal should be field determined by personnel of Entech Engineering Inc. The estimated location of the Type 3 soils is shown on Figure No. 1.

Roadway Construction - Full Depth Asphalt and Asphalt on Aggregate Basecourse Alternatives

Prior to placement of the asphalt, the subgrade should be proofrolled and compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 at ± 2 percent of optimum moisture content. Any loose or soft areas should be removed and replaced with suitable materials. Basecourse materials should be compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 at ± 2 percent of optimum moisture content. Special attention should be given to areas adjacent to manholes, inlet structures, and valves.

Roadway Construction – Cement Stabilized Subgrade Alternative

Prior to placement of the asphalt, the subgrade shall be stabilized by addition of cement to a depth of at least 8, 10, or 12 inches, as determined by Roadway Classification. The depth of the required cement stabilized subgrade is shown in the previous table. The amount of cement applied shall be 2.0 percent (by weight) of the subgrade's maximum dry density as determined by the Modified Proctor Test (ASTM D-1557) based on laboratory cement stabilization testing. The cement should be spread evenly on the subgrade surface and be thoroughly mixed into the subgrade over the appropriate 8, 10, or 12-inch depth such that a uniform blend of soil and cement is achieved. Prior to application or mixing of the cement, the upper 8, 10, or 12 inches of subgrade should be thoroughly moisture conditioned to the soil's optimum water content or as much as 2 percent more than the optimum water content as necessary to provide a compactable soil condition. Densification of the cement-stabilized subgrade should be completed to obtain a compaction of at least 95 percent of the subgrade maximum dry density as determined by the Modified Proctor Test (ASTM D-1557). Satisfactory compaction of the subgrade shall occur within 90 minutes from the time of mixing the cement into the subgrade.

The following conditions shall be observed as part of the subgrade stabilization:

- Type I/II cement as supplied. A local supplier shall be used. All cement used for stabilization should come from the same source. If cement sources are changed a new laboratory mix design should be completed.
- Moisture conditioning of the subgrade and/or mixing of the cement into the subgrade shall not occur when soil temperatures are below 40°F. Cement treated subgrades should be

maintained at a temperature of 40°F or greater until the subgrade has been compacted as required.

- Cement placement, cement mixing and compaction of the cement treated subgrade should be observed by a Soils Engineer. The Soils Engineer should complete in-situ compaction tests and construct representative compacted specimens of the treated subgrade material for subsequent laboratory quality assurance testing.
- Pending the results of the field density testing, microfracturing of the stabilized subgrade will likely be required. Soil strengths in excess of 200 psi require microfracturing.

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, cement, 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



Reviewed by:



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

DPS/am

Encl.

Entech Job No. 220780
AAprojects/2022/220780 pr

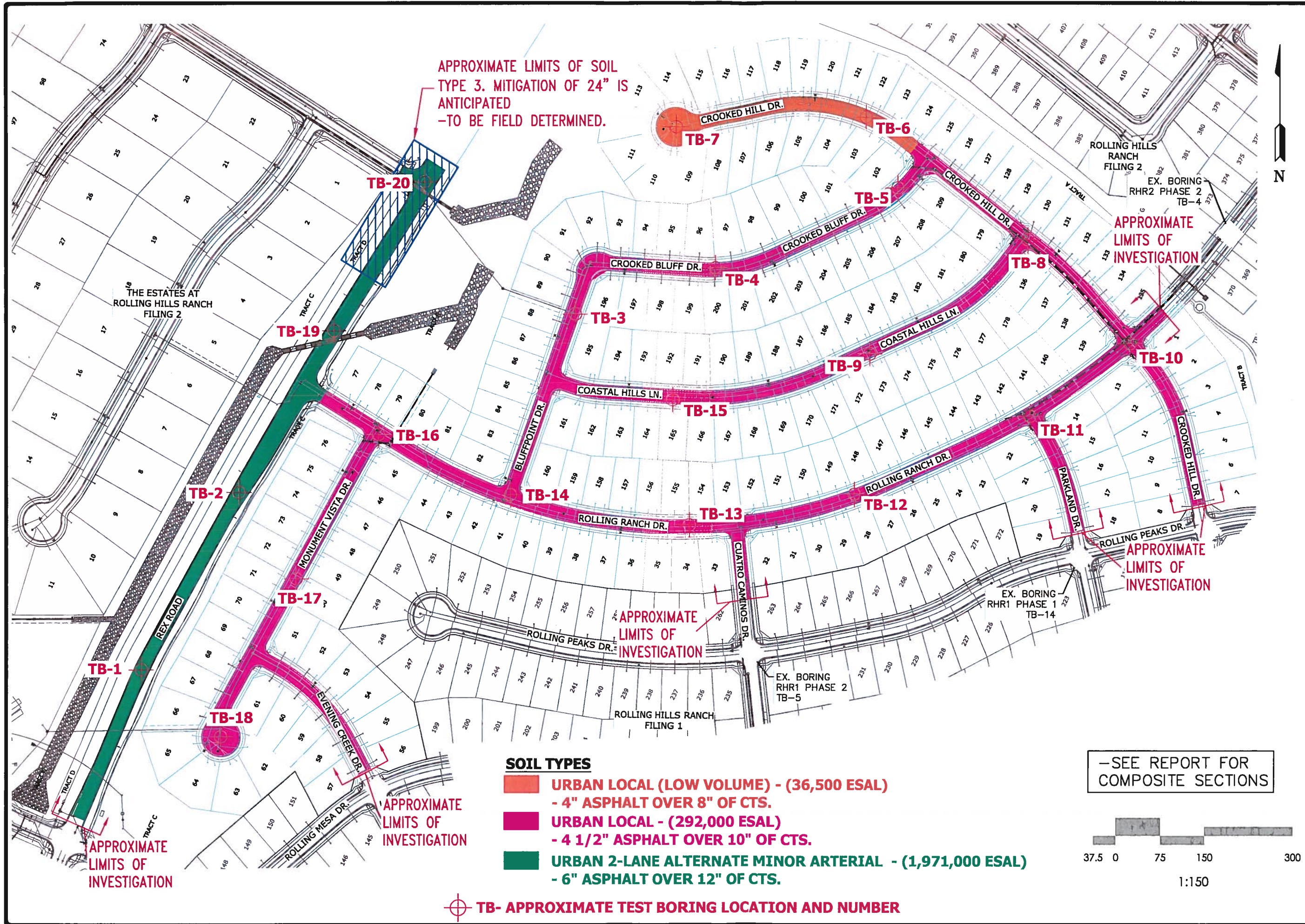
TABLE

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

CLIENT TECH CONTRACTORS
PROJECT MERIDIAN RANCH, FILING 3
JOB NO. 220780

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	3	0-3	10.6	100.8	27.9	30	15		A-2-6	-0.8	SC	FILL, SAND, CLAYEY
1	3	1-2	11.5	102.4	26.8	30	12		A-2-6	-0.3	SC	FILL, SAND, CLAYEY
1	4	1-2			26.3	NV	NP		A-2-4		SM	FILL, SAND, SILTY
1	5	1-2			11.6	NV	NP		A-1-b		SM-SW	FILL, SAND, SLIGHTLY SILTY
1	6	1-2			13.0	NV	NP	0.01	A-1-b		SM	FILL, SAND, SILTY
1	7	1-2			7.9	NV	NP		A-1-b		SM-SW	FILL, SAND, SLIGHTLY SILTY
1	8	1-2	6.6	102.0	18.8	31	11		A-2-6	-0.6	SC	FILL, SAND, CLAYEY
1	9	1-2	12.7	104.7	18.0	32	12		A-2-6	-0.3	SC	FILL, SAND, CLAYEY
1	10	1-2			13.1	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	11	1-2	9.9	112.3	17.8	30	14		A-2-6	0.1	SC	FILL, SAND, CLAYEY
1	17	0-3			25.9	24	10		A-2-4		SC	FILL, SAND, CLAYEY
1	12	1-2	9.6	104.8	26.5	32	17	0.00	A-2-6	-1.2	SC	FILL, SAND, CLAYEY
1	13	1-2			24.3	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	14	1-2			22.5	NV	NP		A-2-4		SM	FILL, SAND, SILTY
1	15	1-2			13.2	NV	NP	<0.01	A-2-4		SM	FILL, SAND, SILTY
1	16	1-2			24.3	26	10		A-2-4		SM	FILL, SAND, CLAYEY
1, CBR #2	17	1-2			12.6	NV	NP		A-1-b		SM	FILL, SAND, SILTY
2	1	1-2			14.7	NV	NP	<0.01	A-1-b		SM	SAND, SILTY
2	2	1-2			27.8	NV	NP	0.01	A-2-4		SM	SAND, SILTY
2	18	1-2			13.6	NV	NP		A-1-b		SM	SAND, SILTY
2	19	1-2			18.1	NV	NP		A-1-b		SM	SAND, SILTY
3	20	1-2	13.7	103.9	62.4	42	24		A-7-6	-0.1	CL	CLAY, SANDY
4	13	10	9.6	115.1	21.8	NV	NP	0.00	A-1-b	0.9	SM	SANDSTONE, SILTY
4	17	10			10.2	NV	NP		A-1-b		SM-SW	SANDSTONE, SLIGHTLY SILTY
4	19	5			16.4	NP	NV		A-2-4		SM	SANDSTONE, SILTY
4	3	5			9.4	NP	NV		A-1-b		SM-SW	SANDSTONE, SLIGHTLY SILTY
4	5	10			11.0	NV	NP		A-1-b		SM-SW	SANDSTONE, SLIGHTLY SILTY
4	8	10			10.3	NV	NP		A-1-b		SM-SW	SANDSTONE, SLIGHTLY SILTY
4	9	5			20.8	NV	NP	<0.01	A-2-4		SM	SANDSTONE, SILTY
4	11	10			10.5				A-1-b		SM-SW	SANDSTONE, SLIGHTLY SILTY
5	14	5			38.7	NV	NP		A-4		SM	SANDSTONE, VERY SILTY
5	20	5	10.4	96.7	46.2	26	13	<0.01	A-6	-1.5	SC	SANDSTONE, VERY CLAYEY
5	20	10	13.1	113.3	48.3	NV	NP	<0.01	A-4	0.1	SM	SANDSTONE, VERY SILTY
5	1	5			40.7	35	19		A-6		SC	SANDSTONE, VERY CLAYEY
5	4	5			43.7	NV	NP	<0.01	A-4		SM	SANDSTONE, VERY SILTY

FIGURE



APPROXIMATE LIMITS OF SOIL TYPE 3. MITIGATION OF 24" IS ANTICIPATED -TO BE FIELD DETERMINED.

APPROXIMATE LIMITS OF INVESTIGATION

APPROXIMATE LIMITS OF INVESTIGATION

APPROXIMATE LIMITS OF INVESTIGATION

SOIL TYPES

- URBAN LOCAL (LOW VOLUME) - (36,500 ESAL)
- 4" ASPHALT OVER 8" OF CTS.
- URBAN LOCAL - (292,000 ESAL)
- 4 1/2" ASPHALT OVER 10" OF CTS.
- URBAN 2-LANE ALTERNATE MINOR ARTERIAL - (1,971,000 ESAL)
- 6" ASPHALT OVER 12" OF CTS.

TB- APPROXIMATE TEST BORING LOCATION AND NUMBER

-SEE REPORT FOR COMPOSITE SECTIONS



REVISION	BY

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

TEST BORING LOCATION MAP
ROLLING HILLS RANCH AT MERIDIAN RANCH, F3
COLORADO SPRINGS, CO.
FOR: TECH CONTRACTORS

DRAWN	JAC
CHECKED	DPS
DATE	6/03/22
SCALE	1:150
JOB NO.	220780
FIGURE NO.	1



Approximate Scale
Scale: 1" = 1,000'

LEGEND:

- = Urban 2-Lane Minor Arterial
- = Urban Residential Collector
- = Urban Local
- ⋯ = Urban Local (Low Volume)

Figure 14

Recommended Street Classifications

Rolling Hills at Meridian Ranch Filings 1-3 (LSC #194180)

*FR No. 2
JOB NO. 220780*

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
 DATE DRILLED 4/12/2022
 Job # 220780

TEST BORING NO. 2
 DATE DRILLED 4/12/2022
 CLIENT TECH CONTRACTORS
 LOCATION MERIDIAN RANCH, FILING 3

REMARKS

DRY TO 5', 4/12/22
 SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, DENSE, MOIST

SANDSTONE, VERY CLAYEY,
 FINE GRAINED, GRAY BROWN,
 VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		43	3.7	2
5-10	[Symbol]		50 10"	10.9	4
10-15					
15-20					
20-25					

REMARKS

DRY TO 5', 4/12/22
 SAND, SILTY, FINE TO COARSE
 GRAINED, DARK BROWN TO
 LIGHT BROWN, LOOSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		8	11.8	2
5-10	[Symbol]		6	17.2	2
10-15					
15-20					
20-25					



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:
 220780

FIG NO.:
 A-1

TEST BORING NO. 3
 DATE DRILLED 4/12/2022
 Job # 220780

TEST BORING NO. 4
 DATE DRILLED 4/12/2022
 CLIENT TECH CONTRACTORS
 LOCATION MERIDIAN RANCH, FILING 3

REMARKS

DRY TO 5', 4/12/22

FILL 0-4', SAND, SILTY, FINE TO COARSE GRAINED, TAN, LOOSE, MOIST

SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-4	[Symbol]		5	11.0	1
5	[Symbol]		50 8"	5.3	4
10					
15					
20					

REMARKS

DRY TO 5', 4/12/22

FILL 0-4', SAND, CLAYEY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST

SANDSTONE, VERY SILTY, FINE GRAINED, TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-4	[Symbol]		12	11.2	1
5	[Symbol]		50 6"	16.8	5
10					
15					
20					



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:
 220780

FIG NO.:
 A- 2

TEST BORING NO. 5
 DATE DRILLED 4/12/2022
 Job # 220780

TEST BORING NO. 6
 DATE DRILLED 4/12/2022
 CLIENT TECH CONTRACTORS
 LOCATION MERIDIAN RANCH, FILING 3

REMARKS

DRY TO 10', 4/12/22

FILL 0-8', SAND, SLIGHTLY SILTY,
 FINE TO COARSE GRAINED,
 BROWN TO TAN, LOOSE, MOIST

SANDSTONE, SLIGHTLY SILTY,
 FINE TO COARSE GRAINED, TAN,
 VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-8	(Symbol: dots)		7	4.7	1
5	(Symbol: dots)		7	3.4	1
10	(Symbol: dots)		50 7"	11.7	4
15					
20					

REMARKS

DRY TO 5', 4/12/22

FILL 0-3', SAND, SILTY, FINE TO
 COARSE GRAINED, TAN, MEDIUM
 DENSE TO LOOSE, MOIST
 SAND, SILTY, FINE TO MEDIUM
 GRAINED, DARK BROWN, LOOSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-3	(Symbol: dots)		22	7.6	1
5	(Symbol: dots)		6	5.3	2
10					
15					
20					



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:
SW

DATE:
6-3-22

JOB NO.:
 220780

FIG NO.:
 A-3

TEST BORING NO. 7
 DATE DRILLED 4/12/2022
 Job # 220780

TEST BORING NO. 8
 DATE DRILLED 4/12/2022
 CLIENT TECH CONTRACTORS
 LOCATION MERIDIAN RANCH, FILING 3

REMARKS						REMARKS					
Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 4/12/22						DRY TO 10', 4/12/22					
FILL 0-5', SAND, SLIGHTLY SILTY TO SILTY, FINE TO COARSE GRAINED, DARK BROWN, MEDIUM DENSE, MOIST						FILL 0-4', SAND, CLAYEY, FINE TO MEDIUM GRAINED, DARK BROWN, LOOSE, MOIST					
5			14	4.0	1	5			7	7.1	1
			20	12.8	1	5			3	8.7	2
10						10			50 6"	7.9	4
15						15					
20						20					
SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST											



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-5-22</i>
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JOB NO.:
 220780

FIG NO.:
 A- 4

TEST BORING NO. 9
 DATE DRILLED 4/12/2022
 Job # 220780

TEST BORING NO. 10
 DATE DRILLED 4/12/2022
 CLIENT TECH CONTRACTORS
 LOCATION MERIDIAN RANCH, FILING 3

REMARKS

DRY TO 5', 4/12/22

FILL 0-4', SAND, CLAYEY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST

SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-4'	[Symbol]		17	10.6	1
5'	[Symbol]		50 6"	11.0	4

REMARKS

DRY TO 5', 4/12/22

FILL 0-5', SAND, SILTY, FINE TO COARSE GRAINED, TAN, LOOSE TO MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5'	[Symbol]		8	6.1	1
5'	[Symbol]		19	5.2	1



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:
 220780

FIG NO.:
 A- 5

TEST BORING NO. 11
 DATE DRILLED 4/12/2022
 Job # 220780

TEST BORING NO. 12
 DATE DRILLED 5/9/2022
 CLIENT TECH CONTRACTORS
 LOCATION MERIDIAN RANCH, FILING 3

REMARKS

DRY TO 10', 4/12/22

FILL 0-3', SAND, CLAYEY, FINE TO COARSE GRAINED, DARK BROWN, MEDIUM DENSE, MOIST SAND, SILTY, FINE TO MEDIUM GRAINED, BROWN, LOOSE, MOIST

SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-3	[Symbol]		20	11.3	1
5	[Symbol]		9	10.2	2
10	[Symbol]		50 6"	8.8	4
15					
20					

REMARKS

DRY TO 5', 5/9/22

FILL 0-5', SAND, CLAYEY, FINE TO MEDIUM GRAINED, TAN, LOOSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		7	9.0	1
5	[Symbol]		8	9.4	1
10					
15					
20					



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED: *SW*

DATE: *6-3-22*

JOB NO.:
 220780

FIG NO.:
 A- 6

TEST BORING NO. 13
 DATE DRILLED 5/9/2022
 Job # 220780

TEST BORING NO. 14
 DATE DRILLED 5/9/2022
 CLIENT TECH CONTRACTORS
 LOCATION MERIDIAN RANCH, FILING 3

REMARKS

DRY TO 10', 5/9/22

FILL 0-9', SAND, SILTY, FINE TO COARSE GRAINED, TAN, LOOSE TO MEDIUM DENSE, MOIST

SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		8	7.5	1
5-10	[Symbol]		11	5.5	1
10-10.10"	[Symbol]		50 10"	7.7	4

REMARKS

DRY TO 5', 5/9/22

FILL 0-3', SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST
 SANDSTONE, VERY SILTY, FINE GRAINED, TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		17	6.5	1
5-5.08"	[Symbol]		50 8"	4.0	5



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TEST BORING LOG

DRAWN:

DATE:

CHECKED: SW

DATE: 6-3-22

JOB NO.:
 220780

FIG NO.:
 A-7

TEST BORING NO. 15
 DATE DRILLED 5/9/2022
 Job # 220780

TEST BORING NO. 16
 DATE DRILLED 5/9/2022
 CLIENT TECH CONTRACTORS
 LOCATION MERIDIAN RANCH, FILING 3

REMARKS						REMARKS					
Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 5/9/22						DRY TO 5', 5/9/22					
FILL 0-9', SAND, SILTY, FINE TO COARSE GRAINED, TAN, LOOSE TO MEDIUM DENSE, MOIST						FILL 0-5', SAND, CLAYEY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST TO DRY					
5	[Symbol]		13	11.4	1	5	[Symbol]		18	4.2	1
5	[Symbol]		9	8.2	1	5	[Symbol]		13	2.8	1
10						10					
15						15					
20						20					



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TEST BORING LOG

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:
 220780

FIG NO.:
 A- 8

TEST BORING NO. 17
 DATE DRILLED 5/9/2022
 Job # 220780

TEST BORING NO. 18
 DATE DRILLED 5/9/2022
 CLIENT TECH CONTRACTORS
 LOCATION MERIDIAN RANCH, FILING 3

REMARKS

REMARKS

DRY TO 10', 5/9/22

FILL 0-4', SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST

SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-4	[Symbol]		17	6.4	1
5	[Symbol]		50 6"	8.0	4
10	[Symbol]		50 6"	4.6	4
15					
20					

DRY TO 5', 5/9/22

SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		29	6.5	1
5	[Symbol]		46	8.4	1
10					
15					
20					



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TEST BORING LOG

DRAWN:

DATE:

CHECKED: *SW*

DATE:

6-3-22

JOB NO.:
 220780

FIG NO.:
 A- 9

TEST BORING NO. 19
 DATE DRILLED 5/9/2022
 Job # 220780

TEST BORING NO. 20
 DATE DRILLED 5/9/2022
 CLIENT TECH CONTRACTORS
 LOCATION MERIDIAN RANCH, FILING 3

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 5/9/22							DRY TO 5', 5/9/22						
SAND, SILTY, FINE TO COARSE GRAINED, TAN, DENSE, MOIST LOOSE, MOIST				44	5.9	2	CLAY, SANDY, GRAY BROWN, STIFF, MOIST				15	15.6	3
SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST	5			50 11"	9.1	4	SANDSTONE, VERY CLAYEY, FINE GRAINED, TAN, VERY DENSE, MOIST	5			50 4"	9.0	5
	10						SANDSTONE, VERY SILTY, FINE GRAINED, GRAY BROWN, VERY DENSE, MOIST	10			50 9"	11.6	5
	15							15					
	20							20					



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TEST BORING LOG

DRAWN:

DATE:

CHECKED: *SW*

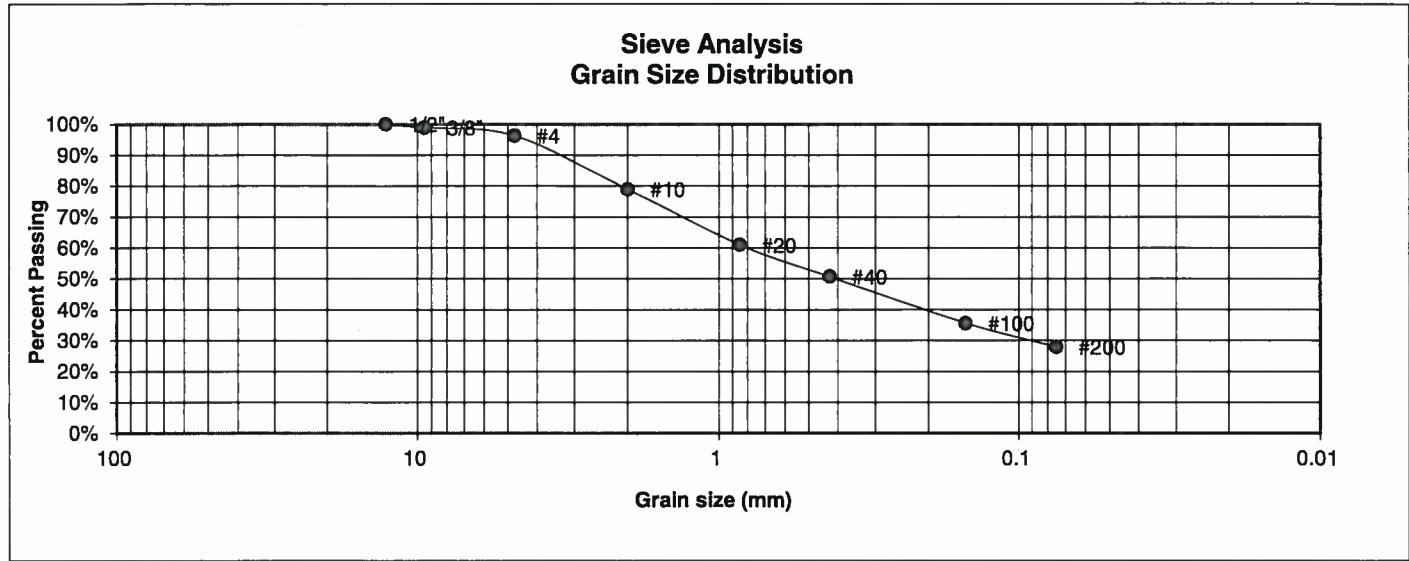
DATE: *6-3-22*

JOB NO.:
 220780

FIG NO.:
 A- 10

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1, CBR	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	3	JOB NO.	220780
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"	100.0%
3/8"	98.9%
4	96.3%
10	79.0%
20	61.0%
40	50.7%
100	35.6%
200	27.9%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	30
Plastic Index	15

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: <i>SW</i>	DATE: <i>6-3-22</i>
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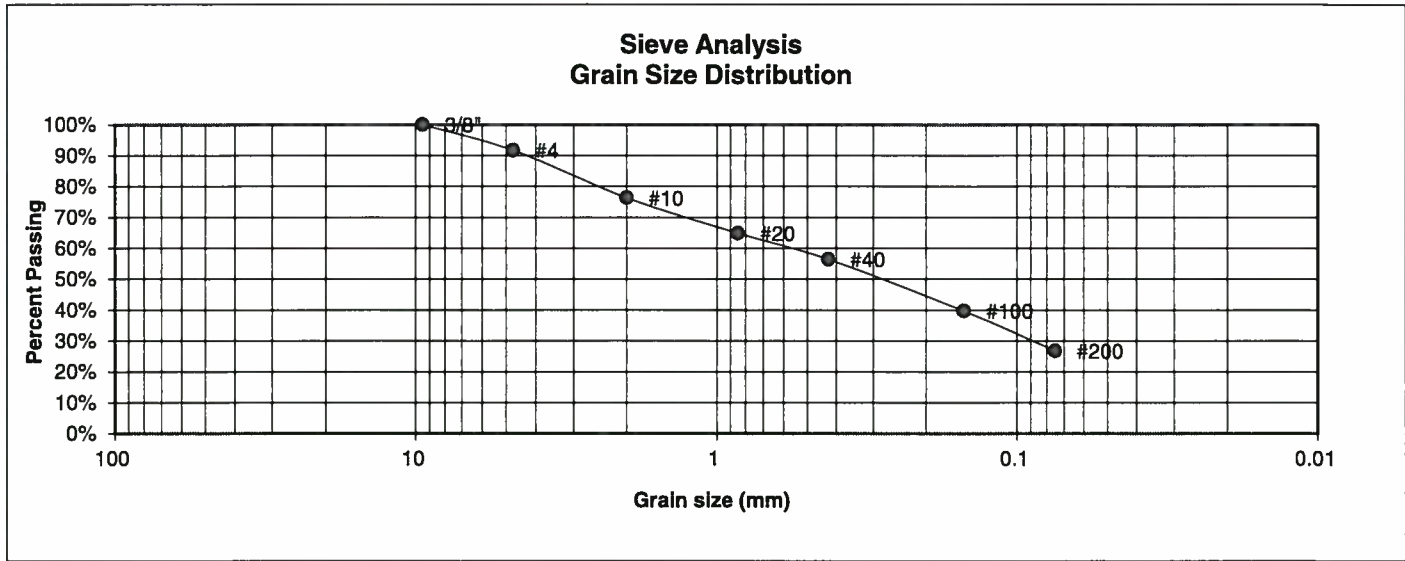
JOB NO.:

220780

FIG NO.:

B-1

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	3	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-6	<u>GROUP INDEX</u>	0



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	91.7%
10	76.3%
20	64.9%
40	56.5%
100	39.7%
200	26.8%

<u>Atterberg Limits</u>	
Plastic Limit	18
Liquid Limit	30
Plastic Index	12

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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505 ELKTON DRIVE
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**LABORATORY TEST
RESULTS**

<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> <i>SU</i>	<u>DATE:</u> <i>6-3-22</i>
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JOB NO.:

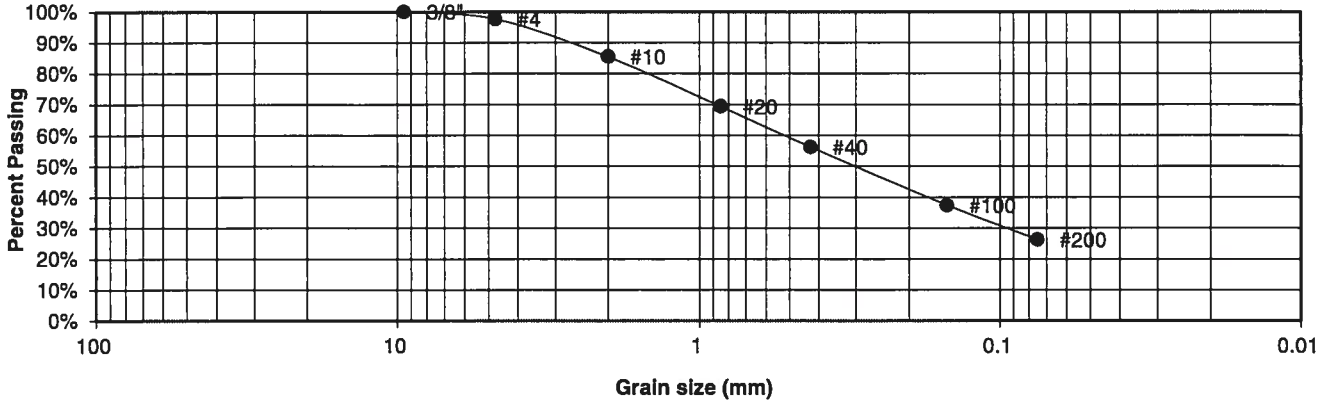
220780

FIG NO.:

B-2

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	4	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-4	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.7%
10	85.5%
20	69.4%
40	56.3%
100	37.4%
200	26.3%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: SW	DATE: 6-3-22
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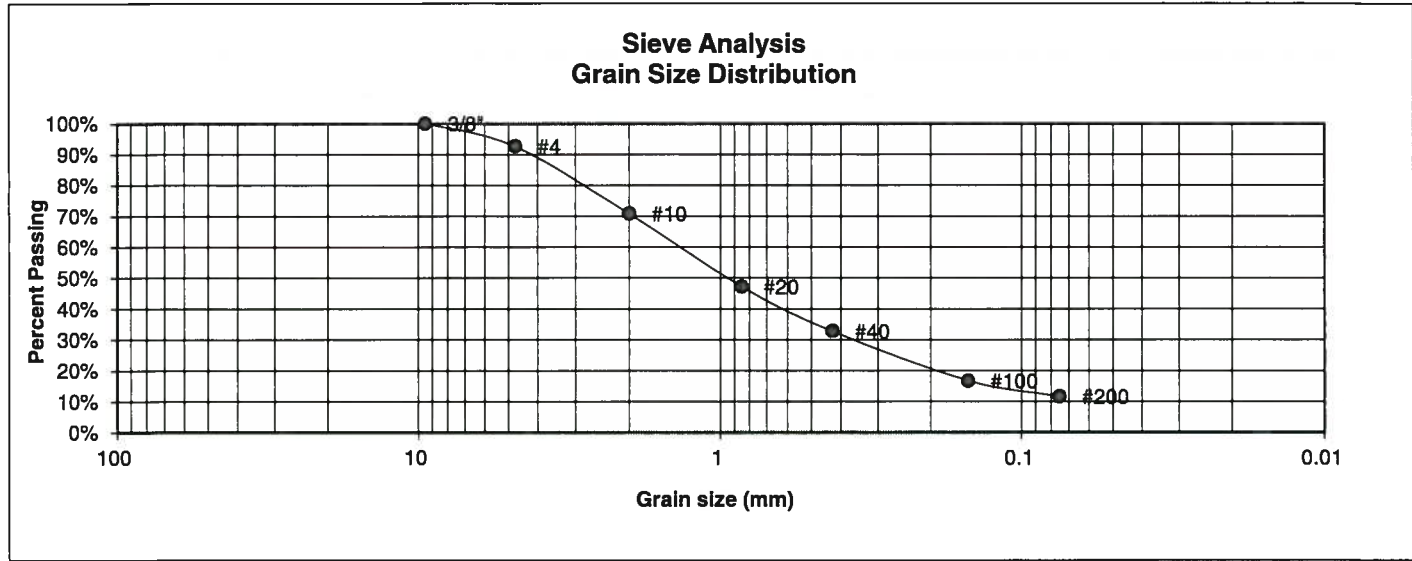
JOB NO.:

220780

FIG NO.:

B-3

UNIFIED CLASSIFICATION	SM-SW	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	5	JOB NO.	220780
DEPTH (FT)	1-2	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	92.6%
10	70.8%
20	47.2%
40	32.8%
100	16.7%
200	11.6%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

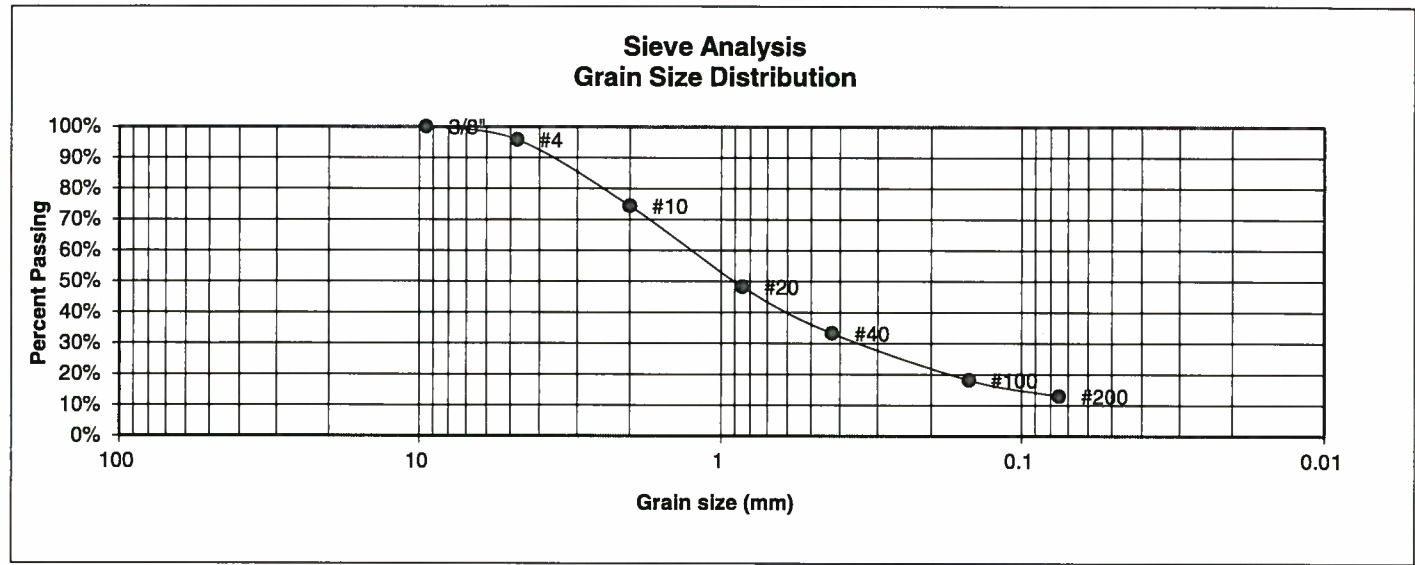
DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:

220780
FIG NO.:

B-4

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	6	JOB NO.	220780
DEPTH (FT)	1-2	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	95.8%
10	74.4%
20	48.3%
40	33.2%
100	18.1%
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)



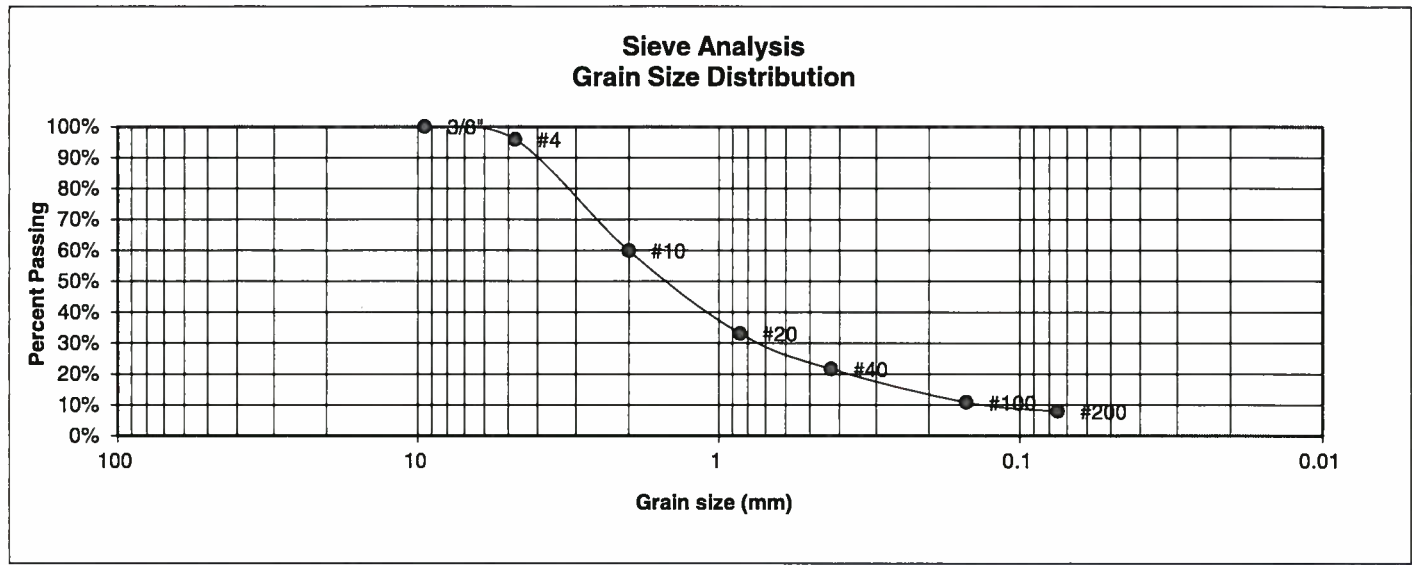
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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:
220780
FIG NO.:
B-5

UNIFIED CLASSIFICATION	SM-SW	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	7	JOB NO.	220780
DEPTH (FT)	1-2	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	95.9%
10	59.8%
20	33.1%
40	21.6%
100	10.8%
200	7.9%

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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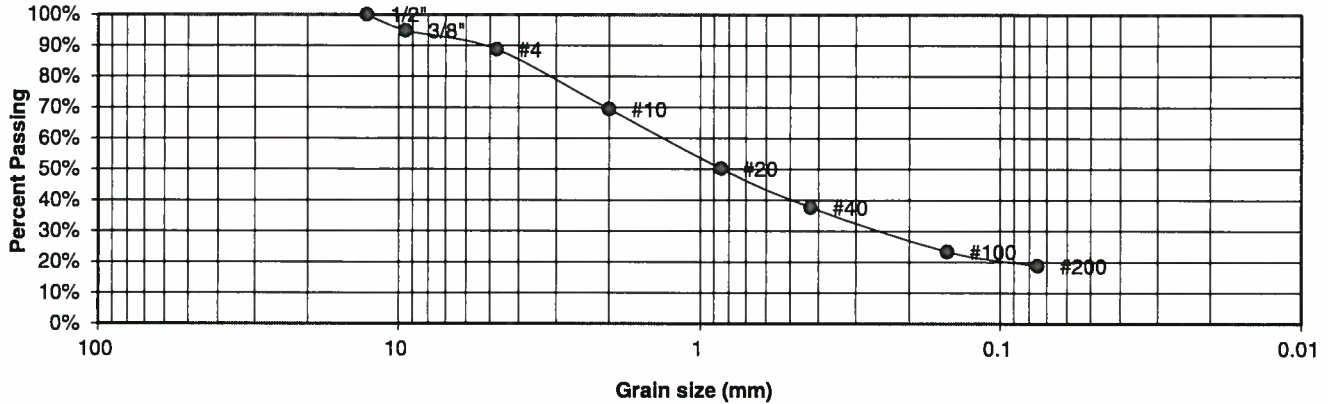
**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:
220780
FIG NO.:
B-6

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	8	JOB NO.	220780
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-6	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"	94.8%
4	88.7%
10	69.4%
20	50.2%
40	37.7%
100	23.3%
200	18.8%

Atterberg Limits	
Plastic Limit	19
Liquid Limit	31
Plastic Index	11

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



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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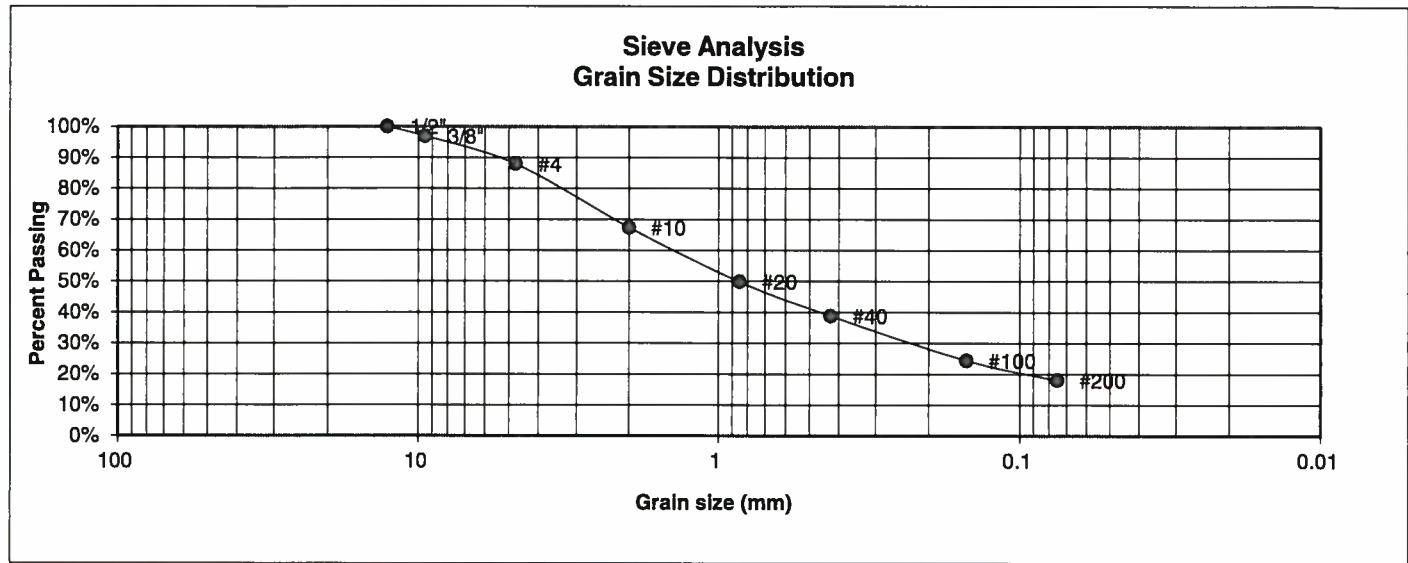
JOB NO.:

220780

FIG NO.:

B-7

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	9	JOB NO.	220780
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"	96.9%
4	87.9%
10	67.4%
20	49.9%
40	38.8%
100	24.4%
200	18.0%

Atterberg Limits	
Plastic Limit	20
Liquid Limit	32
Plastic Index	12

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



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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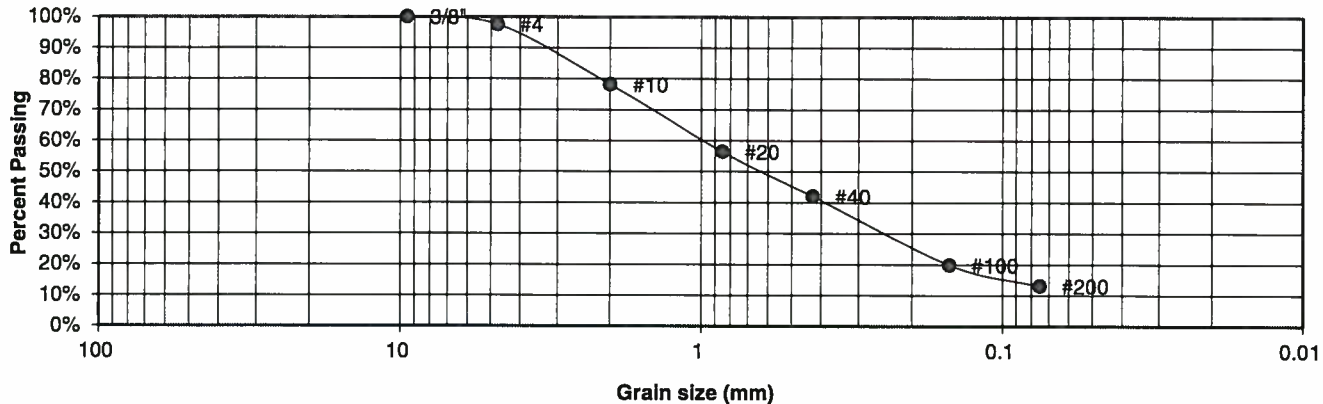
JOB NO.:

220780
FIG NO.:

B-8

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	10	JOB NO.	220780
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	97.6%
10	78.2%
20	56.4%
40	42.0%
100	19.8%
200	13.1%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:

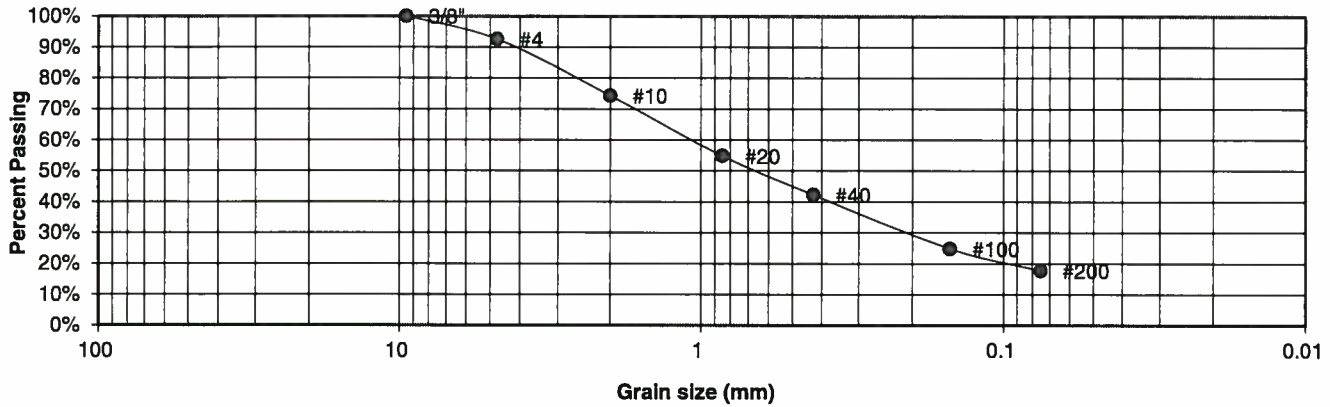
220780

FIG NO.:

B-9

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	11	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-6	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.6%
10	74.3%
20	54.8%
40	42.2%
100	24.8%
200	17.8%

<u>Atterberg Limits</u>	
Plastic Limit	16
Liquid Limit	30
Plastic Index	14

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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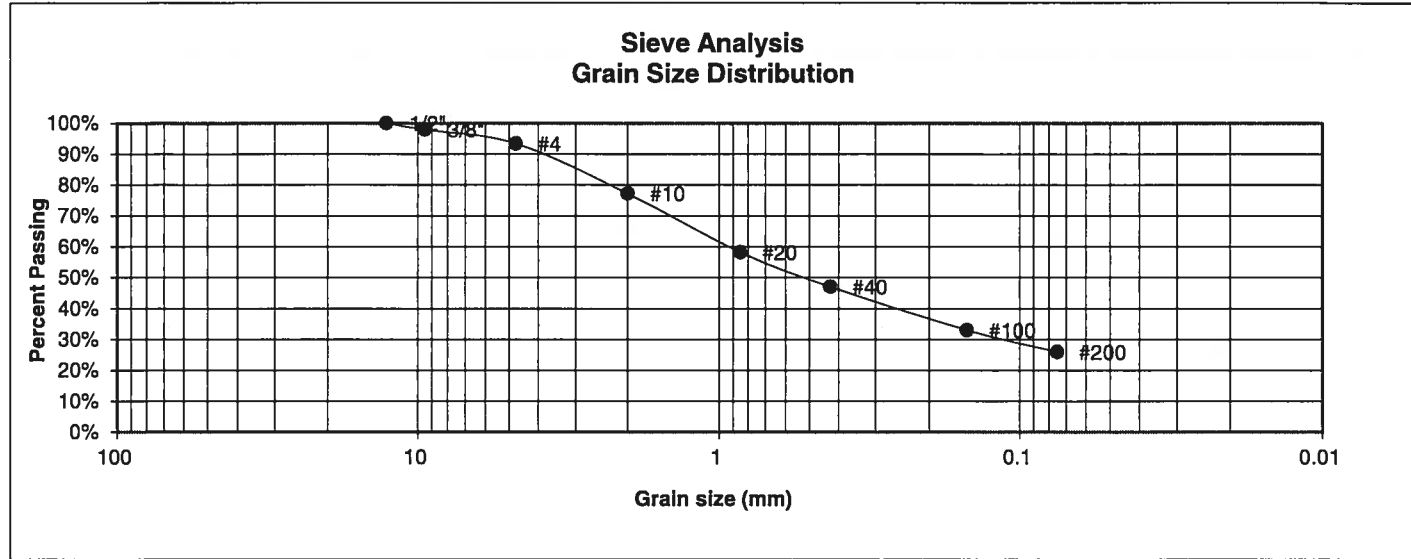
JOB NO.:

220780

FIG NO.:

B-10

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	17	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	0-3	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-4	<u>GROUP INDEX</u>	0



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.9%
4	93.4%
10	77.3%
20	58.2%
40	47.1%
100	33.0%
200	25.9%

<u>Atterberg Limits</u>	
Plastic Limit	14
Liquid Limit	24
Plastic Index	10

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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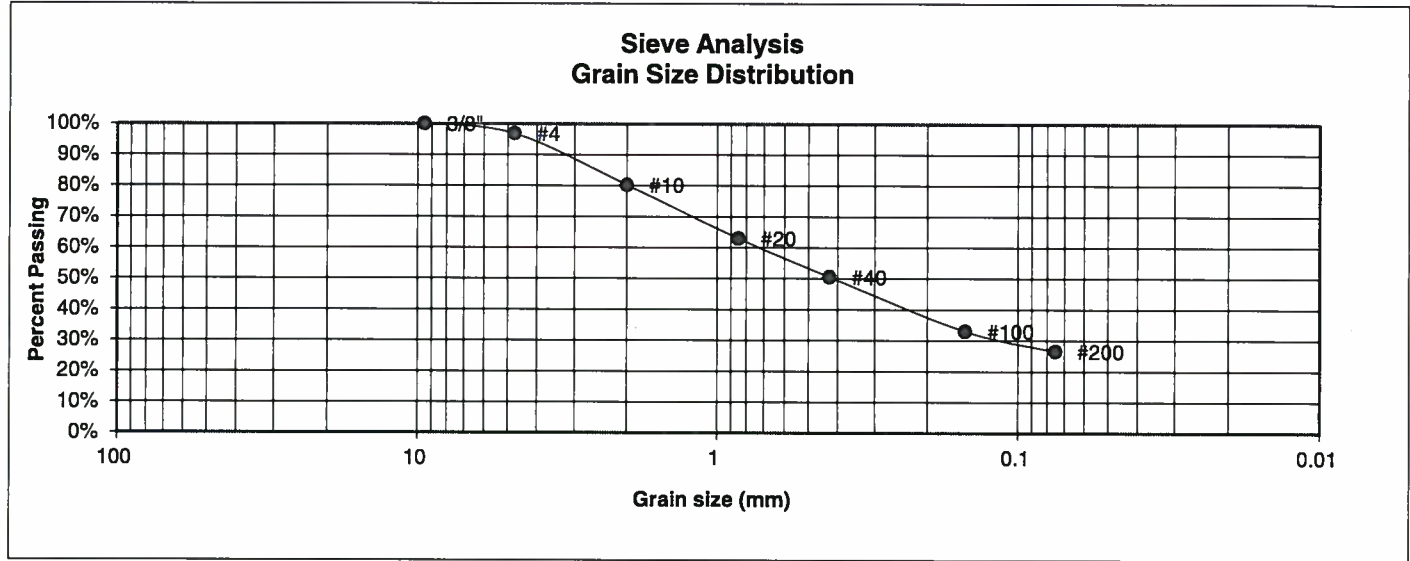
JOB NO.:

220780

FIG. NO.:

B-11

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	12	JOB NO.	220780
DEPTH (FT)	1-2	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	96.9%
10	80.2%
20	63.0%
40	50.5%
100	33.0%
200	26.5%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	32
Plastic Index	17

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



**ENTECH
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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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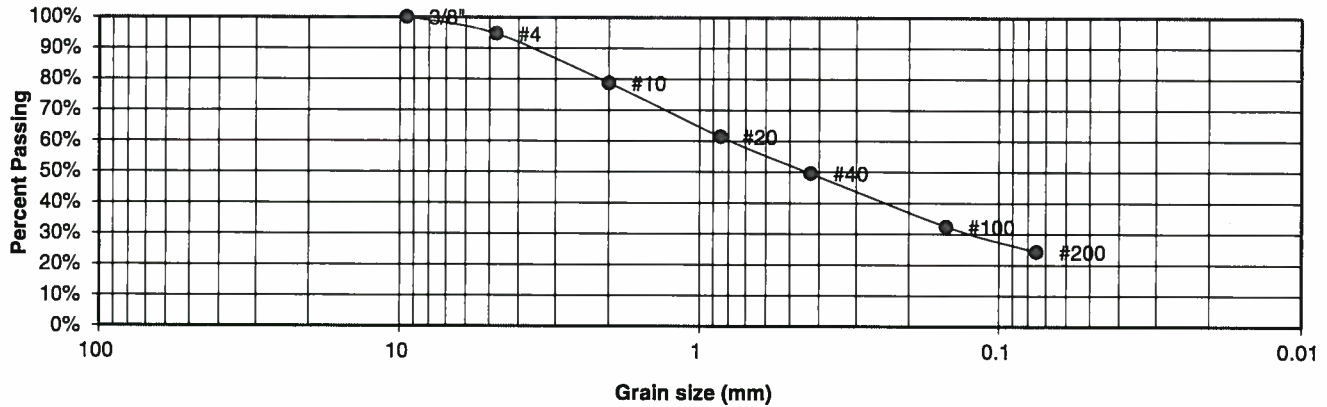
JOB NO.:

220780
FIG NO.:

B-12

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	13	JOB NO.	220780
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	94.7%
10	78.8%
20	61.4%
40	49.6%
100	32.4%
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)	



**ENTECH
ENGINEERING, INC.**

505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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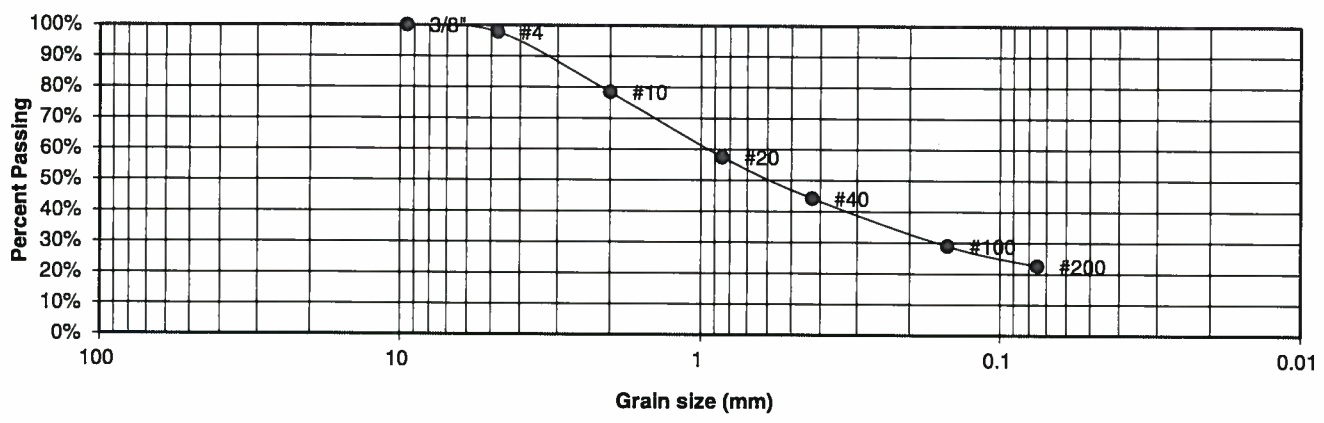
JOB NO.:

220780
FIG NO.:

B-13

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	14	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-4	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.8%
10	78.4%
20	57.5%
40	44.2%
100	28.9%
200	22.5%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



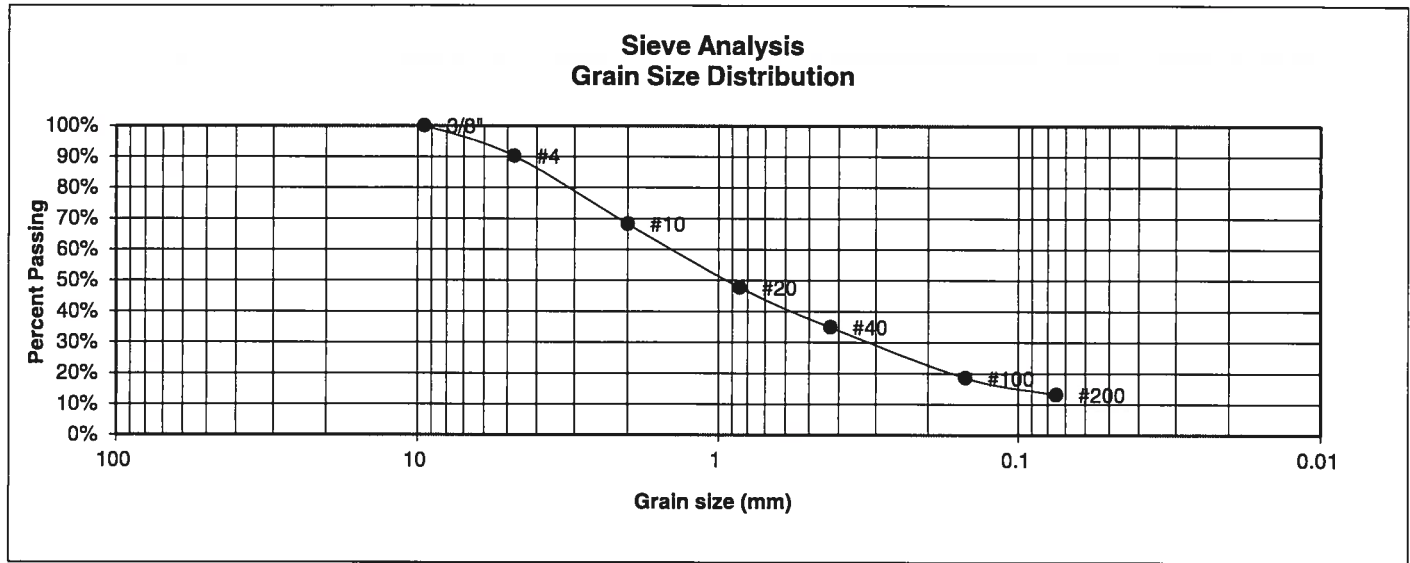
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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		SW	6-3-22

JOB NO.:
220780
FIG NO.:
B-14

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	15	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-4	<u>GROUP INDEX</u>	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	90.3%
10	68.2%
20	47.7%
40	34.9%
100	18.5%
200	13.2%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

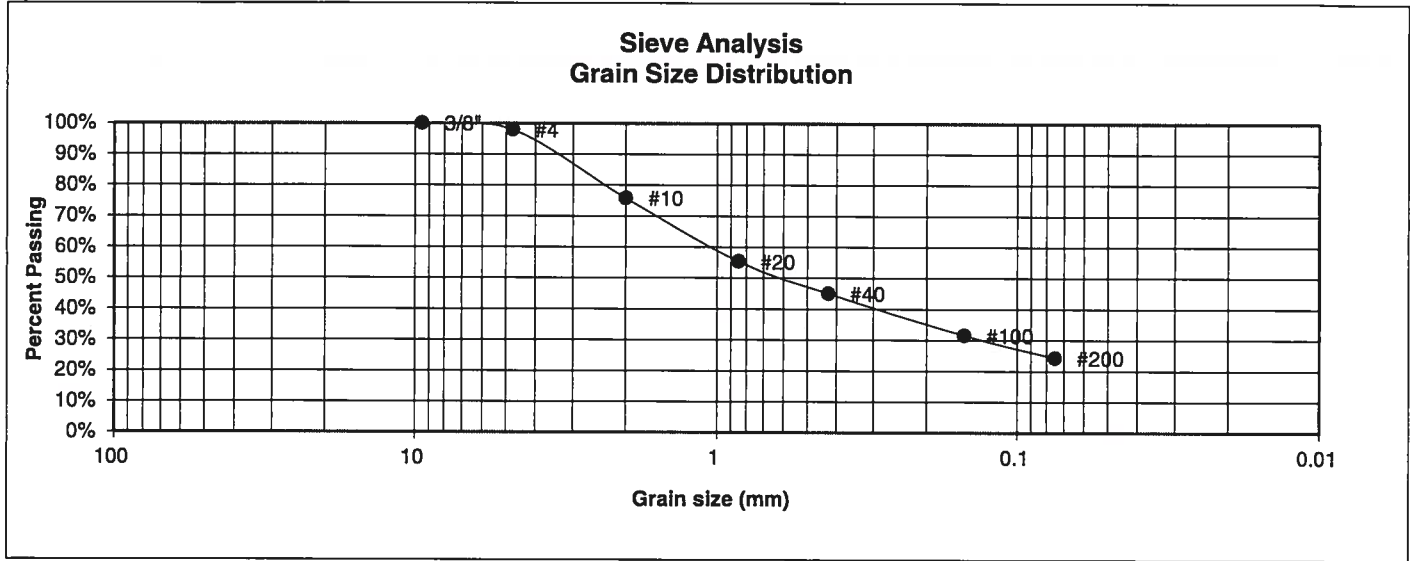
DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:

220780
FIG NO.:

B-15

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	16	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-4	<u>GROUP INDEX</u>	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.9%
10	75.8%
20	55.3%
40	45.0%
100	31.6%
200	24.3%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	26
Plastic Index	10

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



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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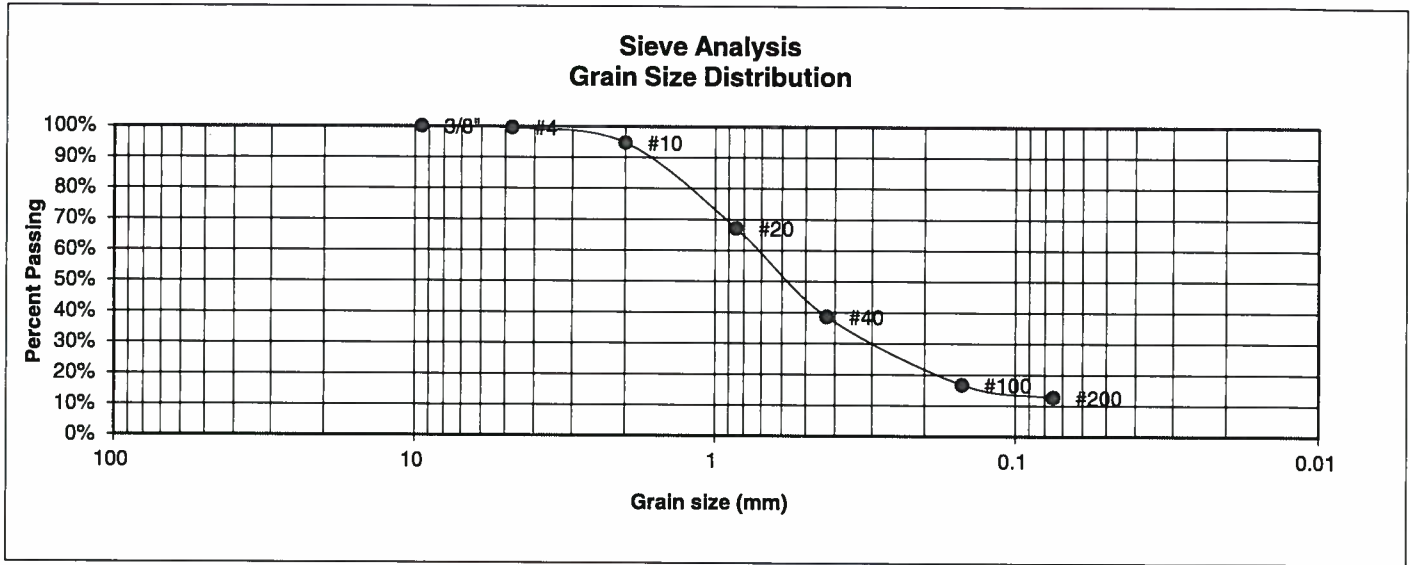
JOB NO.:

220780

FIG NO.:

B-16

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	17	JOB NO.	220780
DEPTH (FT)	1-2	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	99.6%
10	94.7%
20	67.2%
40	38.6%
100	16.7%
200	12.6%

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)	



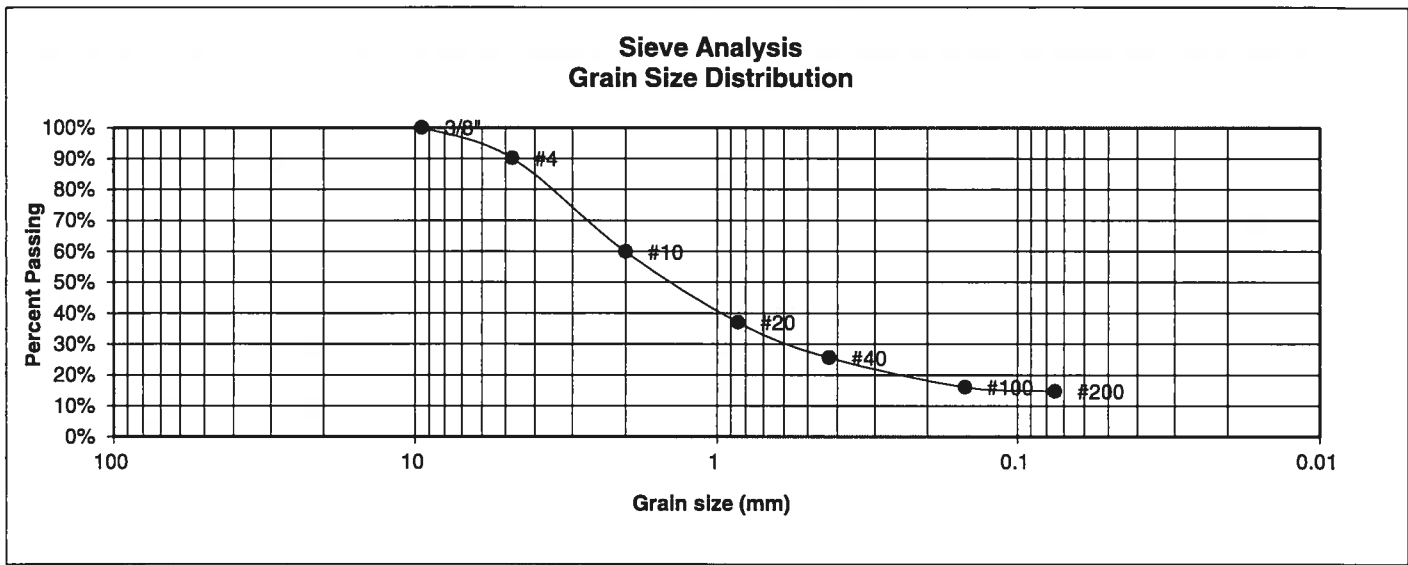
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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:
220780
FIG NO.:
8-17

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	1A	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	1	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	90.1%
10	59.8%
20	37.0%
40	25.6%
100	16.0%
200	14.7%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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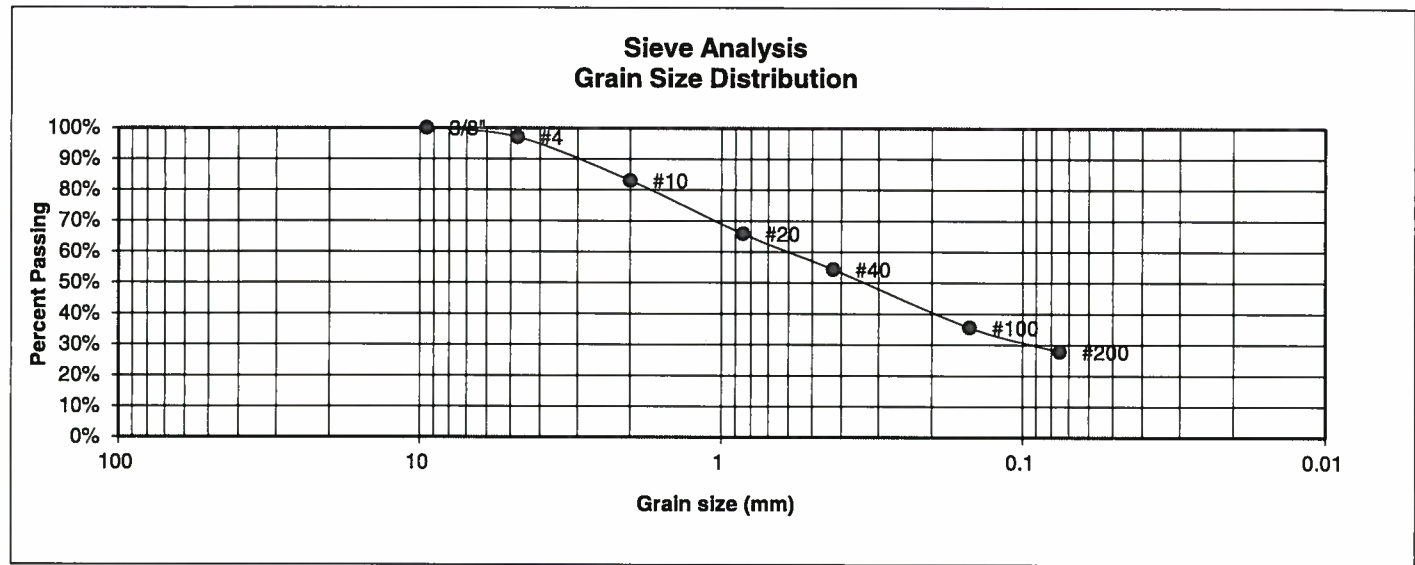
JOB NO.:

220780

FIG NO.:

B-18

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1A	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	2	JOB NO.	220780
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	97.0%
10	83.0%
20	65.9%
40	54.4%
100	35.5%
200	27.8%

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)	



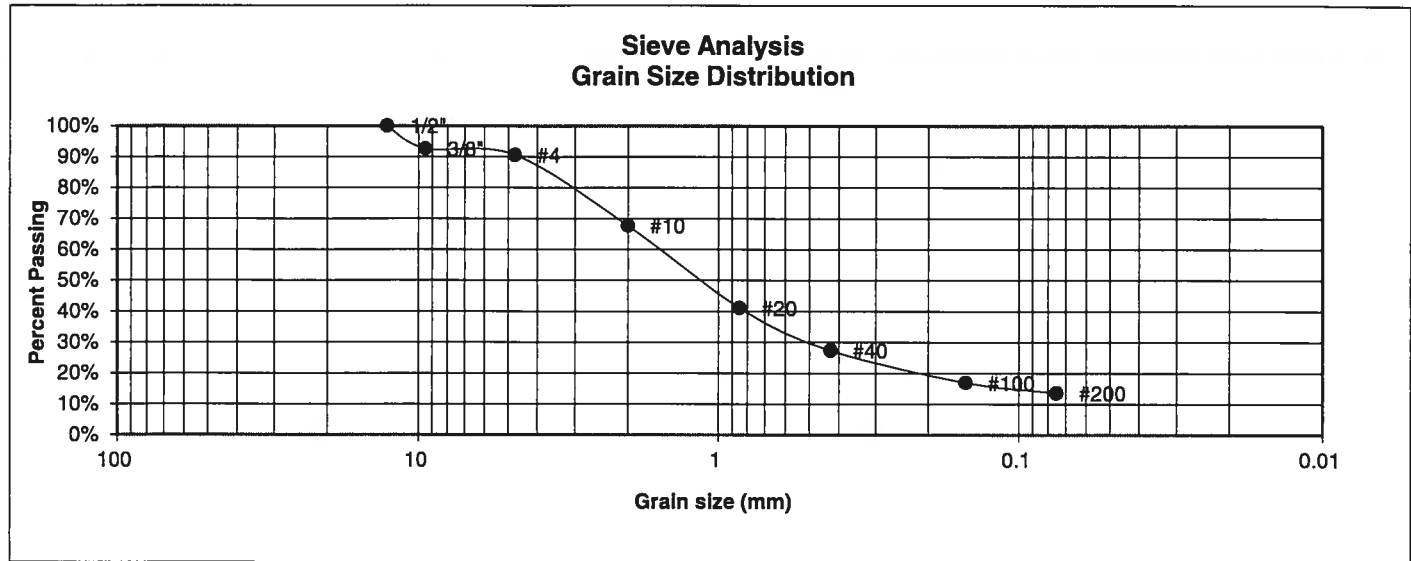
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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:
220780
FIG NO.:
B-19

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	18	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	92.6%
4	90.6%
10	67.7%
20	41.1%
40	27.4%
100	17.0%
200	13.6%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>8-3-22</i>
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JOB NO.:

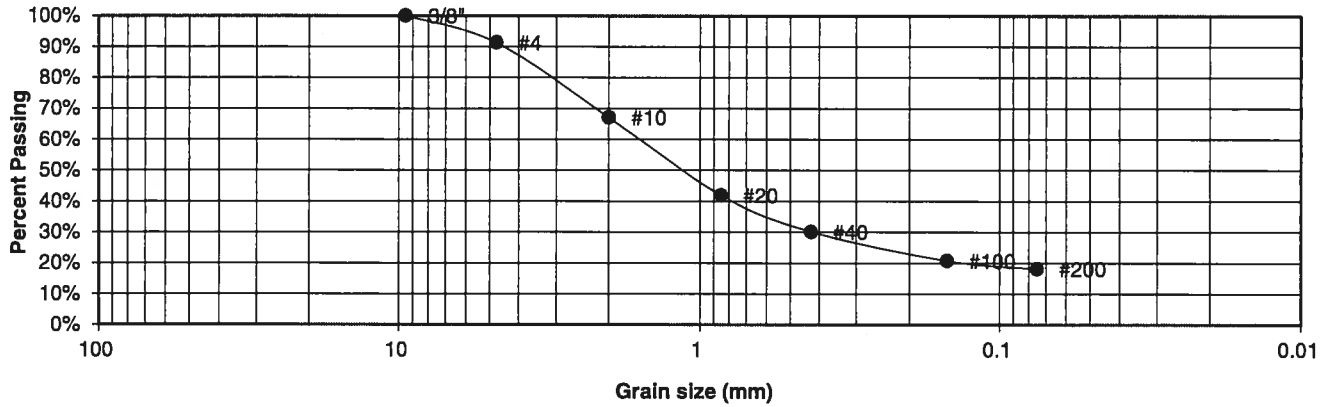
220780

FIG NO.:

B-20

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	19	JOB NO.	220780
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	91.3%
10	67.1%
20	41.9%
40	30.1%
100	20.7%
200	18.1%

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)	



**ENTECH
ENGINEERING, INC.**

505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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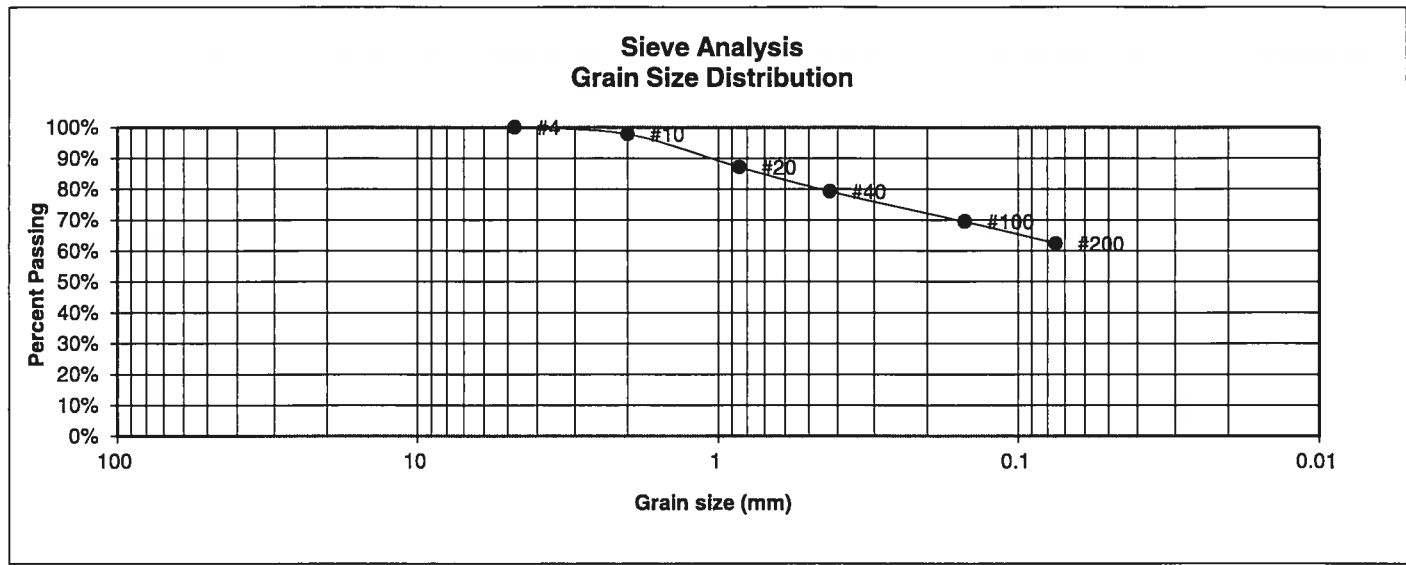
JOB NO.:

220780

FIG NO.:

B-21

UNIFIED CLASSIFICATION	CL	CLIENT	TECH CONTRACTORS
SOIL TYPE #	3	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	20	JOB NO.	220780
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	100.0%
10	97.8%
20	87.1%
40	79.3%
100	69.5%
200	62.4%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	42
Plastic Index	24

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



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

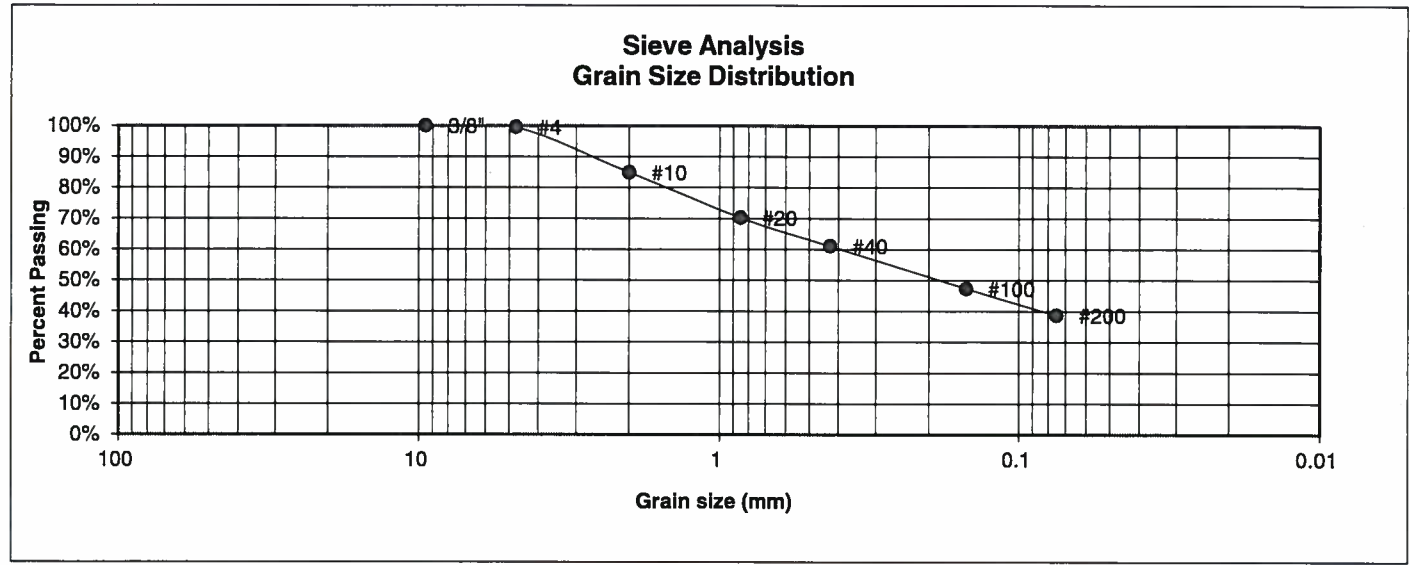
DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:

220780
FIG NO.:

B-22

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	3	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	14	JOB NO.	220780
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-4	GROUP INDEX	



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.5%
10	84.9%
20	70.2%
40	61.1%
100	47.3%
200	38.7%

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)	



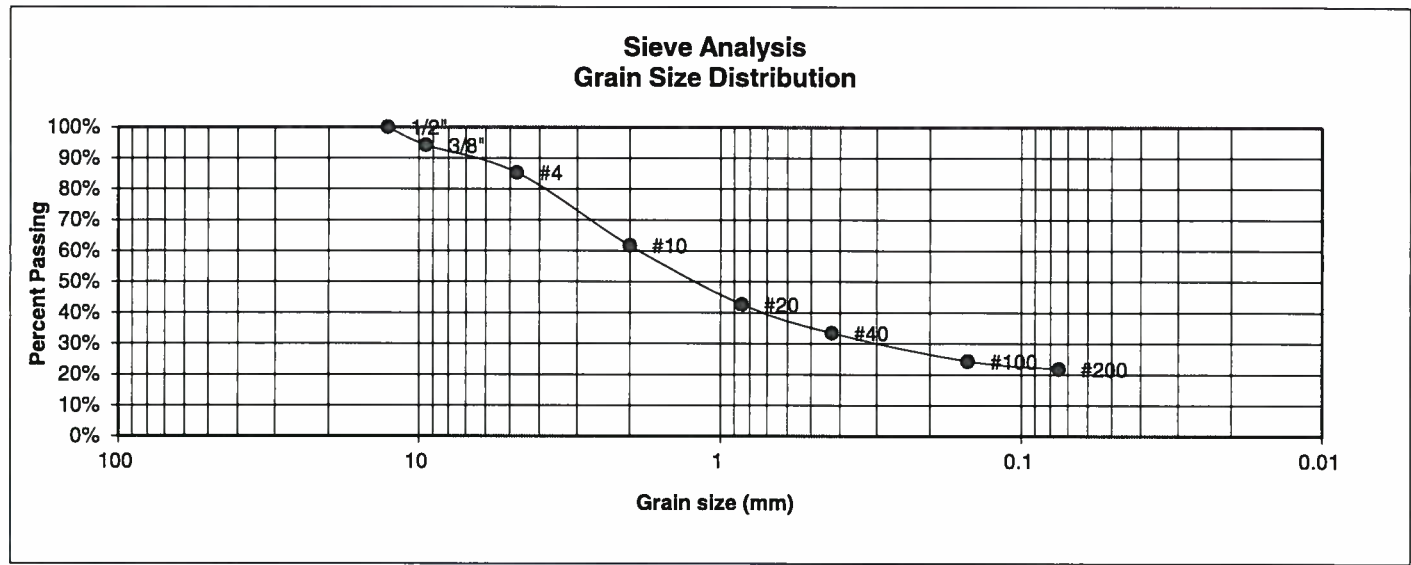
ENTECH ENGINEERING, INC.
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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:
220780
FIG NO.:
8-23

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	4	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	13	JOB NO.	220780
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"	100.0%
3/8"	94.2%
4	85.3%
10	61.7%
20	42.7%
40	33.4%
100	24.3%
200	21.8%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

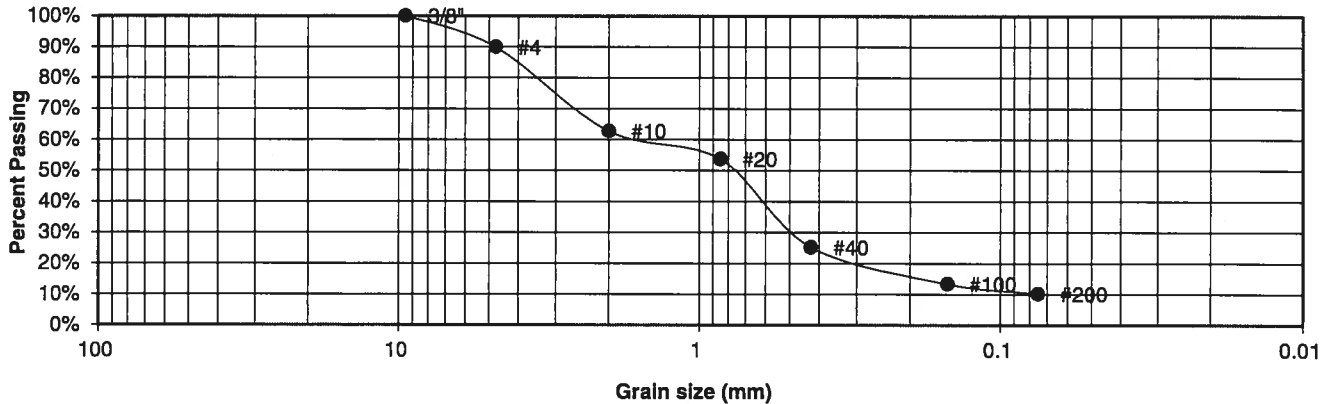
**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:
220780
FIG NO.:
B-24

UNIFIED CLASSIFICATION	SM-SW	CLIENT	TECH CONTRACTORS
SOIL TYPE #	4	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	17	JOB NO.	220780
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"	
3/8"	100.0%
4	89.9%
10	62.7%
20	53.7%
40	25.2%
100	13.3%
200	10.2%

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)	



**ENTECH
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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:

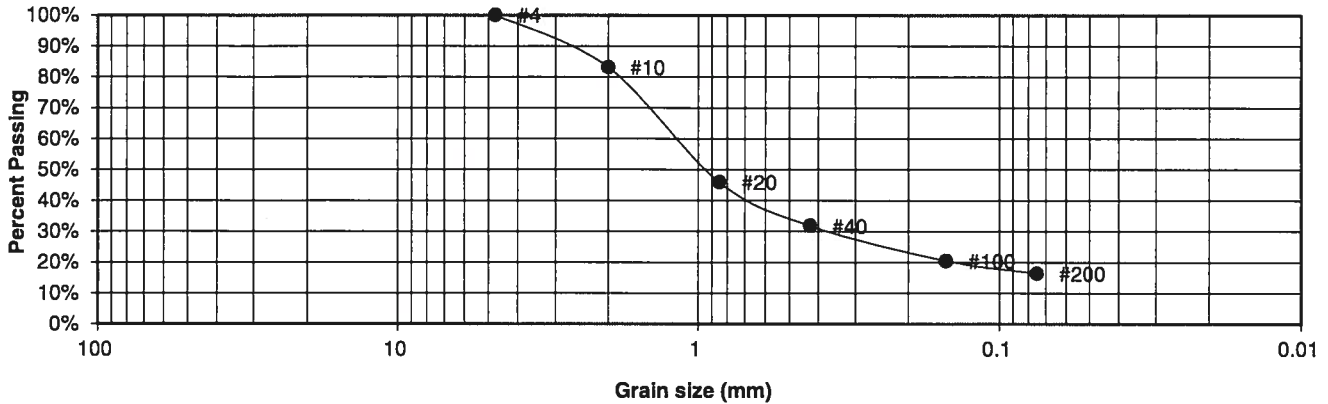
220780

FIG NO.:

B-25

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	4	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	19	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	5	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-4	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	83.1%
20	45.9%
40	31.8%
100	20.5%
200	16.4%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NP
Plastic Index	NV

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH
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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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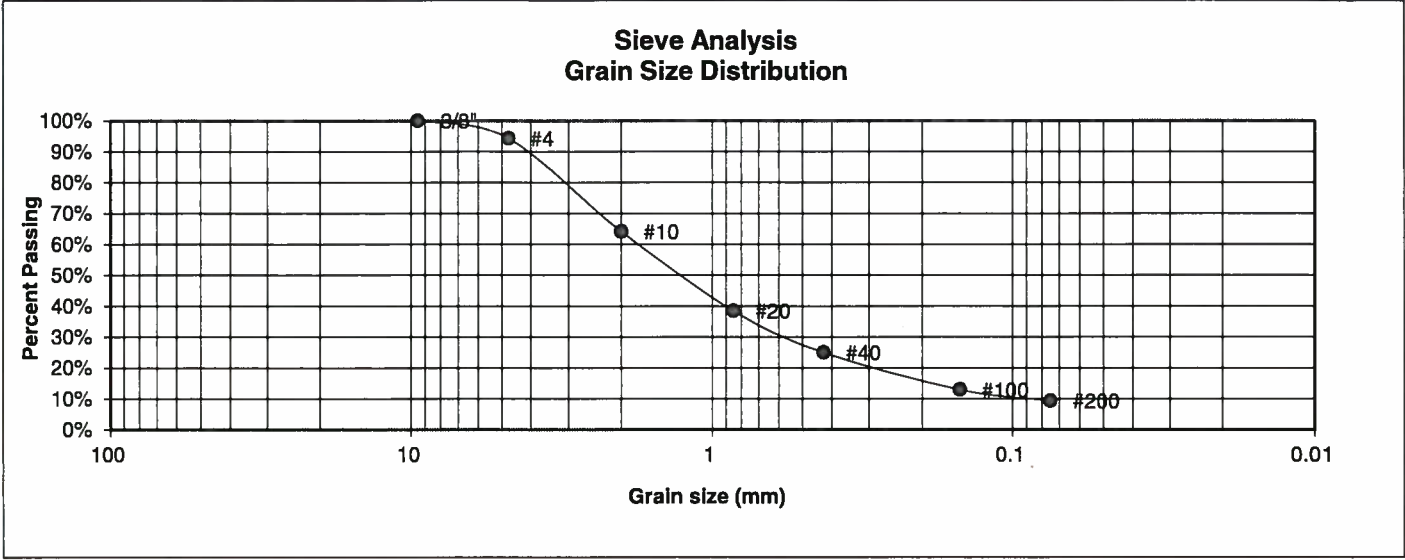
JOB NO.:

220780

FIG NO.:

B-26

UNIFIED CLASSIFICATION	SM-SW	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	3	JOB NO.	220780
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	94.3%
10	64.1%
20	38.4%
40	25.0%
100	12.9%
200	9.4%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NP
Plastic Index	NV

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



**ENTECH
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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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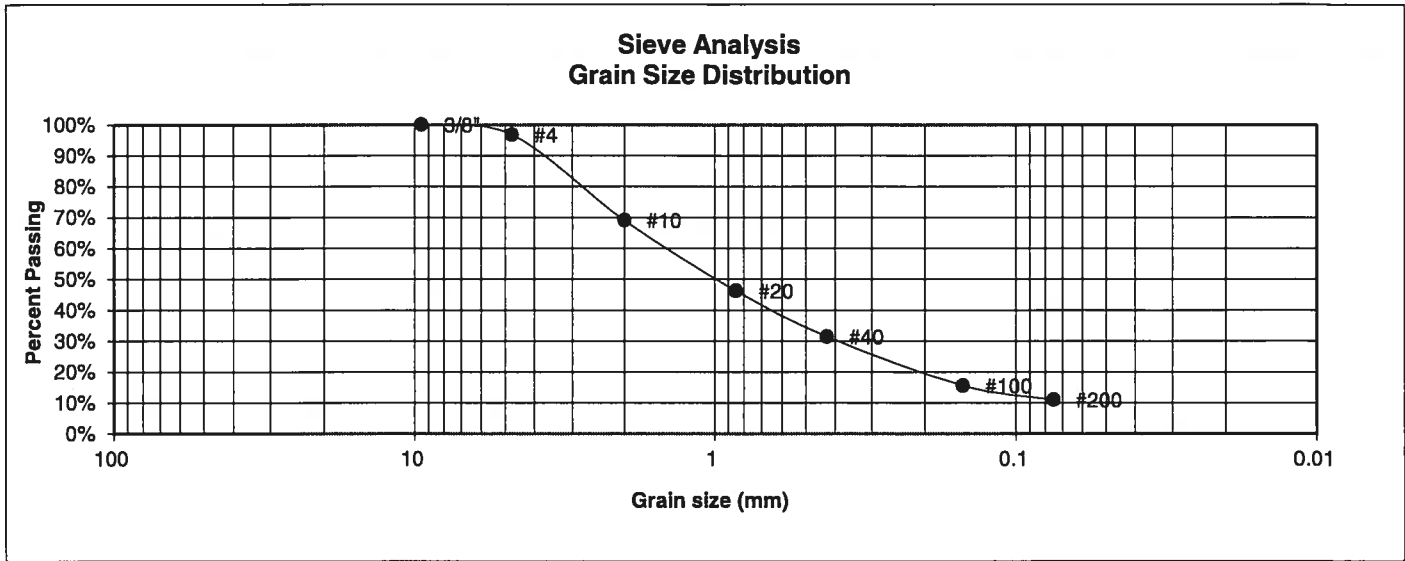
JOB NO.:

220780

FIG NO.:

B-27

<u>UNIFIED CLASSIFICATION</u>	SM-SW	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	5	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.8%
10	69.1%
20	46.3%
40	31.4%
100	15.6%
200	11.0%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

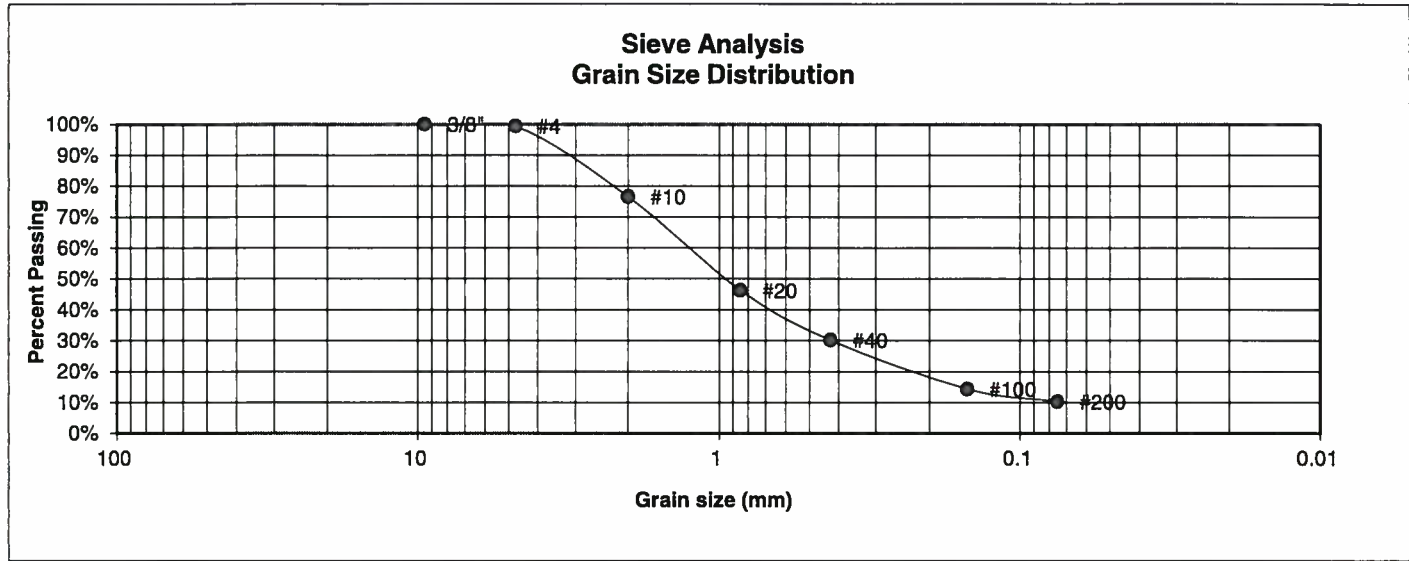
DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:

220780
FIG NO.:

B-28

UNIFIED CLASSIFICATION	SM-SW	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	8	JOB NO.	220780
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"	100.0%
4	99.4%
10	76.6%
20	46.3%
40	30.2%
100	14.3%
200	10.3%

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)	



**ENTECH
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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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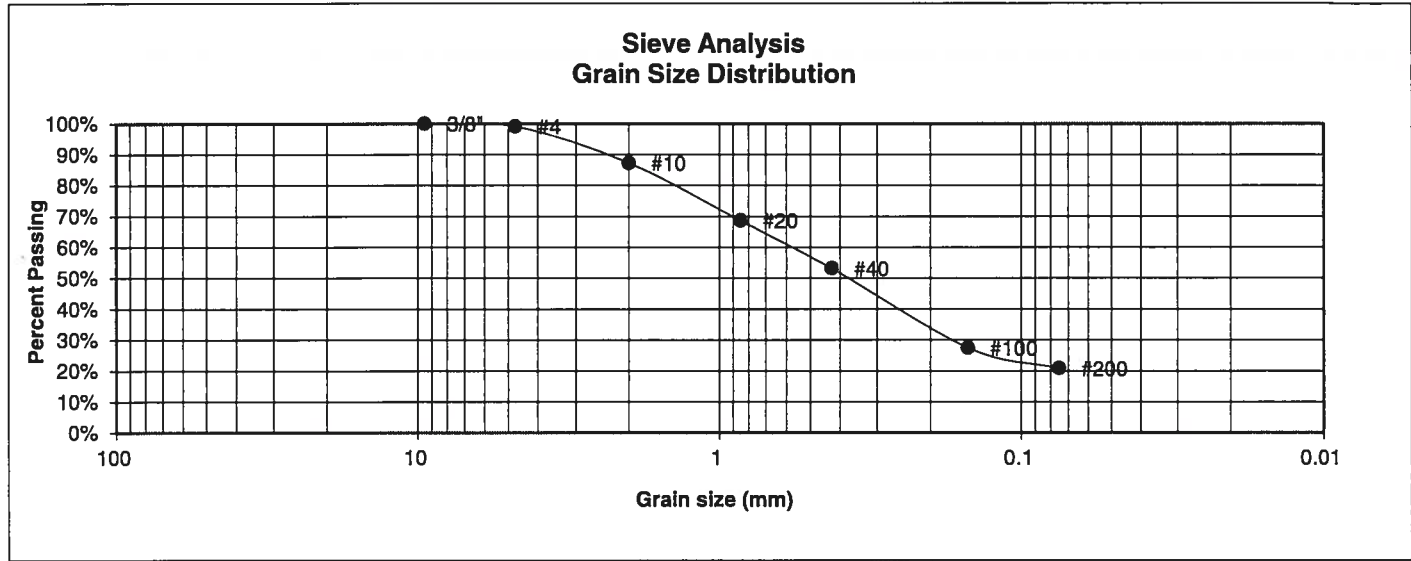
JOB NO.:

220780

FIG NO.:

B-29

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	9	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	5	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-4	<u>GROUP INDEX</u>	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.1%
10	87.3%
20	68.7%
40	53.2%
100	27.4%
200	20.8%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:

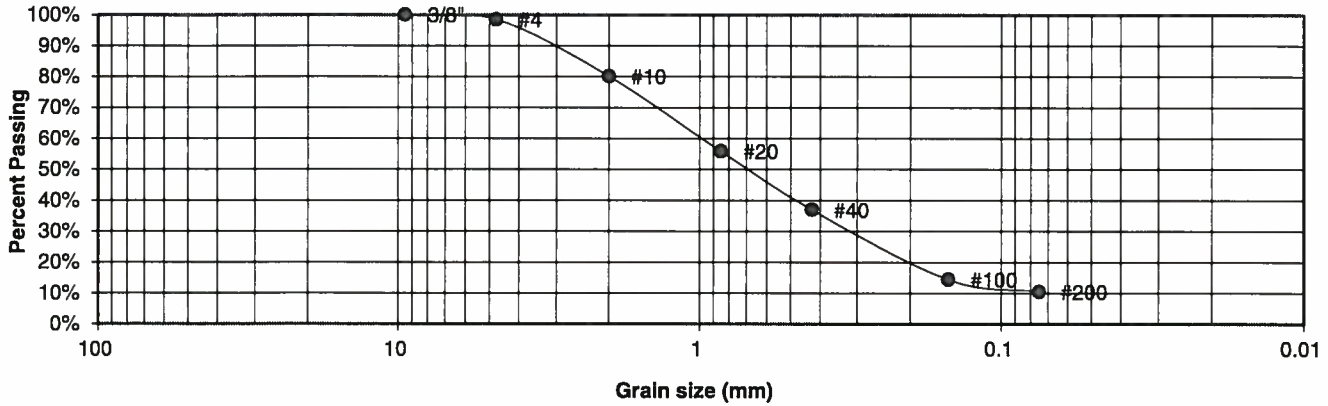
220780

FIG NO.:

B-30

<u>UNIFIED CLASSIFICATION</u>	SM-SW	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	11	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-1-b	<u>GROUP INDEX</u>	0

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.5%
10	80.1%
20	55.9%
40	37.0%
100	14.4%
200	10.5%

Atterberg Limits
 Plastic Limit
 Liquid Limit
 Plastic Index

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



**ENTECH
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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>sw</i>	DATE: <i>6-3-22</i>
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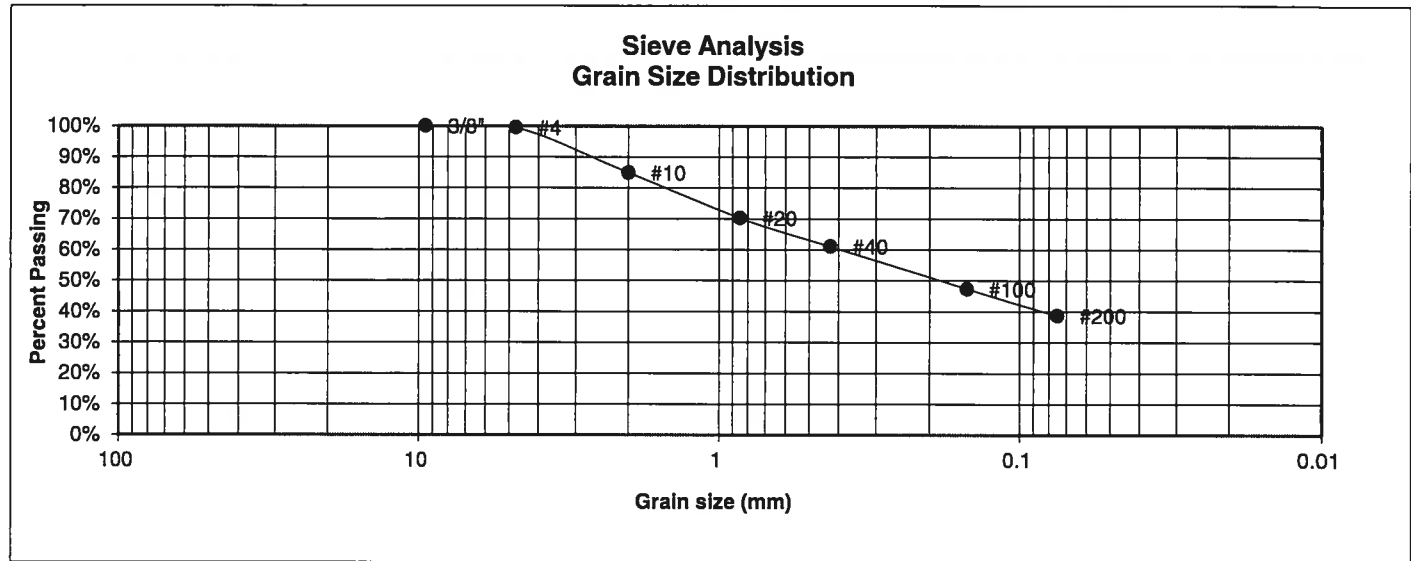
JOB NO.:

220780

FIG NO.:

B-31

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	5	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	14	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	5	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-4	<u>GROUP INDEX</u>	



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.5%
10	84.9%
20	70.2%
40	61.1%
100	47.3%
200	38.7%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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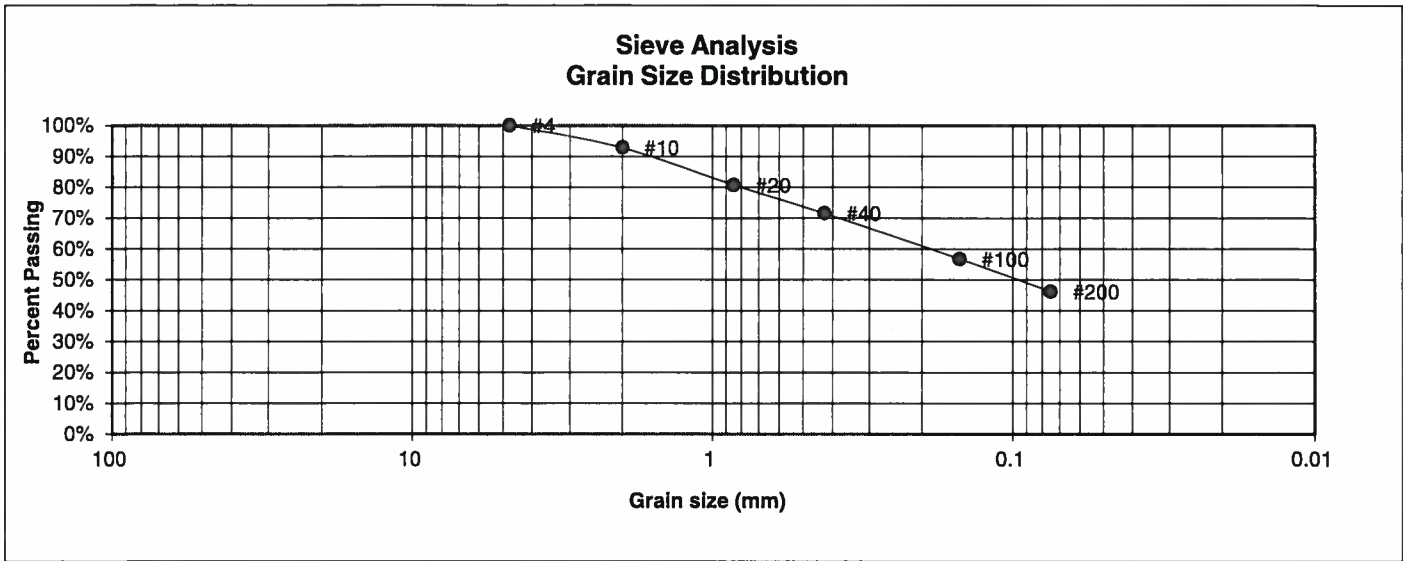
JOB NO.:

220780

FIG NO.:

B-32

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	5	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	20	JOB NO.	220780
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	1



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	92.8%
20	80.8%
40	71.5%
100	56.8%
200	46.2%

Atterberg Limits	
Plastic Limit	13
Liquid Limit	26
Plastic Index	13

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



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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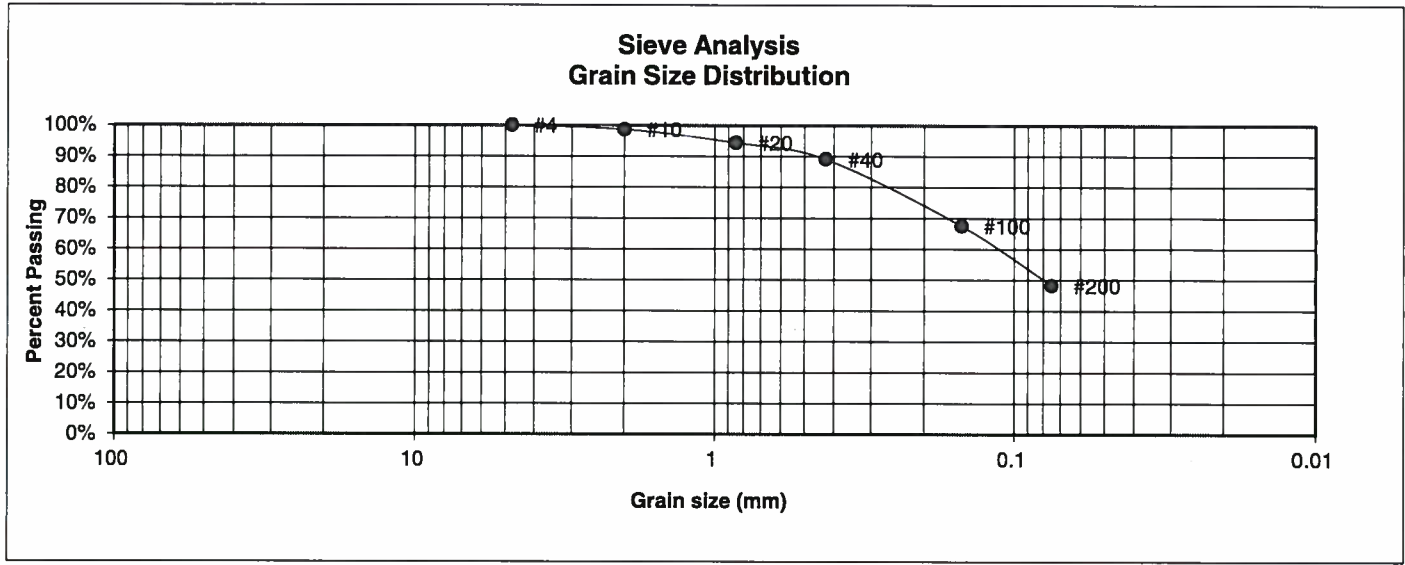
JOB NO.:

220780

FIG NO.:

B-33

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	5	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	20	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-4	<u>GROUP INDEX</u>	0



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.7%
20	94.4%
40	89.1%
100	67.5%
200	48.3%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

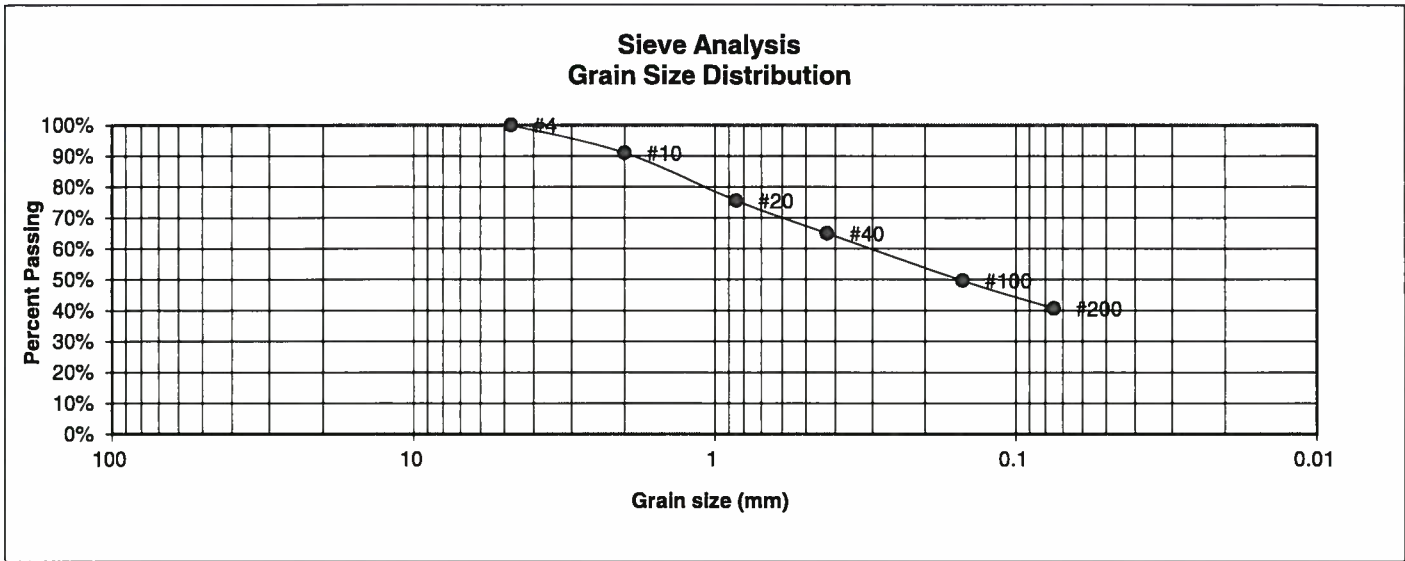
DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:

220780
FIG NO.:

B-34

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	TECH CONTRACTORS
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	MERIDIAN RANCH, FILING 3
<u>TEST BORING #</u>	1	<u>JOB NO.</u>	220780
<u>DEPTH (FT)</u>	5	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-6	<u>GROUP INDEX</u>	3



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	91.0%
20	75.6%
40	65.0%
100	49.7%
200	40.7%

<u>Atterberg Limits</u>	
Plastic Limit	16
Liquid Limit	35
Plastic Index	19

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH
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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> SW	<u>DATE:</u> 6-3-22
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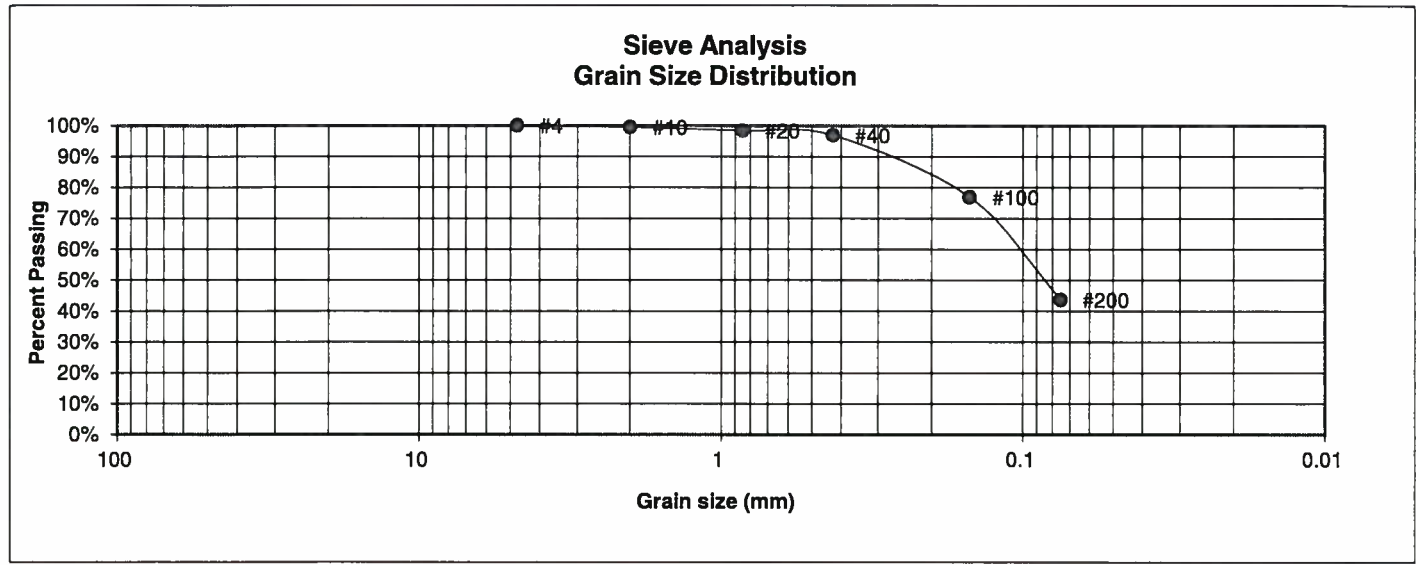
JOB NO.:

220780

FIG NO.:

B-35

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2	PROJECT	MERIDIAN RANCH, FILING 3
TEST BORING #	4	JOB NO.	220780
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-4	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.5%
20	98.4%
40	96.9%
100	76.9%
200	43.7%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

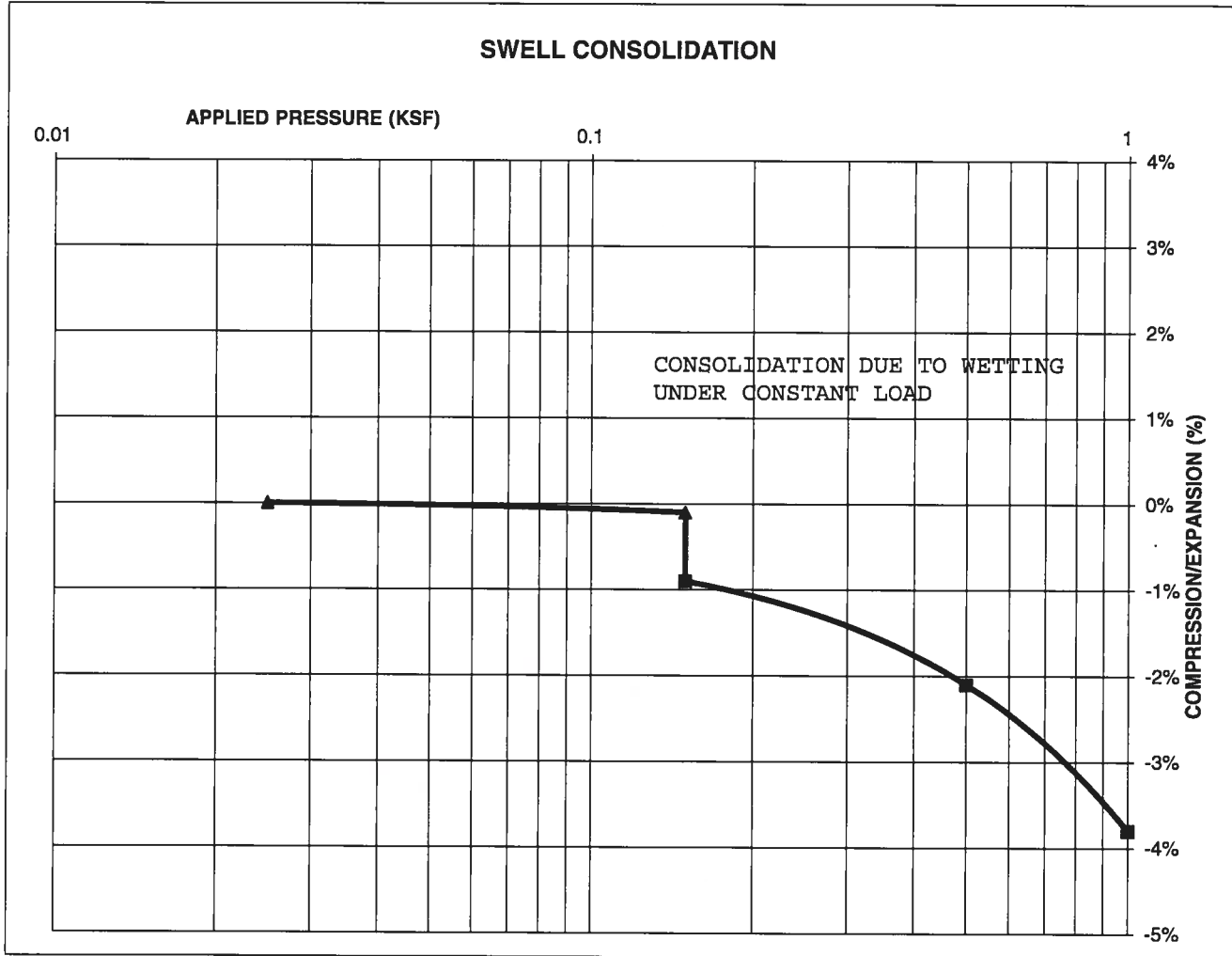
DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>6-3-22</i>
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JOB NO.:
220780
FIG NO.:
B-36

CONSOLIDATION TEST RESULTS

TEST BORING #	3	DEPTH(ft)	0-3
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			101
NATURAL MOISTURE CONTENT			10.6%
SWELL/CONSOLIDATION (%)			-0.8%

JOB NO. 220780
 CLIENT TECH CONTRACTORS
 PROJECT MERIDIAN RANCH, FILING 3



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION
TEST RESULTS**

DRAWN:

DATE:

CHECKED: *SW*

DATE: *6-3-22*

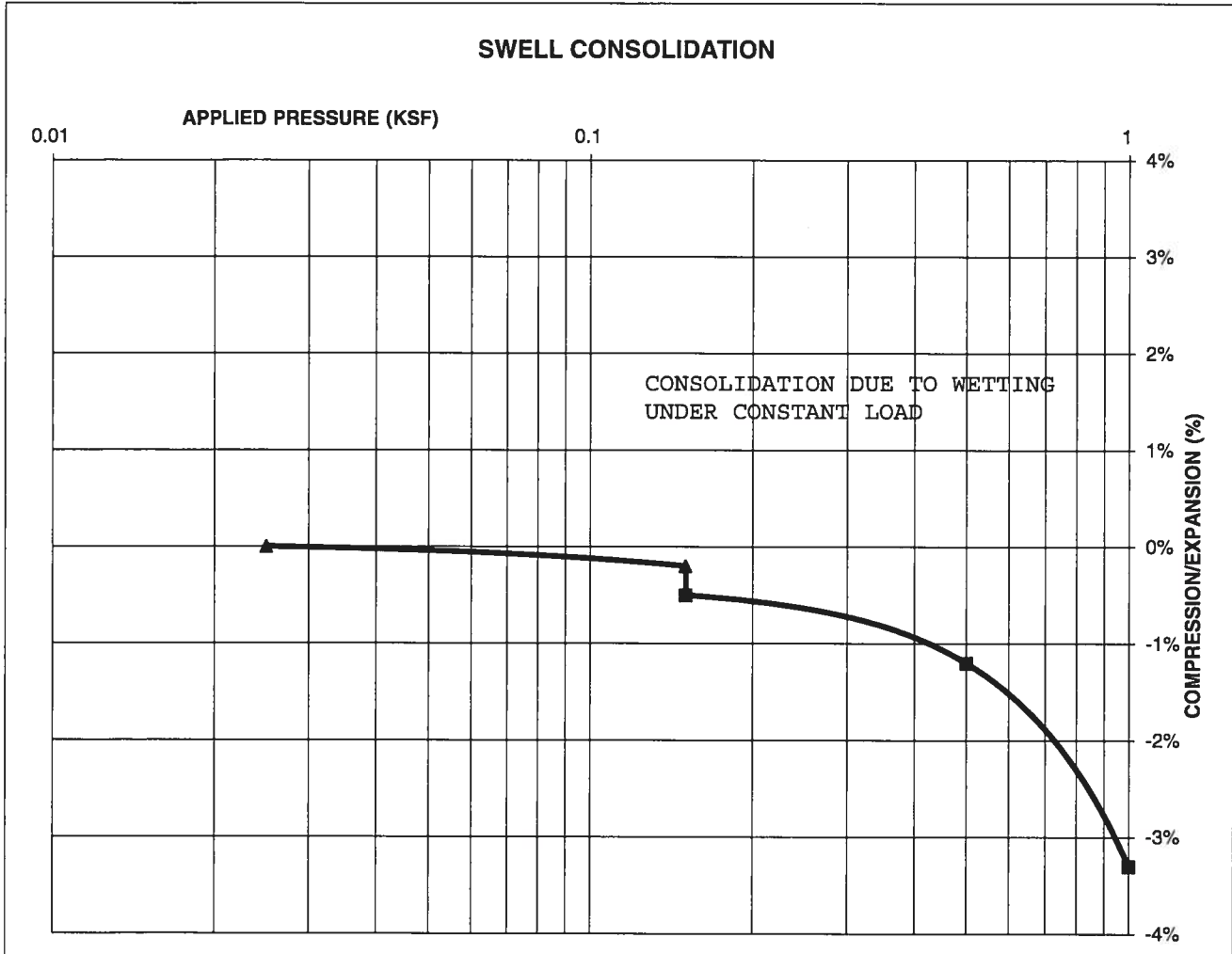
JOB NO.:
220780

FIG NO.:
B-37

CONSOLIDATION TEST RESULTS

TEST BORING #	3	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			102
NATURAL MOISTURE CONTENT			11.5%
SWELL/CONSOLIDATION (%)			-0.3%

JOB NO. 220780
 CLIENT TECH CONTRACTORS
 PROJECT MERIDIAN RANCH, FILING 3



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

CHECKED: *SW*

DATE: *6-3-22*

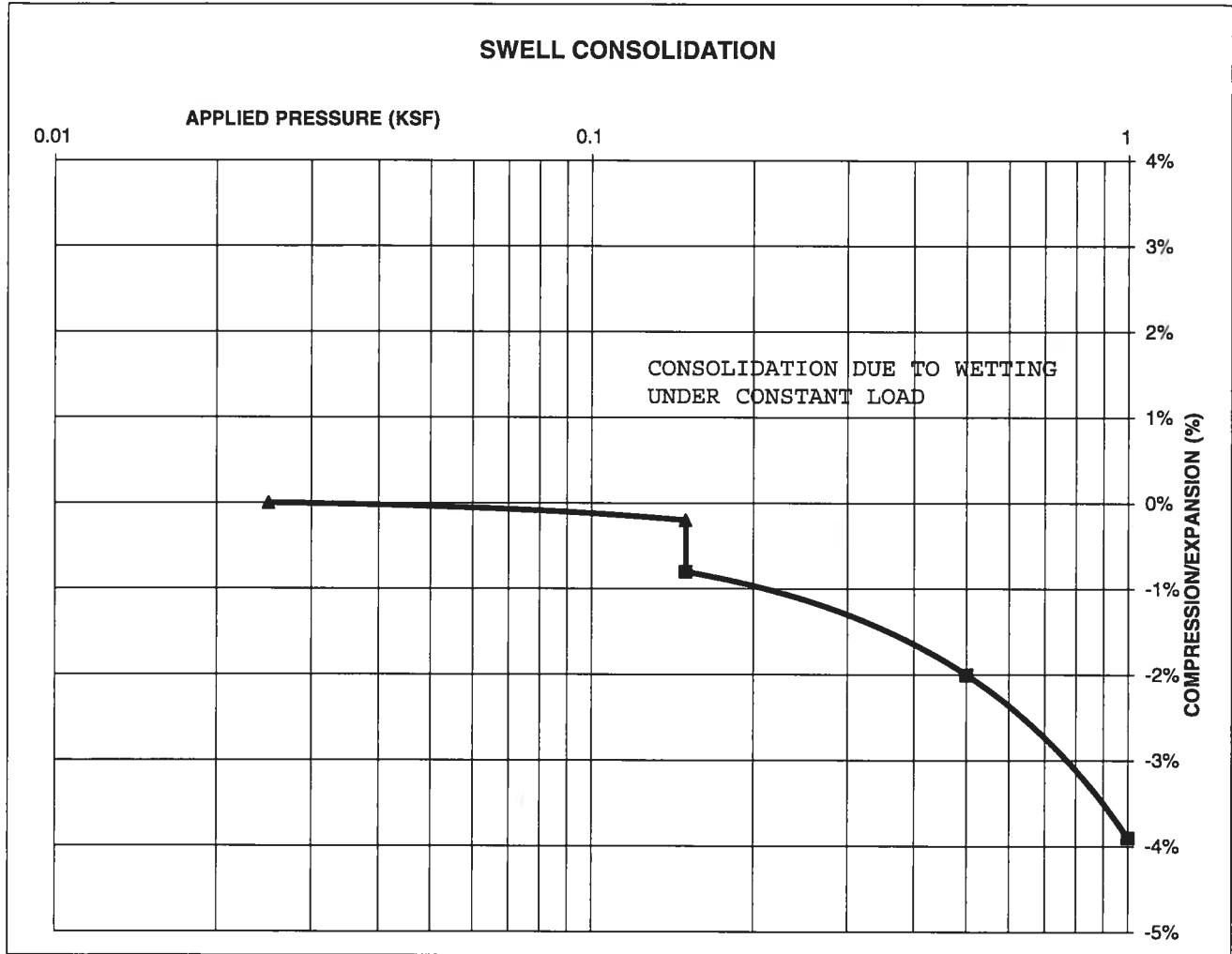
JOB NO.:
 220780

FIG NO.:
B-38

CONSOLIDATION TEST RESULTS

TEST BORING #	8	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			102
NATURAL MOISTURE CONTENT			6.6%
SWELL/CONSOLIDATION (%)			-0.6%

JOB NO. 220780
 CLIENT TECH CONTRACTORS
 PROJECT MERIDIAN RANCH, FILING 3



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 505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

CHECKED: *SW*

DATE: *6-3-22*

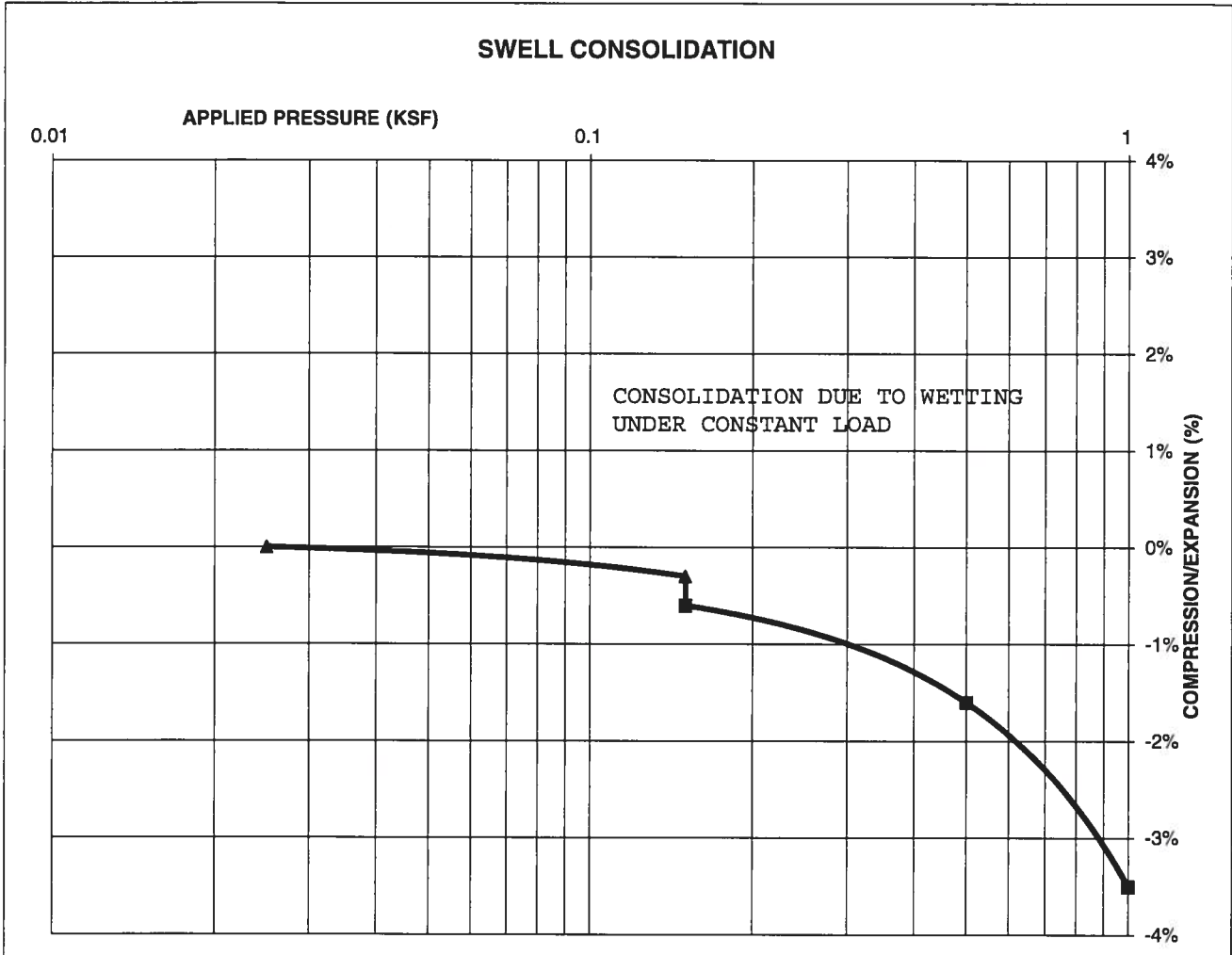
JOB NO.:
220780

FIG NO.:
B-39

CONSOLIDATION TEST RESULTS

TEST BORING #	9	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			105
NATURAL MOISTURE CONTENT			12.7%
SWELL/CONSOLIDATION (%)			-0.3%

JOB NO. 220780
 CLIENT TECH CONTRACTORS
 PROJECT MERIDIAN RANCH, FILING 3



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 COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
 TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

SW

6-3-22

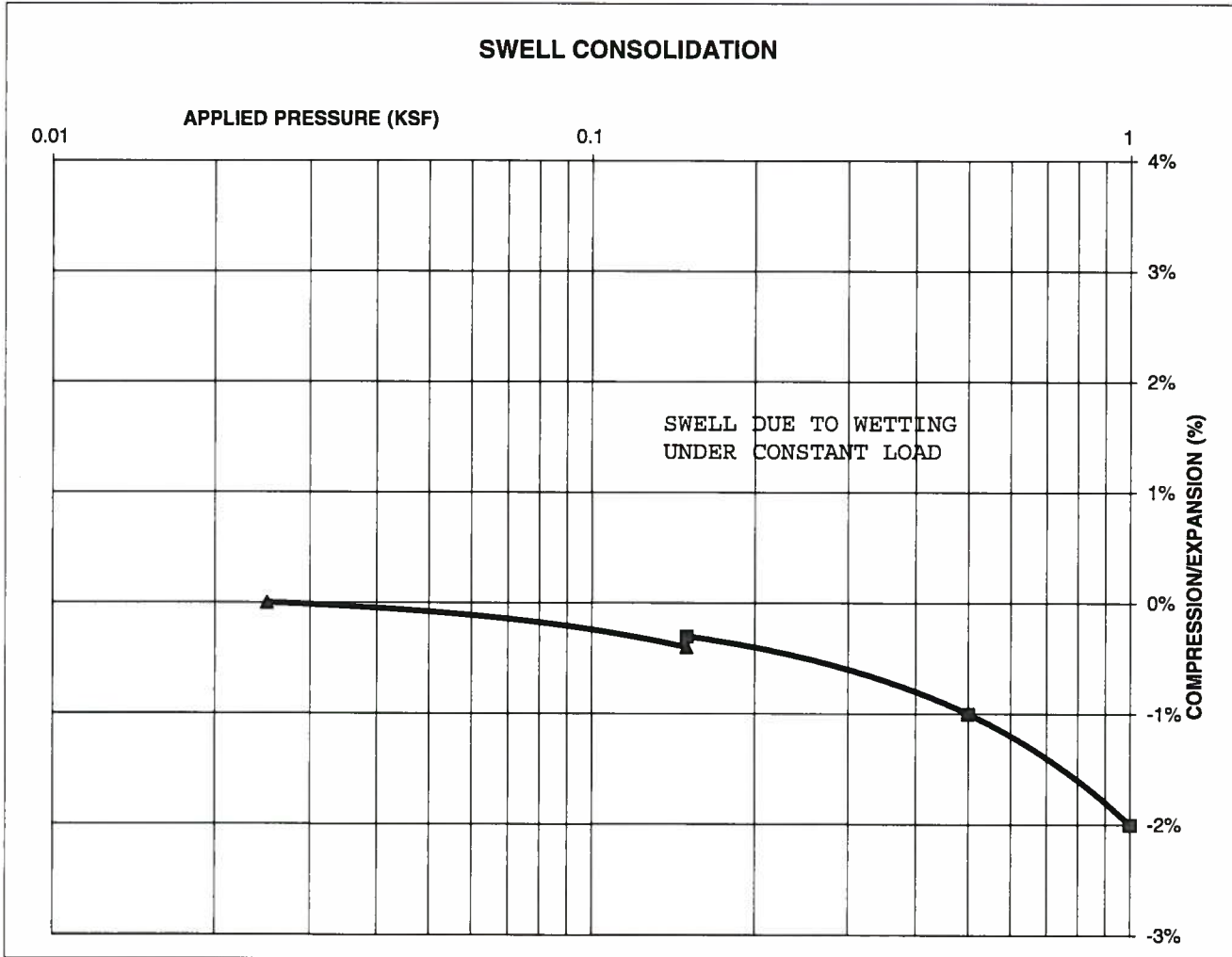
JOB NO.:
 220780

FIG NO.:
 B-40

CONSOLIDATION TEST RESULTS

TEST BORING #	11	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			112
NATURAL MOISTURE CONTENT			9.9%
SWELL/CONSOLIDATION (%)			0.1%

JOB NO. 220780
 CLIENT TECH CONTRACTORS
 PROJECT MERIDIAN RANCH, FILING 3



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

CHECKED: *SW*

DATE: *6-3-22*

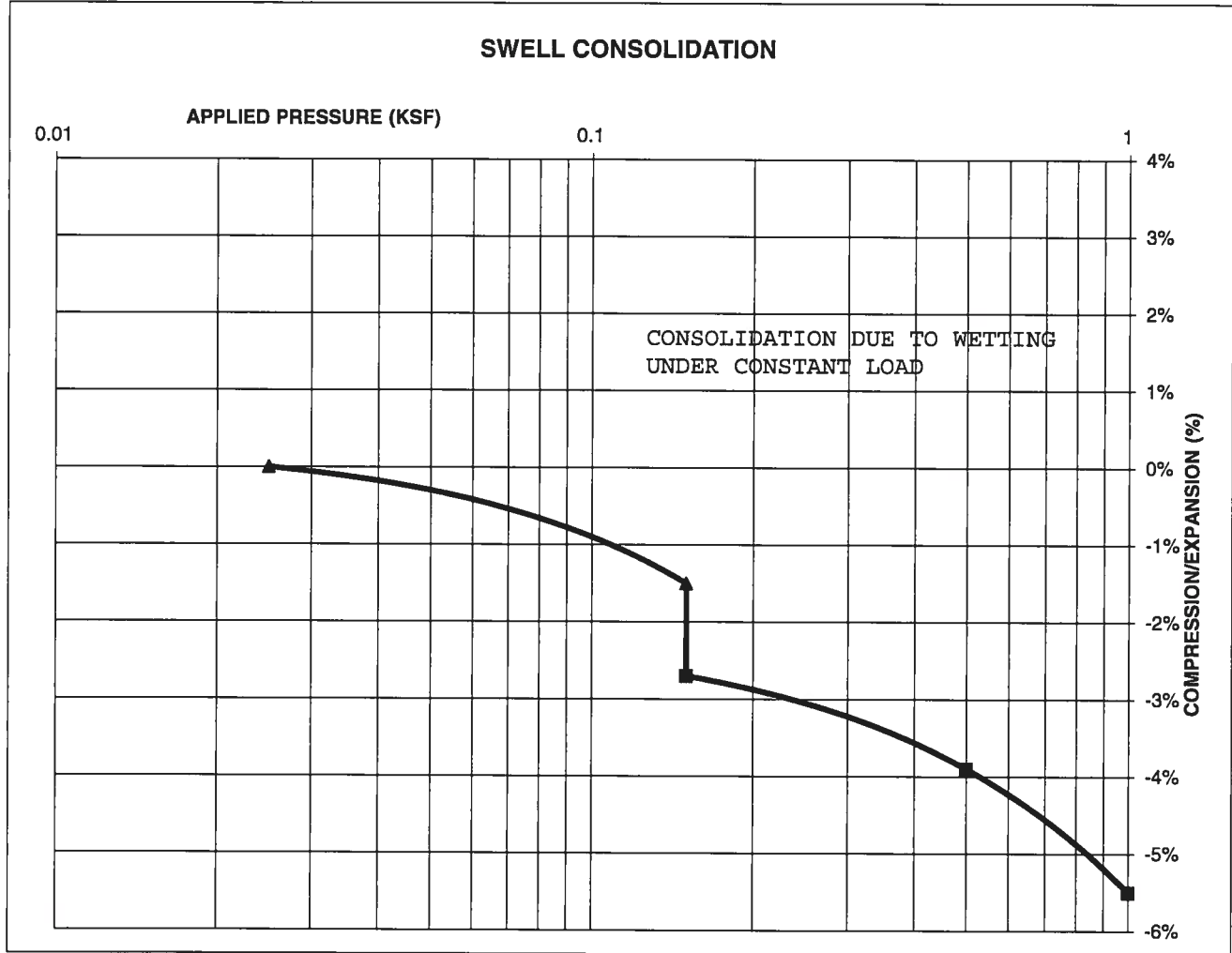
JOB NO.:
 220780

FIG NO.:
B-41

CONSOLIDATION TEST RESULTS

TEST BORING #	12	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			105
NATURAL MOISTURE CONTENT			9.6%
SWELL/CONSOLIDATION (%)			-1.2%

JOB NO. 220780
 CLIENT TECH CONTRACTORS
 PROJECT MERIDIAN RANCH, FILING 3



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

CHECKED: *SW*

DATE: *6-3-22*

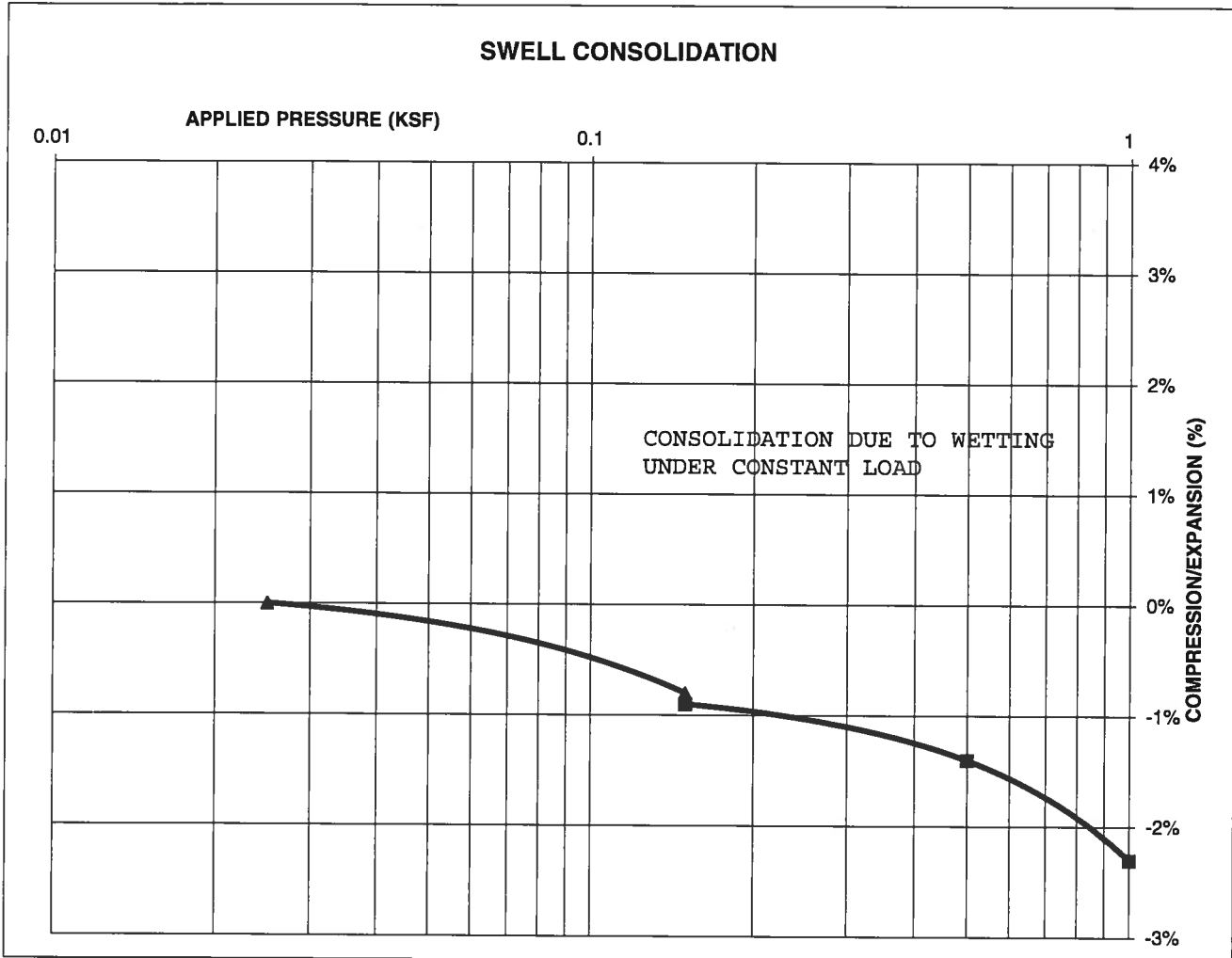
JOB NO.:
 220780

FIG NO.:
B-42

CONSOLIDATION TEST RESULTS

TEST BORING #	20	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			104
NATURAL MOISTURE CONTENT			13.7%
SWELL/CONSOLIDATION (%)			-0.1%

JOB NO. 220780
 CLIENT TECH CONTRACTORS
 PROJECT MERIDIAN RANCH, FILING 3



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505 ELKTON DRIVE
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**SWELL CONSOLIDATION
TEST RESULTS**

DRAWN:

DATE:

CHECKED: *SW*

DATE: *6-3-22*

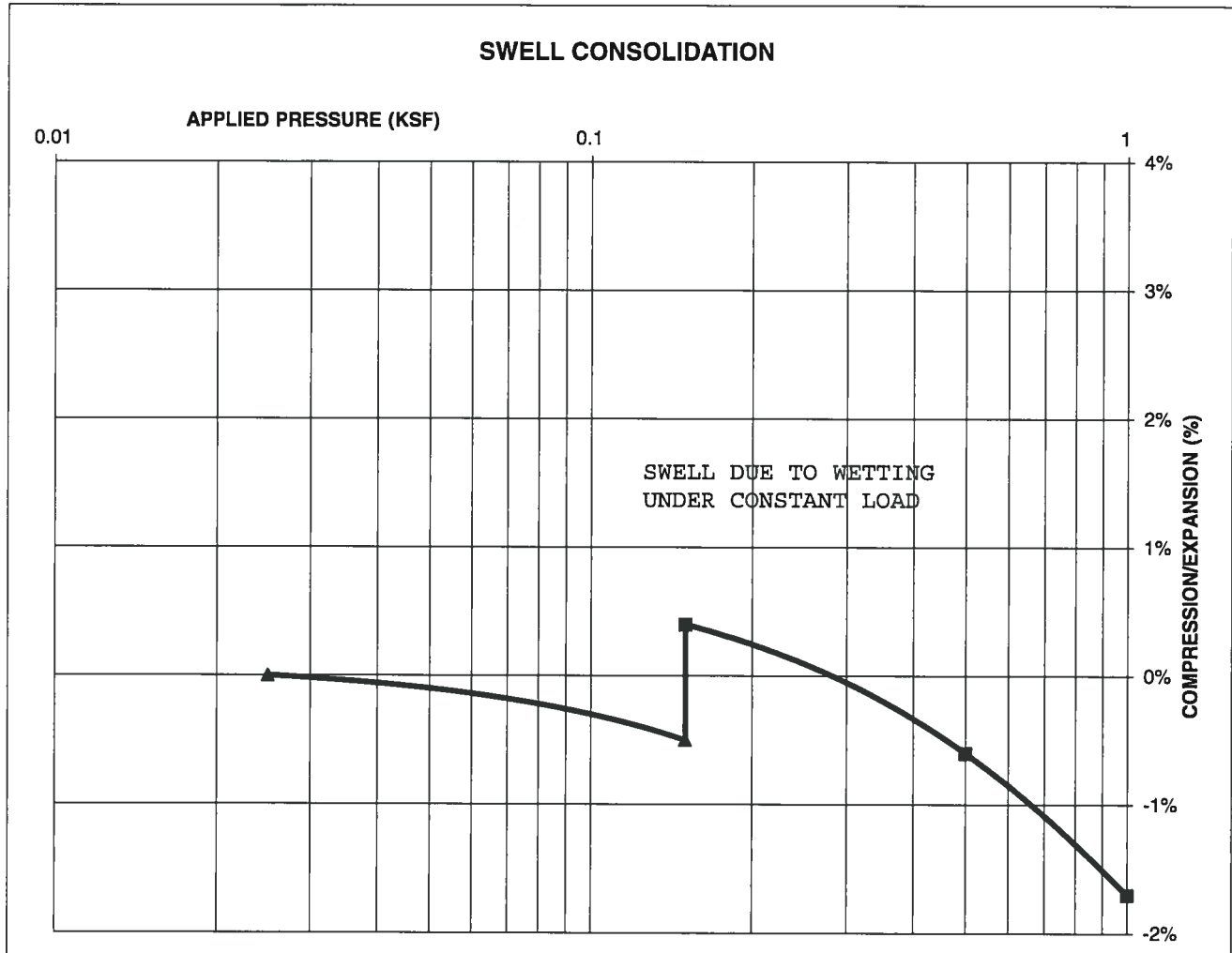
JOB NO.:
220780

FIG NO.:
B-43

CONSOLIDATION TEST RESULTS

TEST BORING #	13	DEPTH(ft)	10
DESCRIPTION	SM	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			115
NATURAL MOISTURE CONTENT			9.6%
SWELL/CONSOLIDATION (%)			0.9%

JOB NO. 220780
 CLIENT TECH CONTRACTORS
 PROJECT MERIDIAN RANCH, FILING 3



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505 ELKTON DRIVE
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**SWELL CONSOLIDATION
TEST RESULTS**

DRAWN:

DATE:

CHECKED: *SW*

DATE: *6-3-22*

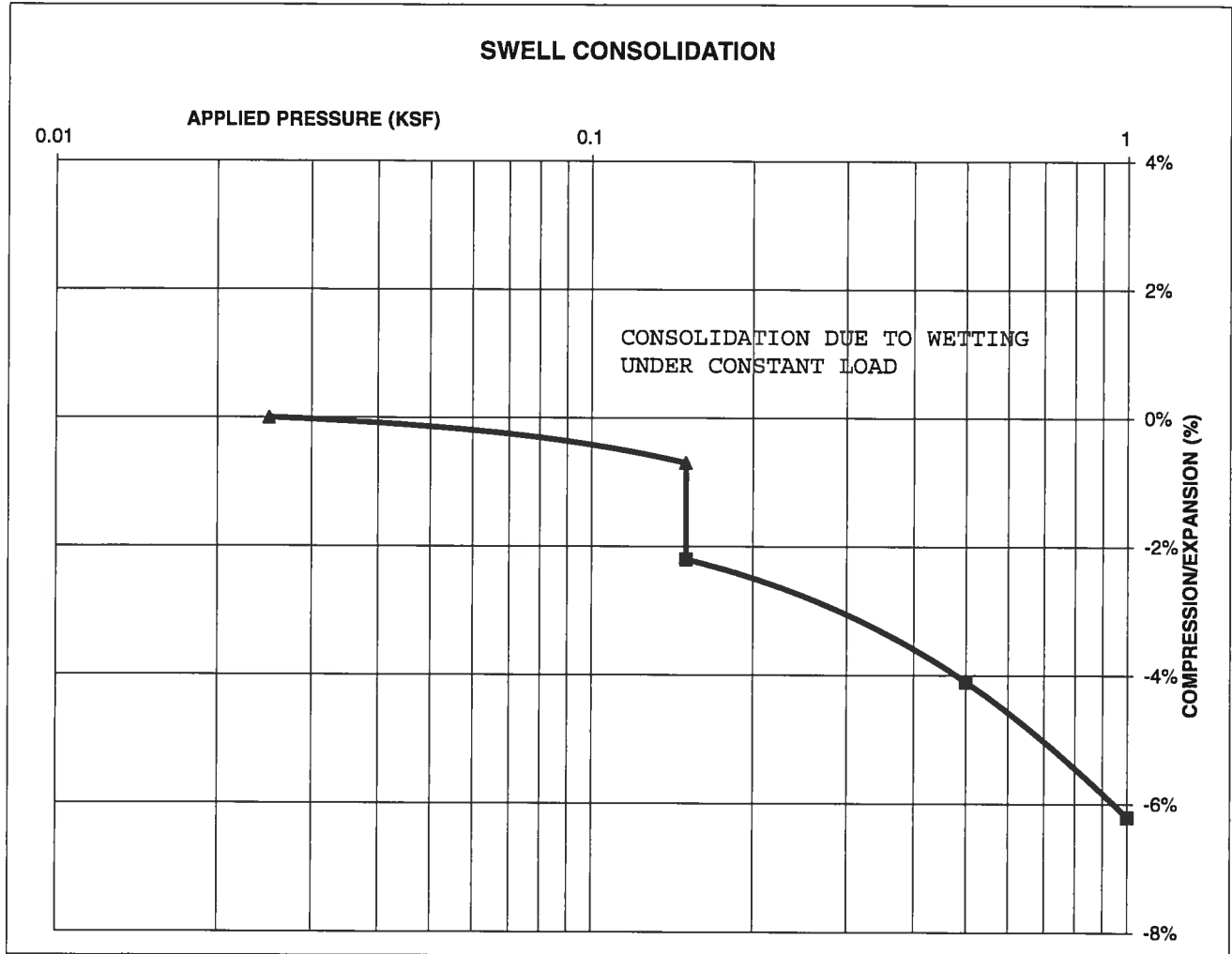
JOB NO.:
220780

FIG NO.:
B-44

CONSOLIDATION TEST RESULTS

TEST BORING #	20	DEPTH(ft)	5
DESCRIPTION	SC	SOIL TYPE	5
NATURAL UNIT DRY WEIGHT (PCF)	97		
NATURAL MOISTURE CONTENT	10.4%		
SWELL/CONSOLIDATION (%)	-1.5%		

JOB NO. 220780
 CLIENT TECH CONTRACTORS
 PROJECT MERIDIAN RANCH, FILING 3



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION
TEST RESULTS**

DRAWN:

DATE:

CHECKED: *SW*

DATE: *6-3-22*

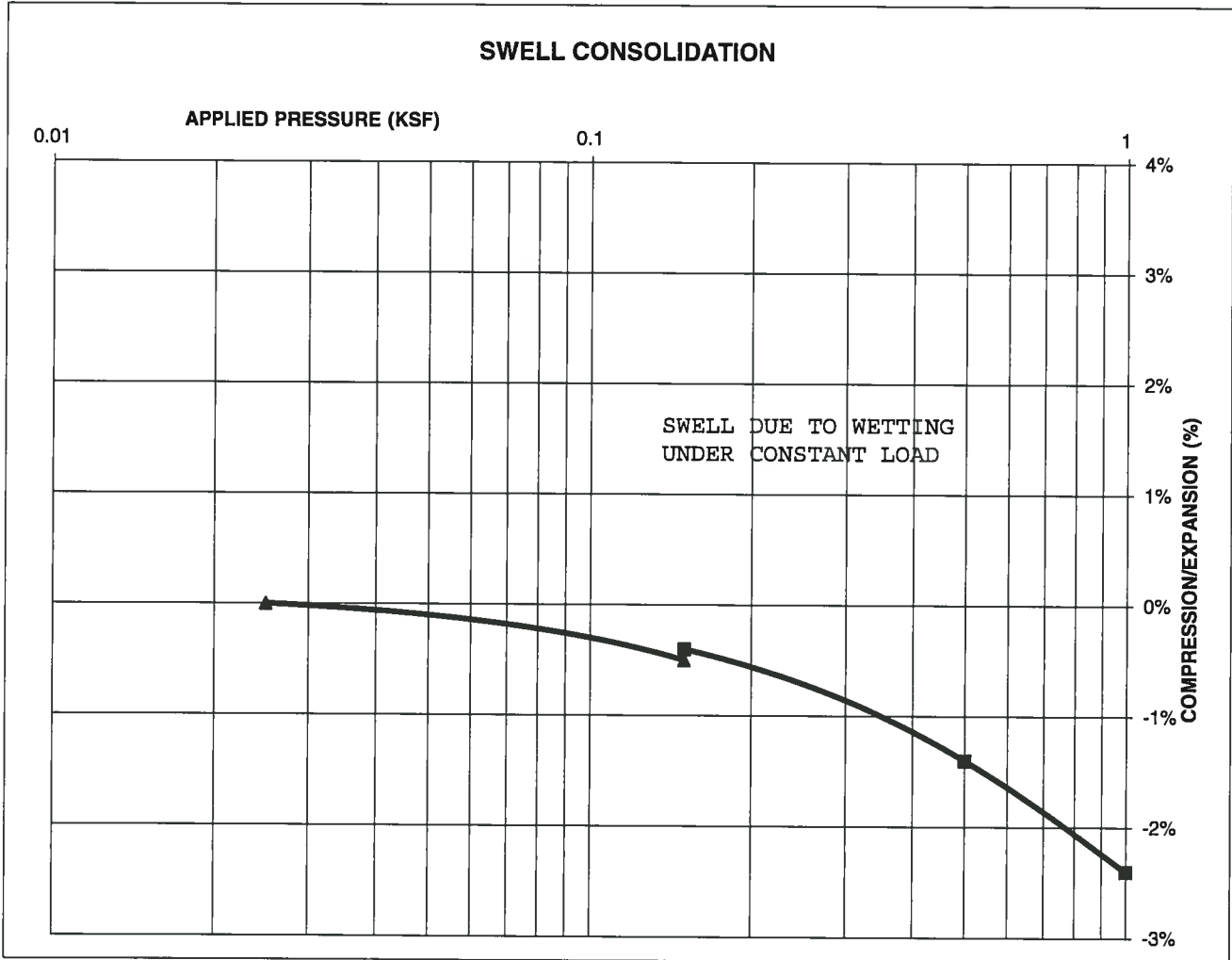
JOB NO.:
220780

FIG NO.:
B-45

CONSOLIDATION TEST RESULTS

TEST BORING #	20	DEPTH(ft)	10
DESCRIPTION	SM	SOIL TYPE	5
NATURAL UNIT DRY WEIGHT (PCF)			113
NATURAL MOISTURE CONTENT			13.1%
SWELL/CONSOLIDATION (%)			0.1%

JOB NO. 220780
 CLIENT TECH CONTRACTORS
 PROJECT MERIDIAN RANCH, FILING 3



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505 ELKTON DRIVE
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**SWELL CONSOLIDATION
TEST RESULTS**

DRAWN:

DATE:

CHECKED:

DATE:

SW

6-3-22

JOB NO.:
220780

FIG NO.:
B-46

CLIENT	TECH CONTRACTORS	JOB NO.	220780
PROJECT	MERIDIAN RANCH, FILING 3	DATE	4/27/2022
LOCATION	MERIDIAN RANCH, FILING 3	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	1-2	1	SM	<0.01
TB-2	1-2	1	SM	0.01
TB-6	1-2	1	SM	0.01
TB-4	5	2	SM	<0.01
TB-9	5	2	SM	<0.01
TB-12	1-2	1	SC	0.00
TB-15	1-2	1	SM	<0.01
TB-13	10	4	SM	0.00
TB-20	5	5	SC	<0.01
TB-20	10	5	SM	<0.01

QC BLANK PASS



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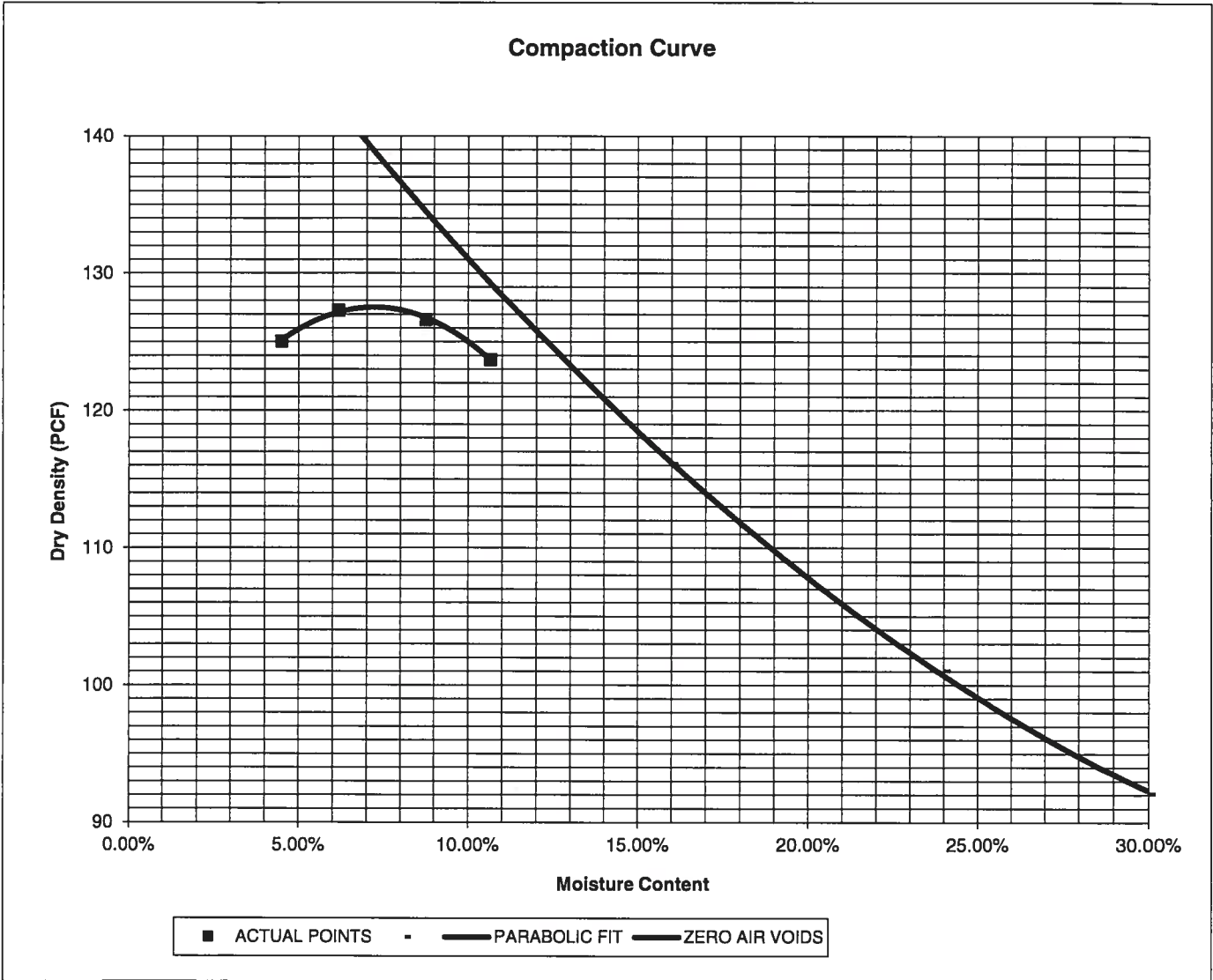
**LABORATORY TEST
SULFATE RESULTS**

DRAWN:	DATE:	CHECKED: SW	DATE: 6-3-22
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JOB NO.: 220780
FIG NO.: B-47

PROJECT	MERIDIAN RANCH, FILING 3	CLIENT	TECH CONTRACTORS
SAMPLE LOCATION	TB-3 @ 0-3', SOIL TYPE #1	JOB NO.	220780
SOIL DESCRIPTION	SAND, CLAYEY, BROWN	DATE	04/17/22

IDENTIFICATION	SC	COMPACTION TEST #	1
TEST DESIGNATION / METHOD	ASTM D-1557-A	TEST BY	BC
MAXIMUM DRY DENSITY (PCF)	127.4	OPTIMUM MOISTURE	7.3%




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MOISTURE DENSITY RELATION

DRAWN:	DATE:	CHECKED: <i>DS</i>	DATE: <i>6/9/22</i>
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JOB NO.:
220780
FIG NO.:
B-418

CBR TEST LOAD DATA

JOB NO: 220780
 CLIENT: TECH CONTRACTORS
 PROJECT: MERIDIAN RANCH, FILING 3
 SOIL TYPE: 1

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

PENETRATION DEPTH (INCHES)	10 BLOWS		25 BLOWS		56 BLOWS	
	MOLD # 1	MOLD # 2	MOLD # 2	MOLD # 2	MOLD # 3	MOLD # 3
	LOAD(LBS) (LBS)	STRESS (PSI)	LOAD(LBS) (LBS)	STRESS (PSI)	LOAD(LBS) (LBS)	STRESS (PSI)
0.000	0	0.00	0	0.00	0	0.00
0.025	120	40.10	240	80.20	540	180.45
0.050	262	87.55	523	174.77	760	253.97
0.075	284	94.90	568	189.81	897	299.75
0.100	303	101.25	606	202.51	1107	369.92
0.125	325	108.60	650	217.21	1326	443.11
0.150	349	116.62	698	233.25	1596	533.33
0.175	383	127.99	766	255.97	1820	608.19
0.200	411	137.34	822	274.69	2096	700.42
0.300	503	168.09	1005	335.84	3142	1049.96
0.400	630	210.53	1259	420.72	3920	1309.94
0.500	765	255.64	1510	504.59	5081	1697.91

FINAL MOISTURE CONTENT

	MOLD # 1	MOLD # 2	MOLD # 3
CAN #	342	343	361
WT. CAN	8.51	8.5	8.57
WT. CAN+WET	234.79	257.81	234.78
WT. CAN+DRY	205.99	226.67	212.35
WT. H2O	28.8	31.14	22.43
WT. DRY SOIL	197.48	218.17	203.78
MOISTURE CONTENT	14.58%	14.27%	11.01%

WET DENSITY (PCF)	126.3	132.5	138.5
DRY DENSITY (PCF)	118.3	124.0	129.7

BEARING RATIO 10.13 20.25 36.99

90% OF DRY DENSITY 119.8
 95% OF DRY DENSITY 126.4

BEARING RATIO AT 90% OF MAX	12.77 ~ R VALUE	37
BEARING RATIO AT 95% OF MAX	27.42 ~ R VALUE	73



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ENGINEERING, INC.**

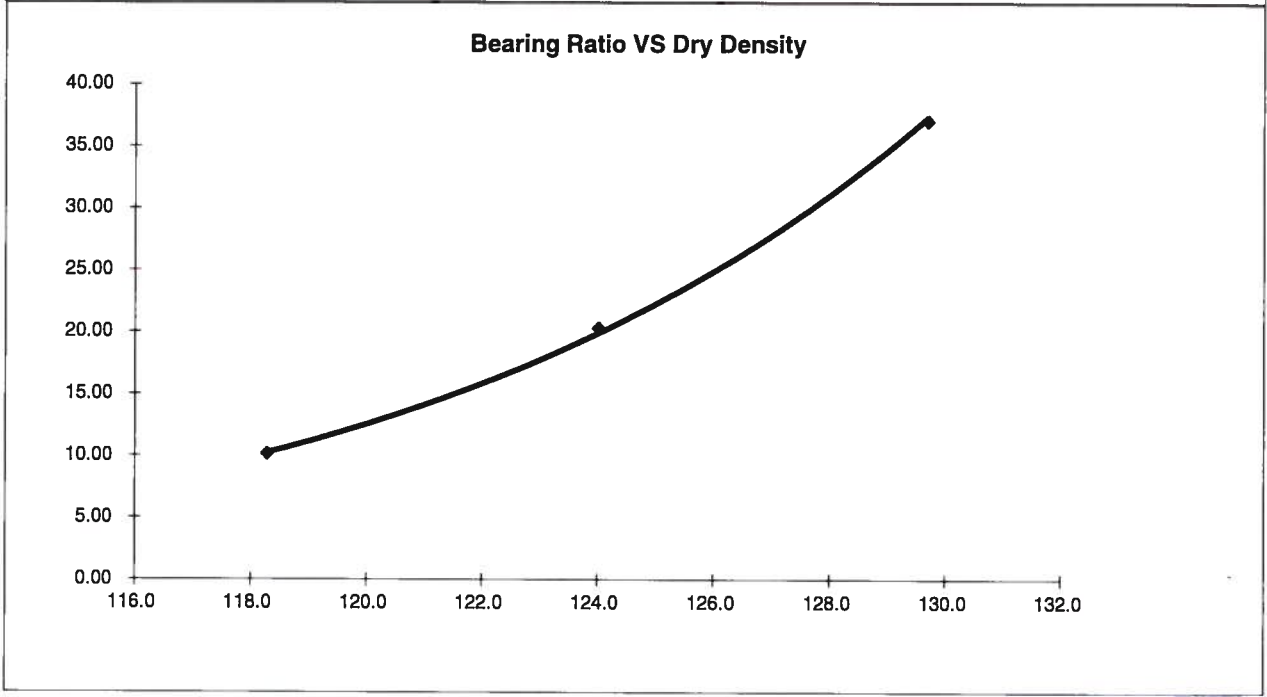
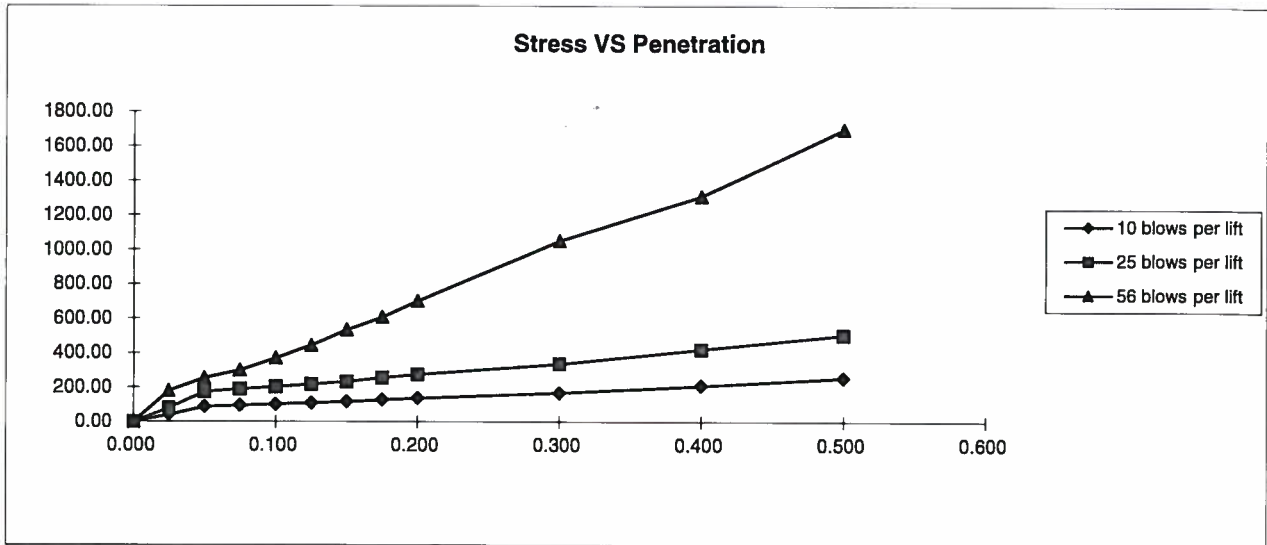
505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

CBR TEST DATA

DRAWN: DATE: CHECKED: *DS* DATE: *5/3/22*

JOB NO:
220780

FIG NO:
B-49



BEARING RATIO AT 90% OF MAX	12.77 ~ R VALUE	37.00
BEARING RATIO AT 95% OF MAX	27.42 ~ R VALUE	73.00

JOB NO: 220780
SOIL TYPE: 1



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COLORADO SPRINGS, COLORADO 80907

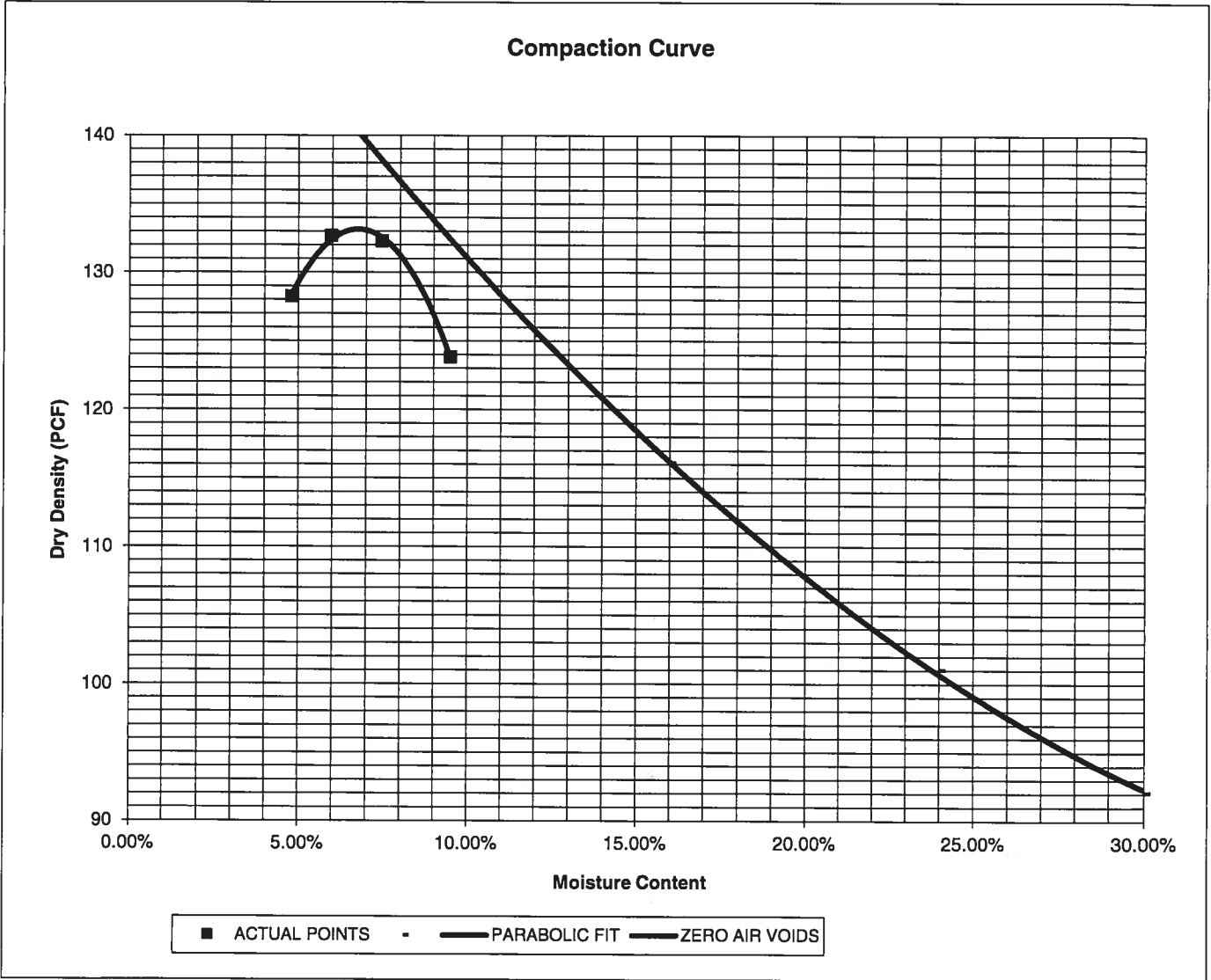
CALIFORNIA BEARING RATIO

DRAWN:	DATE:	CHECKED: <i>DS</i>	DATE: <i>6/3/22</i>
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JOB NO.: 220780
FIG NO.: *B-50*

PROJECT	MERIDIAN RANCH, FILING 3	CLIENT	TECH CONTRACTORS
SAMPLE LOCATION	TB-17 @ 0-3', SOIL TYPE #1	JOB NO.	220780
SOIL DESCRIPTION	FILL, SAND, SILTY, BROWN	DATE	05/11/22

IDENTIFICATION	SM	COMPACTION TEST #	2
TEST DESIGNATION / METHOD	ASTM D-1557-A	TEST BY	BC
MAXIMUM DRY DENSITY (PCF)	133.1	OPTIMUM MOISTURE	6.8%




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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

MOISTURE DENSITY RELATION

DRAWN:	DATE:	CHECKED:	DATE:
		<i>DS</i>	6/17/22

JOB NO.:
220780
FIG NO.:
B-51

CBR TEST LOAD DATA

JOB NO: 220780
 CLIENT: TECH CONTRACTORS
 PROJECT: MERIDIAN RANCH, FILING 3
 SOIL TYPE: 1

PISTON		PISTON		10 BLOWS		25 BLOWS		56 BLOWS	
DIAMETER (cm)		AREA (in ²)		MOLD # 1		MOLD # 2		MOLD # 3	
4.958		2.993		LOAD(LBS)	STRESS (PSI)	LOAD(LBS)	STRESS (PSI)	LOAD(LBS)	STRESS (PSI)
PENETRATION DEPTH (INCHES)									
0.000		0	0.00	0	0.00	0	0.00	0	0.00
0.025		71	23.73	129	43.11	129	43.11	129	43.11
0.050		124	41.44	179	59.82	257	85.88	257	85.88
0.075		146	48.79	204	68.17	312	104.26	312	104.26
0.100		207	69.17	300	100.25	432	144.36	432	144.36
0.125		246	82.21	329	109.94	462	154.39	462	154.39
0.150		287	95.91	357	119.30	517	172.76	517	172.76
0.175		310	103.59	407	136.01	600	200.50	600	200.50
0.200		365	121.97	500	167.08	688	229.91	688	229.91
0.300		548	183.12	769	256.97	940	314.12	940	314.12
0.400		726	242.61	1014	338.85	1122	374.94	1122	374.94
0.500		882	294.74	1210	404.34	1319	440.77	1319	440.77

FINAL MOISTURE CONTENT

	MOLD # 1	MOLD # 2	MOLD # 3
CAN #	342	343	361
WT. CAN	8.51	8.5	8.57
WT. CAN+WET	234.79	257.81	234.78
WT. CAN+DRY	205.99	226.67	212.35
WT. H2O	28.8	31.14	22.43
WT. DRY SOIL	197.48	218.17	203.78
MOISTURE CONTENT	14.58%	14.27%	11.01%

WET DENSITY (PCF)	127.3	131.3	136.8
DRY DENSITY (PCF)	118.6	122.4	127.5

BEARING RATIO 6.92 10.03 14.44

90% OF DRY DENSITY 114.7
 95% OF DRY DENSITY 121.1

BEARING RATIO AT 90% OF MAX	3.66 ~ R VALUE	7.5
BEARING RATIO AT 95% OF MAX	8.98 ~ R VALUE	22



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

CBR TEST DATA

DRAWN:

DATE:

CHECKED: *DF*

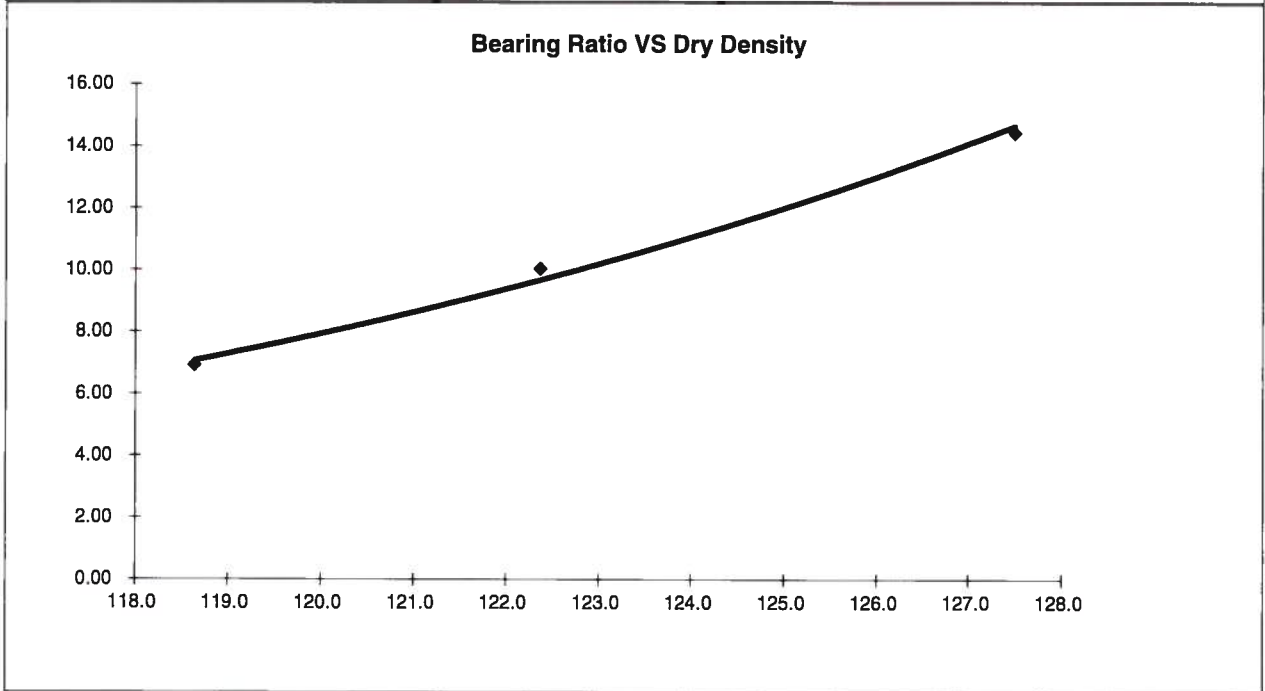
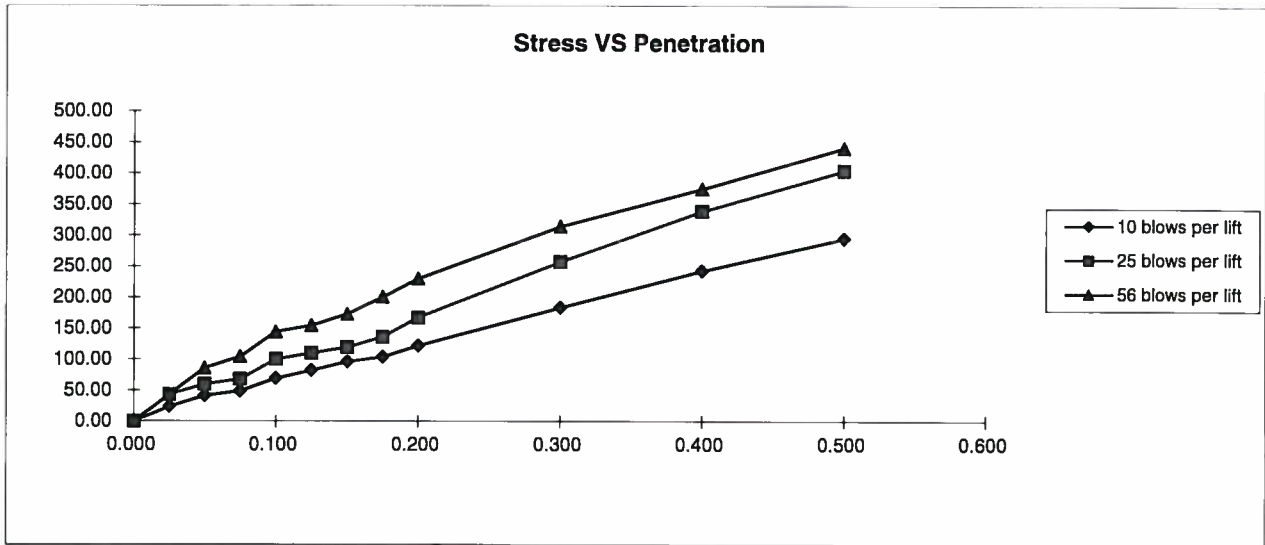
DATE: *6/3/22*

JOB NO.:

220780

FIG NO.:

B-52



BEARING RATIO AT 90% OF MAX	3.66 ~ R VALUE	7.50
BEARING RATIO AT 95% OF MAX	8.98 ~ R VALUE	22.00

JOB NO: 220780
SOIL TYPE: 1



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CALIFORNIA BEARING RATIO

DRAWN:	DATE:	CHECKED: DS	DATE: 6/9/22
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JOB NO.: 220780
FIG NO.: B-53

APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

ROLLING HILLS AT MERIDIAN RANCH FILING 3
CROOKED HILL DRIVE CUL-DE-SAC -LOCAL LOW-VOLUME

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
Hveem Stabilometer (R Value) Results:	R =	22
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.0
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	5273

Weighted Structural Number (WSN): ➔ WSN = 2.11

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

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

Left	Right	Difference
4.56	4.56	0.0

Job No. 220780
Fig. No. C-1

DESIGN CALCULATIONS

DESIGN DATA

ROLLING HILLS AT MERIDIAN RANCH FILING 3

CROOKED HILL DRIVE CUL-DE-SAC -LOCAL LOW-VOLUME

Equivalent (18 kip) Single Axle Load Applications (ESAL): ESAL = 36,500

Hveem Stabilometer (R Value) Results: R = 22

Weighted Structural Number (WSN): WSN = 2.11

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)

$$D_1 = (WSN)/C_1 = 4.8 \text{ inches of Full Depth Asphalt}$$

Use 5.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 3.5 inches

$$D_2 = ((WSN) - (t)(C_1))/C_2 = 5.2 \text{ inches of Aggregate}$$

Base Course, use 6.0 inches

RECOMMENDED ALTERNATIVES

1. 3.5 inches of Asphalt + 6.0 inches of Aggregate Base Course, or
2. 5.0 inches of Full Depth Asphalt

Job No. 220780

Fig. No. C-2

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA:

ROLLING HILLS AT MERIDIAN RANCH FILING 3

CROOKED HILL DRIVE CUL-DE-SAC -LOCAL LOW-VOLUME

Equivalent (18 kip) Single Axle Load Applications (ESAL): ESAL = 36,500

Hveem Stabilometer (R Value) Results: R = 22

Weighted Structural Number (WSN): WSN = 2.11

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt

$C_2 = 0.11$ Strength Coefficient - Cement Treated Subgrade.

$D_1 =$ Depth of Asphalt (inches)

$D_2 =$ Depth of Cement Treated Subgrade (inches)

FOR FULL DEPTH ASPHALT SECTION - (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1 = 4.8$ inches of Full Depth Asphalt

Use 5.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 3.2$ inches

Use 8.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 8 inches of Cement Treated Subgrade.
2. 5.0 inches of Full Depth Asphalt

Job No. 220780

Fig. No. C-3

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

ROLLING HILLS AT MERIDIAN RANCH FILING 3, PHASE 2
ALL URBAN LOCAL ROADWAYS

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	292,000
Hveem Stabilometer (R Value) Results:	R =	22
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.0
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	5273

Weighted Structural Number (WSN): ➔ WSN = 2.95

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

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

Left	Right	Difference
5.47	5.47	0.0

Job No. 220780
Fig. No. C-4

DESIGN CALCULATIONS

DESIGN DATA

ROLLING HILLS AT MERIDIAN RANCH FILING 3, PHASE 2
ALL URBAN LOCAL ROADWAYS

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 292,000
Hveem Stabilometer (R Value) Results:	R = 22
Weighted Structural Number (WSN):	WSN = 2.95

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)

$D_1 = (WSN)/C_1 = 6.7$ inches of Full Depth Asphalt
Use 7.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 4.5 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 8.8$ inches of Aggregate
Base Course, use 9.0 inches

RECOMMENDED ALTERNATIVES

1. 4.5 inches of Asphalt + 9.0 inches of Aggregate Base Course, or
2. 7.0 inches of Full Depth Asphalt

Job No. 220780

Fig. No. C-5

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA:

ROLLING HILLS AT MERIDIAN RANCH FILING 3, PHASE 2
ALL URBAN LOCAL ROADWAYS

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 292,000
Hveem Stabilometer (R Value) Results:	R = 22
Weighted Structural Number (WSN):	WSN = 2.95

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt
 $C_2 = 0.11$ Strength Coefficient - Cement Treated Subgrade.

$D_1 =$ Depth of Asphalt (inches)

$D_2 =$ Depth of Cement Treated Subgrade (inches)

FOR FULL DEPTH ASPHALT SECTION - (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1 = 6.7$ inches of Full Depth Asphalt
Use 7.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4.5 inches

$$D_2 = ((WSN) - (t)(C_1))/C_2 = 8.8 \text{ inches}$$

Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.5 inches of Asphalt + 10.0 inches of Cement Treated Subgrade.
2. 7.0 inches of Full Depth Asphalt

Job No. 220780

Fig. No. C-6

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

ROLLING HILLS AT MERIDIAN RANCH FILING 3, PHASE 2
URBAN 2-LANE MINOR ARTERIAL

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	1,971,000
Hveem Stabilometer (R Value) Results:	R =	22
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.5
Reliability	Reliability =	85
Reliability (z-statistic)	Z_R =	-1.04
Soil Resilient Modulus	M_R =	5273

Weighted Structural Number (WSN): ➔ WSN = 3.88

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

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

Left	Right	Difference
6.29	6.29	0.0

Job No. 220780
Fig. No. C-7

DESIGN CALCULATIONS

DESIGN DATA

ROLLING HILLS AT MERIDIAN RANCH FILING 3, PHASE 2
URBAN 2-LANE MINOR ARTERIAL

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 1,971,000
Hveem Stabilometer (R Value) Results:	R = 22
Weighted Structural Number (WSN):	WSN = 3.88

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)

$D_1 = (WSN)/C_1 = 8.8$ inches of Full Depth Asphalt
Use 9.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 6 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 11.3$ inches of Aggregate
Base Course, use 12.0 inches

RECOMMENDED ALTERNATIVES

1. 6.0 inches of Asphalt + 12.0 inches of Aggregate Base Course, or
2. 9.0 inches of Full Depth Asphalt

Job No. 220780

Fig. No. C-8

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA: ROLLING HILLS AT MERIDIAN RANCH FILING 3, PHASE 2
URBAN 2-LANE MINOR ARTERIAL

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 1,971,000
Hveem Stabilometer (R Value) Results:	R = 22
Weighted Structural Number (WSN):	WSN = 3.88

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt
 $C_2 = 0.11$ Strength Coefficient - Cement Treated Subgrade.

$D_1 =$ Depth of Asphalt (inches)

$D_2 =$ Depth of Cement Treated Subgrade (inches)

FOR FULL DEPTH ASPHALT SECTION - (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1 = 8.8$ inches of Full Depth Asphalt
Use 9.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 6 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 11.3$ inches

Use 12.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 6.0 inches of Asphalt + 12 inches of Cement Treated Subgrade.
2. 9.0 inches of Full Depth Asphalt

Job No. 220780

Fig. No. C-9