

April 2, 2018
Revised September 12, 2018



ENTECH
ENGINEERING, INC.

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Pulpit Rock, LLC
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Approved, EN
09/26/2018 10:27:33 AM

Attn: Drew Balsick

Re: Pavement Recommendations
Flying Horse North, Filing No. 1
El Paso County, Colorado

Dear Mr. Balsick:

As requested, Entech Engineering, Inc. has obtained samples of the pavement subgrade soils for Stagecoach Road, Husted Court, Talbert Court, and Short Wall Court located within Flying Horse North, Filing No. 1 in northern El Paso County, Colorado. Stagecoach Road is proposed to extend from Black Forest Road to Colorado State Highway 83. This section of roadway is estimated at 20,000 feet in length. This letter presents the results of the laboratory testing and pavement recommendations for the roadway sections.

Project Description

The roadways for this project consists of a 20,000-foot section of Stagecoach Road extending from Black Forest Road to Colorado State Highway 83 and two short residential cul-de-sacs that extend north off Stagecoach Road; Husted Court and Short Wall Court. Subsurface Soil Investigation and laboratory testing was performed in order to determine the pavement support characteristics of the soils. The approximate locations of the test borings are presented in the Test Boring Location Map, Figure 1.

Subgrade Conditions

Forty-Two test borings were drilled along the above referenced roadway to depths of approximately 5 and 10 feet below the existing subgrade surface. Test borings 5 through 13 were drilled in the Phase 1 section. Test Borings 1 through 4 will be addressed in a second report for Phase 2. The Test Boring Logs are presented in Appendix A. Sieve Analyses and Atterberg Limit testing were performed on the soil samples obtained from the test borings for the purpose of classification. The subgrade soils percent passing the No. 200 sieve ranged from approximately 9 to 82 percent. Three subgrade soil types were determined through laboratory testing. The Type 1 Soils classify as A-1-b and A-2-4 soils, the Type 2 Soils classify A-2-6 soils, and the Type 3 Soils classify as A-4, A-5, and A-6 soils, using AASHTO Classification System. Soil Type 1 is described as slightly silty to silty sand fill, silty sand, clayey sand fill, clayey sand, and silty clayey sand (SM-SW, SM, SC, SC-SM) with gradations between approximately 9 and 33 percent. Soil Type 2 is described as clayey sand fill and clayey sand (SC) with gradations between approximately 15 and 35 percent. Soil Type 3 is described as a sandy to very sandy clay, clayey to very clayey sand, silty clayey sand and very sandy clay-silt with gradations between approximately 36 and 82 percent. Soil Types 1 and 2 typically provide good pavement support characteristics; whereas, Soil Type 3 typically provide fair to poor pavement support characteristics. Groundwater was not encountered in the test borings. Water-soluble sulfate tests results indicated that the subgrade soils exhibit a negligible potential for sulfate attack.

SF 18-001

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Swell/Consolidation Tests performed on the A-2-6 soil samples resulted in volume changes ranging between 0.4 to 1.9 percent, indicating low swell potentials. Swell/Consolidation Tests performed on the A-4, A-5, and A-6 soil samples resulted in volume changes of ranging between 0.1 to 1.9 percent, indicating low swell potentials. The samples tested did not exceeded the allowable swell values. These Swell Test results indicate mitigation of the expansive potential of the subgrade soils will not be required. Due to the varied soil types and their expected pavement support characteristics, other areas may exist in the roadways in which overexcavation may be required and should be field determined. Mitigation requirements, if required, are discussed later in this report. Laboratory test results are presented in Appendix B and are summarized on Table 1. Based on the testing, the subgrade soils for these roadways exhibit poor to good subgrade support characteristics.

California Bearing Ratio (CBR) testing was performed on the three soil types previously described that were encountered in the proposed roadway subgrades. The results of the CBR testing, classification testing, and Swell/Consolidation tests are presented in Appendix B and summarized as follows:

CBR No. 1

Soil Type 1 – Silty Sand Fill

R @ 90% = 12.0

R @ 95% = 30.0

Use R = 20.0 for design

Classification Testing

Liquid Limit	NV
Plasticity Index	NP
Percent Passing 200	26.5
AASHTO Classification	A-1-b
Group Index	0
Unified Soils Classification	SM

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CBR No. 2

Soil Type 2 – Clayey Sand

R @ 90% = 26.0
R @ 95% = 50.0
Use R = 38.0 for design

Classification Testing

Liquid Limit	25
Plasticity Index	14
Percent Passing 200	31.6
AASHTO Classification	A-2-6
Group Index	1
Unified Soils Classification	SC

CBR No. 3

Soil Type 3 – Very Clayey Sand

R @ 90% = 1.0
R @ 95% = 6.0
Use R = 6.0 for design

Classification Testing

Liquid Limit	29
Plasticity Index	17
Percent Passing 200	37.5
AASHTO Classification	A-6
Group Index	2
Unified Soils Classification	SC

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El Paso County, Colorado

Pavement Design

CBR testing was used to determine pavement sections for the roadway. Pavement sections were determined utilizing the Pavement Design Criteria and Report for El Paso County. A Traffic Impact Analysis report was prepared for this filing by LSC Transportation Consultants, Inc. dated July 21, 2016, LSC Job No. 164050. This report was used in determining the roadway classifications. The report section indicating Recommended Street Classifications is included in Appendix D. Stagecoach Road is categorized as a rural minor collector east of the intersection of Shortwall Drive which uses an 18K ESAL value of 109,500, and categorized as a rural major collector west of the intersection of Shortwall Drive which uses an 18K ESAL value of 273,750 for design purposes. Husted Court, Talbert Court, and Short Wall Court are categorized as rural local roadways which use an 18K ESAL value of 36,500 for design purposes. Pavement alternatives for asphalt over aggregate base course and cement stabilized subgrade sections are provided.

Design parameters used in the pavement analysis for the roadway section are as follows:

Reliability (Rural Local)	75%
Reliability (Rural Collector)	80%
Serviceability Index	
Rural Local	2.0
Rural Collector	2.5
Standard Deviation	0.45
Resilient Modulus – Soil Type 1	4,940 psi
Resilient Modulus – Soil Type 2	8,896 psi
Resilient Modulus – Soil Type 3	3,126 psi
“R” Value Subgrade – Soil Type 1	20.0
“R” Value Subgrade – Soil Type 2	38.0
“R” Value Subgrade – Soil Type 3	6.0
Hot Bituminous Pavement	0.44
Base Course	0.11
Cement Stabilized Subgrade	0.12

The pavement design nomographs and calculations are presented in Appendix C. Pavement section alternatives for the roadway sections are presented below. Any additional grading may result in subgrade soils with different support characteristics. The following pavement sections should be re-evaluated if additional grading is performed.

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Rural Local Roads

Pavement Sections – Rural Local Road
Soil Type 1 – R=20.0

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Base Course (in)</u>
1. Asphalt Over Base Course	3.5	6.0
2. Asphalt Over Base Course	-	-
3. Asphalt Over Stabilized Subgrade	4.0*	10.0*

Pavement Sections – Rural Local Road
Soil Type 2 – R=38.0

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Base Course (in)</u>
1. Asphalt Over Base Course	3.0*	4.0*
2. Asphalt Over Base Course	-	-
3. Asphalt Over Stabilized Subgrade	4.0*	10.0*

Pavement Sections – Rural Local Road
Soil Type 3 – R=6.0

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Base Course (in)</u>
1. Asphalt Over Base Course	4.0	7.0
2. Asphalt Over Base Course	-	-
3. Asphalt Over Stabilized Subgrade	4.0*	10.0*

Stagecoach Road – Minor Collector

Pavement Sections – Rural Minor Collector
Soil Type 1 – R=20.0

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Base Course (in)</u>
1. Asphalt Over Base Course	4.0	7.0
2. Asphalt Over Base Course	4.5	6.0*
3. Asphalt Over Stabilized Subgrade	4.0*	10.0*

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Pavement Sections – Rural Minor Collector
Soil Type 2 – R=38.0

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Base Course (in)</u>
1. Asphalt Over Base Course	3.0*	7.0
2. Asphalt Over Base Course	3.5	6.0*
3. Asphalt Over Stabilized Subgrade	4.0*	10.0*

Pavement Sections – Rural Minor Collector
Soil Type 3 – R=6.0

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Base Course (in)</u>
1. Asphalt Over Base Course	4.5	9.0
2. Asphalt Over Base Course	5.0	7.0
3. Asphalt Over Stabilized Subgrade	4.0*	10.0*

Stagecoach Road – Major Collector

Pavement Sections – Rural Major Collector
Soil Type 1 – R=20.0

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Base Course (in)</u>
1. Asphalt Over Base Course	4.5	8.5
2. Asphalt Over Stabilized Subgrade	4.0*	10.0*

Pavement Sections – Rural Major Collector
Soil Type 2 – R=38.0

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Base Course (in)</u>
1. Asphalt Over Base Course	3.5	8.0
2. Asphalt Over Stabilized Subgrade	4.0*	10.0*

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Pavement Sections – Rural Major Collector
Soil Type 3 – R=6.0

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Base Course (in)</u>
1. Asphalt Over Base Course	5.0	11.0
2. Asphalt Over Base Course	5.5	9.0
3. Asphalt Over Stabilized Subgrade	5.0	10.0*

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

In summary, if the cement treated subgrade is used a section of 4-inches asphalt on 10-inches of treated subgrade is recommended on all of the roads with the exception of the rural major collector roads with underlying Soil Type 3 subgrade which will use a section of 5-inches asphalt on 10-inches of treated subgrade.

Mitigation

The El Paso County Pavement Design Criteria and Report requires mitigation of expansive soils for roadway subgrades that have swells of 2 percent or greater with a 150 pound per square foot surcharge. No samples at subgrade depth resulted in volume changes exceeding 2.0 percent. Based on the results of the laboratory testing, mitigation for expansive soils is not expected. If subgrade soils differ from those described in this report and the soils are expansive, then the extents of and depths of overexcavation should be field determined. Personnel of Entech Engineering, Inc. should be on-site to verify the locations and approximate depths of overexcavation during the subgrade preparation. Density testing should be performed on the fill material.

Roadway Construction - Full Depth Asphalt and Asphalt on Aggregate Base Course Alternatives

Prior to placement of the asphalt, the cohesionless subgrade soils should be proofrolled, scarified, moisture conditioned and compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 at ± 2 percent of optimum moisture, and the cohesive subgrade soils should be proofrolled, scarified, moisture conditioned and compacted to a minimum of 95 percent of its maximum Standard Proctor Dry Density, ASTM D-698 at 0 to 3 percent of optimum moisture. Any loose or soft areas should be removed and replaced with suitable materials. Base course 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.

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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 10 inches. 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 a 10-inch depth such that a uniform blend of soil and cement is achieved. Prior to application or mixing of the cement, the upper 10 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.

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, subgrade conditions, compaction of materials and roadway construction methods shall meet the El Paso County specifications.


Pulpit Rock, LLC
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We trust that this report contains the information you require. If you have questions or need additional information, please contact us.

Respectfully Submitted,

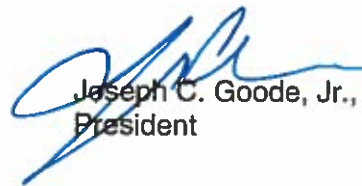
ENTECH ENGINEERING, INC.

Reviewed by:


Stan C. Culp, P.E.
Senior Engineer



SEAL: COLORADO REGISTERED
STANLEY CLARE CULP
36723
9/12/18
PROFESSIONAL ENGINEER


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

SCC/sc
Encl.
Entech Job No. 171671
AAprojects/2017/171671/171671 pr_r

TABLE

TABLE 1

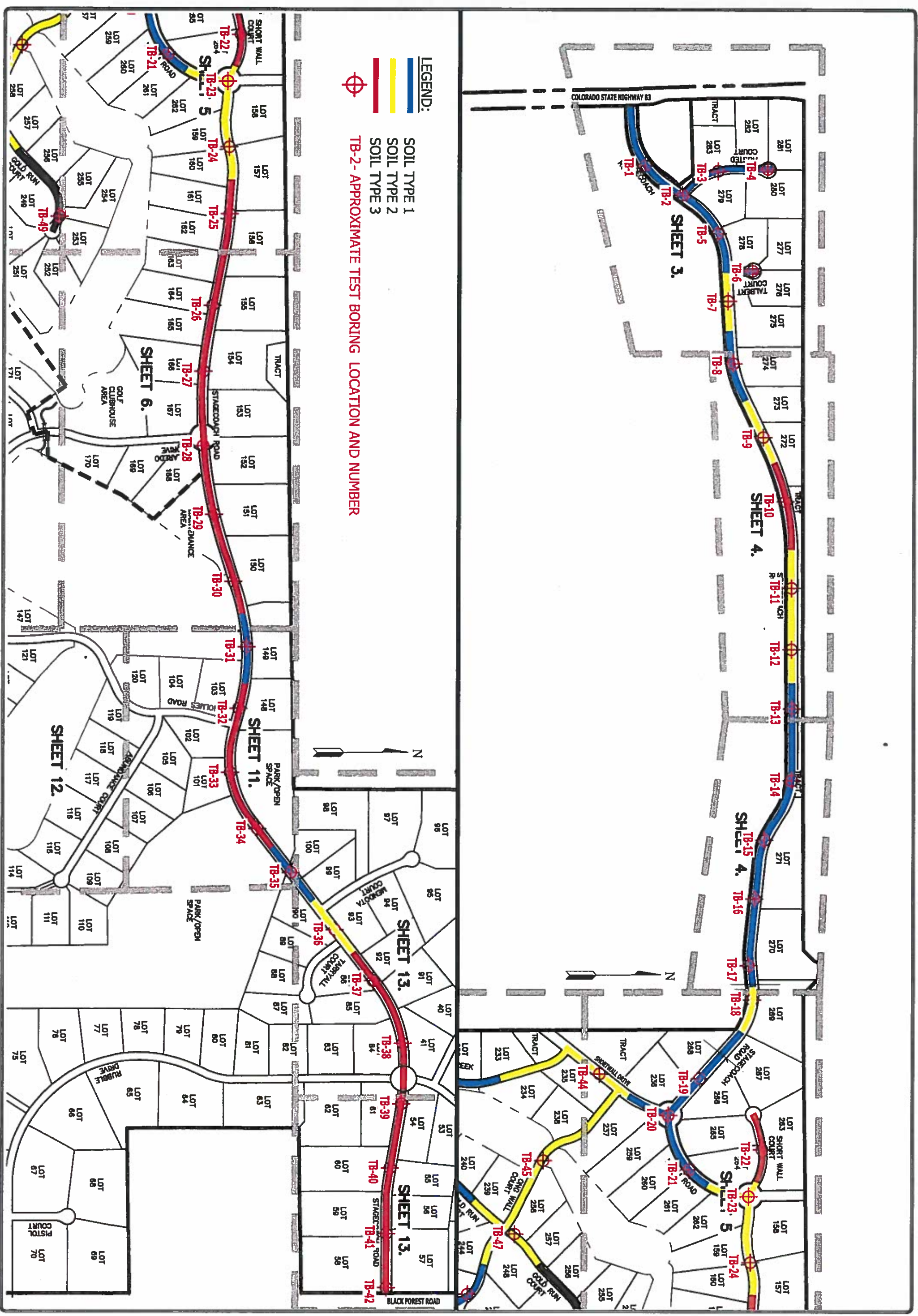
SUMMARY OF LABORATORY TEST RESULTS

CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1
 JOB NO. 171671

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	4	0-3			26.5	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	2	1-2			11.8	NV	NP		A-1-b		SM-SW	FILL, SAND, SLIGHTLY SILTY
1	4	1-2			8.5	NV	NP		A-1-b		SM-SW	FILL, SAND, SLIGHTLY SILTY
1	5	1-2			13.1	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	6	1-2			15.3	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	13	1-2			24.8	21	5		A-2-4		SC-SM	SAND, CLAYEY, SILTY
1	14	1-2			29.6	25	10		A-2-4		SC	FILL, SAND, CLAYEY
1	16	1-2			16.7	26	10		A-2-4		SC	FILL, SAND, CLAYEY
1	17	1-2			29.7	28	10	<0.01	A-2-4		SC	SAND, CLAYEY
1	19	1-2			22.7	27	10	0.01	A-2-4		SC	SAND, CLAYEY
1	20	1-2			17.9	NV	NP		A-1-b		SM	SAND, SILTY
1	21	1-2			16.1	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	9	1-2			15.7	25	8		A-2-4		SC	SAND, CLAYEY
1	31	1-2			18.5	NV	NP		A-1-b		SM	SAND, SILTY
1	35	1-2			33.0	25	8		A-2-4		SC	FILL, SAND, CLAYEY
1	5	5			13.2	NV	NP		A-1-b		SM	SAND, SILTY
1	6	10			20.1	NV	NP		A-1-b		SM	SAND, SILTY
1	8	5			15.2	NV	NP		A-1-b		SM	SAND, SILTY
1	35	5			37.7	27	10		A-2-4		SC	SAND, CLAYEY
1	20	0-3			31.9						SC	SAND, CLAYEY
2, CBR #2	10	0-3	16.9	108.3	31.6	25	14		A-2-6	0.4	SC	SAND, CLAYEY
2	1	1-2	15.5	110.9	21.0	29	13		A-2-6	1.9	SC	FILL, SAND, CLAYEY
2	3	1-2	12.7	115.6	19.1	26	12	<0.01	A-2-6	1.2	SC	FILL, SAND, CLAYEY
2	11	1-2	15.9	101.1	14.8	26	12	0.01	A-2-6	1.6	SC	FILL, SAND, CLAYEY
2	12	1-2	14.6	106.1	27.3	26	11		A-2-6	1.0	SC	FILL, SAND, CLAYEY
2	7	1-2	12.2	116.9	20.6	30	16	<0.01	A-2-6	1.9	SC	SAND, CLAYEY
2	8	1-2	17.9	103.0	20.2	27	18		A-2-6	1.0	SC	SAND, CLAYEY
2	18	1-2	12.1	105.2	34.5	24	11		A-2-6	0.4	SC	SAND, CLAYEY
2	23	1-2	15.4	110.7	32.6	30	12		A-2-6	1.1	SC	SAND, CLAYEY
2	24	1-2	14.7	114.7	20.2	26	12		A-2-6	1.7	SC	SAND, CLAYEY
2	36	1-2	5.7	120.7	20.1	30	11		A-2-6	0.9	SC	SAND, CLAYEY
2	7	0-3			28.6						SC	SAND, CLAYEY
3, CBR #2	15	0-3	15.3	114.9	37.5	29	17		A-6	1.6	SC	SAND, VERY CLAYEY
3	10	1-2	16.9	110.6	52.4	28	13		A-6	1.1	CL	CLAY, VERY SANDY
3	22	1-2	10.8	107.2	42.3	27	12	<0.01	A-6	0.3	SC	SAND, VERY CLAYEY
3	25	1-2	8.1	140.3	66.0	26	11		A-6	1.9	CL	CLAY, SANDY

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
3	26	1-2	11.8	113.3	55.6	25	10	<0.01	A-4	1.8	CL	CLAY, VERY SANDY
3	27	1-2	9.3	108.2	47.2	28	12		A-6	0.9	SC	SAND, VERY CLAYEY
3	28	1-2	8.7	118.0	36.9	21	5		A-4	0.6	SC-SM	SAND, CLAYEY, SILTY
3	29	1-2	11.2	119.3	35.6	26	11		A-6	0.1	SC	SAND, CLAYEY
3	30	1-2	7.5	114.3	72.4	30	15		A-6	0.1	CL	CLAY, SANDY
3	32	1-2	10.7	111.9	55.7	28	15		A-6	0.3	CL	CLAY, VERY SANDY
3	33	1-2	14.4	104.8	56.3	21	7		A-4	0.8	CL	CLAY, VERY SANDY
3	34	1-2	7.6	114.0	43.5	27	11		A-6	0.4	SC	SAND, VERY CLAYEY
3	37	1-2	16.3	107.8	71.8	28	11		A-6	1.6	CL	CLAY, SANDY
3	38	1-2	11.3	118.3	78.4	30	10		A-5	0.5	CL	CLAY, SANDY
3	39	1-2	7.4	115.9	59.0	31	16		A-6	0.0	CL	CLAY, VERY SANDY
3	40	1-2	7.5	121.1	76.1	32	14		A-6	0.3	CL	CLAY, SANDY
3	41	1-2	16.3	114.0	58.7	28	6	<0.01	A-4	0.8	CL-ML	CLAY-SILT, VERY SANDY
3	42	1-2	10.8	115.1	81.6	25	8		A-4	0.1	CL	CLAY, SANDY
3	28	5	8.8	116.8	55.0	31	17		A-6	-0.1	CL	CLAY, VERY SANDY
3	29	5	17.2	109.7	73.1	28	11		A-6	1.7	CL	CLAY, SANDY
3	26	10	13.4	112.4	49.4	39	25		A-6	0.3	SC	SAND, VERY CLAYEY
4	1	5			13.8	NV	NP		A-1-b		SM	SANDSTONE, SILTY
4	9	5			12.6	NV	NP		A-1-b		SM	SANDSTONE, SILTY
4	15	1-2	7.6	110.3	17.9	39	18	<0.01	A-2-6	0.1	SC	SANDSTONE, CLAYEY
4	23	10	12.9	112.7	22.6	38	17	<0.01	A-2-6	-0.4	SC	SANDSTONE, CLAYEY
4	31	10			20.6	NV	NP		A-1-b		SM	WEATHERED SANDSTONE, SILTY
4	36	10	12.3	113.6	25.0	34	18	0.01	A-2-6	-0.1	SM	SANDSTONE, SILTY
4	40	10			21.5	NV	NP		A-2-4		SM	WEATHERED SANDSTONE, SILTY

FIGURE



TEST BORING LOCATION MAP
 FLYING HORSE NORTH, FILING 1
 EL PASO COUNTY, CO
 FOR: PULPIT ROCK, LLC

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

DESIGNED BY: S. CLUP	DATE: 02/14/18
CHECKED BY: S. CLUP	SCALE: AS SHOWN
DRAWN BY: S. CLUP	JOB NO.: 171671
	FIGURE NO.: 1

REVISIONS	BY:
09-12-18	SC

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
 DATE DRILLED 10/13/2017
 Job # 171671

TEST BORING NO. 2
 DATE DRILLED 10/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 10/13/17						
FILL 0-3', SAND, CLAYEY, FINE TO COARSE GRAINED, TAN, DENSE, MOIST				33	8.7	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, LIGHT RED BROWN, VERY DENSE, MOIST	5			50 7"	9.7	4

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 10/13/17						
FILL 0-5', SAND, SLIGHTLY SILTY TO CLAYEY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST				20	6.1	1
	5			13	13.3	1



ENTECH
 ENGINEERING, INC.

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

SCC

2/19/18

JOB NO.:
 171671

FIG NO.:
 A-1

TEST BORING NO. 3
 DATE DRILLED 10/13/2017
 Job # 171671

TEST BORING NO. 4
 DATE DRILLED 10/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 10/13/17						
FILL 0-9', SAND, CLAYEY TO SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST	0-9	[Symbol]		29	8.5	1
	5	[Symbol]		16	6.9	1
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY	10	[Symbol]		18	1.7	2
	15					
	20					

REMARKS

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 10/13/17						
FILL 0-4', SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, LOOSE, MOIST	0-4	[Symbol]		9	3.5	1
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST	5	[Symbol]		17	4.1	2
	10					
	15					
	20					



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 ENGINEERING, INC.

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN: DATE: CHECKED: *SCC* DATE: *2/19/18*

JOB NO.:
 171671

FIG NO.:
 A- 2

TEST BORING NO. 5
 DATE DRILLED 10/13/2017
 Job # 171671

TEST BORING NO. 6
 DATE DRILLED 10/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

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', 10/13/17							DRY TO 10', 10/13/17						
FILL 0-3', SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST				17	5.0	1	FILL 0-9', SAND, CLAYEY TO SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST TO DRY				17	2.2	1
SAND, SILTY, FINE TO COARSE GRAINED, RED BROWN, MEDIUM DENSE, MOIST	5			19	6.5	2		5			20	1.8	1
	10						SAND, SILTY, FINE TO COARSE GRAINED, TAN, DENSE, MOIST	10			33	2.7	2
	15							15					
	20							20					



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

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JOB NO:
 171671

FIG NO:
 A- 3

TEST BORING NO. 7
 DATE DRILLED 10/13/2017
 Job # 171671

TEST BORING NO. 8
 DATE DRILLED 10/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 5', 10/13/17
 SAND, CLAYEY, FINE TO COARSE
 GRAINED, TAN, MEDIUM DENSE
 TO DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5	[Symbol]		22	8.7	2
5	[Symbol]		30	9.1	2
10					
15					
20					

REMARKS

DRY TO 10', 10/13/17
 FILL 0-4', SAND, CLAYEY, FINE
 TO COARSE GRAINED, BROWN,
 MEDIUM DENSE, MOIST
 SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, DENSE, MOIST
 SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, RED BROWN,
 VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5	[Symbol]		21	8.2	1
5	[Symbol]		34	3.2	2
10	[Symbol]		50 7"	7.0	4
15					
20					



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

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JOB NO:
171671

FIG NO:
A- 4

TEST BORING NO. 9
 DATE DRILLED 10/13/2017
 Job # 171671

TEST BORING NO. 10
 DATE DRILLED 10/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 5', 10/13/17
 SAND, CLAYEY, FINE TO COARSE
 GRAINED, TAN, DENSE, MOIST
 SANDSTONE, SILTY, FINE
 TO COARSE GRAINED, BUFF,
 VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			43	9.0	2
5			50 10"	6.8	4

REMARKS

DRY TO 5', 10/13/17
 CLAY, SANDY, BROWN, STIFF,
 MOIST
 SAND, CLAYEY TO SILTY,
 FINE TO COARSE GRAINED,
 BUFF, MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			26	7.6	3
5			12	5.4	2



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JOB NO.:
171671

FIG NO.:
A- 5

TEST BORING NO. 11
 DATE DRILLED 10/13/2017
 Job # 171671

TEST BORING NO. 12
 DATE DRILLED 10/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 10', 10/13/17
 POSS. FILL O-9, SAND, CLAYEY,
 FINE TO COARSE GRAINED,
 TAN TO BROWN, MEDIUM
 DENSE, MOIST

 SAND, SILTY, FINE TO COARSE
 GRAINED, RED BROWN, MEDIUM
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5	[Symbol]		21	6.5	2
5	[Symbol]		12	20.3	2
10	[Symbol]		14	5.4	1

REMARKS

DRY TO 5', 10/13/17
 POSS. FILL O-2, SAND,
 CLAYEY, FINE TO COARSE
 GRAINED, TAN, MEDIUM
 DENSE, MOIST
 SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, DENSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5	[Symbol]		21	8.9	2
5	[Symbol]		30	3.9	4



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 COLORADO SPRINGS, COLORADO 80907

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JOB NO:
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FIG NO:
 A- 6

TEST BORING NO. 13
 DATE DRILLED 11/13/2017
 Job # 171671

TEST BORING NO. 14
 DATE DRILLED 11/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 11/13/17						
FILL 0-4, SAND, CLAYEY, SILTY, FINE TO COARSE GRAINED, BUFF, MEDIUM DENSE, MOIST				13	8.3	1
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST	5			20	7.8	1
	10					
	15					
	20					

REMARKS

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 11/13/17						
FILL 0-6', SAND, CLAYEY, FINE TO COARSE GRAINED, BUFF, MEDIUM DENSE, MOIST				19	8.0	1
	5			15	11.2	1
SAND, CLAYEY, FINE TO COARSE GRAINED, BUFF, DENSE, MOIST	10			38	11.9	1
	15					
	20					



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 COLORADO SPRINGS, COLORADO 80907

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JOB NO:
 171671

FIG NO:
 A-7

TEST BORING NO. 15
 DATE DRILLED 11/13/2017
 Job # 171671

TEST BORING NO. 16
 DATE DRILLED 11/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 5', 11/13/17

SAND, SILTY, TAN*
 SANDSTONE, CLAYEY, FINE
 TO COARSE GRAINED, TAN,
 VERY DENSE, MOIST

* - 0-3' SAMPLE CLASSIFIED
 AS A SOIL TYPE #3

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-1	1				
1-10"			50	8.6	4
10-5			50	11.0	4
5-7"			7"		
10					
15					
20					

REMARKS

DRY TO 5', 11/13/17

FILL 0-2.5', SAND, CLAYEY, FINE
 TO COARSE GRAINED, TAN,
 MEDIUM DENSE, MOIST
 SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, RED
 BROWN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-2.5					
2.5-28			28	7.3	1
28-5			50	10.3	4
5-10"			10"		
10					
15					
20					



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

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JOB NO.:
 171671

FIG NO.:
 A- 8

TEST BORING NO. 17
 DATE DRILLED 11/13/2017
 Job # 171671

TEST BORING NO. 18
 DATE DRILLED 11/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 11/13/17						
SAND, SILTY, TAN	0	1		50	8.2	1
SANDSTONE, CLAYEY, FINE	0			9"		4
TO COARSE GRAINED, BUFF,	5			50	10.6	4
VERY DENSE, MOIST	5			6"		
	10			50	8.3	4
	10			4"		
	15					
	20					

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 11/13/17						
FILL 0-5', SAND, CLAYEY, FINE	0			23	6.3	2
TO COARSE GRAINED, BUFF	5			19	9.3	2
TO TAN, MEDIUM DENSE, MOIST	5					
	10					
	15					
	20					



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JOB NO:
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FIG NO:
 A- 9

TEST BORING NO. 19
 DATE DRILLED 11/13/2017
 Job # 171671

TEST BORING NO. 20
 DATE DRILLED 11/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 5', 11/13/17
 SAND, CLAYEY, FINE TO
 COARSE GRAINED, BROWN,
 MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		19	7.3	1	
5		23	6.0	1	
10					
15					
20					

REMARKS

DRY TO 10', 11/13/17
 SAND, SILTY, FINE TO COARSE
 GRAINED, BROWN, DENSE TO
 LOOSE, MOIST

WEATHERED SANDSTONE,
 SILTY, FINE TO COARSE
 GRAINED, DENSE, RED BROWN,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		31	6.4	1	
5		8	5.9	1	
10		40	8.5	4	
15					
20					



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TEST BORING LOG

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JOB NO:
 171671

FIG NO:
 A- 10

TEST BORING NO. 21
 DATE DRILLED 11/13/2017
 Job # 171671

TEST BORING NO. 22
 DATE DRILLED 12/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 5', 11/13/17

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			13	4.1	1
5			6	10.3	1
10					
15					
20					

REMARKS

DRY TO 5', 12/13/17

SAND, VERY CLAYEY, FINE TO COARSE GRAINED, BUFF TO TAN, DENSE TO MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			42	10.0	3
5			24	9.8	3
10					
15					
20					



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

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JOB NO.:
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FIG NO.:
 A- 11

TEST BORING NO. 23
 DATE DRILLED 12/13/2017
 Job # 171671

TEST BORING NO. 24
 DATE DRILLED 12/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 10', 12/13/17
 SAND, CLAYEY, FINE TO COARSE
 GRAINED, BUFF, DENSE, MOIST

 SANDSTONE, CLAYEY, FINE TO
 COARSE GRAINED, RED BROWN,
 VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0 - 3.8	[Symbol]		38	11.7	2
3.8 - 5.0	[Symbol]		50	12.9	4
5.0 - 10.0	[Symbol]		50 9"	12.9	4

REMARKS

DRY TO 5', 12/13/17
 SAND, CLAYEY, FINE TO COARSE
 GRAINED, TAN, MEDIUM
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0 - 1.9	[Symbol]		19	2.5	2
1.9 - 5.0	[Symbol]		15	10.2	2



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JOB NO.:
 171671
 FIG NO.:
 A- 12

TEST BORING NO. 25
 DATE DRILLED 12/13/2017
 Job # 171671

TEST BORING NO. 26
 DATE DRILLED 12/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1




REMARKS

DRY TO 5', 12/13/17
 CLAY, SANDY, TAN, VERY STIFF
 TO FIRM, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		■	36	7.0	3
5		■	13	7.8	3
10					
15					
20					

REMARKS

DRY TO 10', 12/13/17
 CLAY, VERY SANDY, RED
 BROWN, STIFF TO FIRM,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		■	15	10.0	3
5		■	14	7.4	3
10		■	17	12.1	3
15					
20					



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 COLORADO SPRINGS, COLORADO 80907

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JOB NO:
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FIG NO:
 A- 13

TEST BORING NO. 27
 DATE DRILLED 12/13/2017
 Job # 171671

TEST BORING NO. 28
 DATE DRILLED 12/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 5', 12/13/17
 SAND, VERY CLAYEY, FINE TO
 COARSE GRAINED, TAN,
 MEDIUM DENSE TO DENSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		19	8.8	3	
5		33	8.9	3	
10					
15					
20					

REMARKS

DRY TO 5', 12/13/17
 SAND, CLAYEY, SILTY, FINE
 TO COARSE GRAINED, BUFF
 TO BROWN, DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		30	8.0	3	
5		38	10.3	3	
10					
15					
20					



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 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

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JOB NO:
171671

FIG NO:
A- 14

TEST BORING NO. 29
 DATE DRILLED 12/13/2017
 Job # 171671

TEST BORING NO. 30
 DATE DRILLED 12/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 10', 12/13/17

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

CLAY, SANDY, BROWN, STIFF,
 MOIST

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0 - 5	[Symbol: Dotted]	1	16	6.7	3
5 - 10	[Symbol: Diagonal lines]	1	25	14.1	3
10 - 11	[Symbol: Dotted]	1	11	10.7	2

REMARKS

DRY TO 5', 12/13/17

CLAY, SANDY, BROWN, STIFF,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0 - 5	[Symbol: Diagonal lines]	1	25	9.2	3
5 - 10	[Symbol: Diagonal lines]	1	25	6.3	3



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 COLORADO SPRINGS, COLORADO 80907

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JOB NO:
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FIG NO:
 A- 15

TEST BORING NO. 31
 DATE DRILLED 1/25/2018
 Job # 171671

TEST BORING NO. 32
 DATE DRILLED 12/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

REMARKS

DRY TO 10', 1/25/18

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

SAND, CLAYEY, FINE TO COARSE GRAINED, RED BROWN, MEDIUM DENSE, MOIST

WEATHERED SANDSTONE, SILTY, FINE TO COARSE GRAINED, BROWN, DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		12	4.8	1
5-10	[Symbol]		12	9.7	2
10-15	[Symbol]		34	12.5	4

DRY TO 10', 12/13/17

CLAY, VERY SANDY, BROWN, MEDIUM DENSE, MOIST

SAND, CLAYEY, FINE TO COARSE GRAINED, BUFF, DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		22	8.6	3
5-10	[Symbol]		32	5.2	2
10-15	[Symbol]		33	7.1	2



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FIG NO:
 A- 16

TEST BORING NO. 33
 DATE DRILLED 12/13/2017
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TEST BORING NO. 34
 DATE DRILLED 12/13/2017
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 5', 12/13/17
 CLAY, VERY SANDY, RED
 SOFT TO FIRM, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		6	18.5	3	
5		8	15.9	3	
10					
15					
20					

REMARKS

DRY TO 5', 12/13/17
 SAND, VERY CLAYEY, FINE TO
 COARSE GRAINED, TAN TO
 BUFF, MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		25	7.3	3	
5		29	7.1	3	
10					
15					
20					



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JOB NO.:
 171671

FIG NO.:
 A- 17

TEST BORING NO. 35
 DATE DRILLED 1/25/2018
 Job # 171671

TEST BORING NO. 36
 DATE DRILLED 1/25/2018
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 5', 1/25/18
 FILL 0-3', SAND, CLAYEY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST
 SAND, CLAYEY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-3	[Symbol]		21	7.5	1
3-5	[Symbol]		19	8.5	2
5-10	[Symbol]				
10-15	[Symbol]				
15-20	[Symbol]				

REMARKS

DRY TO 10', 1/25/18
 SAND, CLAYEY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST
 SANDSTONE, SILTY, FINE TO COARSE GRAINED, RED BROWN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		24	7.9	2
5-10	[Symbol]		20	8.4	2
10-15	[Symbol]				
15-20	[Symbol]				
20-25	[Symbol]		50	11.6	4



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FIG NO:
 A- 18

TEST BORING NO. 37
 DATE DRILLED 1/25/2018
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TEST BORING NO. 38
 DATE DRILLED 1/25/2018
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1



REMARKS

DRY TO 5', 1/25/18
 CLAY, SANDY, BROWN TO TAN,
 FIRM, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			12	12.9	3
5			14	8.7	3
10					
15					
20					

REMARKS

DRY TO 5', 1/25/18
 CLAY, SANDY, TAN, STIFF,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			22	7.3	3
5			22	8.7	3
10					
15					
20					



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JOB NO:
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FIG NO:
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TEST BORING NO. 39
 DATE DRILLED 1/25/2018
 Job # 171671

TEST BORING NO. 40
 DATE DRILLED 1/25/2018
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1

REMARKS

DRY TO 5', 1/25/18
 CLAY, VERY SANDY, BROWN,
 FIRM, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		14	10.8	3	
5		13	17.9	3	
10					
15					
20					

REMARKS

DRY TO 5', 1/25/18
 CLAY, SANDY, BROWN, STIFF,
 MOIST
 SAND, CLAYEY, FINE TO
 COARSE GRAINED, BROWN,
 MEDIUM DENSE, MOIST
 WEATHERED SANDSTONE,
 SILTY, FINE TO COARSE
 GRAINED, TAN, DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		16	12.5	3	
5		13	5.3	2	
10		35	4.2	4	
15					
20					



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TEST BORING LOG

DRAWN:	DATE:	CHECKED: <i>SCE</i>	DATE: <i>2/19/18</i>
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JOB NO:
 171671

FIG NO:
 A- 20



TEST BORING NO. 41
 DATE DRILLED 1/25/2018
 Job # 171671

TEST BORING NO. 42
 DATE DRILLED 1/25/2018
 CLIENT PULPIT ROCK, LLC
 LOCATION FLYING HORSE NORTH, F-1



REMARKS

REMARKS

DRY TO 5', 1/25/18
 CLAY-SILT, VERY SANDY,
 BROWN TO TAN, FIRM TO
 STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			10	5.7	3
5			16	8.4	3
10					
15					
20					

DRY TO 5', 1/25/18
 CLAY, SANDY, TAN, FIRM
 TO STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			12	8.3	3
5			21	9.6	3
10					
15					
20					



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TEST BORING LOG

DRAWN:

DATE:

CHECKED:

SCC

DATE:

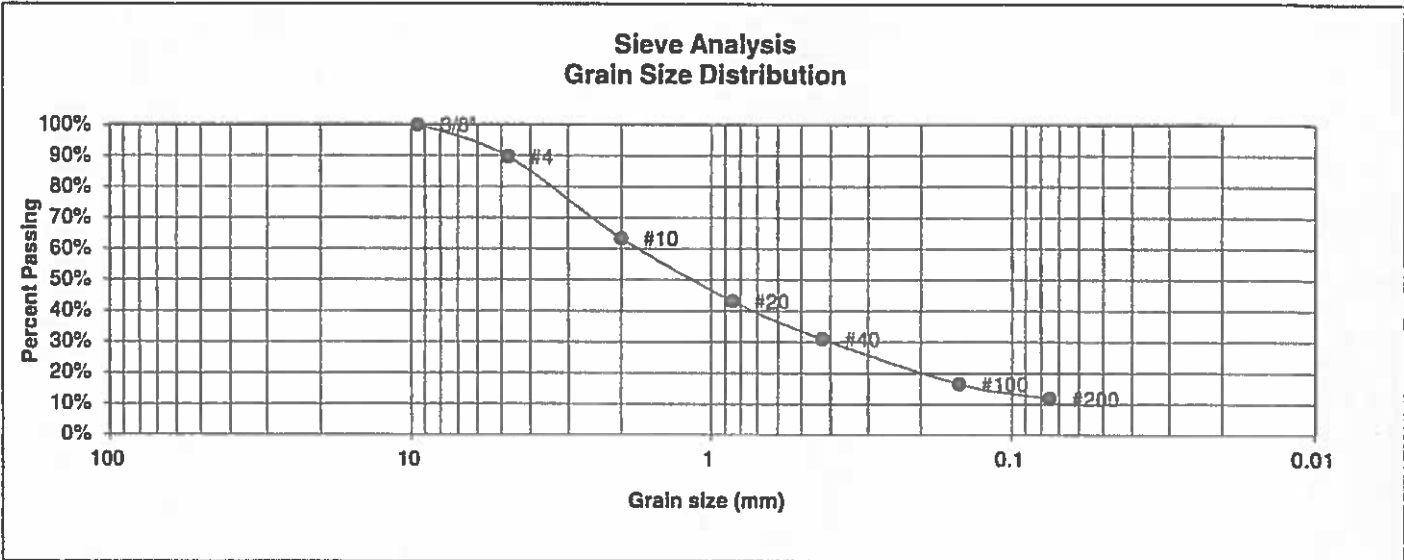
1/19/18

JOB NO:
 171671

FIG NO:
 A- 21

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	SM-SW	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	2	JOB NO.	171671
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	89.7%
10	63.4%
20	43.2%
40	31.0%
100	16.6%
200	11.8%

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**

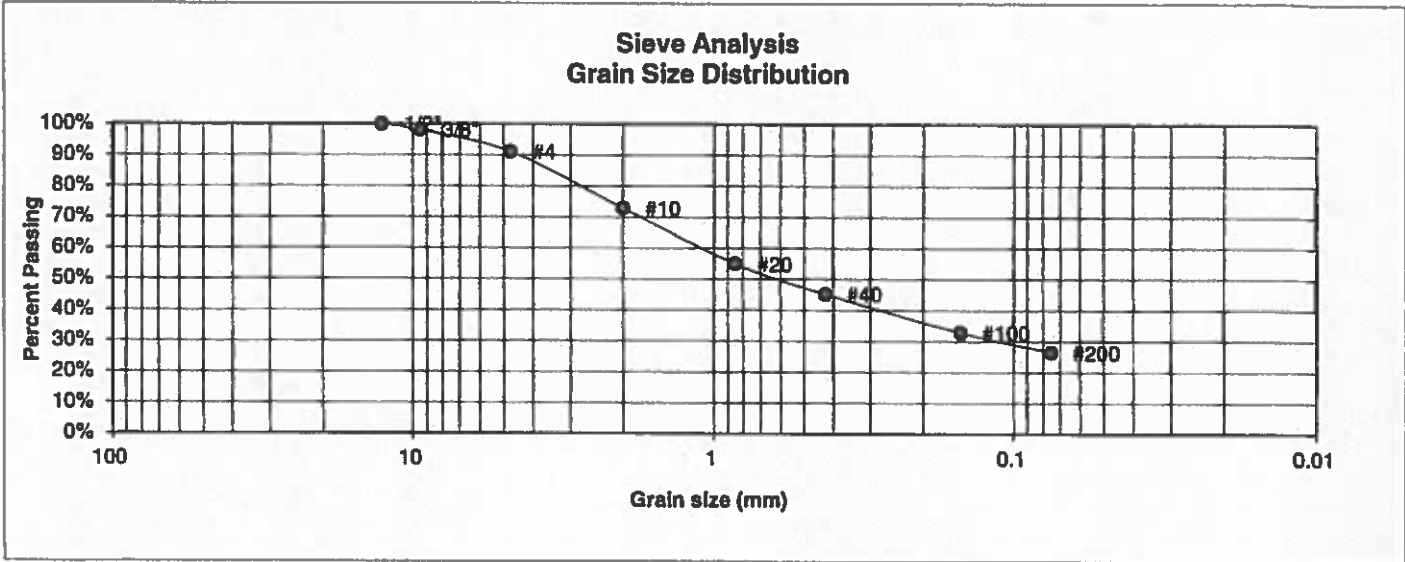
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-1

UNIFIED CLASSIFICATION	SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1, CBR #1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	4	JOB NO.	171671
DEPTH (FT)	0-3	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"	98.1%
4	91.1%
10	72.8%
20	54.9%
40	45.3%
100	32.8%
200	26.5%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

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



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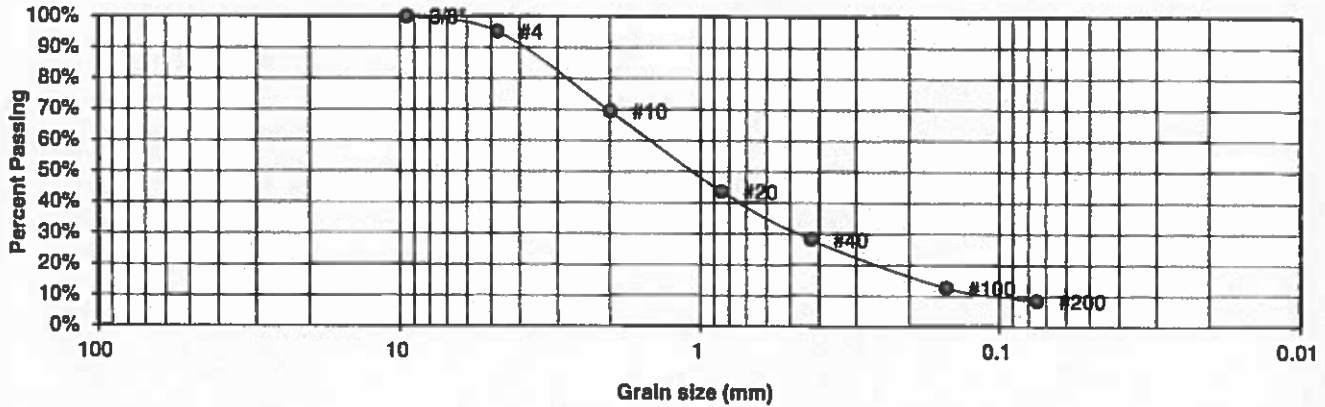
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		ELC	2/19/18

JOB NO.:
 171671
 FIG NO.:
 3-2

UNIFIED CLASSIFICATION	SM-SW	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	4	JOB NO.	171671
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	95.1%
10	69.5%
20	43.6%
40	28.2%
100	12.7%
200	8.5%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

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



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**LABORATORY TEST
RESULTS**

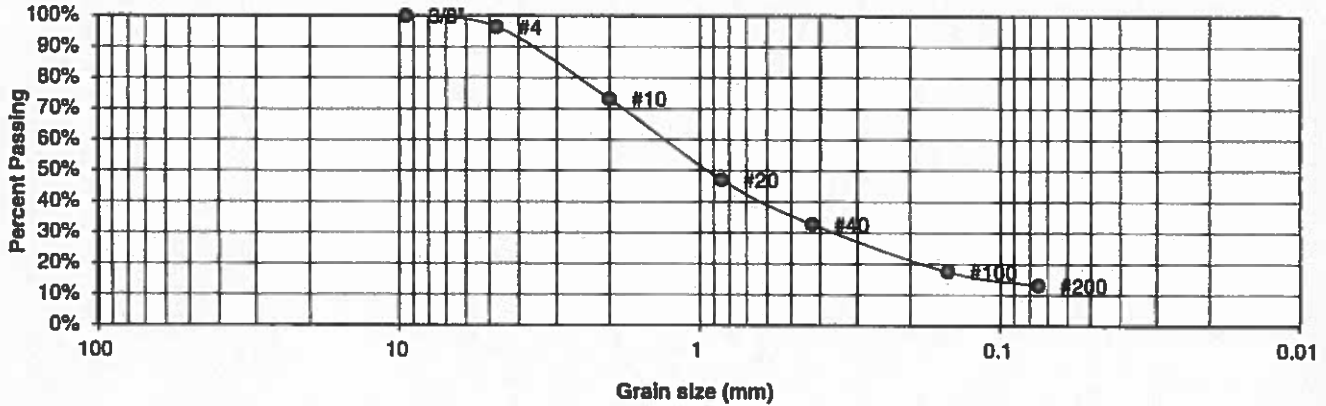
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO:
171671
FIG NO:
B-3

UNIFIED CLASSIFICATION SM
SOIL TYPE # 1
TEST BORING # 5
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-1-b

CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1
JOB NO. 171671
TEST BY BL
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	96.4%
10	73.1%
20	47.1%
40	32.7%
100	17.5%
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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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SCC</i>	DATE: <i>2/19/18</i>
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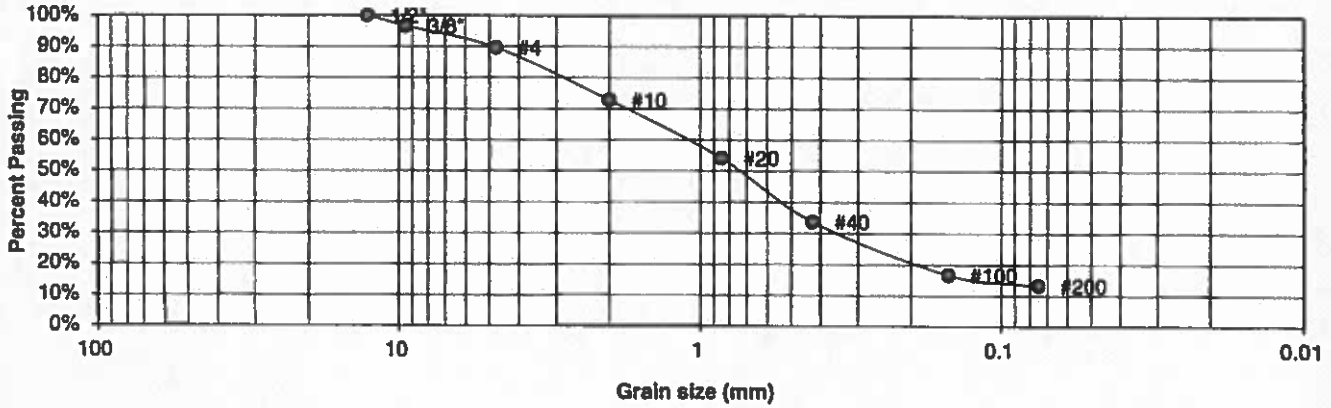
JOB NO.:

171671
FIG NO.:

B-4

UNIFIED CLASSIFICATION	SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	5	JOB NO.	171671
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"	100.0%
3/8"	96.7%
4	89.6%
10	72.9%
20	54.2%
40	33.7%
100	16.7%
200	13.2%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

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



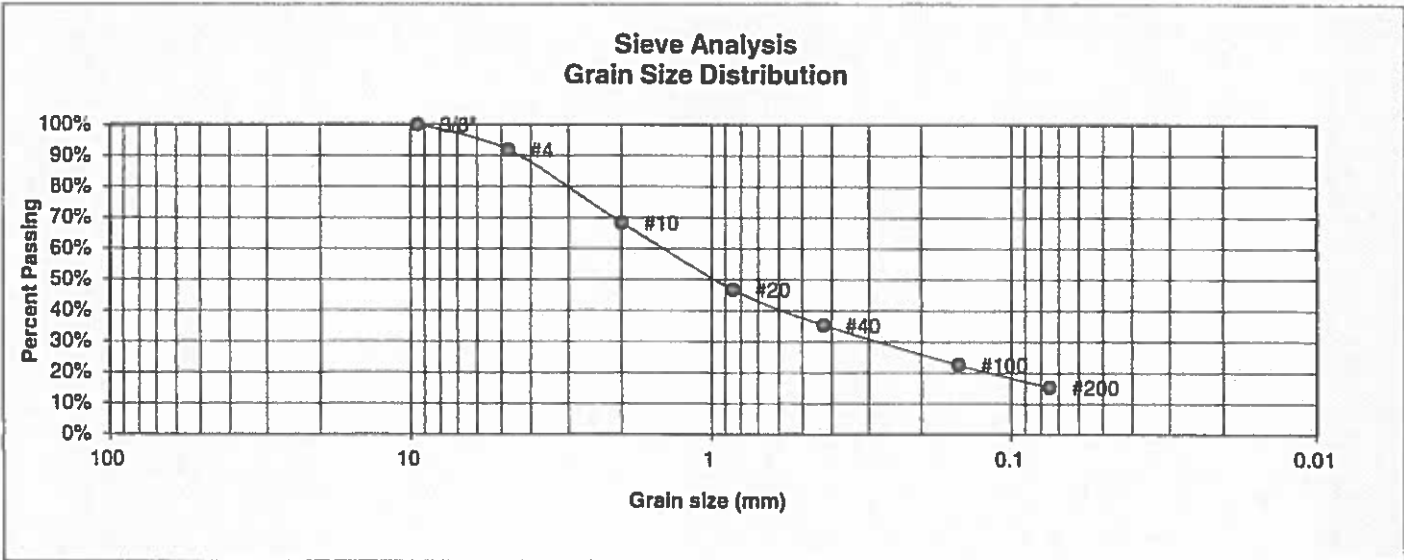
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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO:
171671
FIG NO:
B-5

UNIFIED CLASSIFICATION	SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	6	JOB NO.	171671
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	91.9%
10	68.4%
20	46.9%
40	35.4%
100	22.6%
200	15.3%

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**

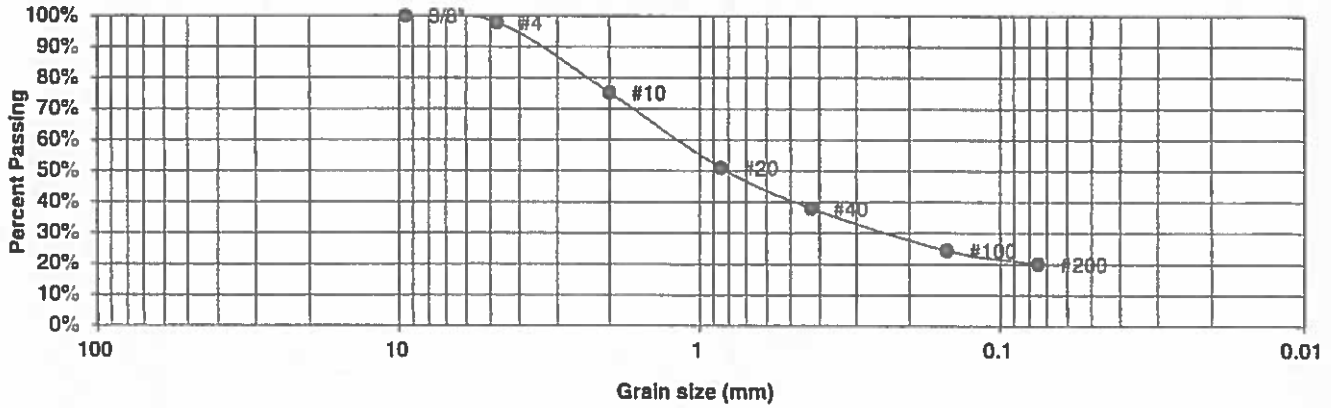
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO:
171671
FIG NO:
B-6

UNIFIED CLASSIFICATION SM
SOIL TYPE # 1
TEST BORING # 6
DEPTH (FT) 10
AASHTO CLASSIFICATION

CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1
JOB NO. 171671
TEST BY BL
GROUP INDEX

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.9%
10	75.2%
20	51.0%
40	38.0%
100	24.4%
200	20.1%

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

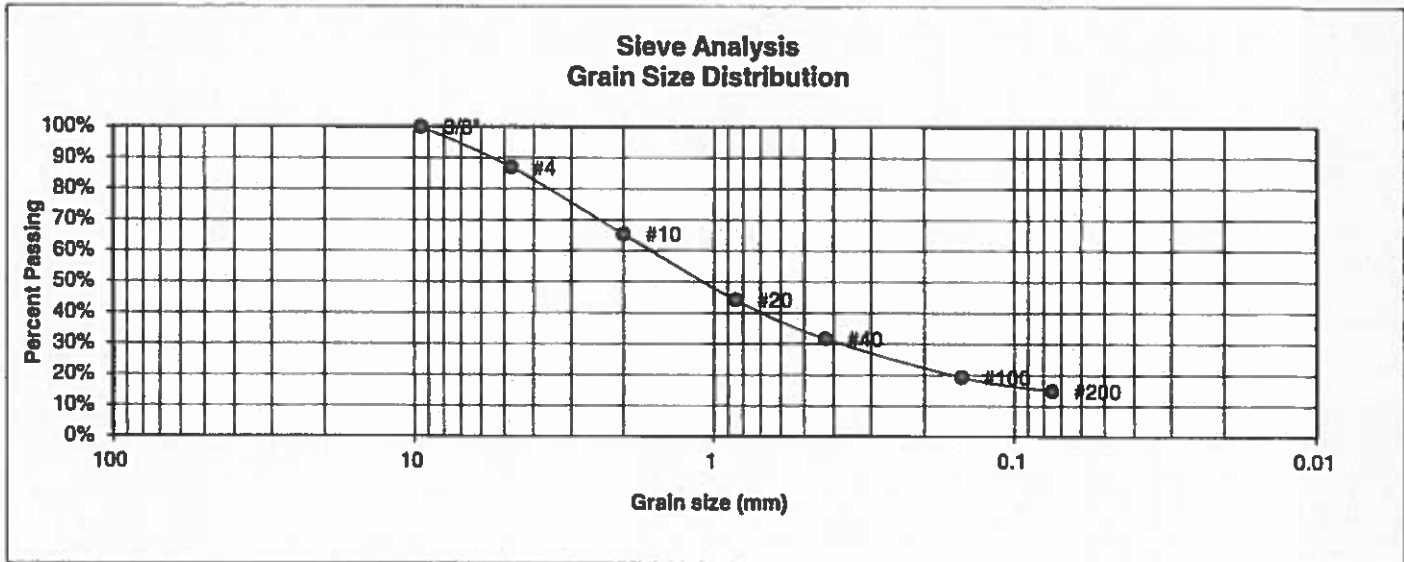
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-7

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	PULPIT ROCK, LLC
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	FLYING HORSE NORTH, F-1
<u>TEST BORING #</u>	7	<u>JOB NO.</u>	171671
<u>DEPTH (FT)</u>	5	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>		<u>GROUP INDEX</u>	



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	87.0%
10	65.3%
20	44.3%
40	31.7%
100	19.3%
200	14.8%

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:

SCC

2/19/18

JOB NO.:

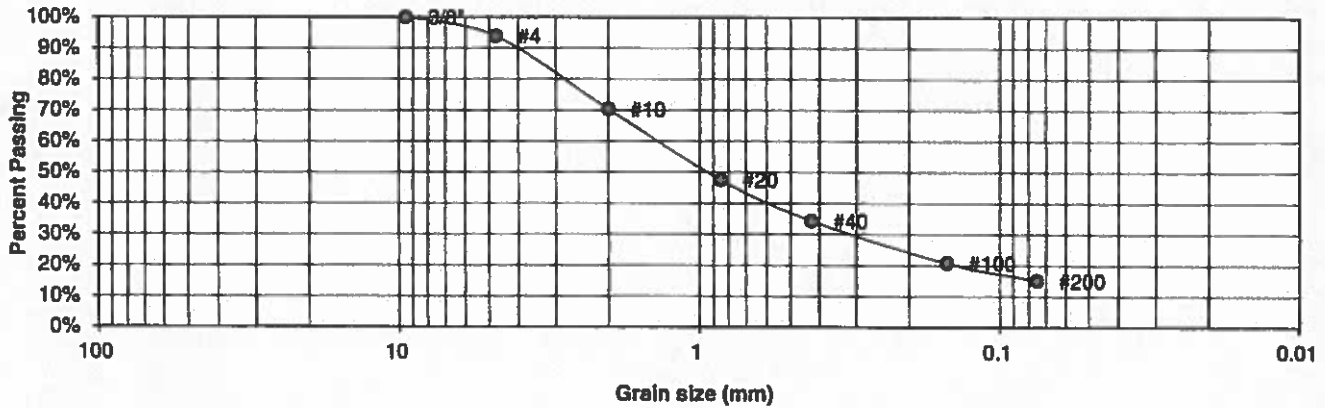
171671

FIG NO.:

B-8

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	PULPIT ROCK, LLC
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	FLYING HORSE NORTH, F-1
<u>TEST BORING #</u>	8	<u>JOB NO.</u>	171671
<u>DEPTH (FT)</u>	5	<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	93.9%
10	70.3%
20	47.6%
40	34.4%
100	20.8%
200	15.2%

<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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**LABORATORY TEST
RESULTS**

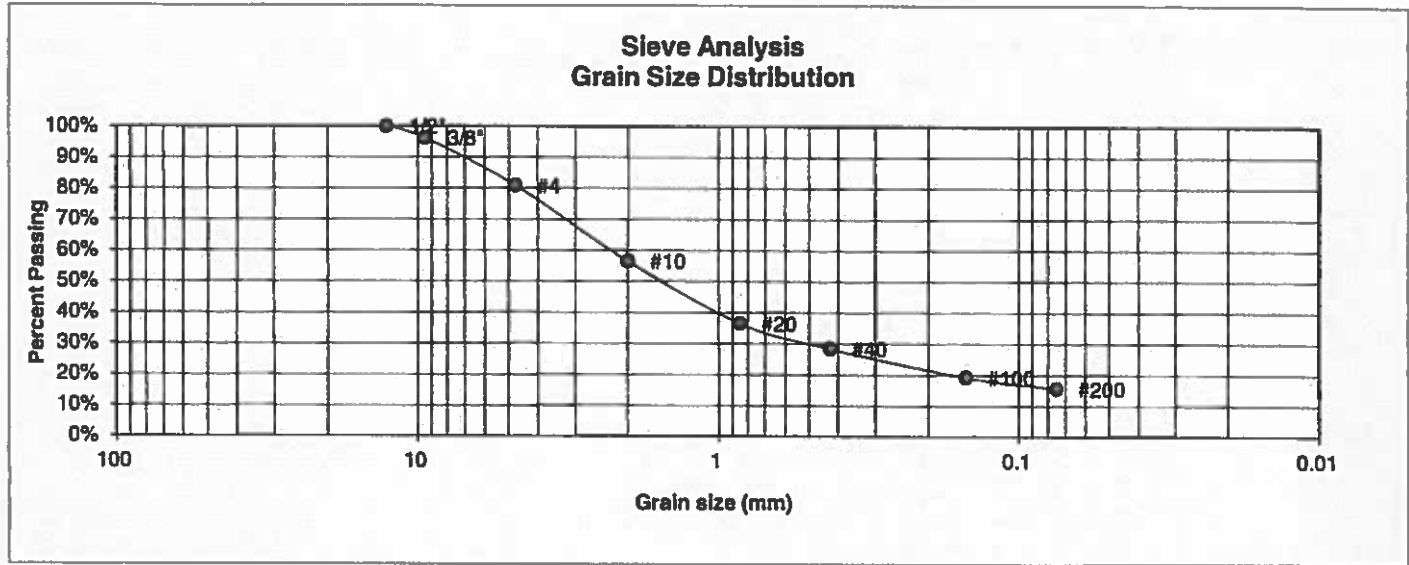
<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> SCC	<u>DATE:</u> 2/19/18
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JOB NO.:

171671
FIG NO.:

B-9

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	9	JOB NO.	171671
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"	100.0%
3/8"	96.2%
4	80.9%
10	56.5%
20	36.6%
40	28.4%
100	19.2%
200	15.7%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	25
Plastic Index	8

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



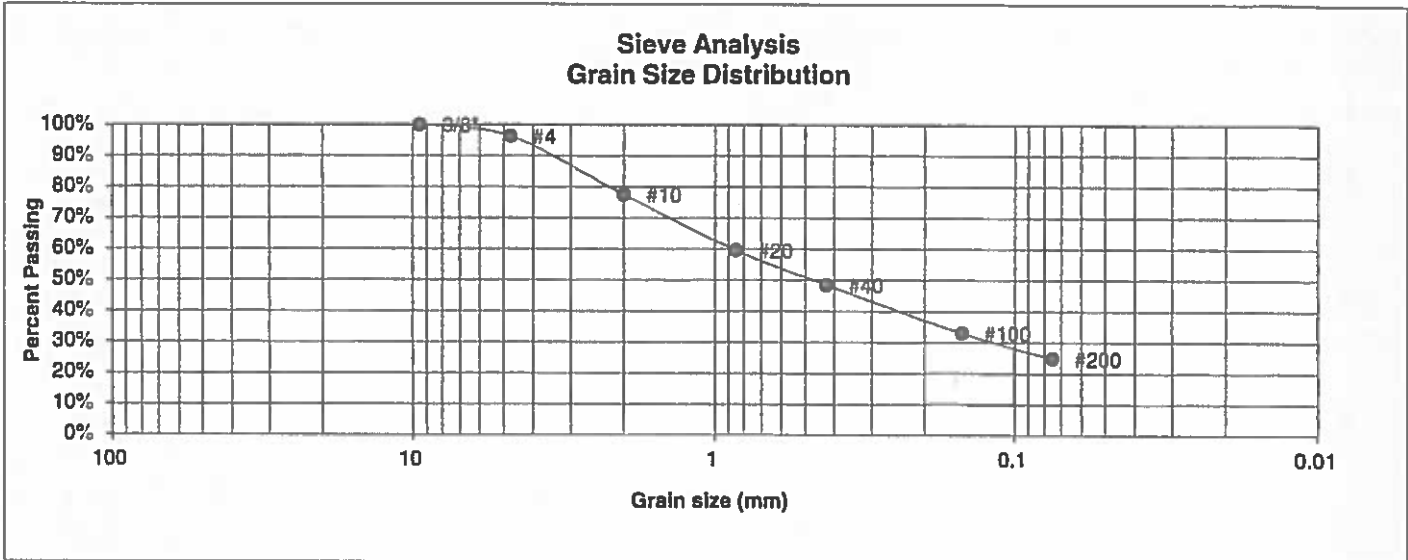
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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:
171671
FIG NO.:
B-10

UNIFIED CLASSIFICATION	SC-SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	13	JOB NO.	171671
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	96.3%
10	77.5%
20	59.6%
40	48.5%
100	33.0%
200	24.8%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	21
Plastic Index	5
Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



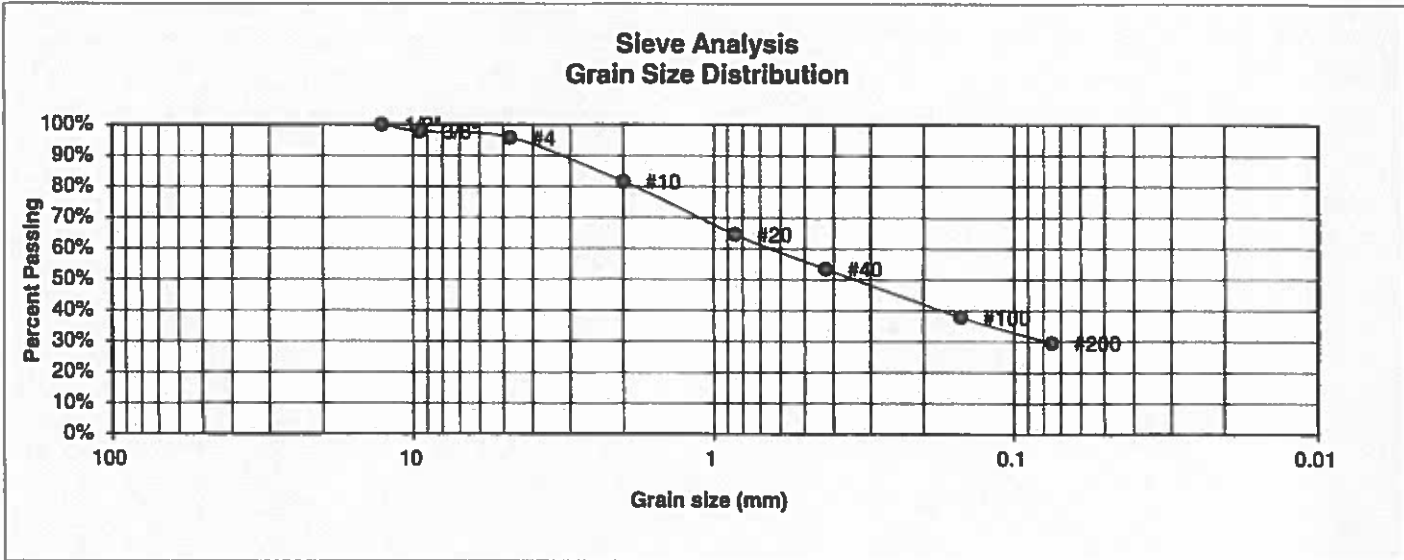
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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: <i>SCC</i>	DATE: <i>2/19/18</i>
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JOB NO.:
171671
FIG NO.:
B-11

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	14	JOB NO.	171671
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"	100.0%
3/8"	97.8%
4	95.8%
10	81.7%
20	64.6%
40	53.4%
100	37.9%
200	29.6%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	25
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**

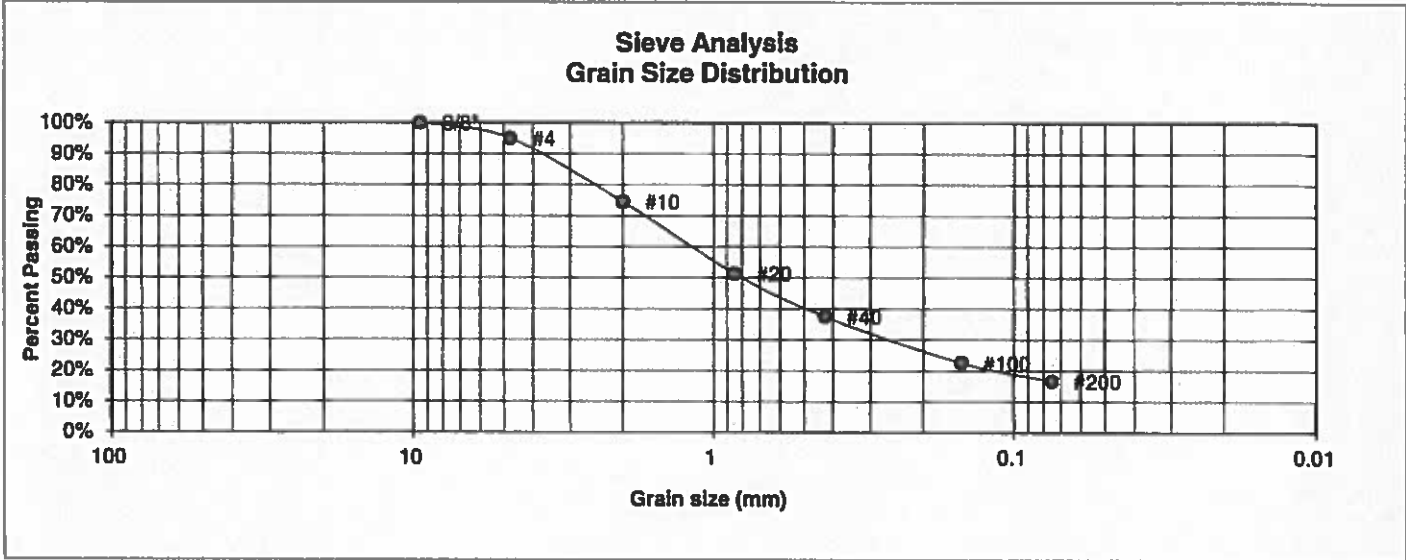
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-12

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	16	JOB NO.	171671
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	94.9%
10	74.5%
20	51.3%
40	37.5%
100	22.6%
200	16.7%

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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**LABORATORY TEST
RESULTS**

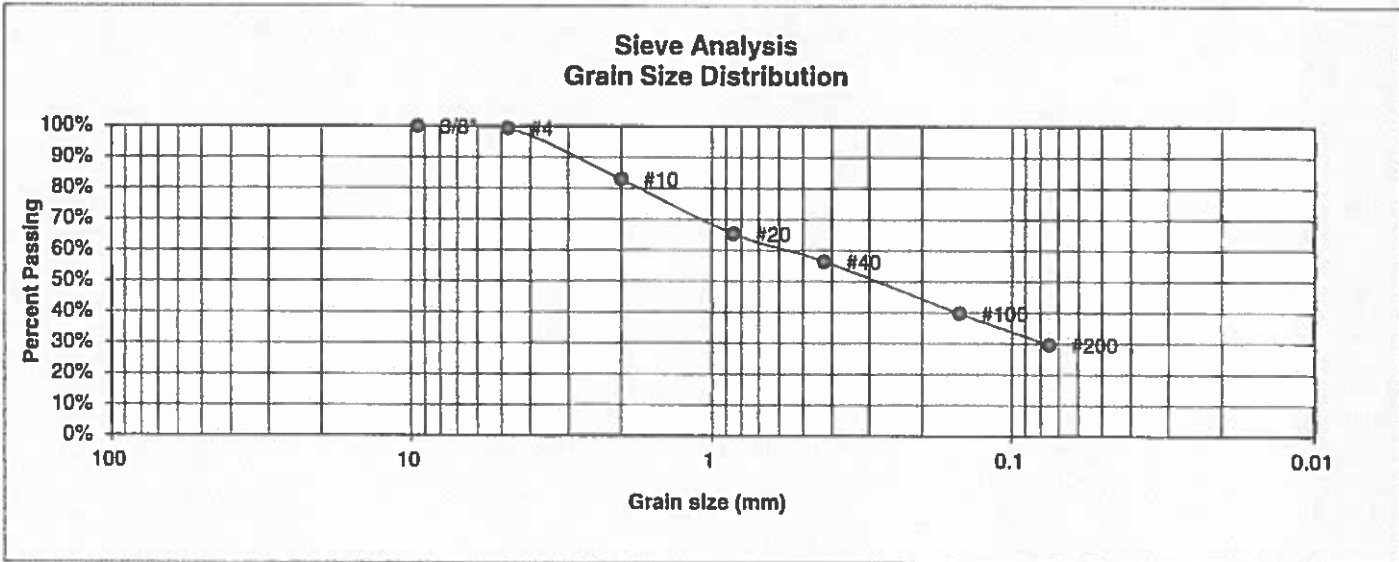
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-13

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	17	JOB NO.	171671
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	99.4%
10	82.9%
20	65.4%
40	56.5%
100	39.7%
200	29.7%

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)	



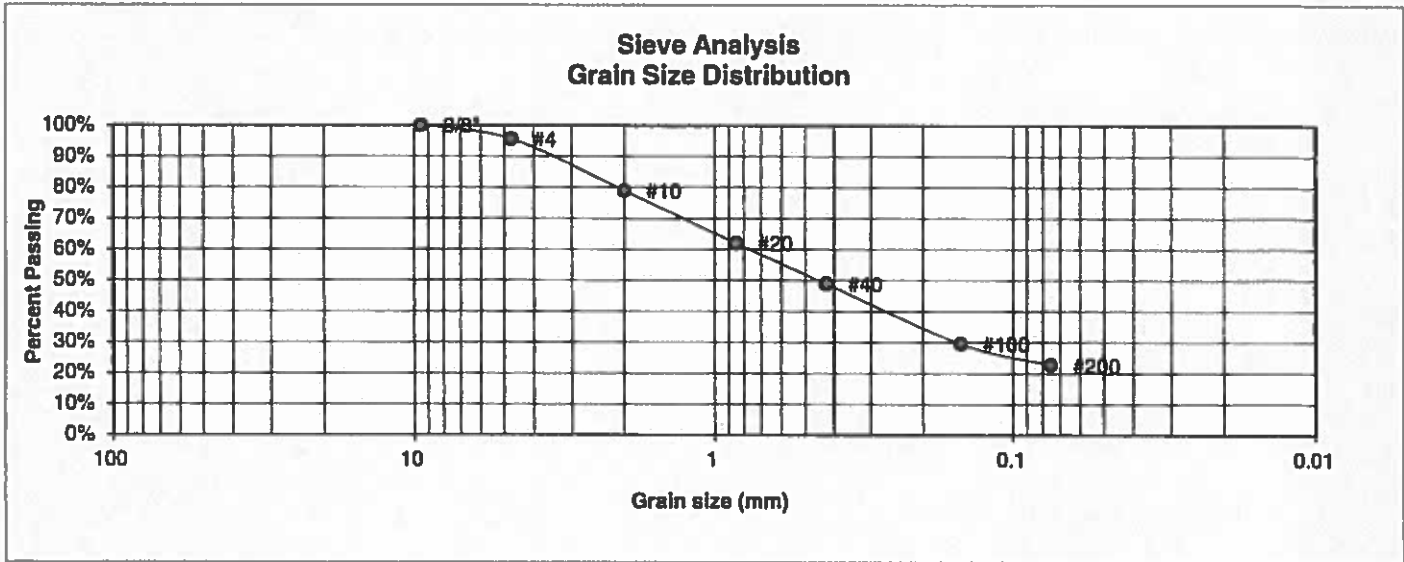
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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:
171671
FIG NO.:
B-14

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	19	JOB NO.	171671
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	95.6%
10	79.0%
20	62.0%
40	48.9%
100	29.6%
200	22.7%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	27
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:
		SCE	2/19/18

JOB NO.:

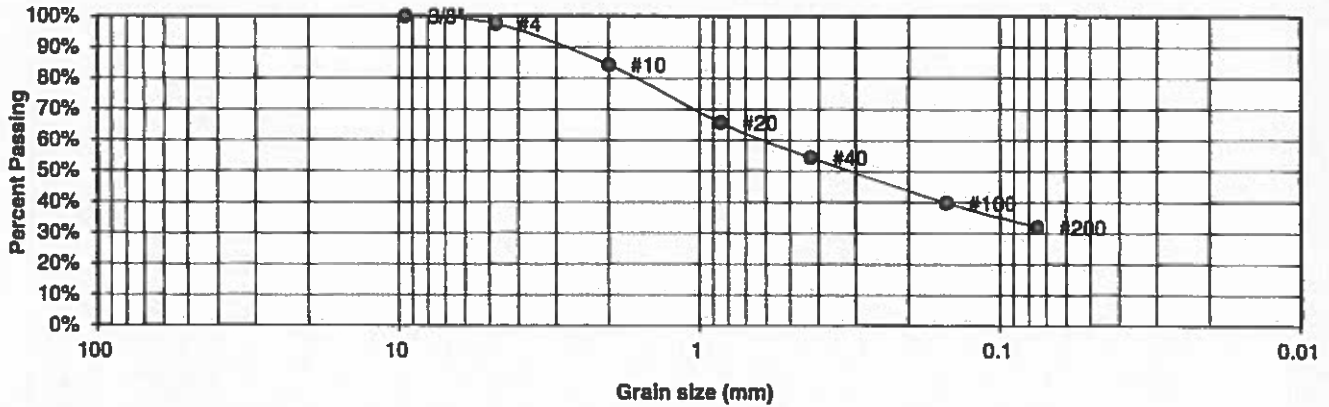
171671
FIG NO.:

B-15

UNIFIED CLASSIFICATION SC
SOIL TYPE # 1
TEST BORING # 20
DEPTH (FT) 0-3
AASHTO CLASSIFICATION

CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1
JOB NO. 171671
TEST BY BL
GROUP INDEX

**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	84.3%
20	65.7%
40	54.5%
100	39.8%
200	31.9%

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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COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

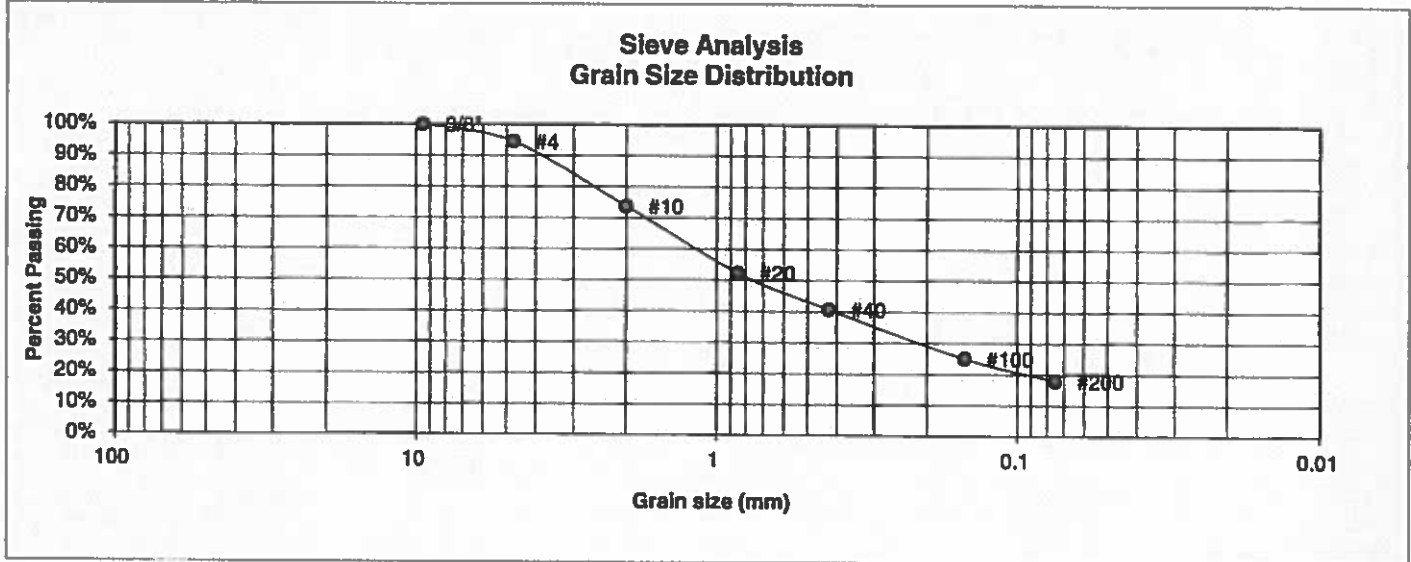
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO:

171671
FIG NO:

B-16

UNIFIED CLASSIFICATION	SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	20	JOB NO.	171671
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	94.5%
10	73.8%
20	52.4%
40	40.7%
100	25.1%
200	17.9%

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)	



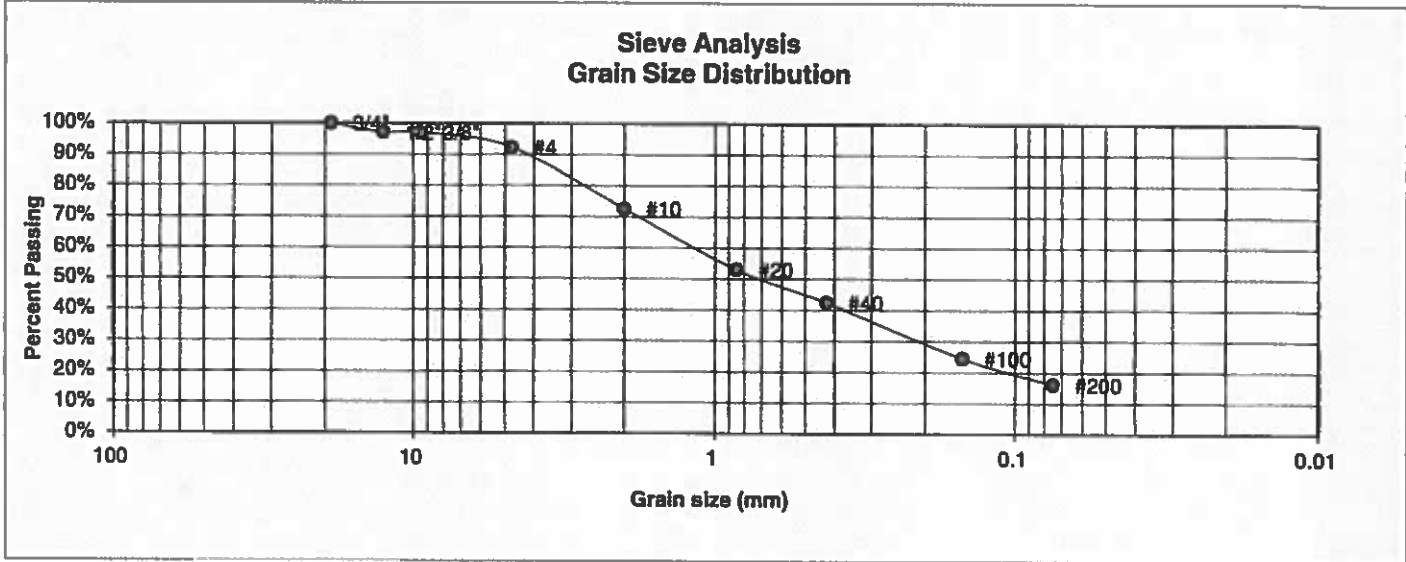
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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:
171671
FIG NO.:
B-17

UNIFIED CLASSIFICATION	SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	21	JOB NO.	171671
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"	100.0%
1/2"	97.2%
3/8"	97.2%
4	92.4%
10	72.5%
20	53.0%
40	42.4%
100	24.5%
200	16.1%

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**

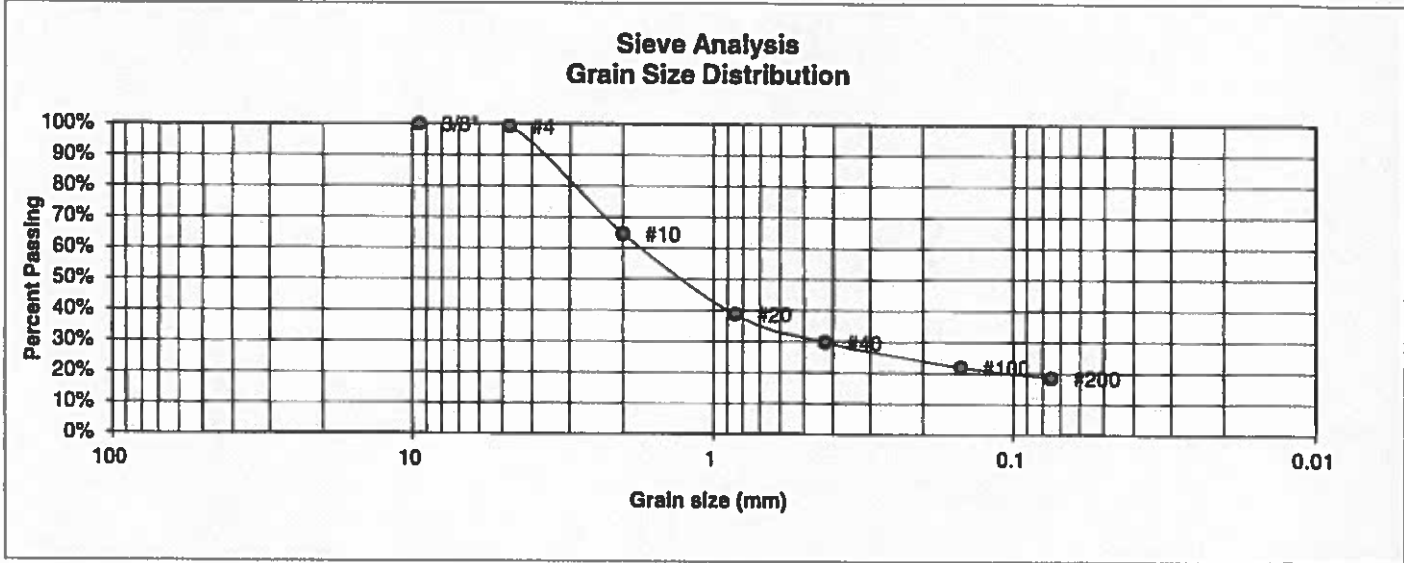
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-18

UNIFIED CLASSIFICATION	SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	31	JOB NO.	171671
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	99.2%
10	64.6%
20	38.8%
40	29.8%
100	21.9%
200	18.5%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

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



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**LABORATORY TEST
RESULTS**

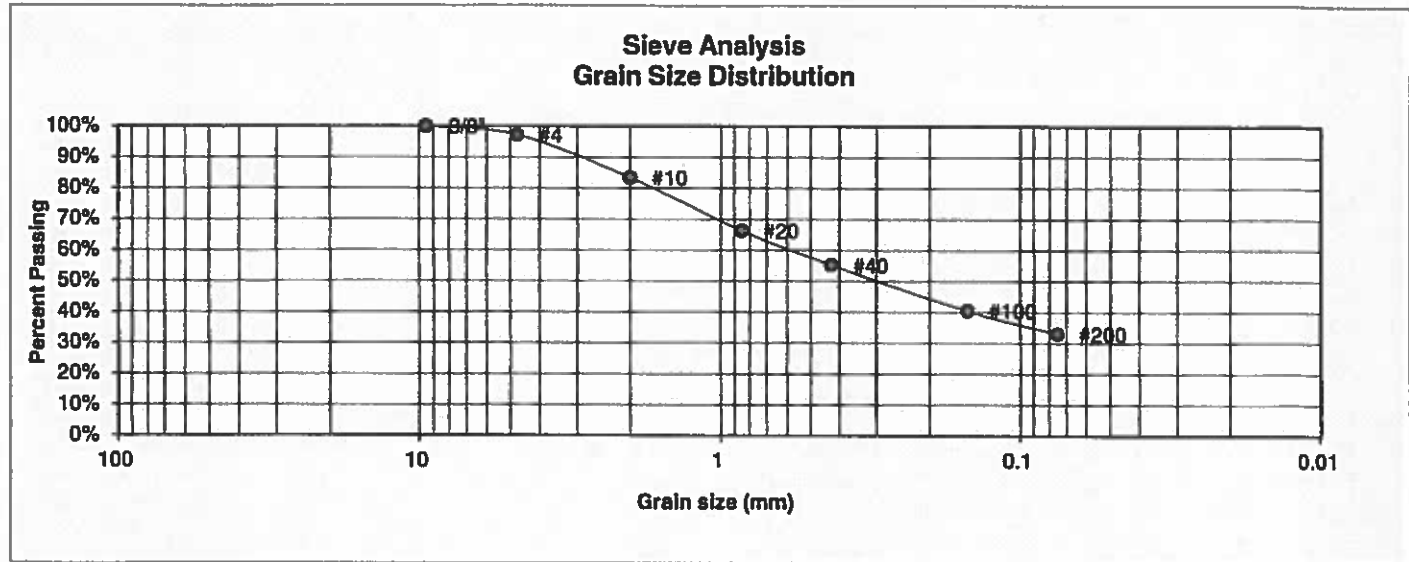
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-19

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	35	JOB NO.	171671
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	97.2%
10	83.4%
20	66.3%
40	55.2%
100	40.4%
200	33.0%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	25
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

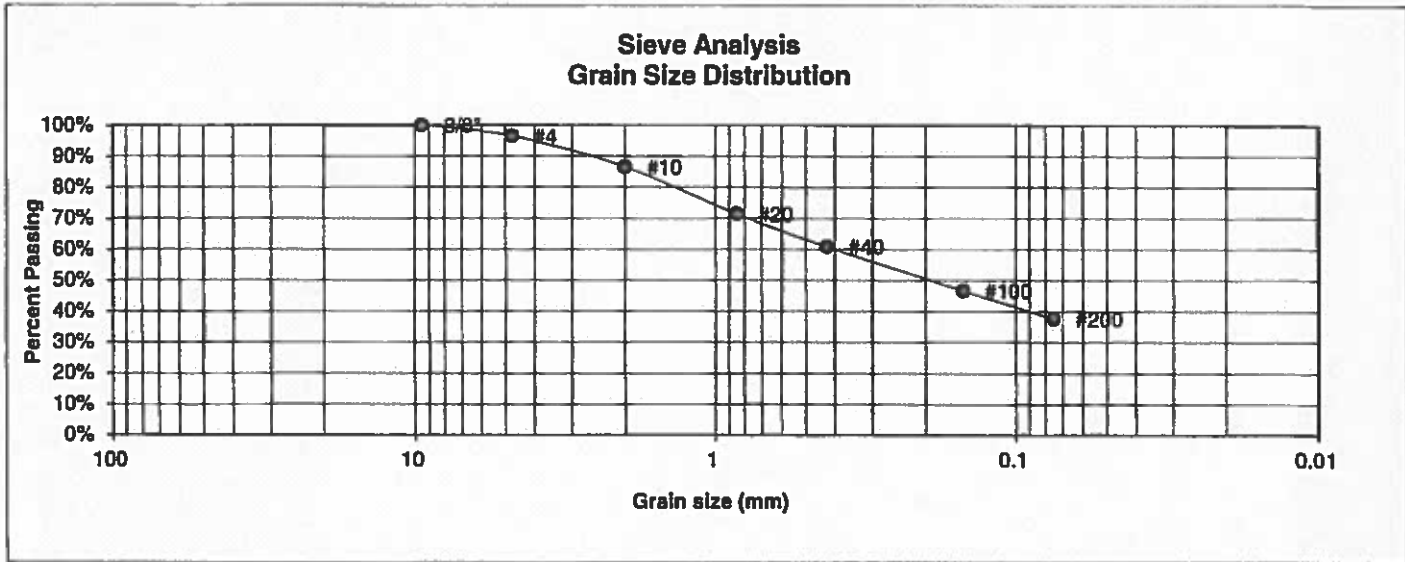
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-20

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	35	JOB NO.	171671
DEPTH (FT)	5	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	96.5%
10	86.6%
20	71.4%
40	60.9%
100	46.7%
200	37.7%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	27
Plastic Index	10

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



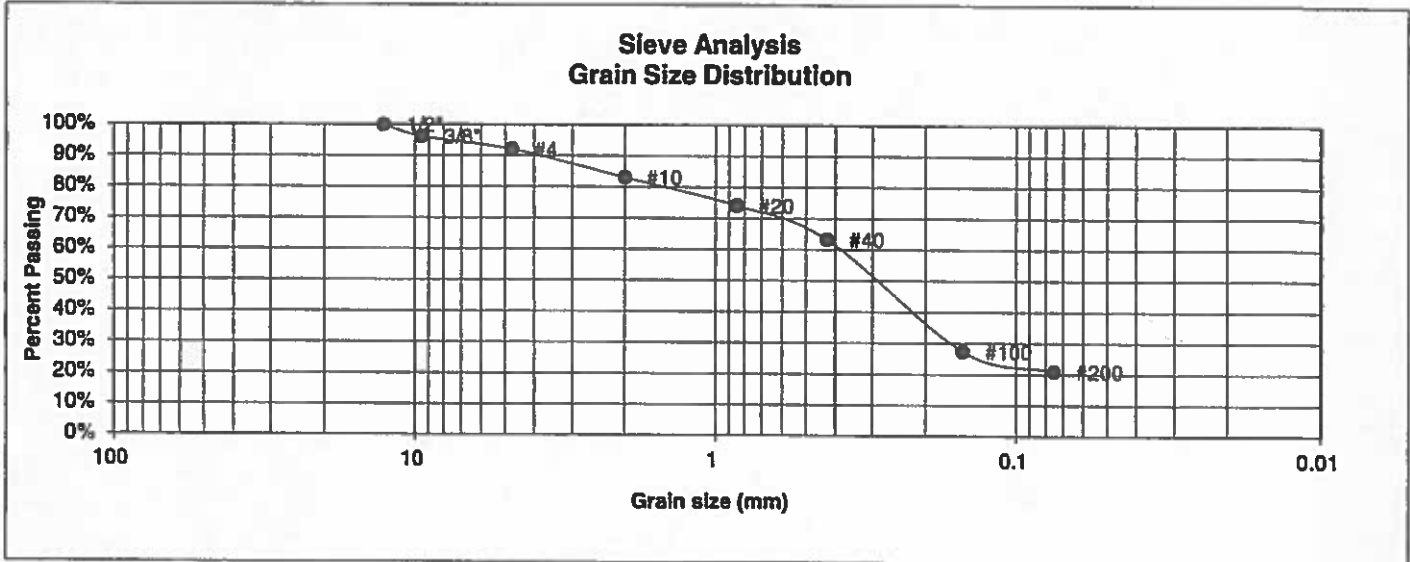
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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/9/18

JOB NO:
171671
FIG NO:
B-21

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	2	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	1	JOB NO.	171671
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"	96.2%
4	92.1%
10	83.1%
20	74.1%
40	63.2%
100	27.4%
200	21.0%

Atterberg Limits

Plastic Limit	16
Liquid Limit	29
Plastic Index	13

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)



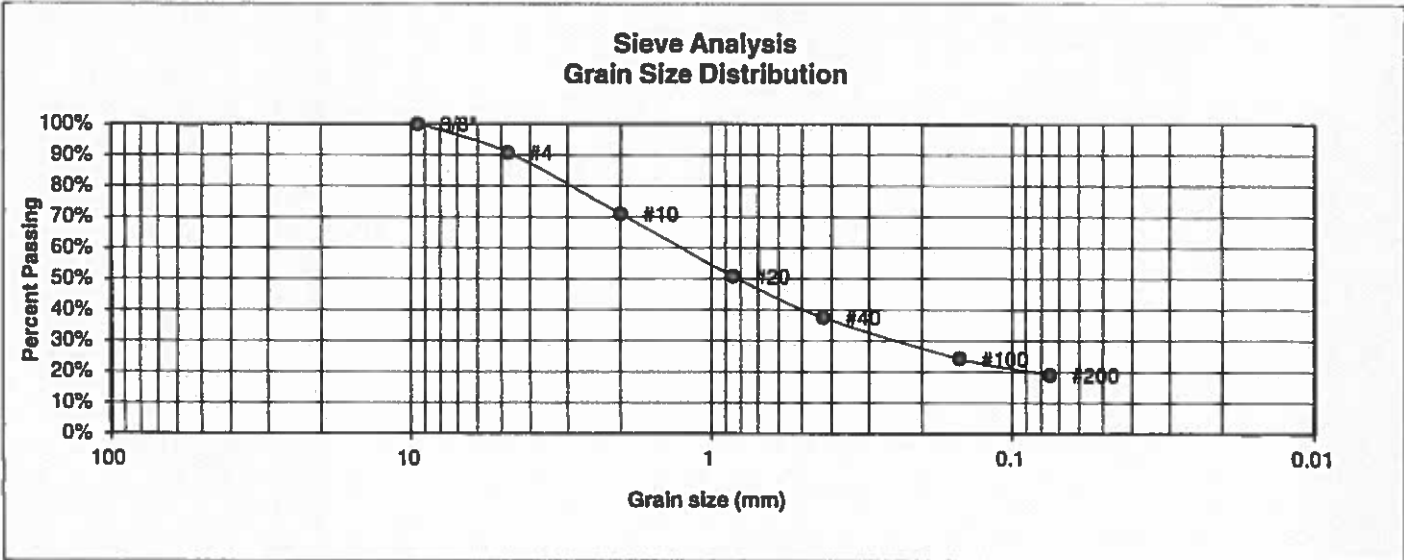
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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		3cc	2/19/18

JOB NO:
171671
FIG NO:
B-22

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	PULPIT ROCK, LLC
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	FLYING HORSE NORTH, F-1
<u>TEST BORING #</u>	3	<u>JOB NO.</u>	171671
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-6	<u>GROUP INDEX</u>	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	90.8%
10	70.9%
20	50.9%
40	37.5%
100	24.3%
200	19.1%

Atterberg Limits	
Plastic Limit	14
Liquid Limit	26
Plastic Index	12

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



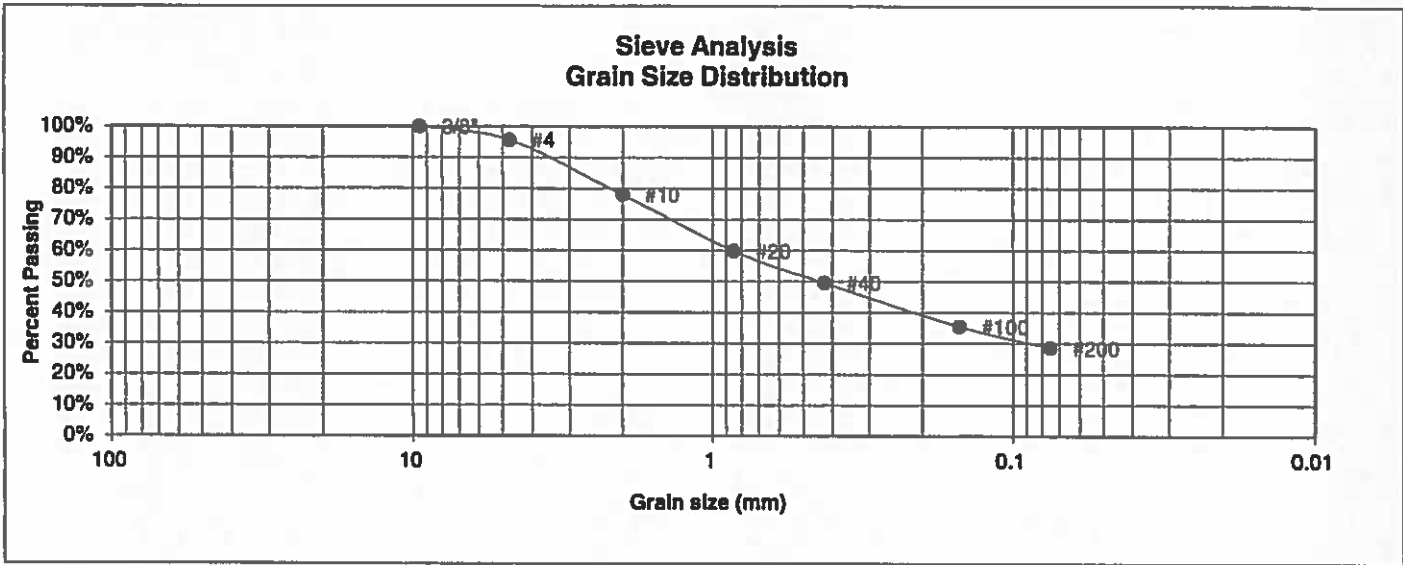
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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO:
171671
FIG NO:
B-23

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	2	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	7	JOB NO.	171671
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	95.6%
10	78.0%
20	59.9%
40	49.5%
100	35.5%
200	28.6%

Atterberg Limits
 Plastic Limit
 Liquid Limit
 Plastic Index

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



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**LABORATORY TEST
RESULTS**

DRAWN:

DATE:

CHECKED:

DATE:

SCC

2/19/18

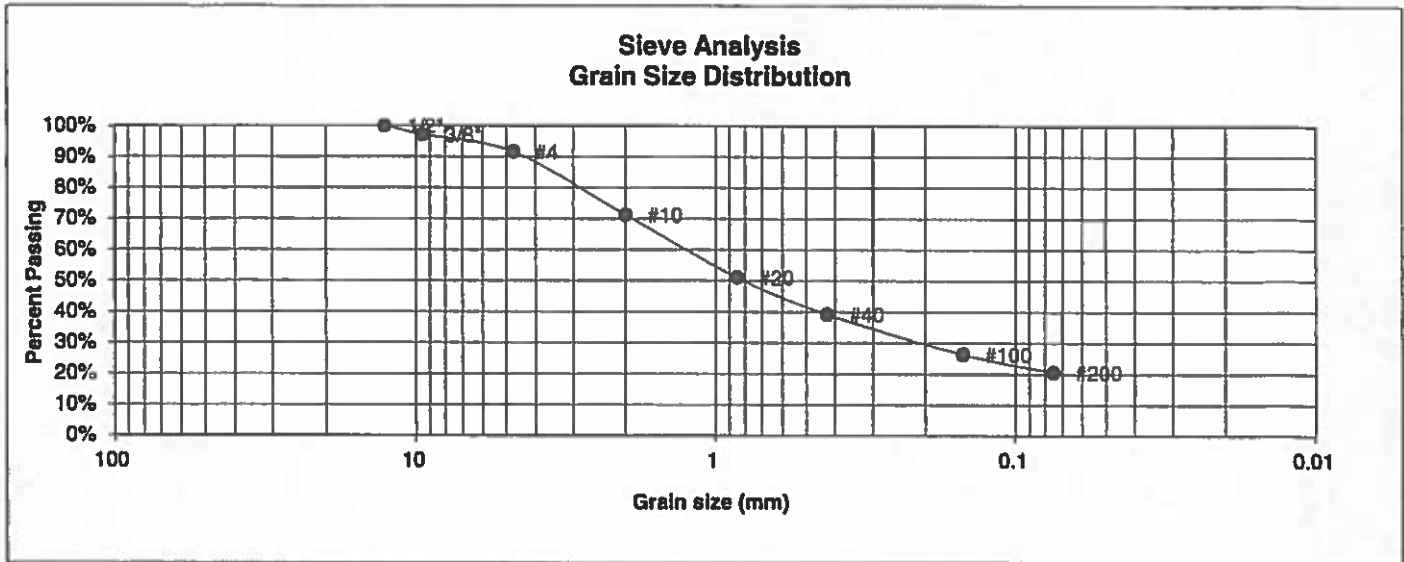
JOB NO.:

171671

FIG NO.:

B-24

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	2	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	7	JOB NO.	171671
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"	97.1%
4	91.6%
10	71.3%
20	51.1%
40	39.2%
100	26.3%
200	20.6%

Atterberg Limits	
Plastic Limit	14
Liquid Limit	30
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**

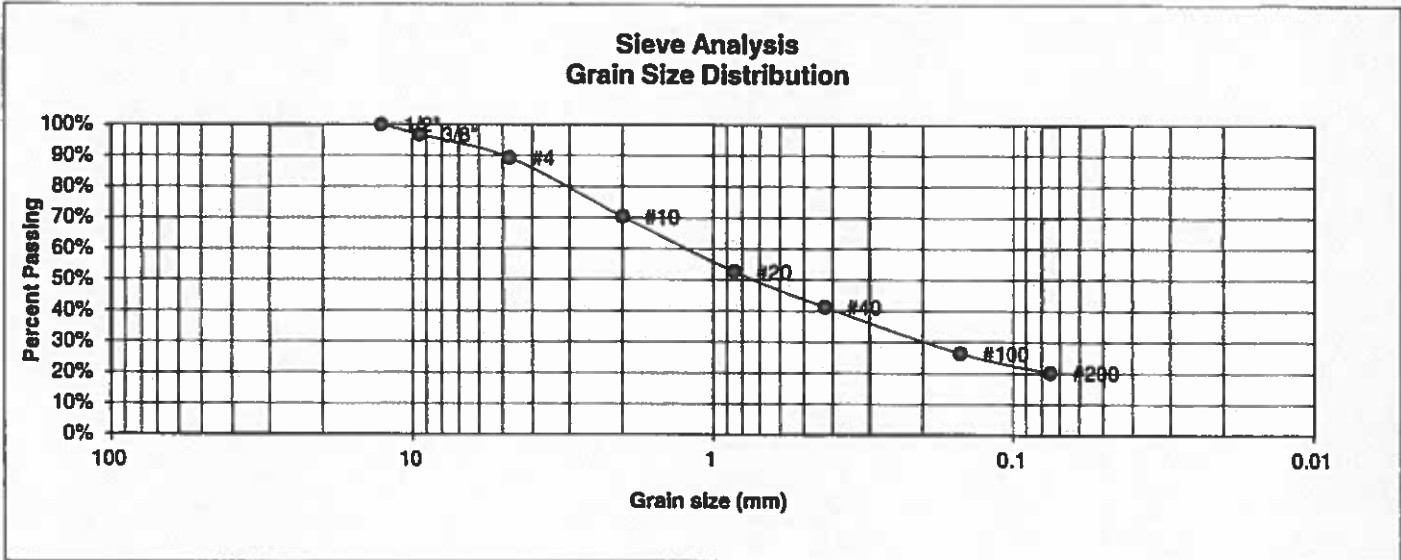
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO:

171671
FIG NO:

B-25

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	2	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	8	JOB NO.	171671
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"	96.8%
4	89.2%
10	70.3%
20	52.6%
40	41.3%
100	26.5%
200	20.2%

Atterberg Limits	
Plastic Limit	8
Liquid Limit	27
Plastic Index	18

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



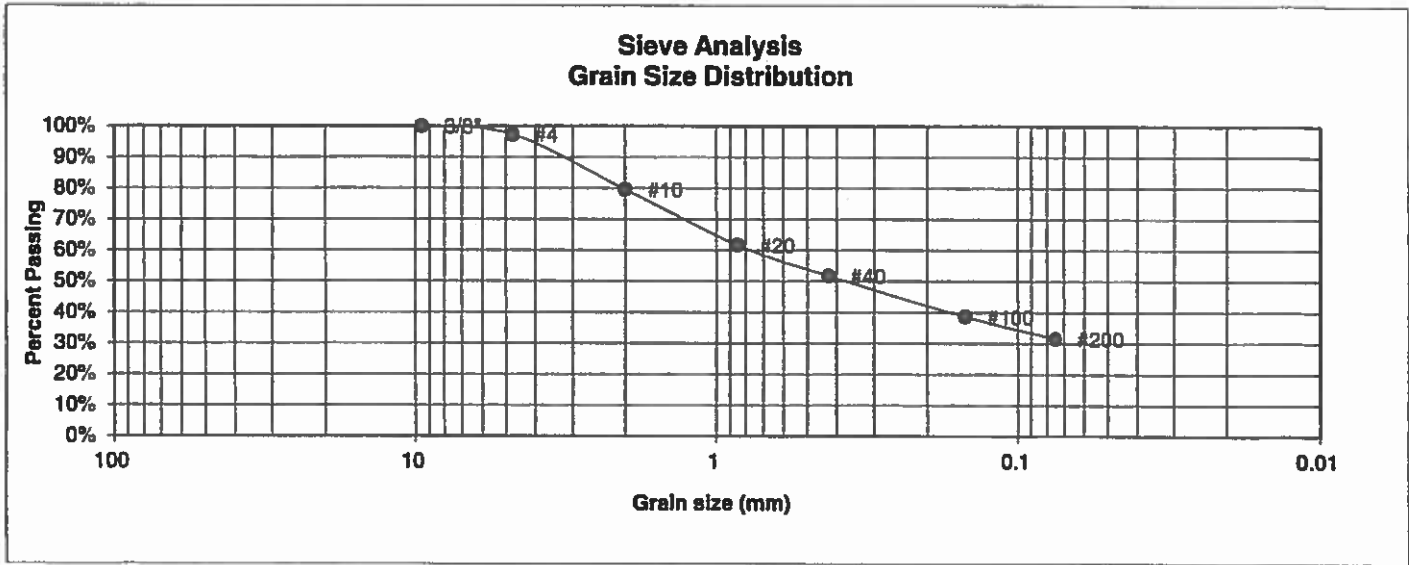
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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:
171671
FIG NO.:
B-26

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	2, CBR #2	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	10	JOB NO.	171671
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	79.6%
20	61.7%
40	51.7%
100	38.6%
200	31.6%

Atterberg Limits	
Plastic Limit	11
Liquid Limit	25
Plastic Index	14

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



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**LABORATORY TEST
RESULTS**

DRAWN:

DATE:

CHECKED:

DATE:

SCC

2/19/18

JOB NO.:

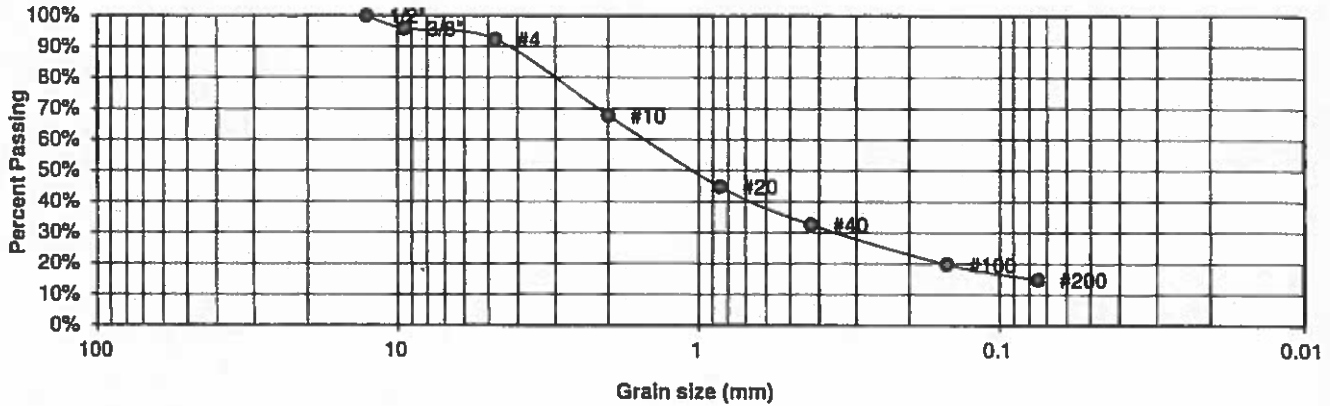
171671

FIG NO.:

B-27

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	2	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	11	JOB NO.	171671
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"	95.9%
4	92.4%
10	67.8%
20	44.8%
40	32.5%
100	19.7%
200	14.8%

Atterberg Limits	
Plastic Limit	14
Liquid Limit	26
Plastic Index	12

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



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**LABORATORY TEST
RESULTS**

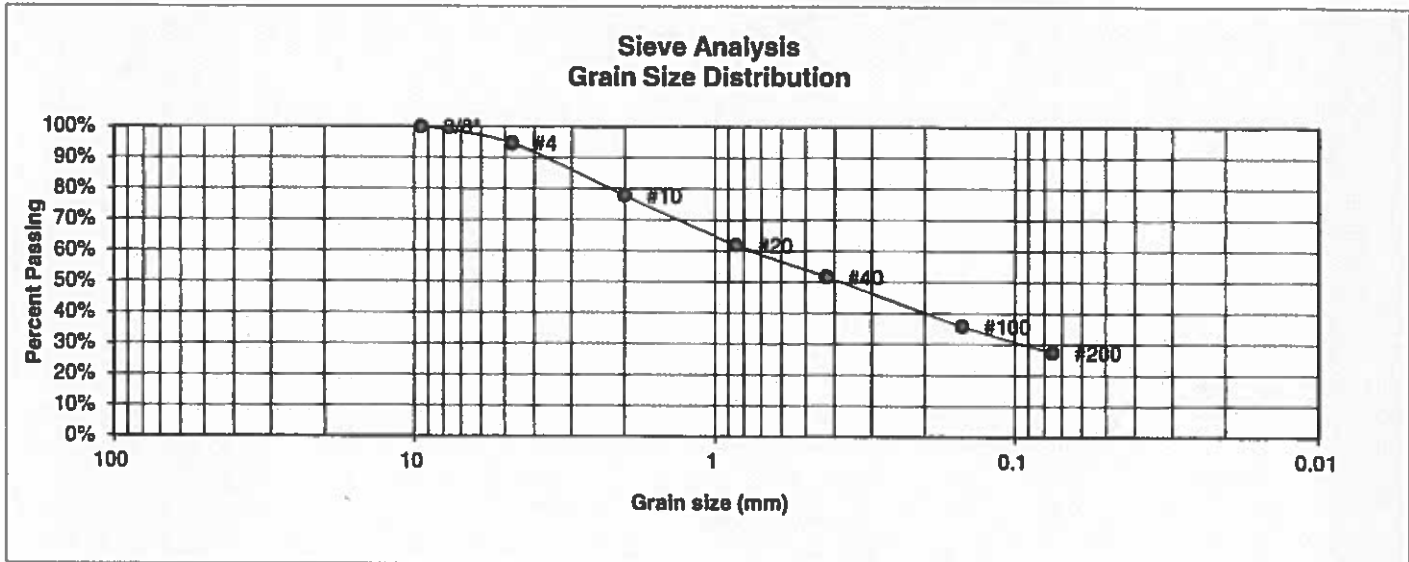
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO:

171671
FIG NO:

B-28

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	2	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	12	JOB NO.	171671
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"	
3/8"	100.0%
4	94.6%
10	77.8%
20	61.9%
40	51.7%
100	35.9%
200	27.3%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	26
Plastic Index	11

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



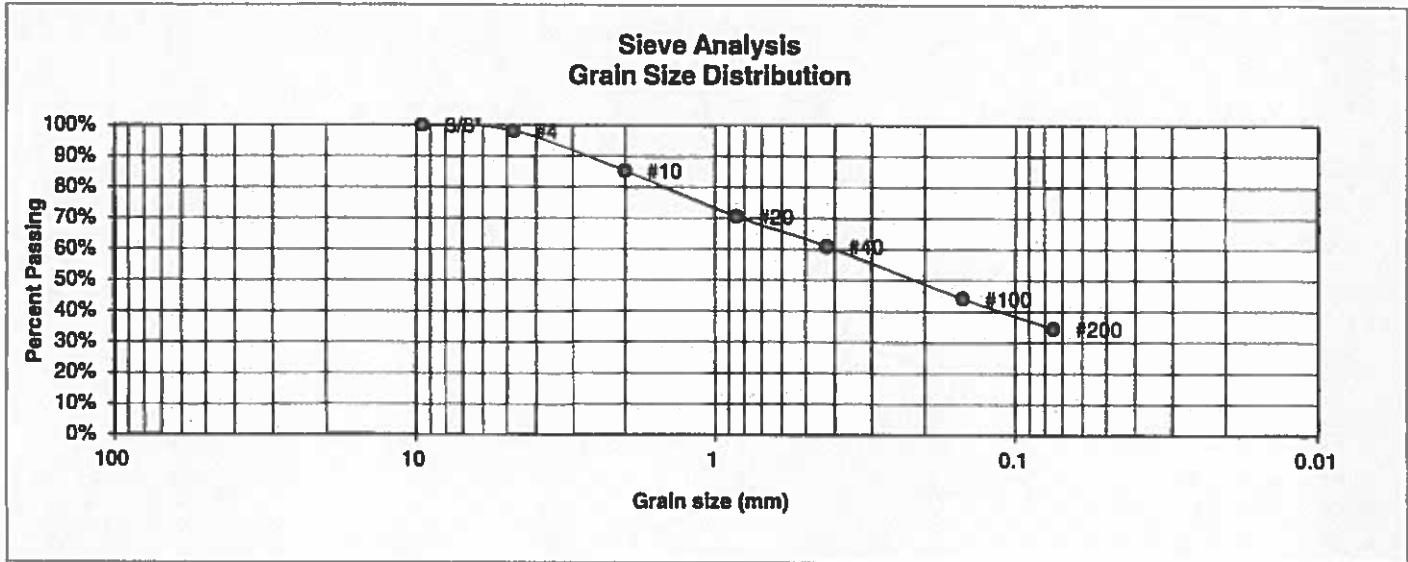
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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO:
171671
FIG NO:
B-29

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	2	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	18	JOB NO.	171671
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"	
3/8"	100.0%
4	98.1%
10	85.2%
20	70.5%
40	61.0%
100	44.1%
200	34.5%

Atterberg Limits	
Plastic Limit	13
Liquid Limit	24
Plastic Index	11

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.:

171671

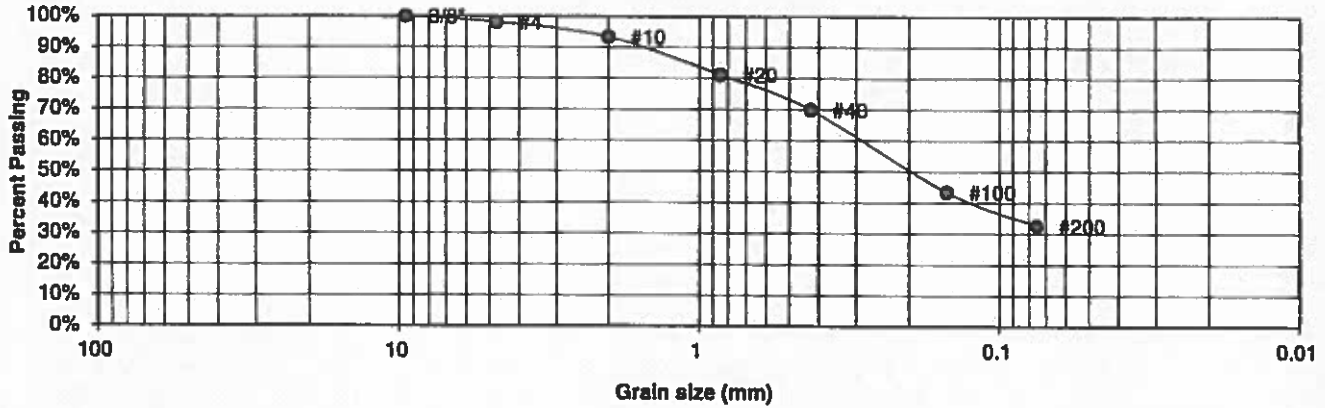
FIG NO.:

B-30

UNIFIED CLASSIFICATION SC
SOIL TYPE # 2
TEST BORING # 23
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-6

CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1
JOB NO. 171671
TEST BY BL
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	98.1%
10	93.4%
20	81.2%
40	69.9%
100	43.5%
200	32.6%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	30
Plastic Index	12

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:
		SCC	2/19/18

JOB NO.:

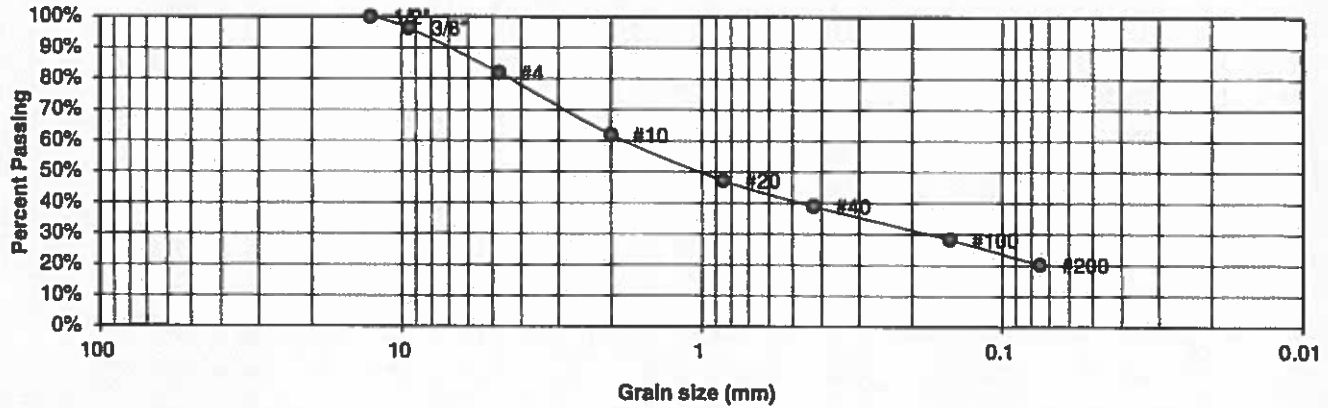
171671

FIG NO.:

B-31

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	PULPIT ROCK, LLC
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	FLYING HORSE NORTH, F-1
<u>TEST BORING #</u>	24	<u>JOB NO.</u>	171671
<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"	100.0%
3/8"	96.3%
4	82.0%
10	62.0%
20	47.3%
40	39.0%
100	28.3%
200	20.2%

<u>Atterberg Limits</u>	
Plastic Limit	14
Liquid Limit	26
Plastic Index	12

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



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**LABORATORY TEST
RESULTS**

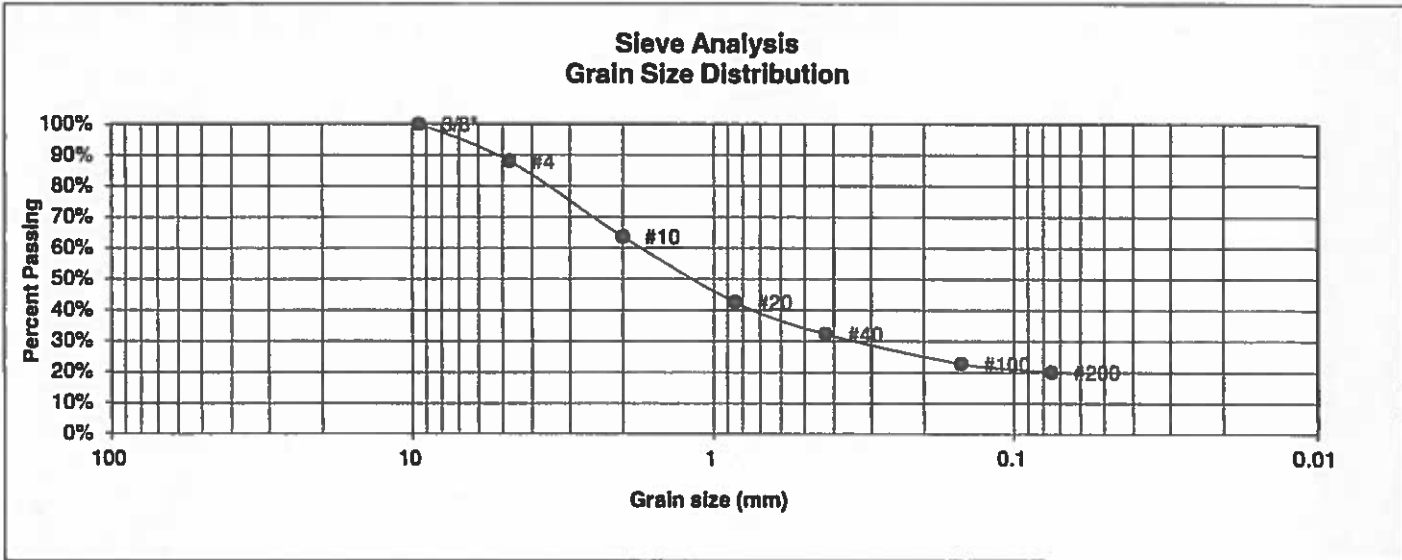
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		SLC	2/19/18

JOB NO.:

171671
FIG NO.:

B-32

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	2	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	36	JOB NO.	171671
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"	
3/8"	100.0%
4	88.0%
10	63.7%
20	42.6%
40	32.4%
100	22.8%
200	20.1%

Atterberg Limits	
Plastic Limit	19
Liquid Limit	30
Plastic Index	11

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



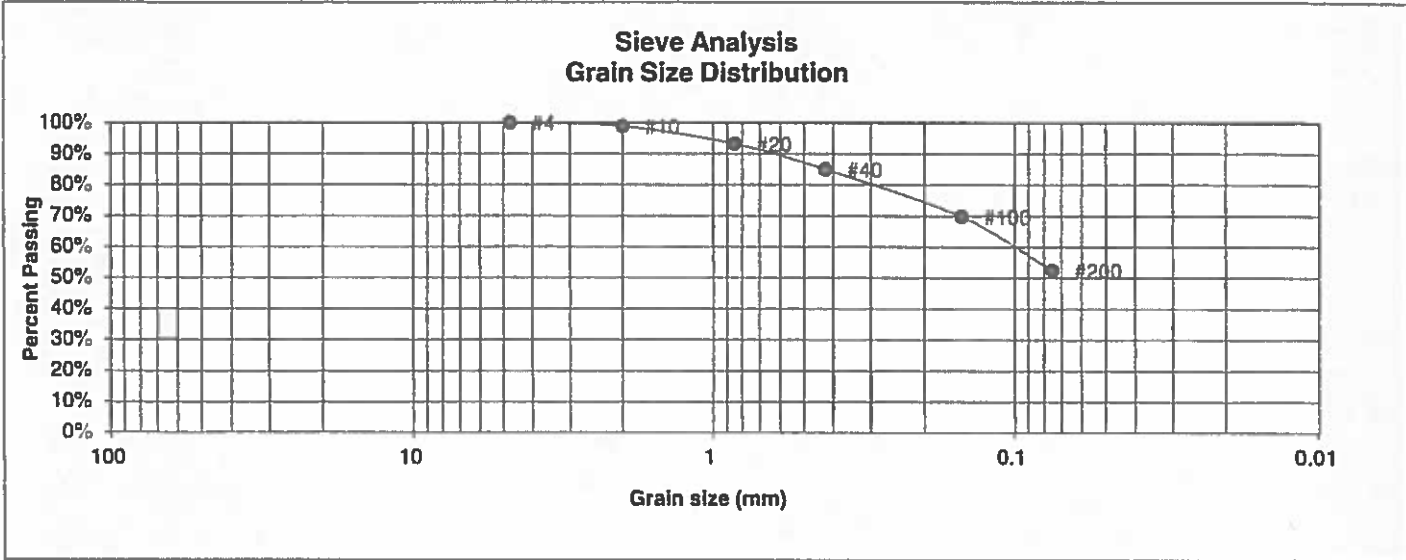
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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:
 171671
 FIG NO.:
B-33

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	10	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	3



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.8%
20	93.2%
40	85.0%
100	69.7%
200	52.4%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	28
Plastic Index	13

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



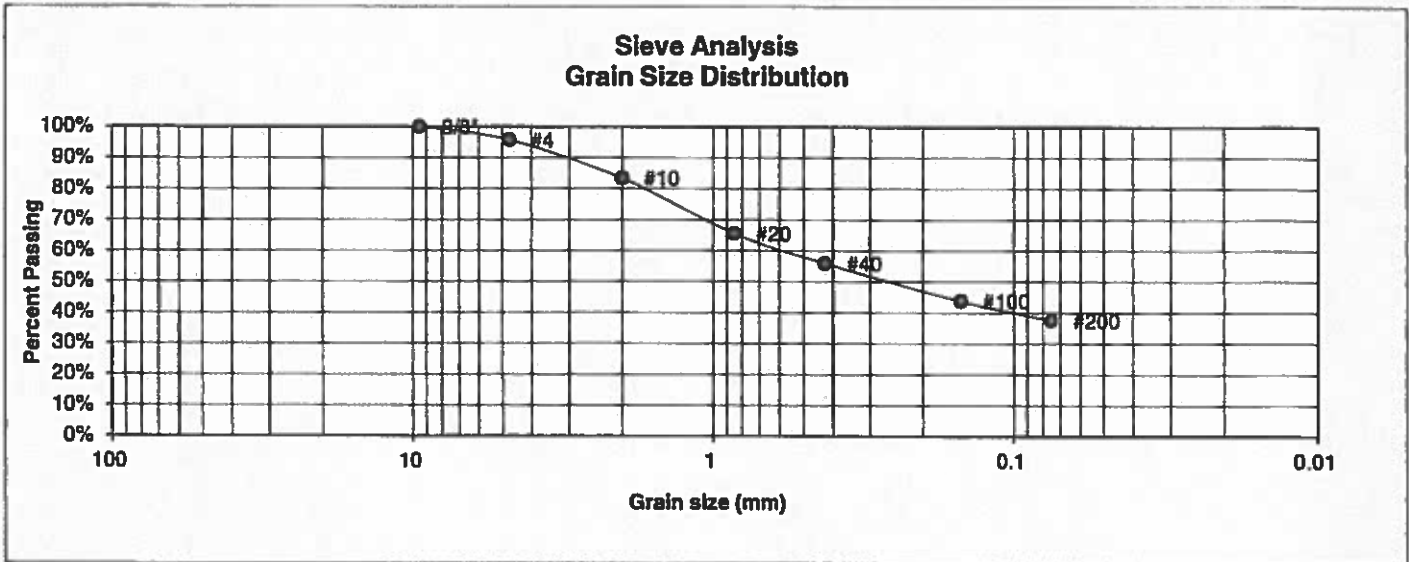
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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	3/9/18

JOB NO.:
171671
FIG NO.:
B-34

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3, CBR #2	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	15	JOB NO.	171671
DEPTH (FT)	0-3	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	2



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.8%
10	83.4%
20	65.6%
40	55.9%
100	43.7%
200	37.5%

Atterberg Limits	
Plastic Limit	12
Liquid Limit	29
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**

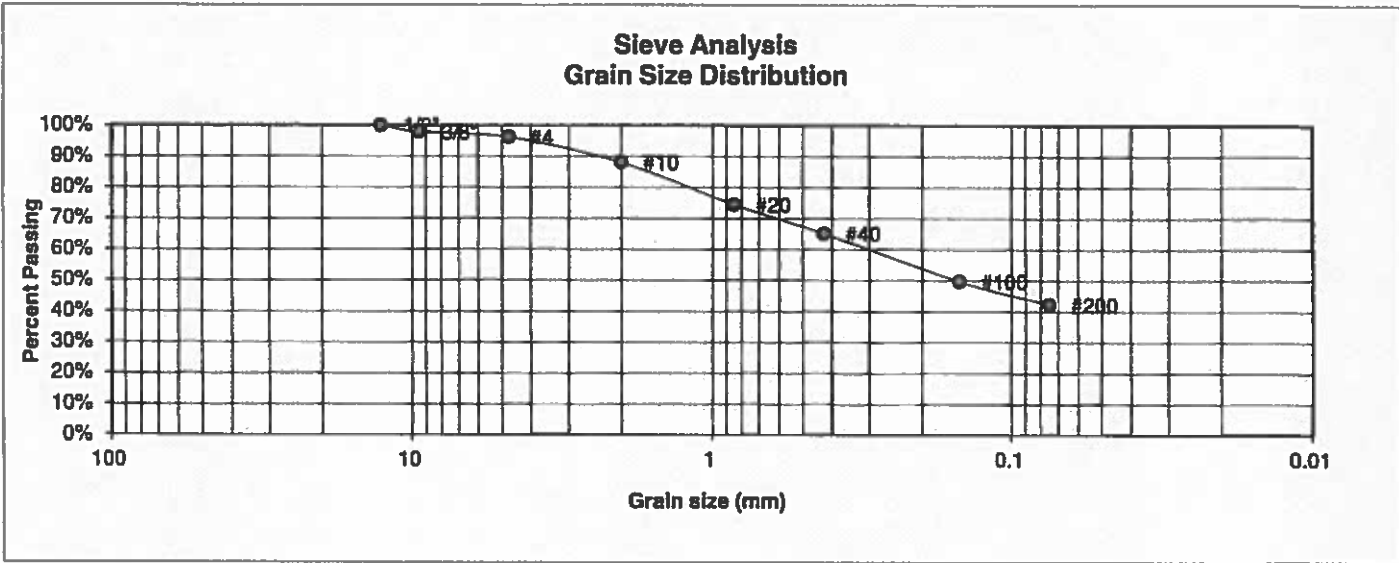
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-35

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	PULPIT ROCK, LLC
<u>SOIL TYPE #</u>	3	<u>PROJECT</u>	FLYING HORSE NORTH, F-1
<u>TEST BORING #</u>	22	<u>JOB NO.</u>	171671
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-6	<u>GROUP INDEX</u>	1



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.8%
4	96.3%
10	88.1%
20	74.5%
40	65.2%
100	49.8%
200	42.3%

<u>Atterberg Limits</u>	
Plastic Limit	15
Liquid Limit	27
Plastic Index	12

<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:
		SCC	2/19/18

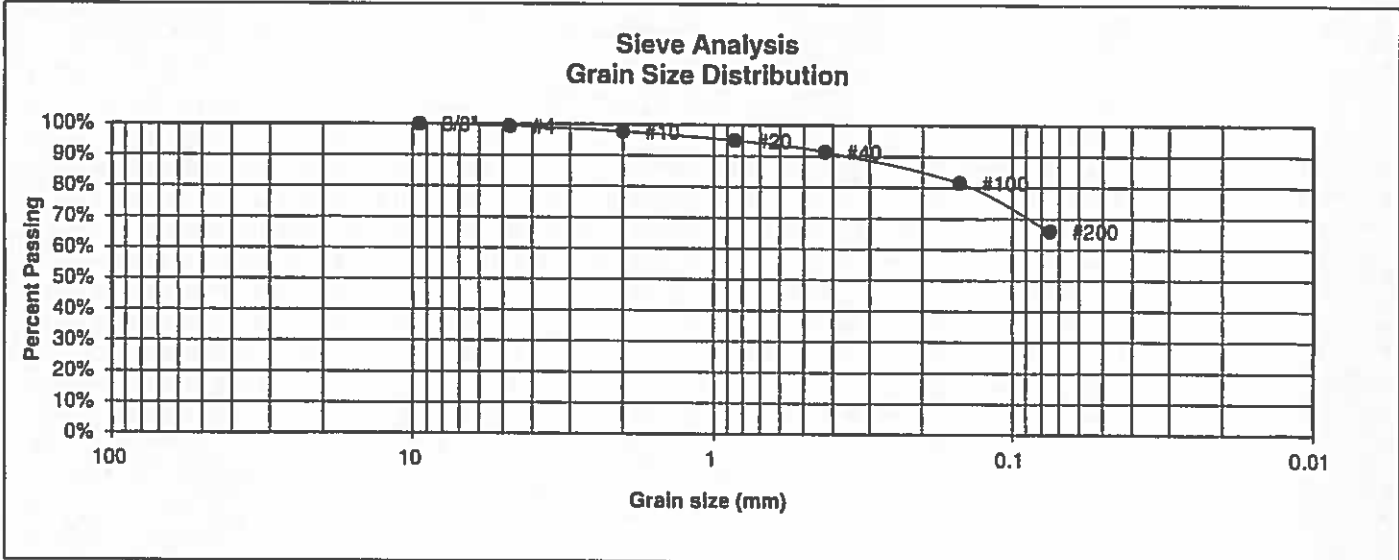
JOB NO.:

171671

FIG NO.:

B-36

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	25	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	4



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.4%
10	97.7%
20	95.0%
40	91.4%
100	81.5%
200	66.0%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	26
Plastic Index	11

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



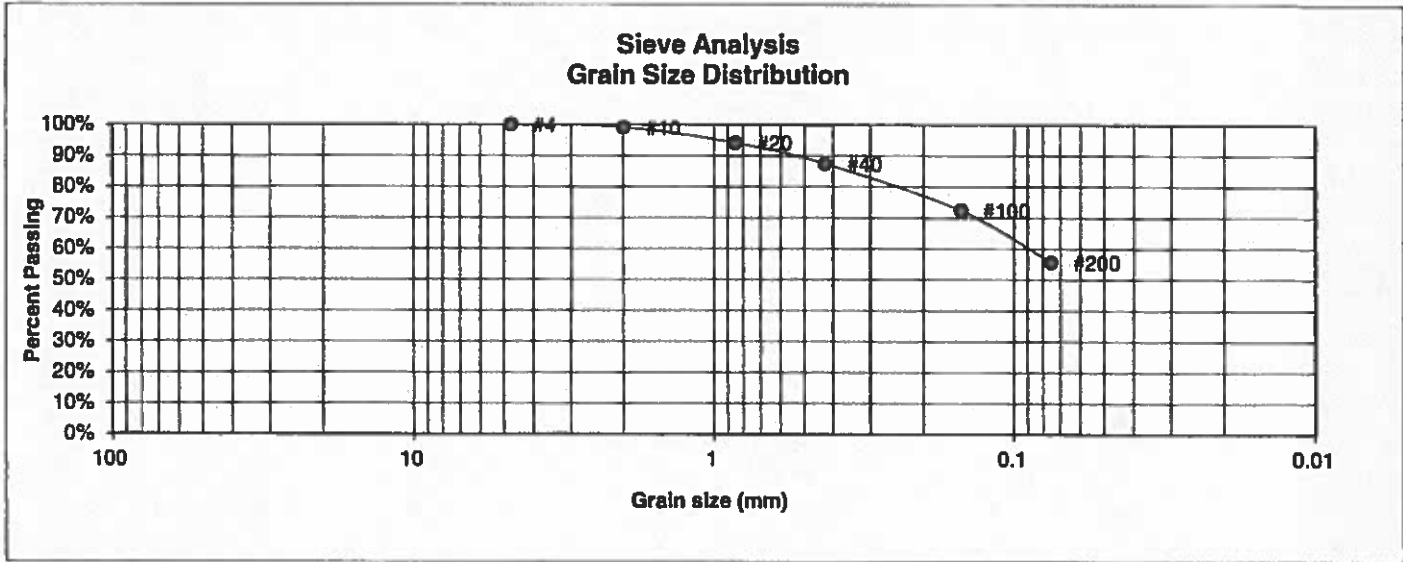
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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:
171671
FIG NO.:
B-37

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	26	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-4	GROUP INDEX	3



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.1%
20	94.1%
40	87.4%
100	72.3%
200	55.6%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	25
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

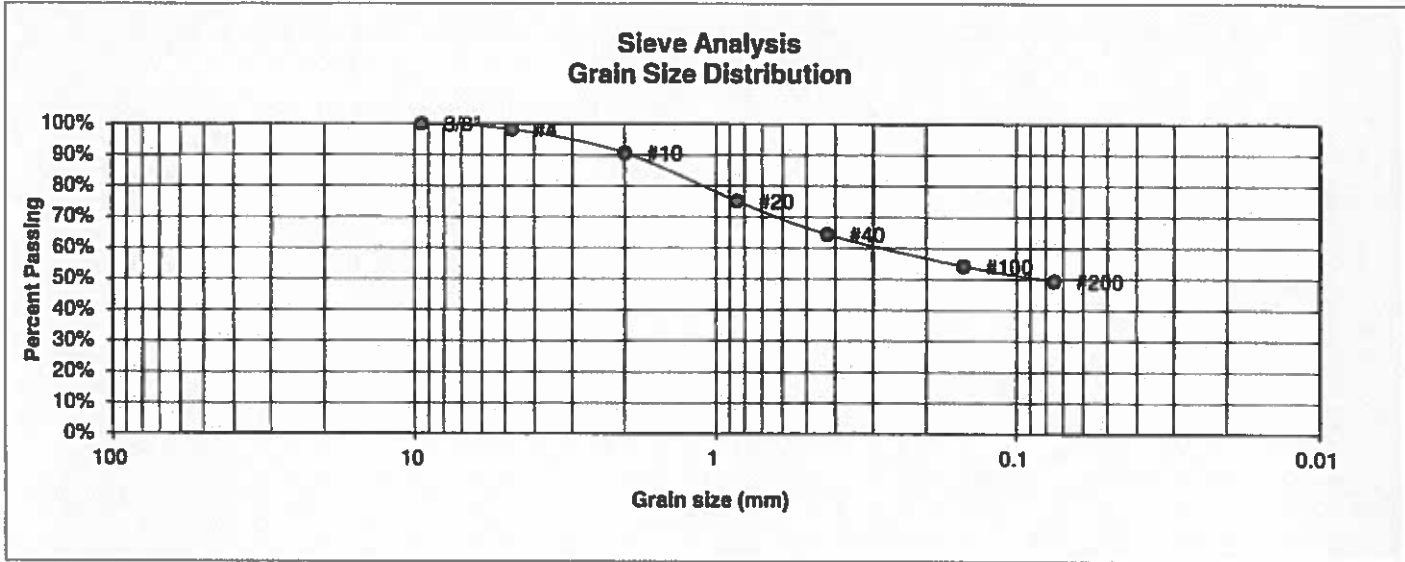
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-38

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	PULPIT ROCK, LLC
<u>SOIL TYPE #</u>	3	<u>PROJECT</u>	FLYING HORSE NORTH, F-1
<u>TEST BORING #</u>	26	<u>JOB NO.</u>	171671
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-6	<u>GROUP INDEX</u>	8



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.1%
10	90.6%
20	75.1%
40	64.4%
100	54.2%
200	49.4%

Atterberg Limits	
Plastic Limit	14
Liquid Limit	39
Plastic Index	25

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



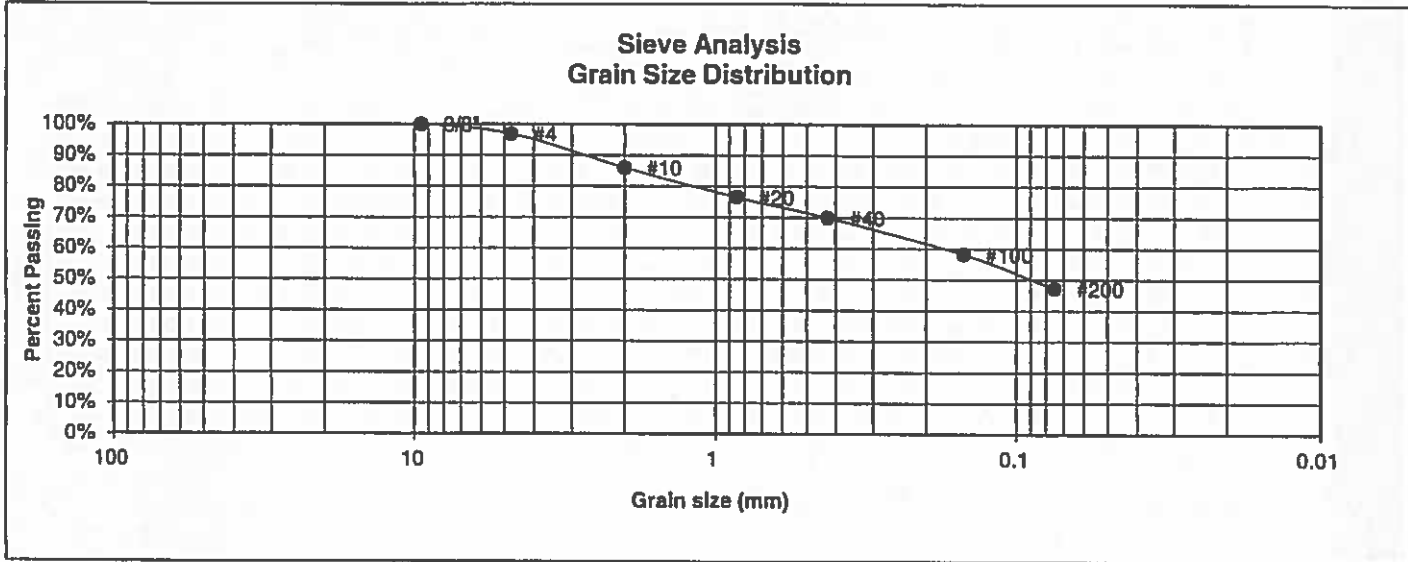
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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:
171671
FIG NO.:
B-39

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	27	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	2



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.9%
10	86.0%
20	76.5%
40	69.9%
100	58.2%
200	47.2%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	28
Plastic Index	12

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



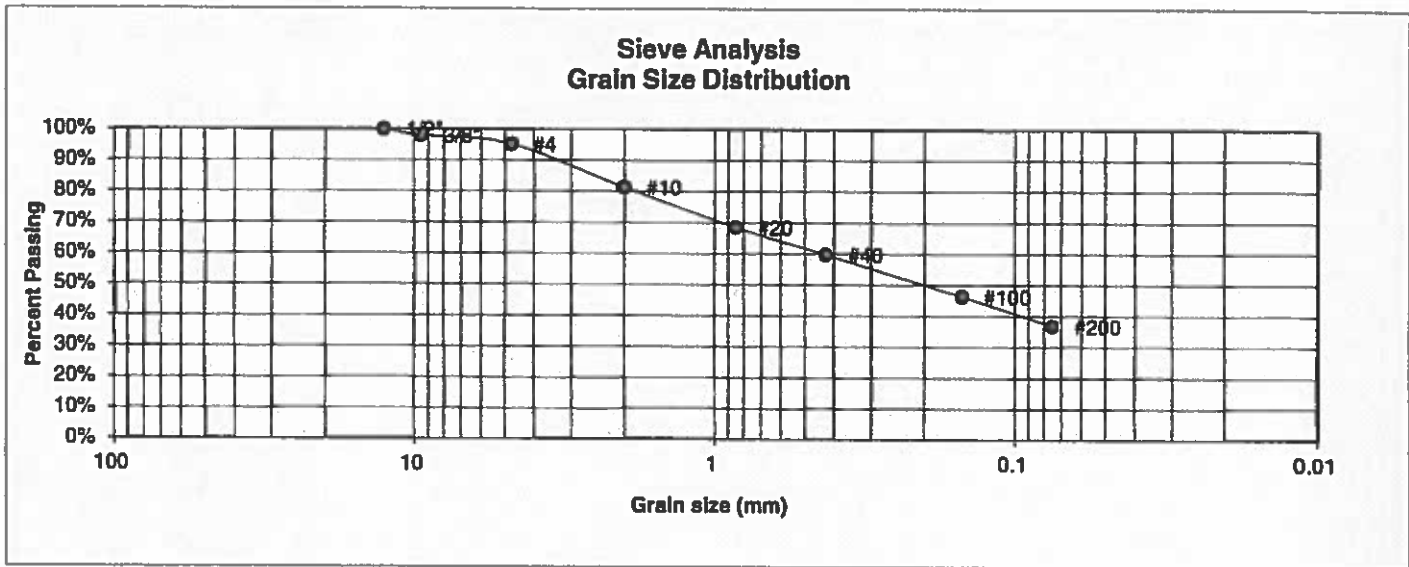
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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:
171671
FIG NO.:
B-40

UNIFIED CLASSIFICATION	SC-SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	28	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-4	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.9%
4	95.2%
10	81.4%
20	68.4%
40	59.8%
100	46.3%
200	36.9%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	21
Plastic Index	5

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:
		SCC	2/19/18

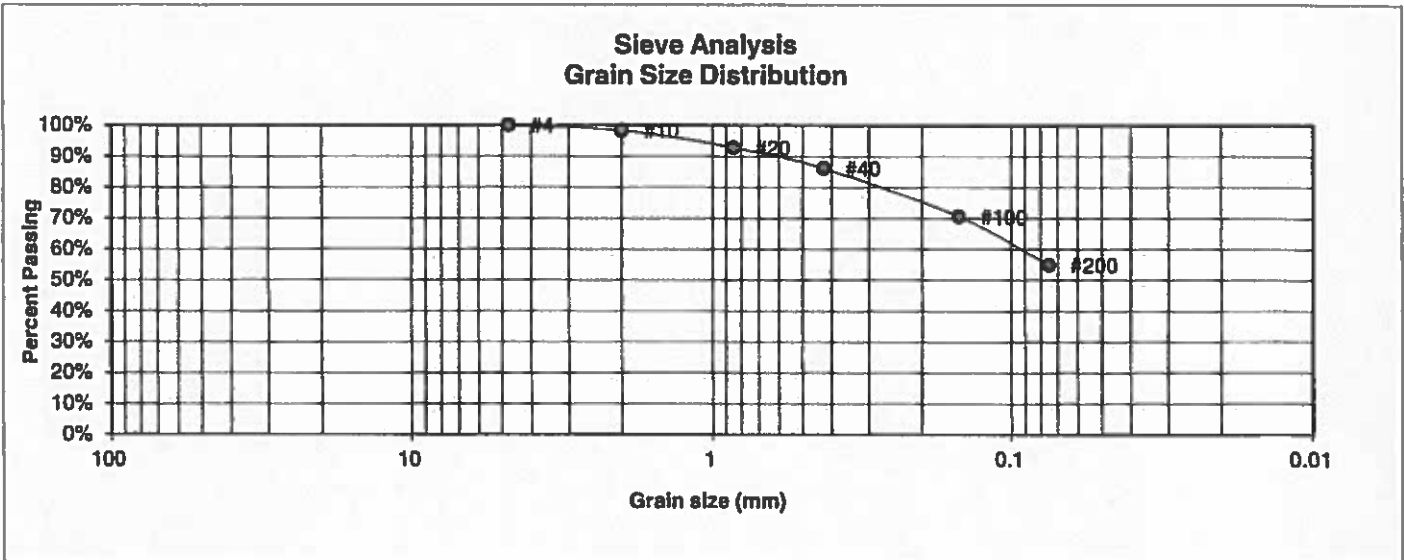
JOB NO.:

171671

FIG NO.:

B-41

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	28	JOB NO.	171671
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	6



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.4%
20	92.9%
40	86.2%
100	70.6%
200	55.0%

Atterberg Limits	
Plastic Limit	14
Liquid Limit	31
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**

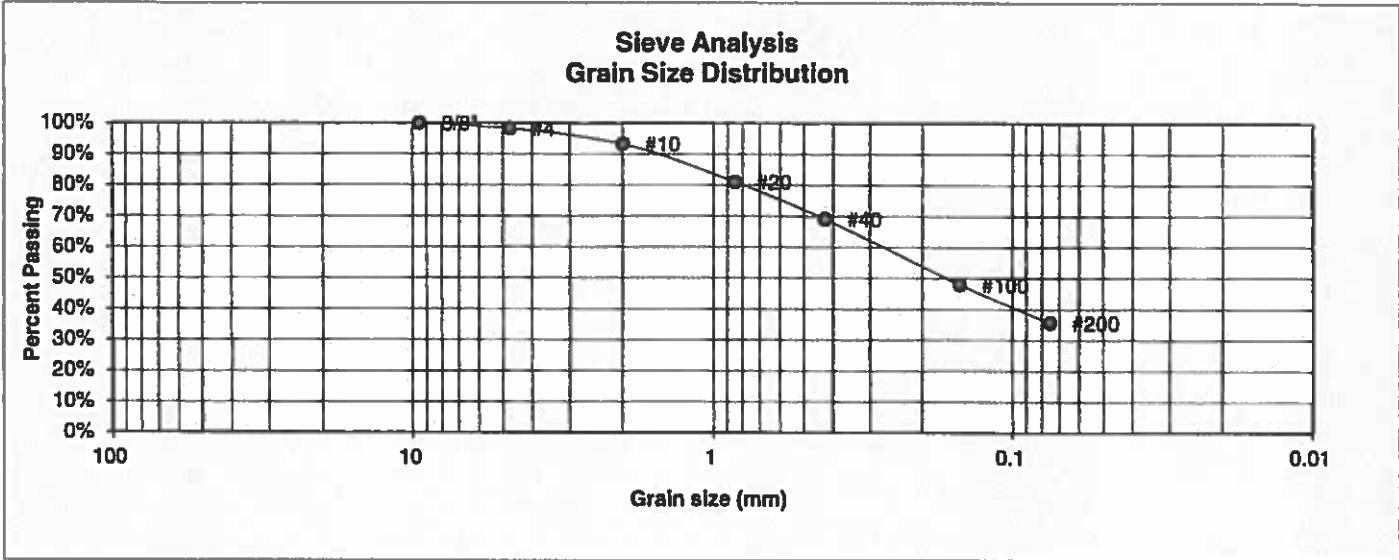
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-42

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	29	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.2%
10	93.3%
20	81.1%
40	69.1%
100	48.0%
200	35.6%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	26
Plastic Index	11

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



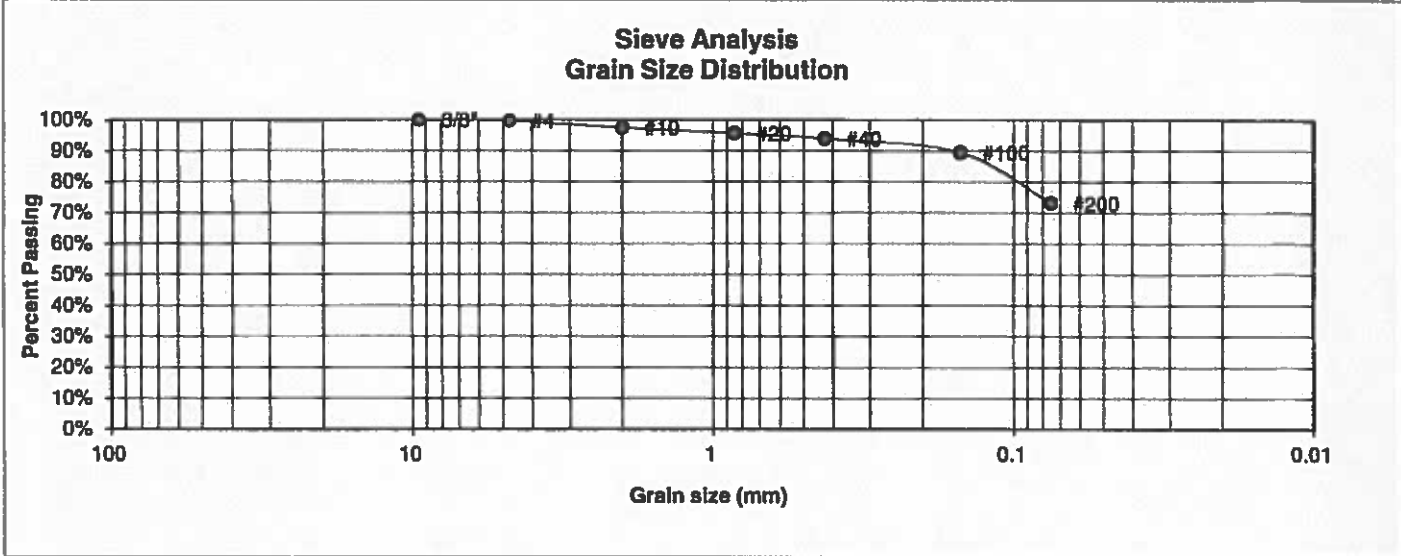
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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:
171671
FIG NO.:
B-43

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	29	JOB NO.	171671
DEPTH (FT)	5	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	6



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.7%
10	97.4%
20	95.6%
40	93.9%
100	89.5%
200	73.1%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	28
Plastic Index	11

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



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**LABORATORY TEST
RESULTS**

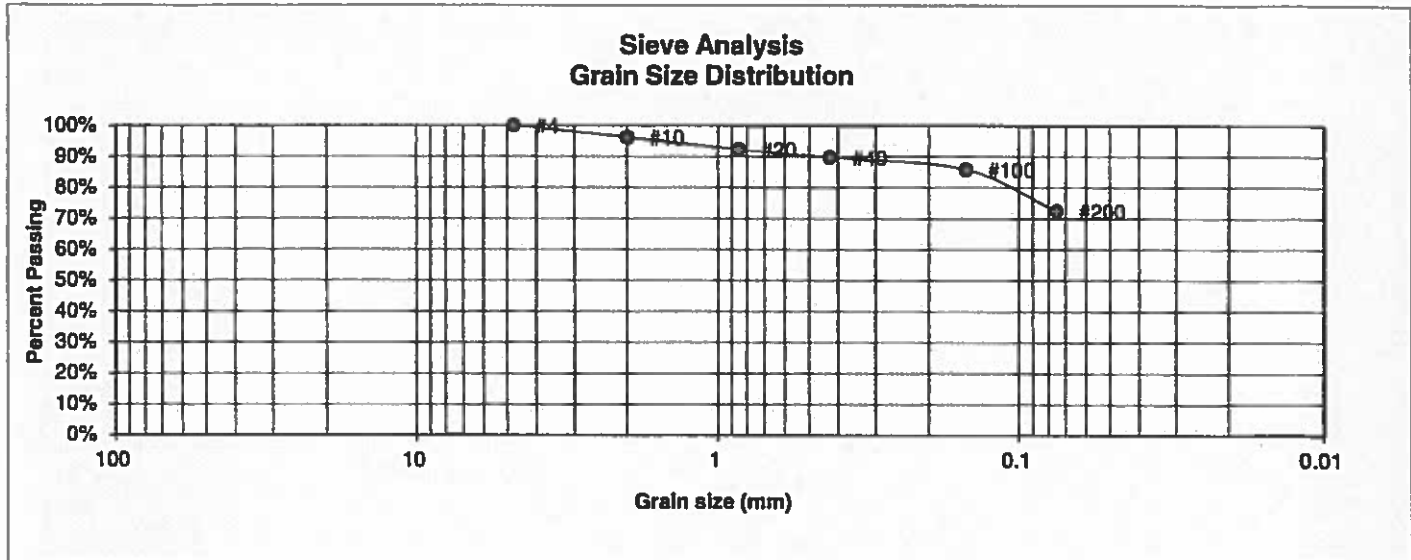
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-44

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	30	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	8



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	96.2%
20	92.2%
40	89.7%
100	85.8%
200	72.4%

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
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DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

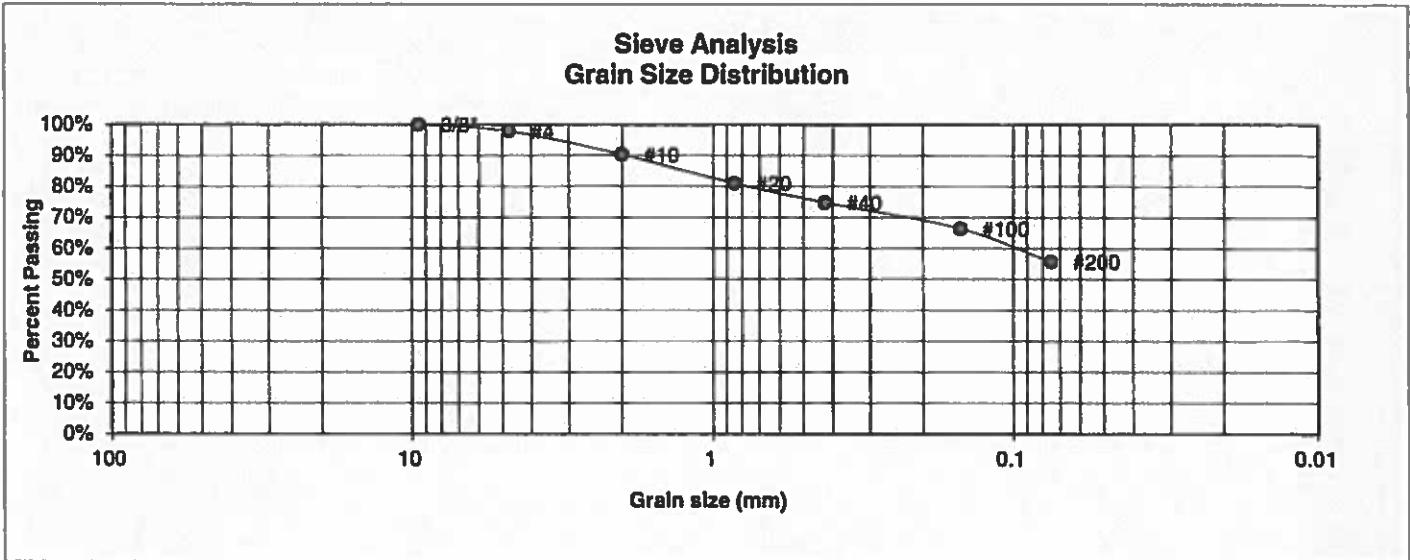
JOB NO:

171671

FIG NO:

B-45

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	32	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	5



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.9%
10	90.3%
20	81.0%
40	74.8%
100	66.4%
200	55.7%

Atterberg Limits	
Plastic Limit	13
Liquid Limit	28
Plastic Index	15

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



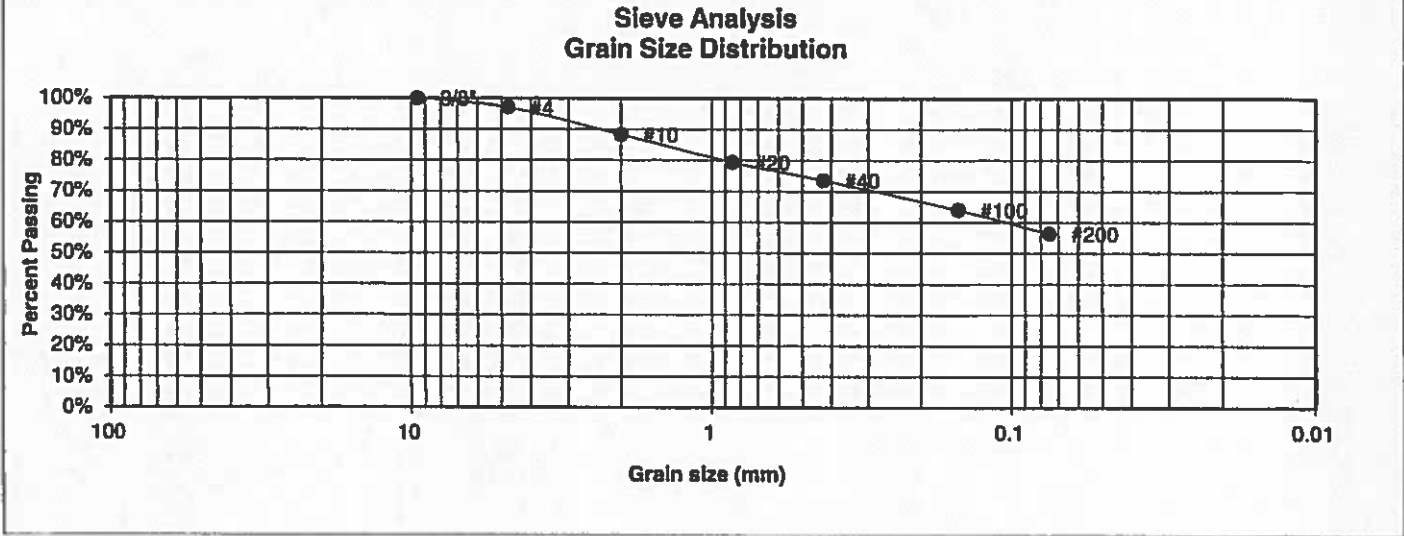
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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/9/18

JOB NO:
 171671
 FIG NO:
 B-46

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	33	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-4	GROUP INDEX	1



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.1%
10	88.3%
20	79.3%
40	73.6%
100	64.0%
200	56.3%

Atterberg Limits	
Plastic Limit	14
Liquid Limit	21
Plastic Index	7

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:
		SCC	2/19/18

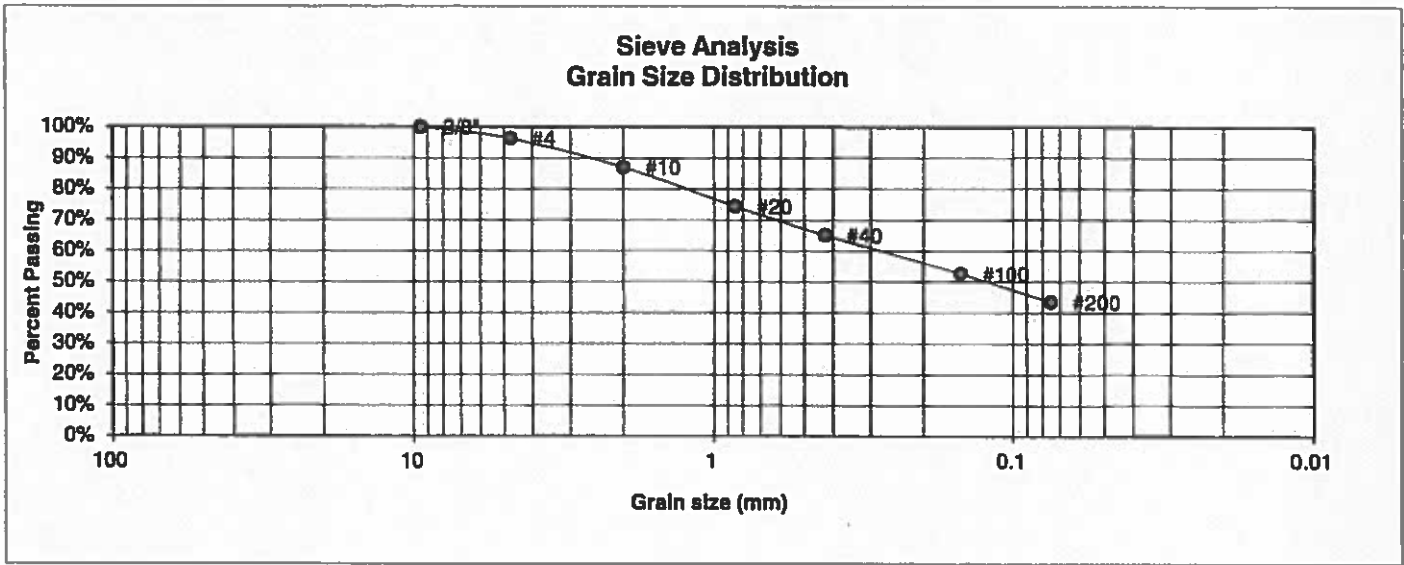
JOB NO.:

171671

FIG NO.:

B-47

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	34	JOB NO.	171671
DEPTH (FT)	1-2	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"	100.0%
#4	96.3%
#10	87.0%
#20	74.4%
#40	65.1%
#100	52.6%
#200	43.5%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	27
Plastic Index	11

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



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**LABORATORY TEST
RESULTS**

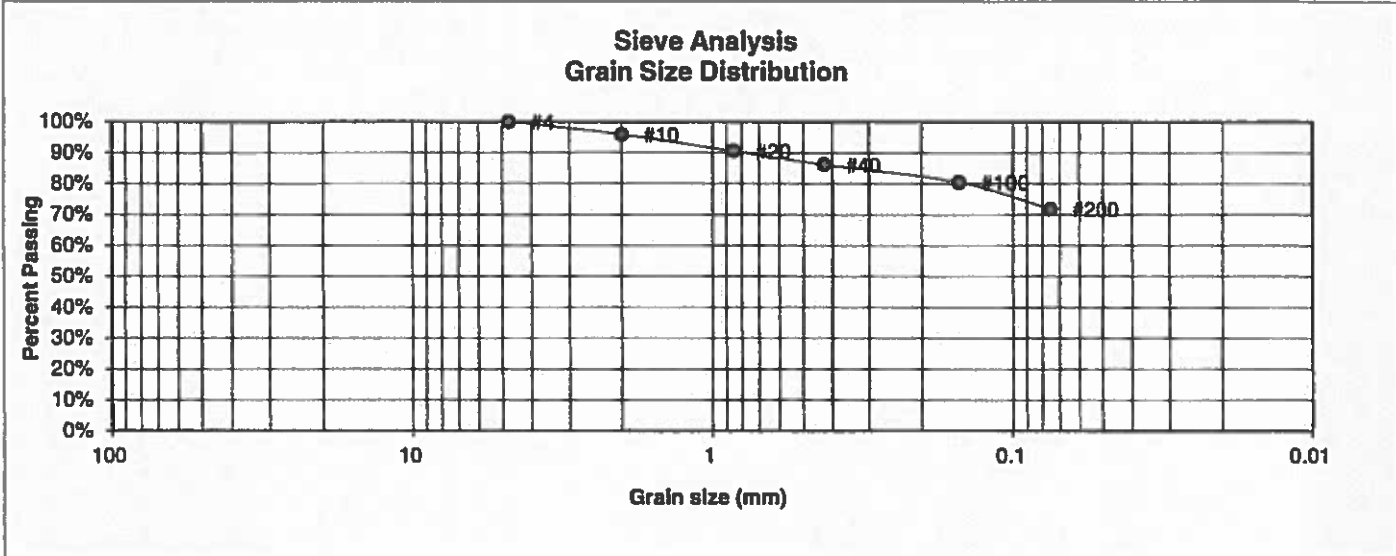
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-48

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	37	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	6



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	95.9%
20	90.5%
40	86.2%
100	80.4%
200	71.8%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	28
Plastic Index	11

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



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**LABORATORY TEST
RESULTS**

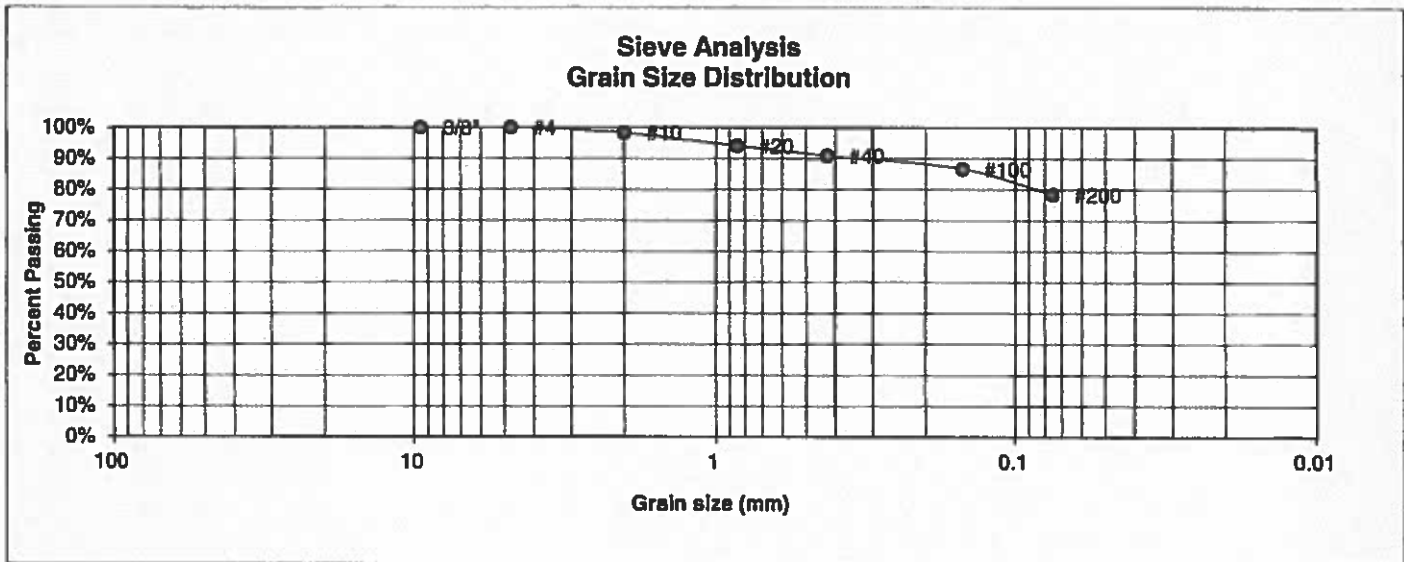
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-49

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	38	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-5	GROUP INDEX	7



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	100.0%
10	98.3%
20	94.0%
40	90.9%
100	86.7%
200	78.4%

Atterberg Limits	
Plastic Limit	19
Liquid Limit	30
Plastic Index	10

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



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**LABORATORY TEST
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DRAWN:

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SCC

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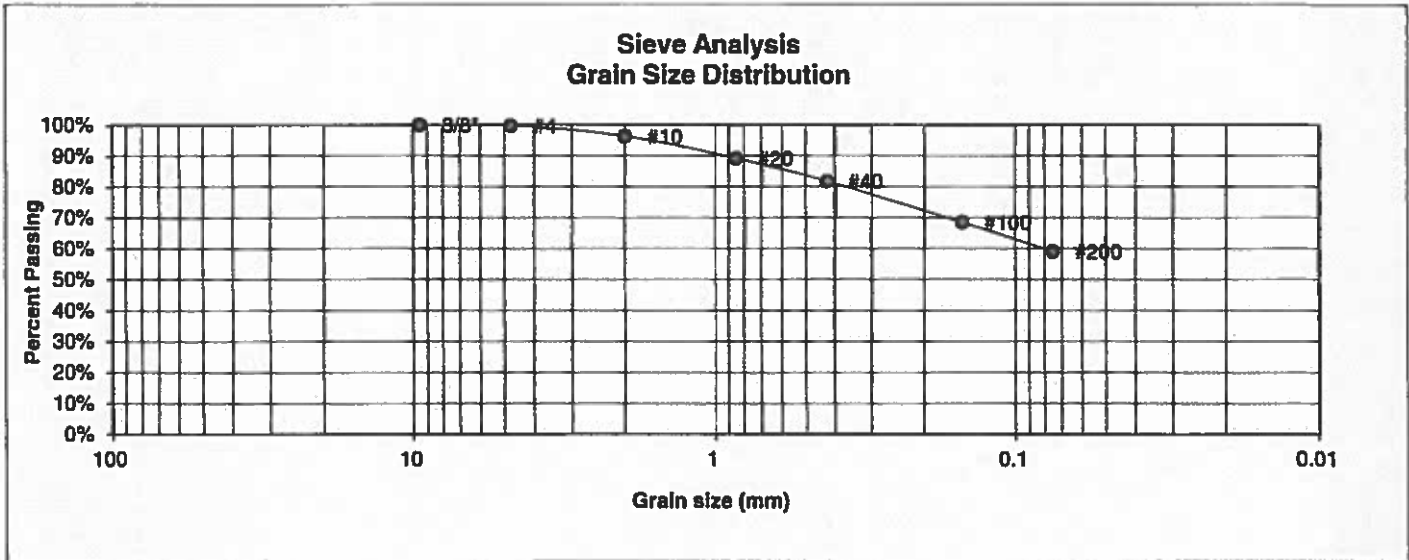
JOB NO.:

171671

FIG NO.:

B-50

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	39	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	6



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.7%
10	96.2%
20	89.1%
40	81.8%
100	68.5%
200	59.0%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	31
Plastic Index	16

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



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**LABORATORY TEST
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DRAWN:

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DATE:

BL

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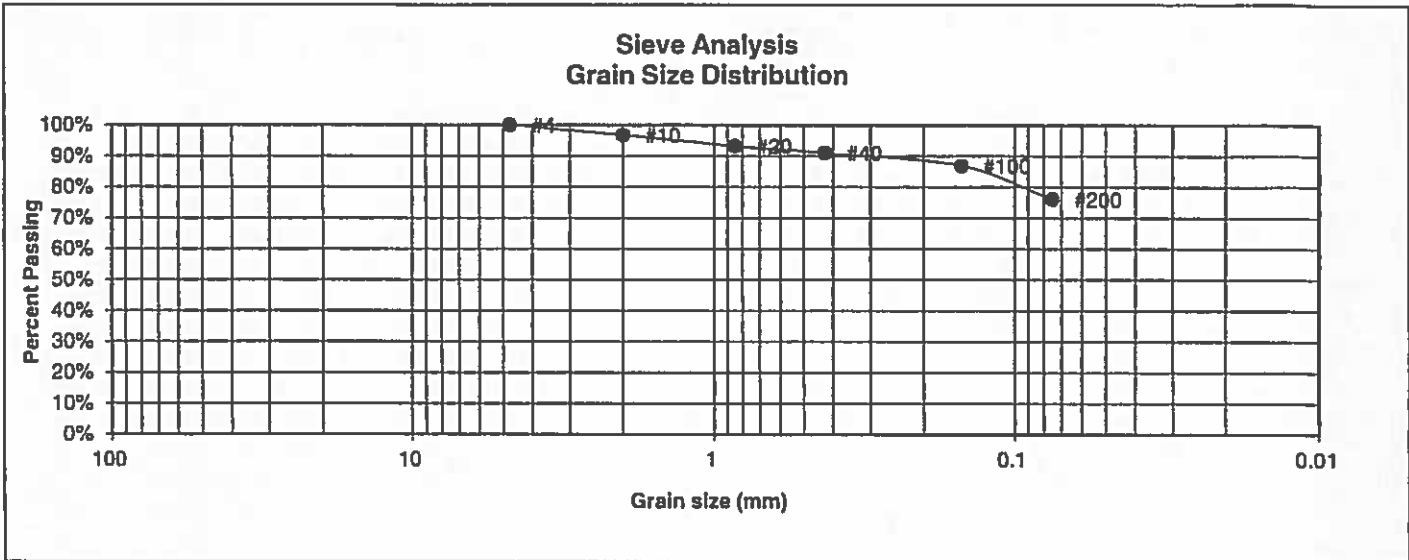
JOB NO.:

171671

FIG NO.:

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UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	40	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	9



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	96.8%
20	93.3%
40	91.1%
100	86.9%
200	76.1%

Atterberg Limits	
Plastic Limit	19
Liquid Limit	32
Plastic Index	14

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



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LABORATORY TEST RESULTS

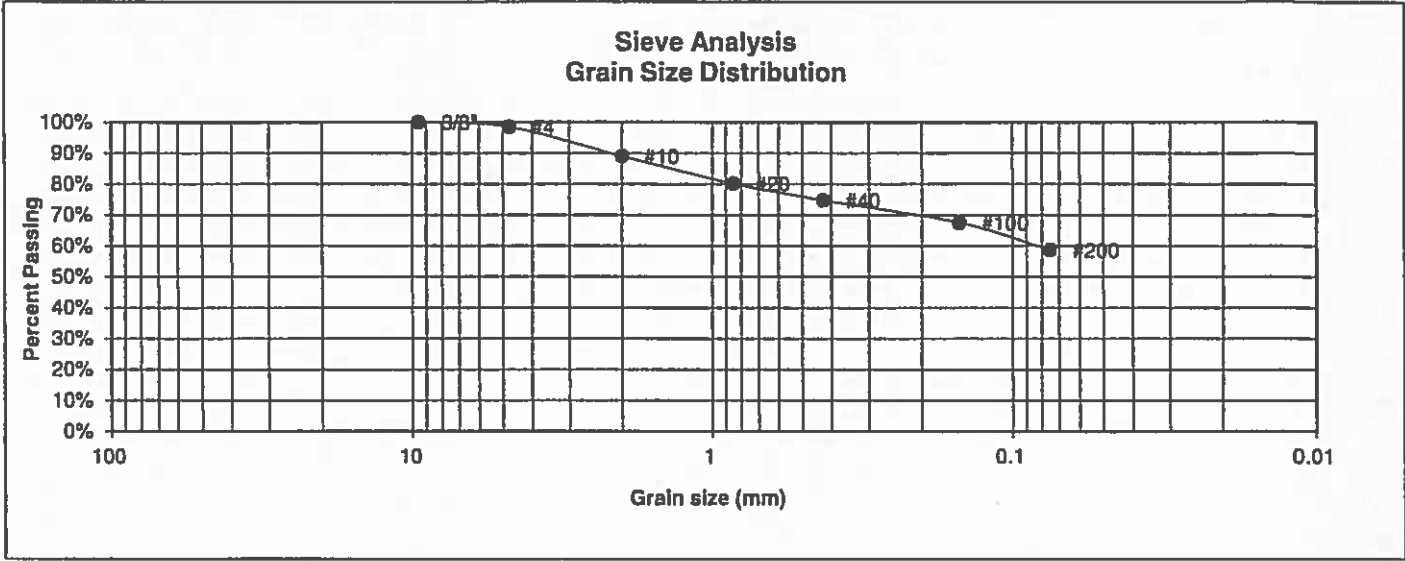
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
 FIG NO.:

B-52

UNIFIED CLASSIFICATION	CL-ML	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	41	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-4	GROUP INDEX	2



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.5%
10	89.0%
20	80.2%
40	74.8%
100	67.6%
200	58.7%

Atterberg Limits	
Plastic Limit	22
Liquid Limit	28
Plastic Index	6

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



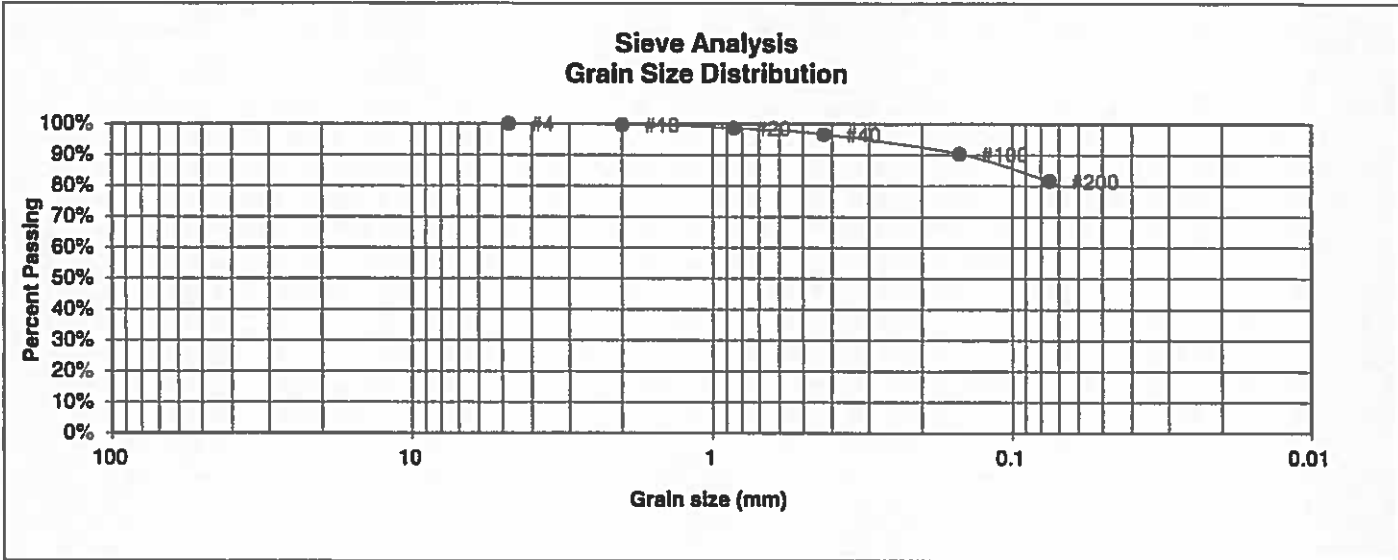
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**LABORATORY TEST
RESULTS**

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JOB NO.:
171671
FIG NO.:
B-53

UNIFIED CLASSIFICATION	CL	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	42	JOB NO.	171671
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-4	GROUP INDEX	4



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	98.7%
40	96.7%
100	90.4%
200	81.6%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	25
Plastic Index	8

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



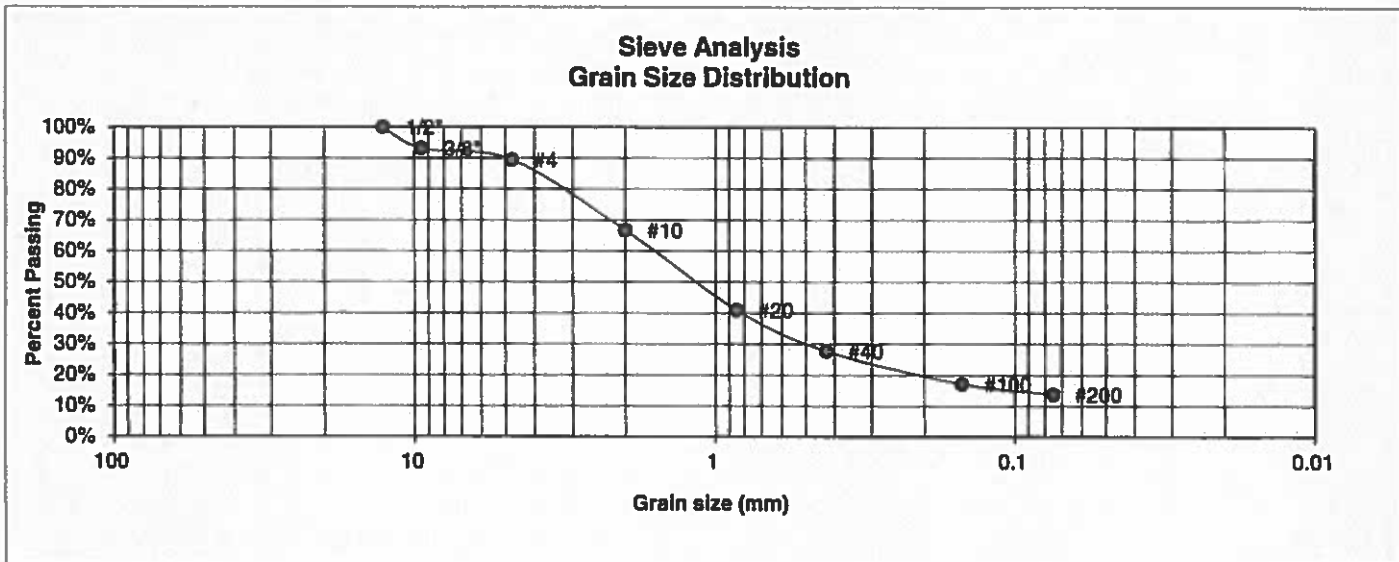
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LABORATORY TEST RESULTS

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		<i>ECC</i>	2/19/18

JOB NO.:
171671
FIG NO.:
B-54

UNIFIED CLASSIFICATION	SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	4	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	1	JOB NO.	171671
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"	100.0%
3/8"	93.0%
4	89.4%
10	66.7%
20	41.0%
40	27.7%
100	17.1%
200	13.8%

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
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DATE:

SCC

3/19/18

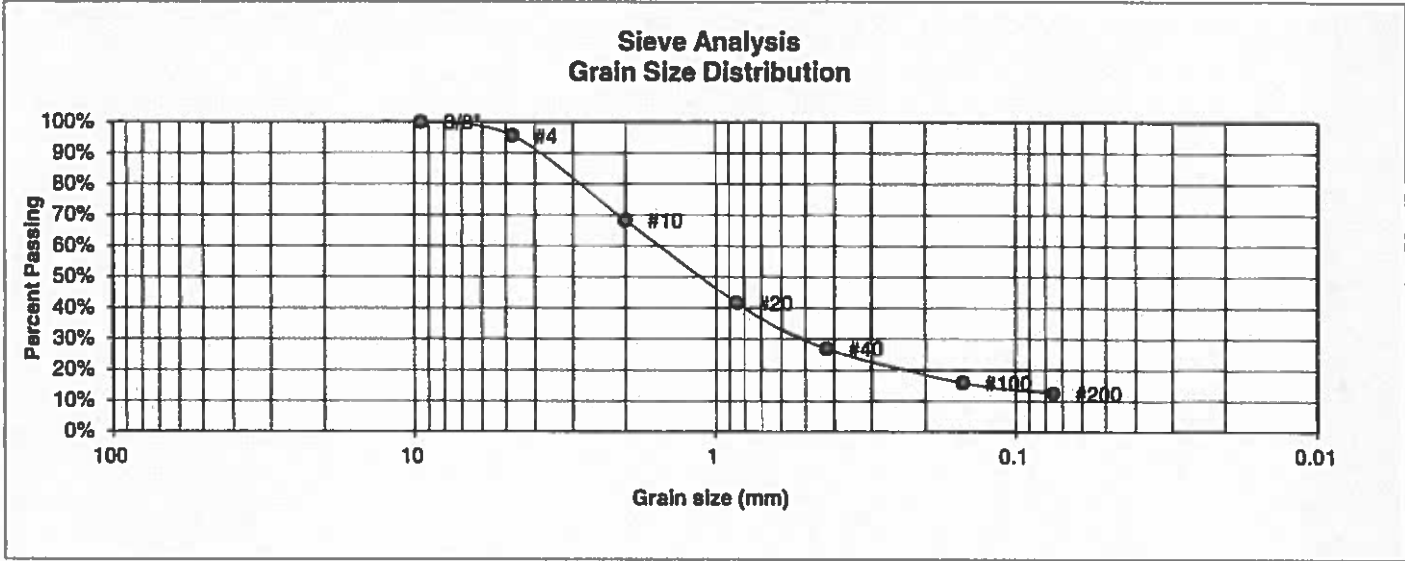
JOB NO.:

171671

FIG NO.:

B-55

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	PULPIT ROCK, LLC
<u>SOIL TYPE #</u>	4	<u>PROJECT</u>	FLYING HORSE NORTH, F-1
<u>TEST BORING #</u>	9	<u>JOB NO.</u>	171671
<u>DEPTH (FT)</u>	5	<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	95.5%
10	68.2%
20	41.7%
40	27.0%
100	16.0%
200	12.6%

<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**

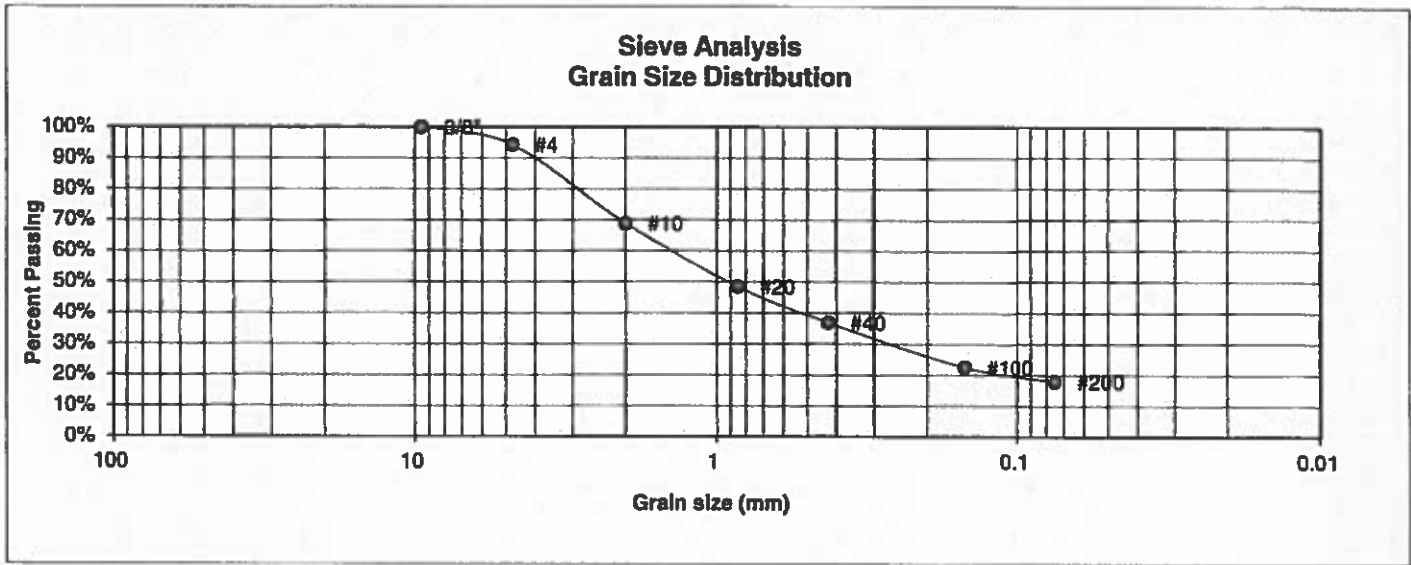
DRAWN:	DATE:	CHECKED:	DATE:
		SLC	2/19/13

JOB NO.:

171671
FIG NO.:

B-56

<u>UNIFIED CLASSIFICATION</u>	SC	<u>CLIENT</u>	PULPIT ROCK, LLC
<u>SOIL TYPE #</u>	4	<u>PROJECT</u>	FLYING HORSE NORTH, F-1
<u>TEST BORING #</u>	15	<u>JOB NO.</u>	171671
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL
<u>AASHTO CLASSIFICATION</u>	A-2-6	<u>GROUP INDEX</u>	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.3%
10	68.9%
20	48.5%
40	36.9%
100	22.5%
200	17.9%

<u>Atterberg Limits</u>	
Plastic Limit	20
Liquid Limit	39
Plastic Index	18

<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:
		SCC	2/19/18

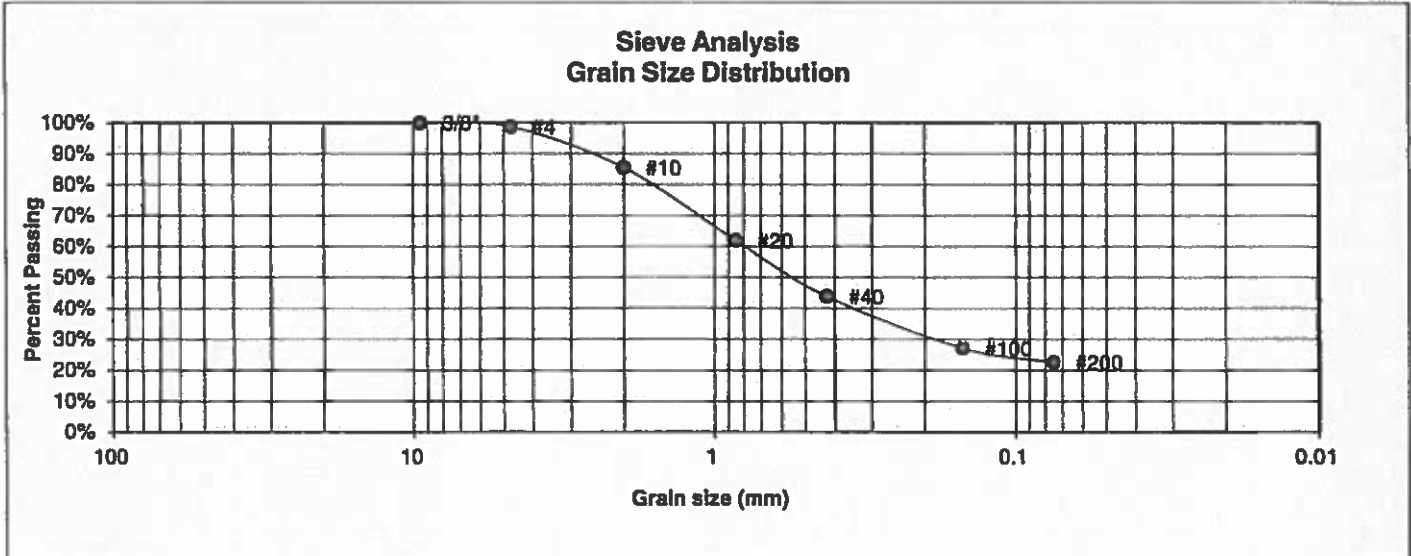
JOB NO.:

171671

FIG NO.:

B-57

UNIFIED CLASSIFICATION	SC	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	4	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	23	JOB NO.	171671
DEPTH (FT)	10	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	98.7%
10	85.5%
20	62.0%
40	43.9%
100	27.1%
200	22.6%

Atterberg Limits	
Plastic Limit	21
Liquid Limit	38
Plastic Index	17

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



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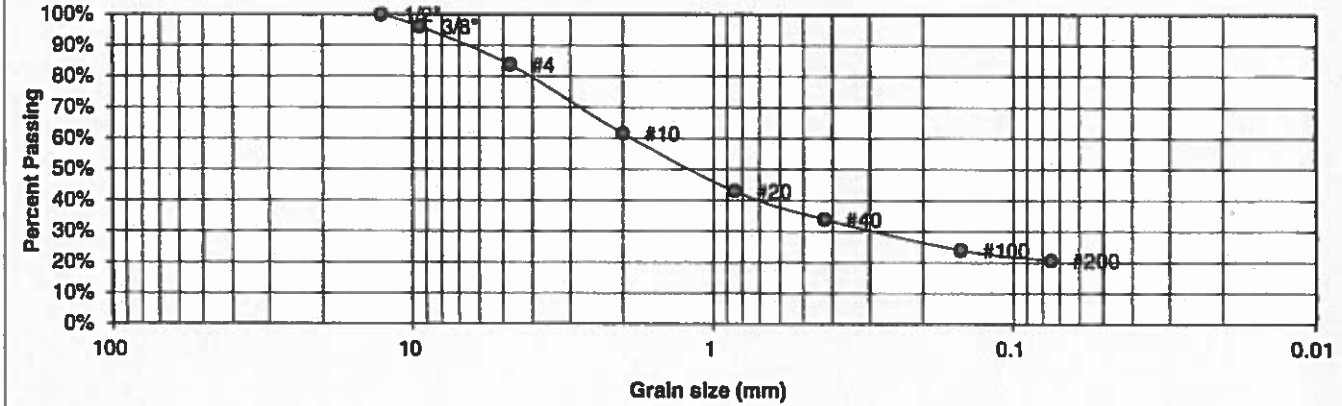
**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		BLC	2/9/18

JOB NO.:
171671
FIG NO.:
B-58

UNIFIED CLASSIFICATION	SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	4	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	31	JOB NO.	171671
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"	96.1%
4	83.8%
10	61.6%
20	42.9%
40	33.9%
100	23.9%
200	20.6%

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**

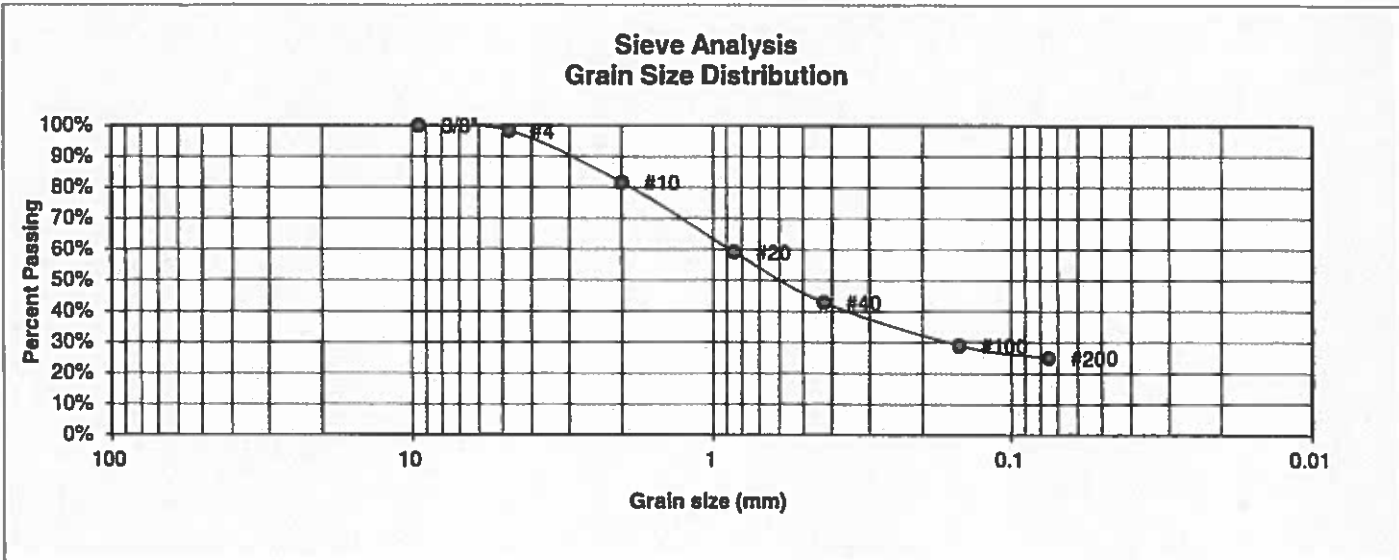
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO.:

171671
FIG NO.:

B-59

UNIFIED CLASSIFICATION	SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	4	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	36	JOB NO.	171671
DEPTH (FT)	10	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	98.3%
10	81.6%
20	59.1%
40	42.9%
100	29.0%
200	25.0%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	34
Plastic Index	18

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



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SCC

2/19/18

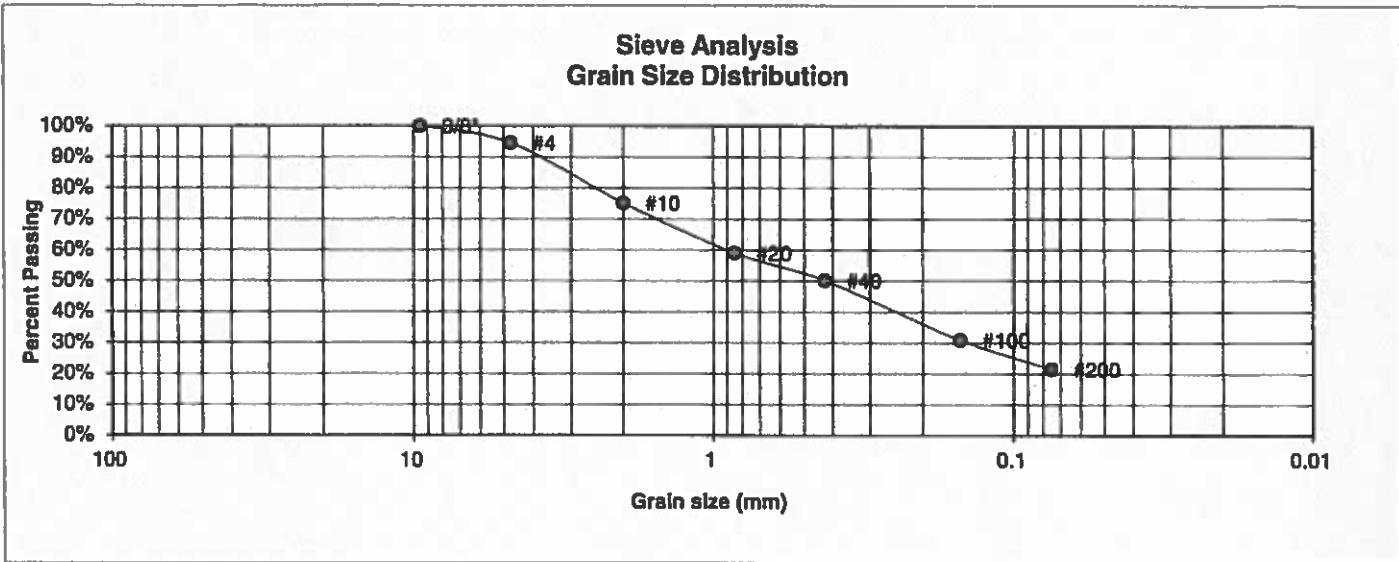
JOB NO:

171671

FIG NO:

B-60

UNIFIED CLASSIFICATION	SM	CLIENT	PULPIT ROCK, LLC
SOIL TYPE #	4	PROJECT	FLYING HORSE NORTH, F-1
TEST BORING #	40	JOB NO.	171671
DEPTH (FT)	10	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	94.6%
10	75.1%
20	59.1%
40	50.1%
100	31.0%
200	21.5%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

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



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**LABORATORY TEST
RESULTS**

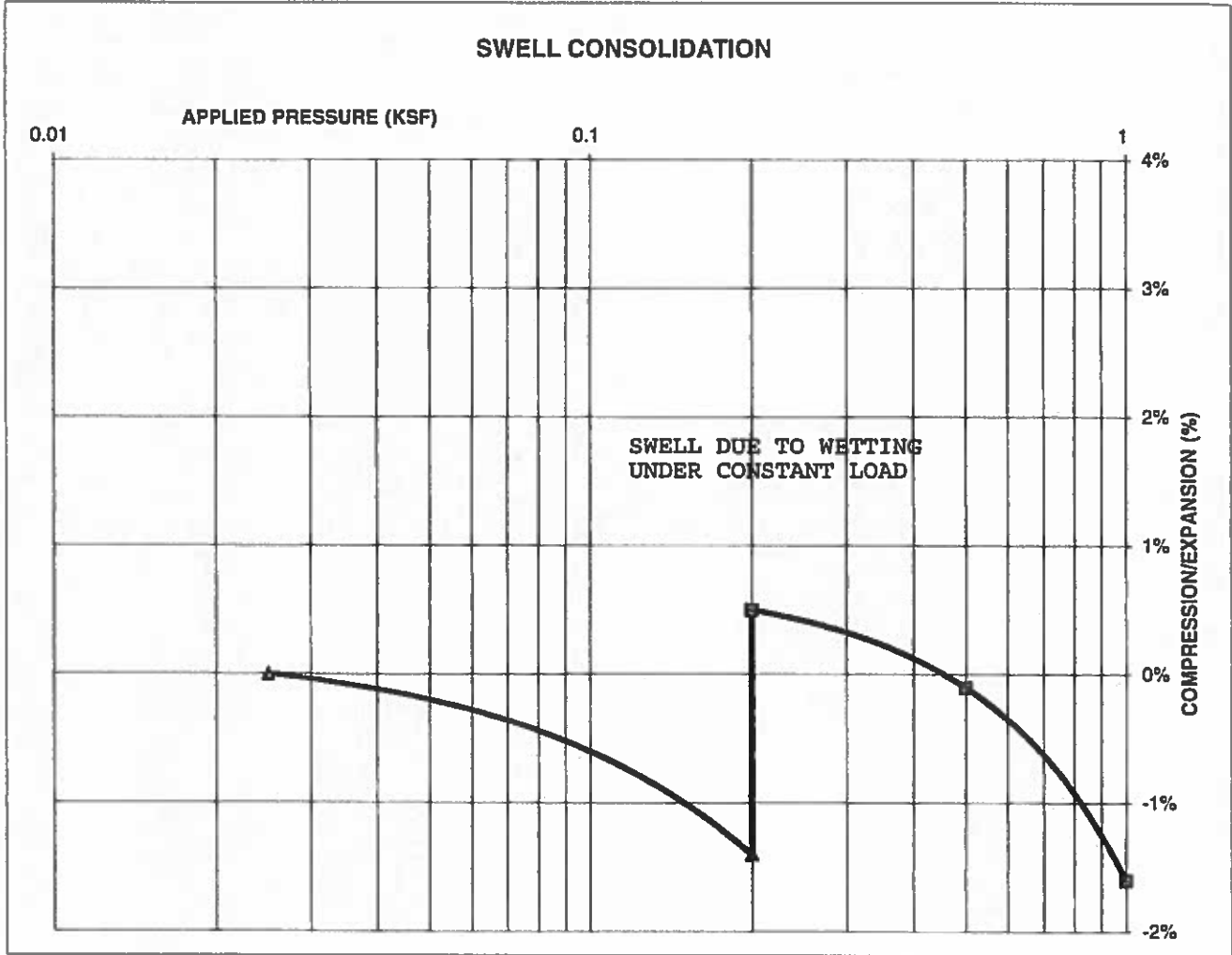
DRAWN:	DATE:	CHECKED:	DATE:
		JLL	2/19/18

JOB NO:
171671
FIG NO:
B-61

CONSOLIDATION TEST RESULTS

TEST BORING #	1	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			111
NATURAL MOISTURE CONTENT			15.5%
SWELL/CONSOLIDATION (%)			1.9%

JOB NO. 171671
CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

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DATE:

SCC

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171671

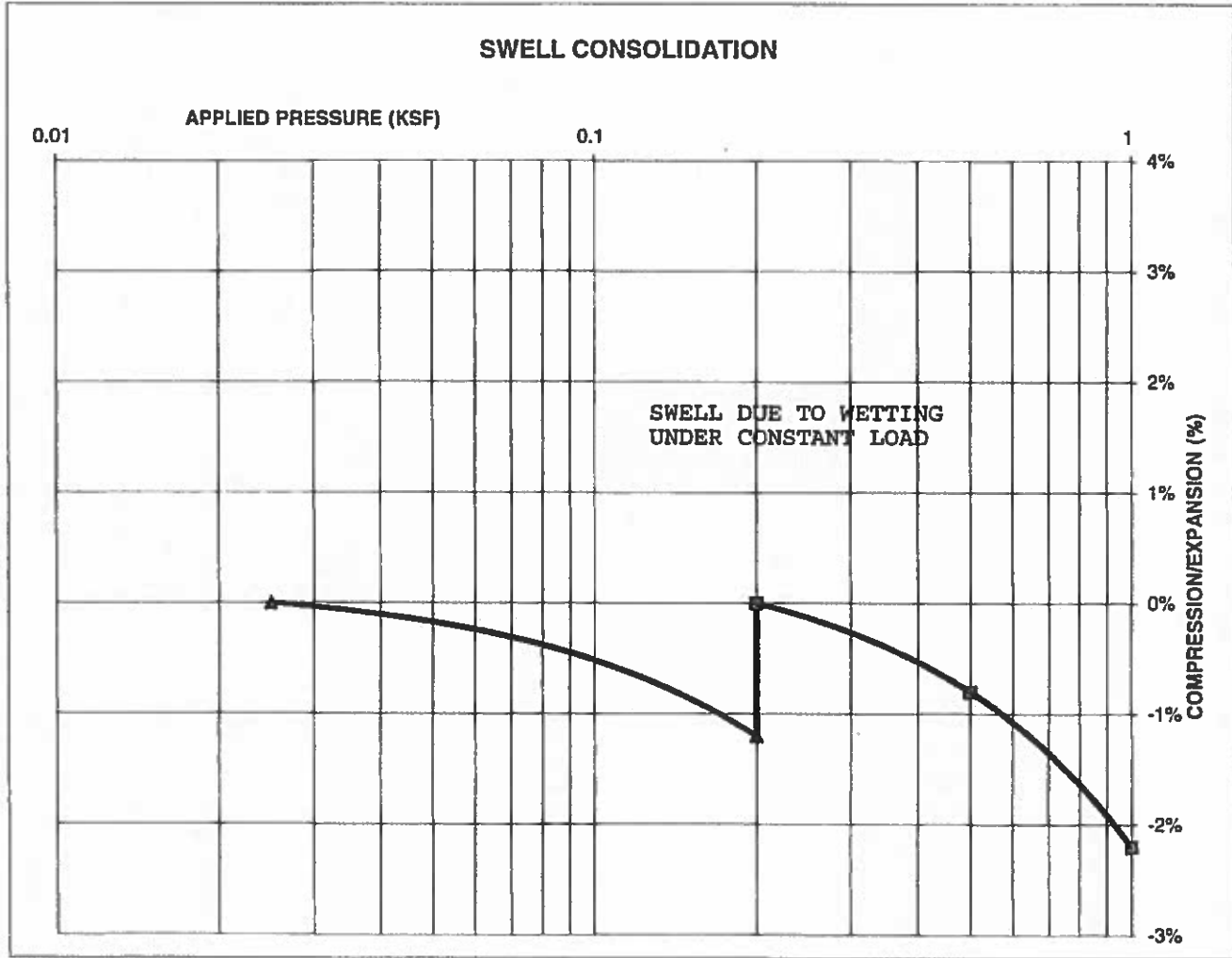
FIG NO.:

B-62

CONSOLIDATION TEST RESULTS

TEST BORING #	3	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			116
NATURAL MOISTURE CONTENT			12.7%
SWELL/CONSOLIDATION (%)			1.2%

JOB NO. 171671
CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

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DATE:

SCC

2/19/18

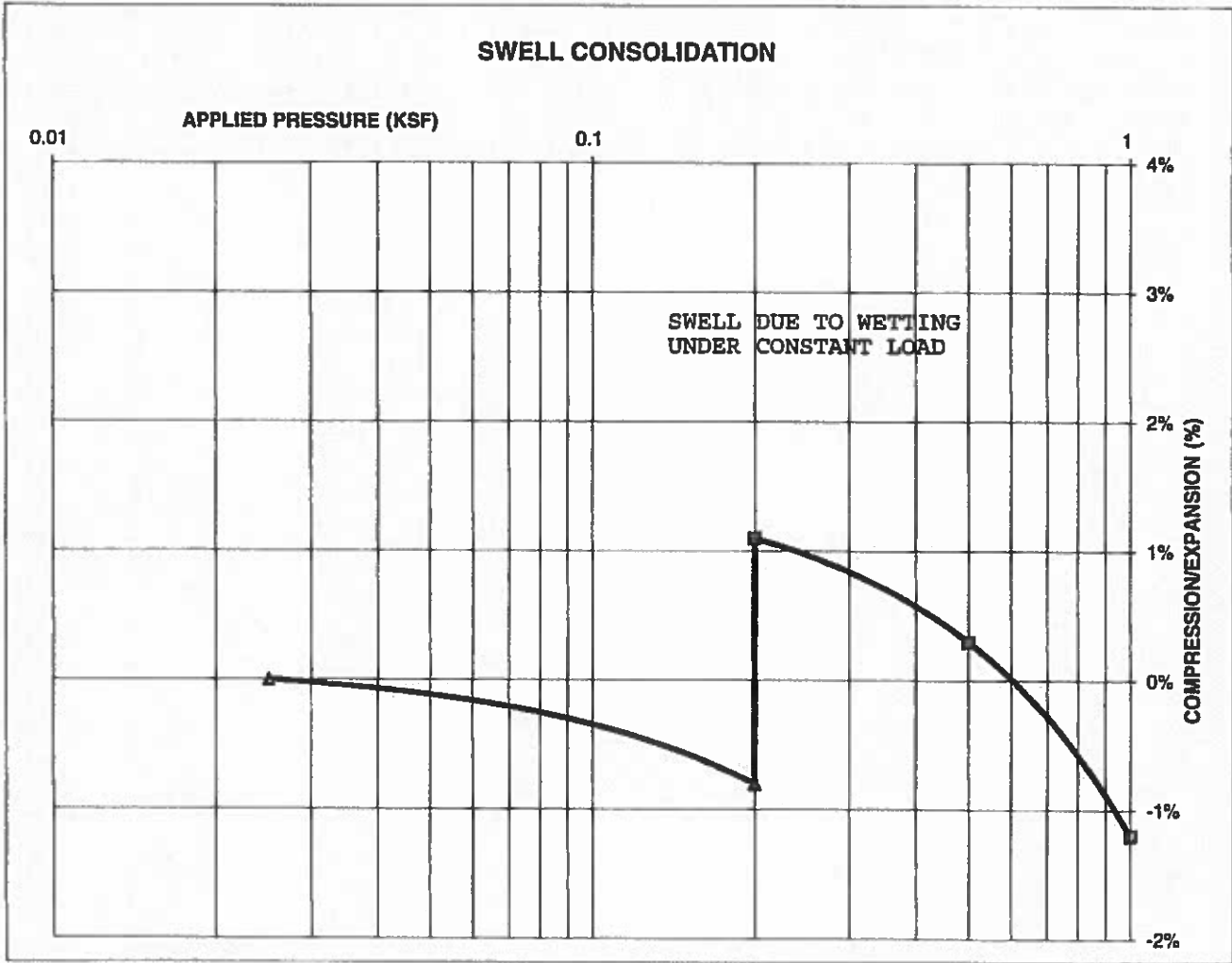
JOB NO.:
171671

FIG NO.:
B-63

CONSOLIDATION TEST RESULTS

TEST BORING #	7	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			117
NATURAL MOISTURE CONTENT			12.2%
SWELL/CONSOLIDATION (%)			1.9%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:	DATE:	CHECKED: <i>SCC</i>	DATE: <i>2/19/18</i>
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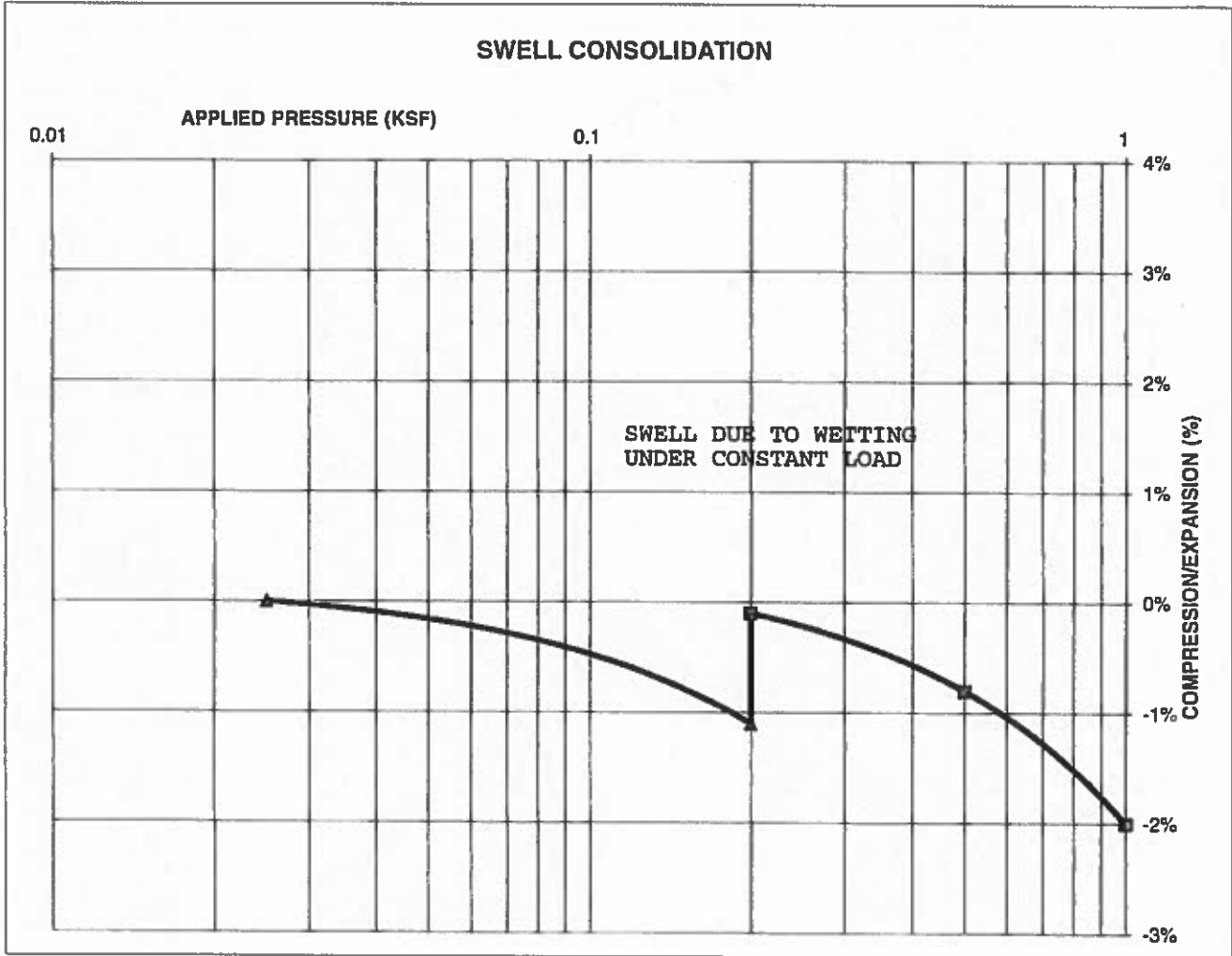
JOB NO.:
 171671

FIG NO.:
B-64

CONSOLIDATION TEST RESULTS

TEST BORING #	8	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			103
NATURAL MOISTURE CONTENT			17.9%
SWELL/CONSOLIDATION (%)			1.0%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:	DATE:	CHECKED: <i>SCC</i>	DATE: <i>2/19/18</i>
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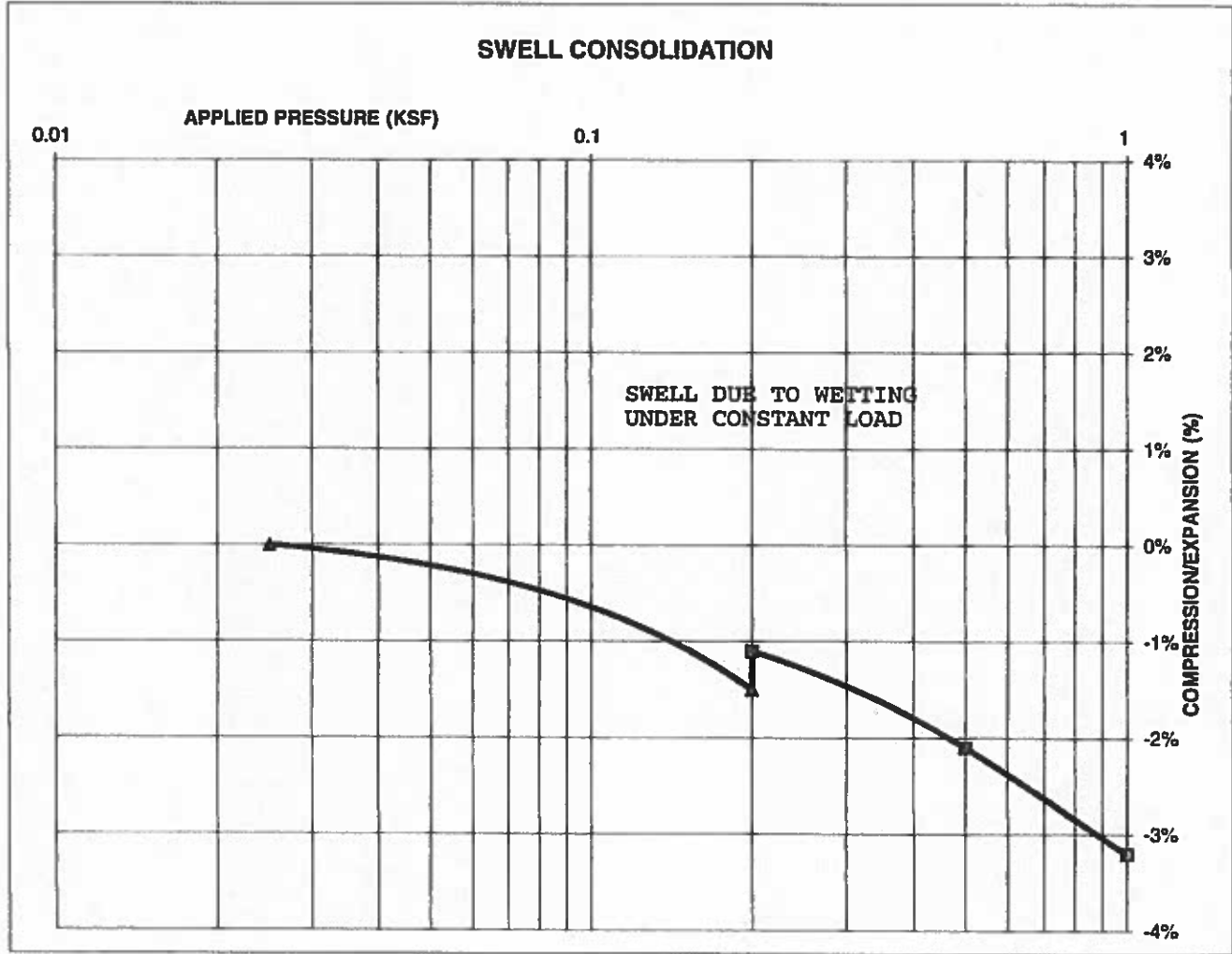
JOB NO:
171671

FIG NO:
B-65

CONSOLIDATION TEST RESULTS

TEST BORING #	10	DEPTH(ft)	0-3
DESCRIPTION	SC	SOIL TYPE	2, CBR #2
NATURAL UNIT DRY WEIGHT (PCF)	108		
NATURAL MOISTURE CONTENT	16.9%		
SWELL/CONSOLIDATION (%)	0.4%		

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

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DATE:
7/19/18

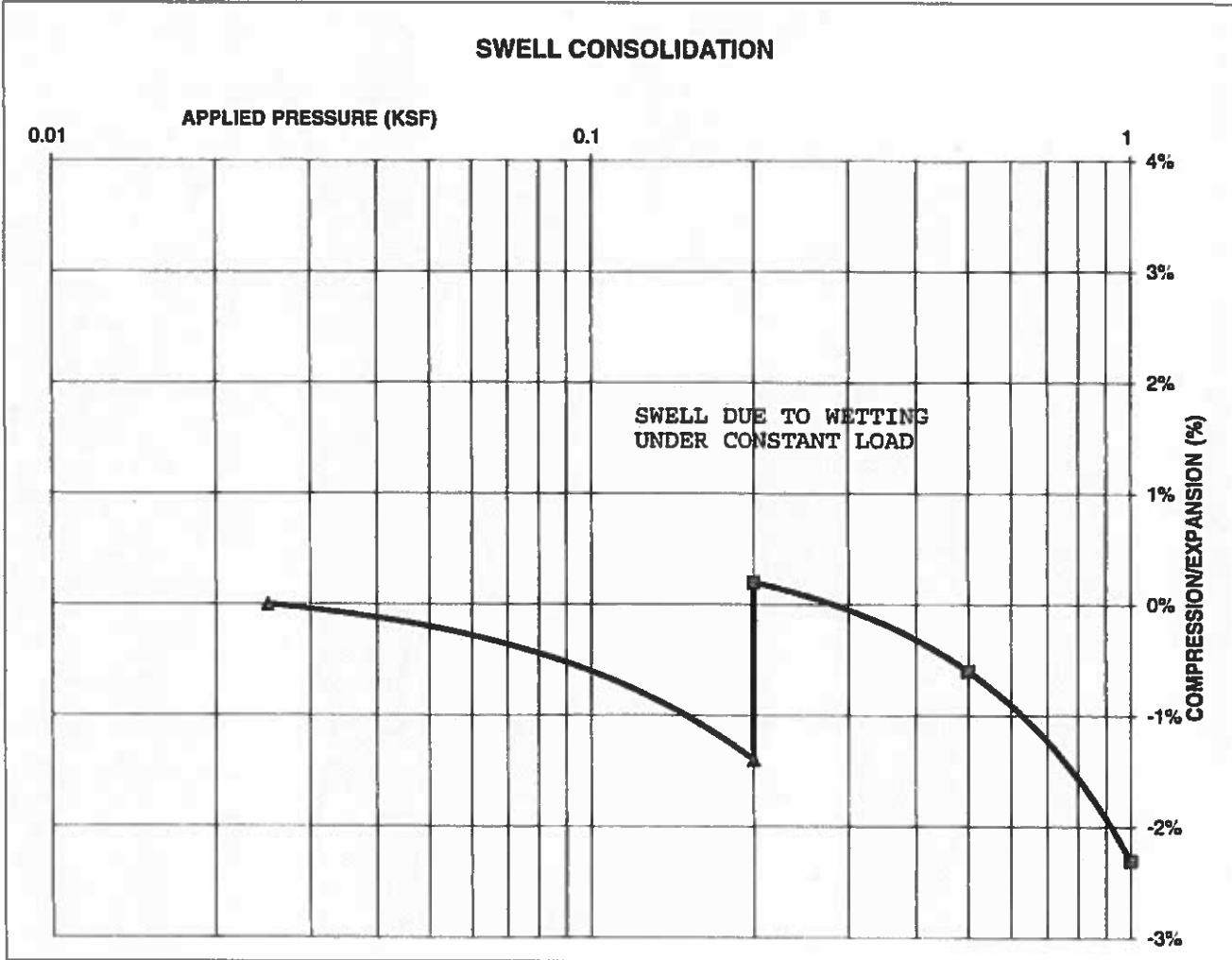
JOB NO.:
 171671

FIG NO.:
B-66

CONSOLIDATION TEST RESULTS

TEST BORING #	11	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			101
NATURAL MOISTURE CONTENT			15.9%
SWELL/CONSOLIDATION (%)			1.6%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE: 7/19/18

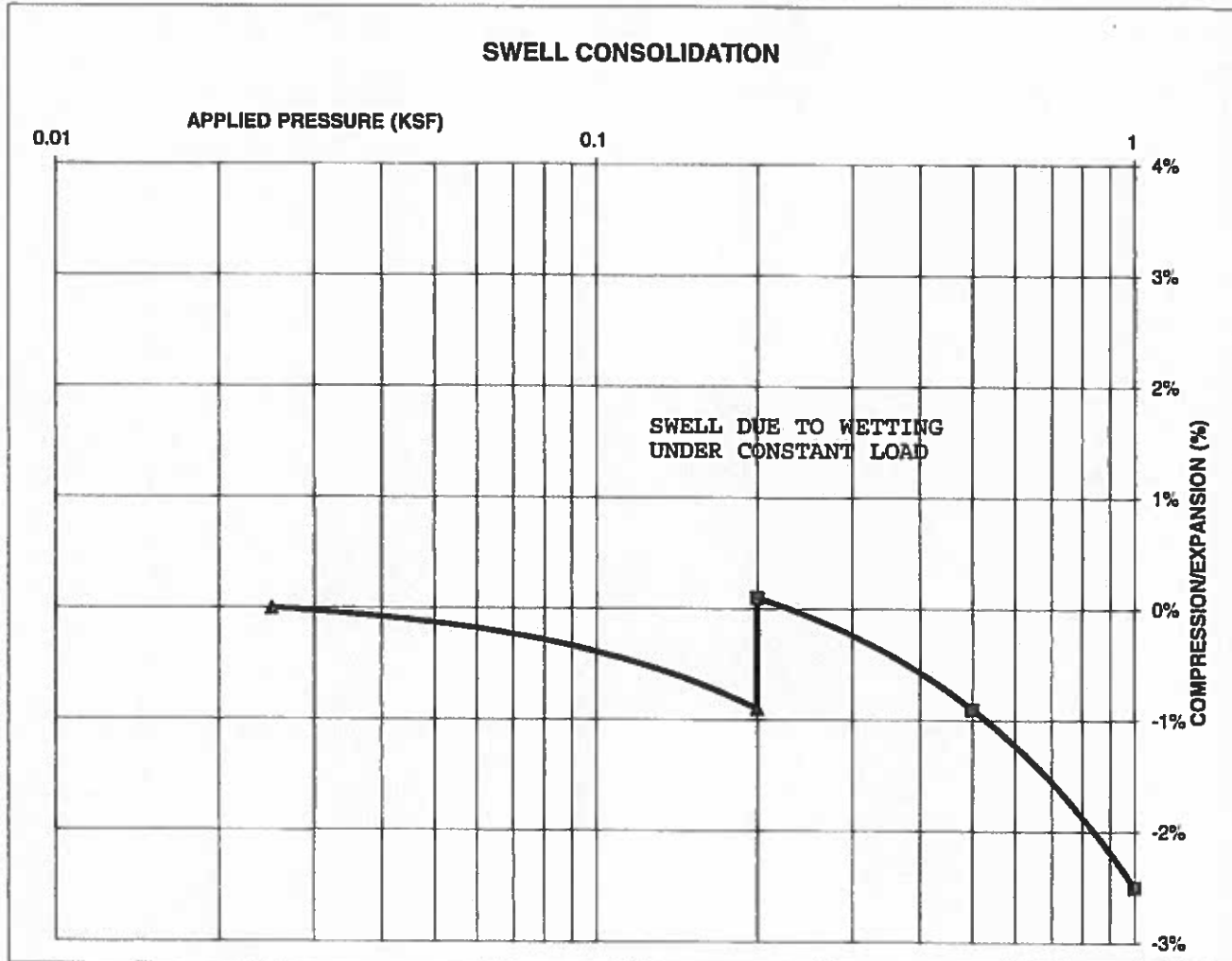
JOB NO.:
 171671

FIG NO.:
 B-67

CONSOLIDATION TEST RESULTS

TEST BORING #	12	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			106
NATURAL MOISTURE CONTENT			14.6%
SWELL/CONSOLIDATION (%)			1.0%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

CHECKED: *SCC*

DATE: *2/19/18*

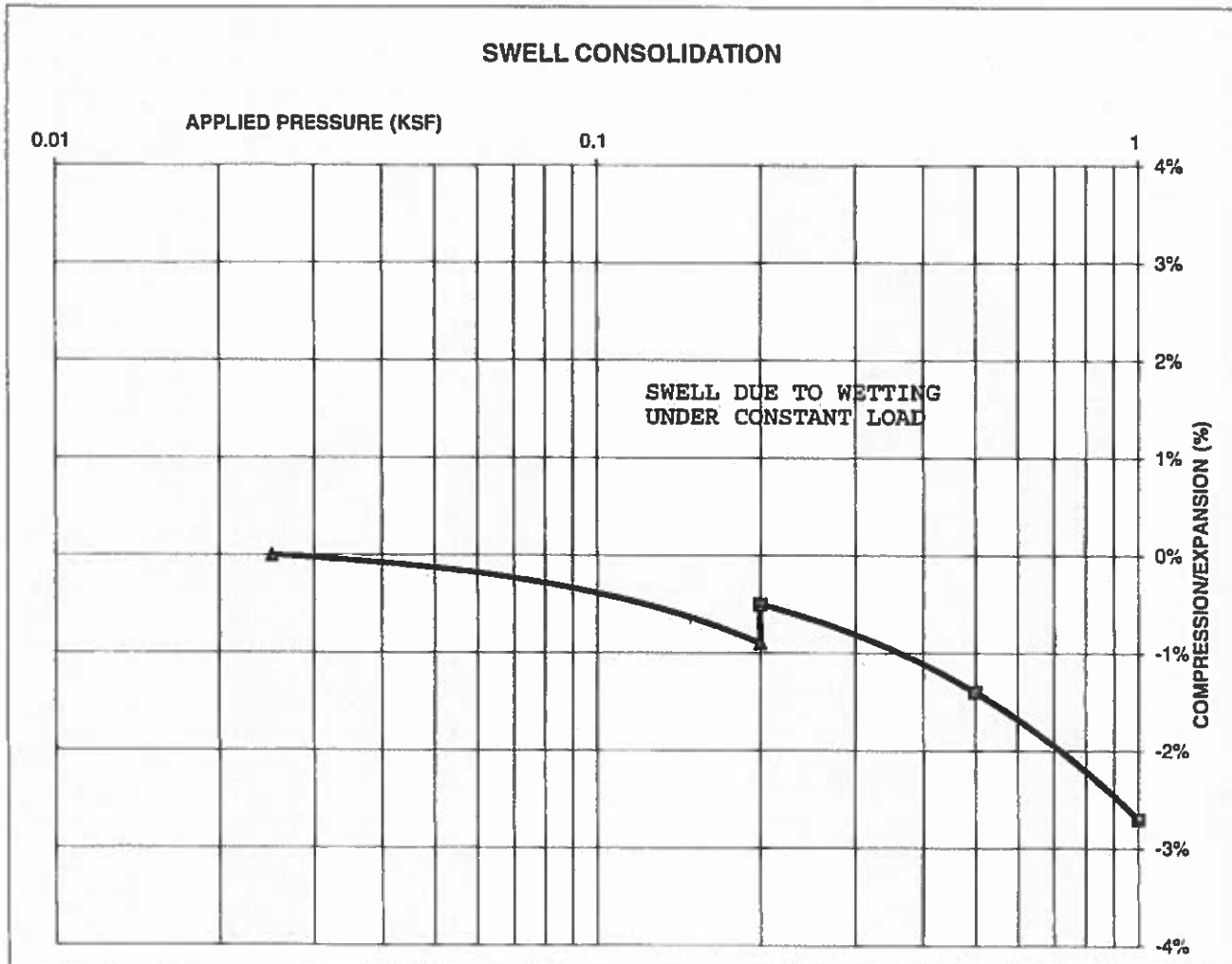
JOB NO:
 171671

FIG NO:
B-68

CONSOLIDATION TEST RESULTS

TEST BORING #	18	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			105
NATURAL MOISTURE CONTENT			12.1%
SWELL/CONSOLIDATION (%)			0.4%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

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DATE:
 2/19/18

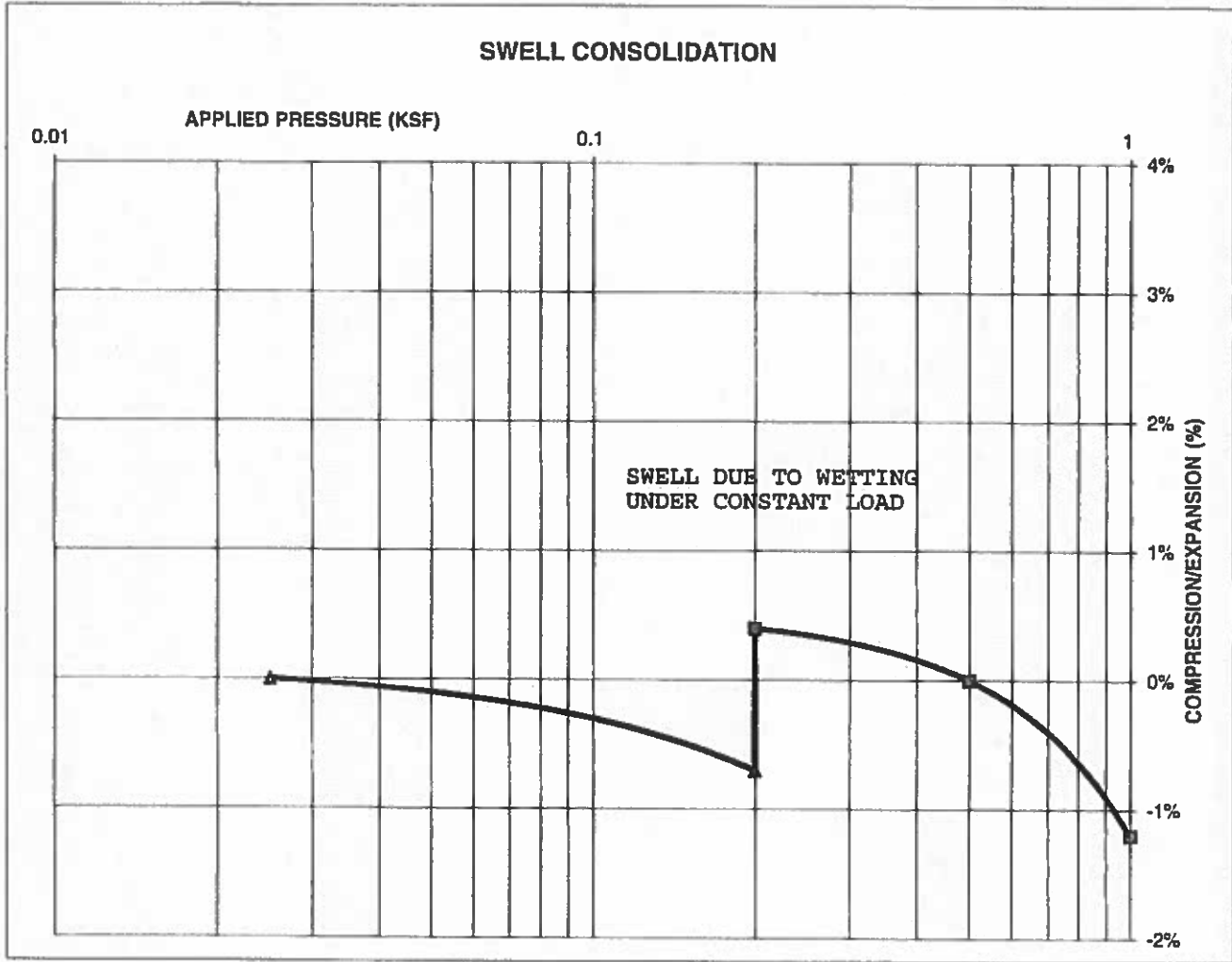
JOB NO.:
 171671

FIG NO.:
 B-69

CONSOLIDATION TEST RESULTS

TEST BORING #	23	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)	111		
NATURAL MOISTURE CONTENT	15.4%		
SWELL/CONSOLIDATION (%)	1.1%		

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE: 2/19/18

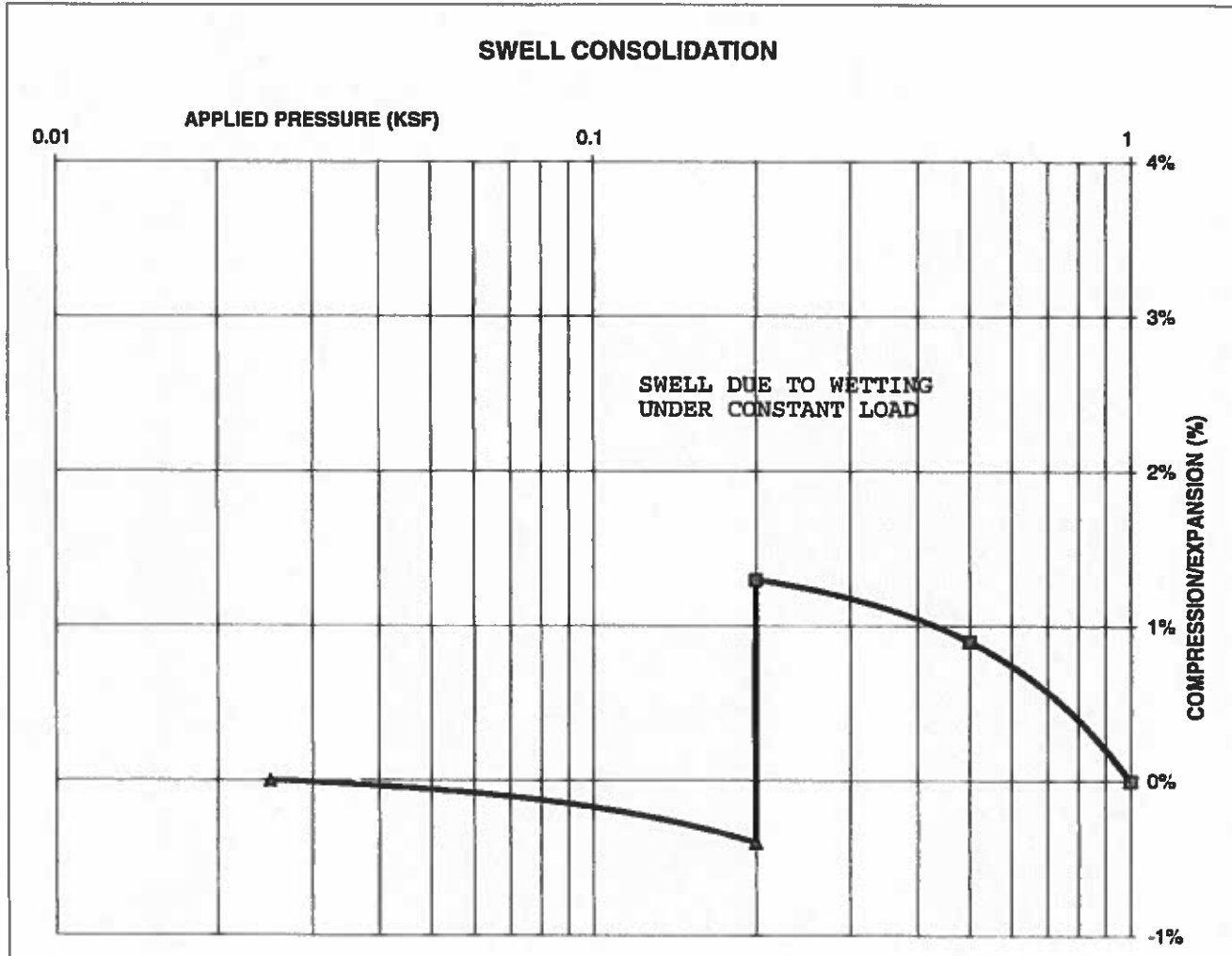
JOB NO.:
 171671

FIG NO.:
 B-70

CONSOLIDATION TEST RESULTS

TEST BORING #	24	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			115
NATURAL MOISTURE CONTENT			14.7%
SWELL/CONSOLIDATION (%)			1.7%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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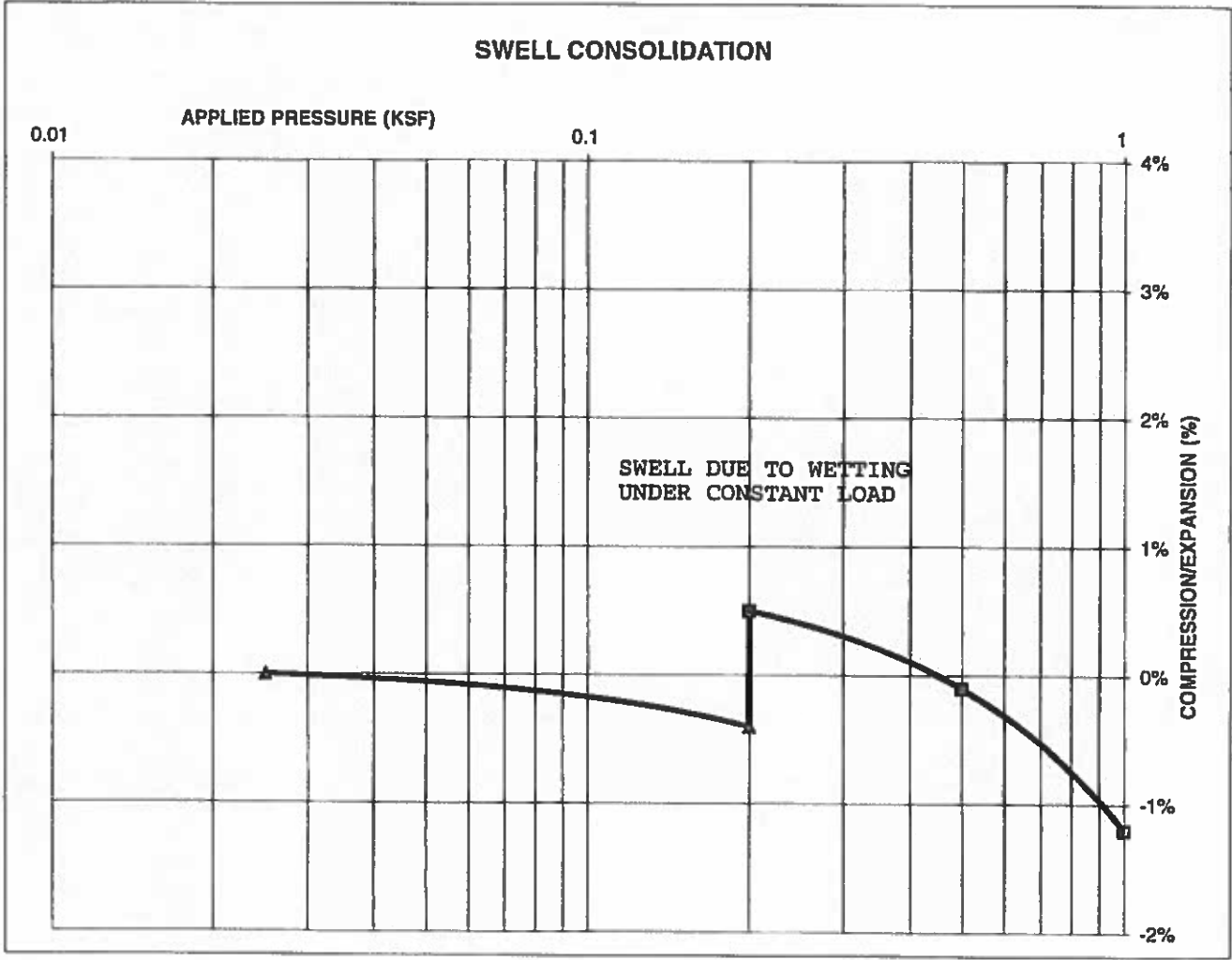
JOB NO.:
 171671

FIG NO.:
 B-71

CONSOLIDATION TEST RESULTS

TEST BORING #	36	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			121
NATURAL MOISTURE CONTENT			5.7%
SWELL/CONSOLIDATION (%)			0.9%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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171671

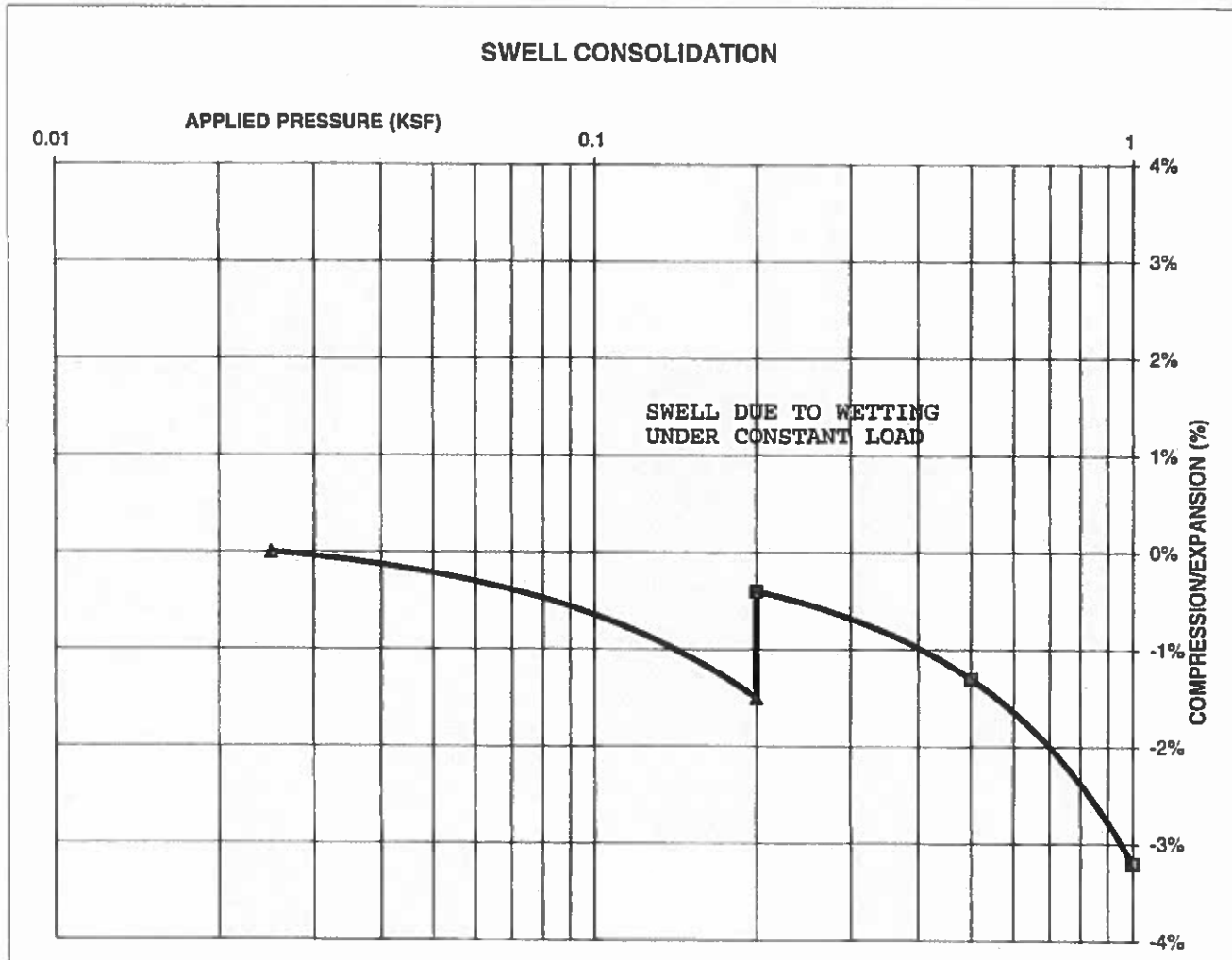
FIG NO.:

B-72

CONSOLIDATION TEST RESULTS

TEST BORING #	10	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			111
NATURAL MOISTURE CONTENT			16.9%
SWELL/CONSOLIDATION (%)			1.1%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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

**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:	DATE:	CHECKED: <i>SLC</i>	DATE: <i>7/19/18</i>
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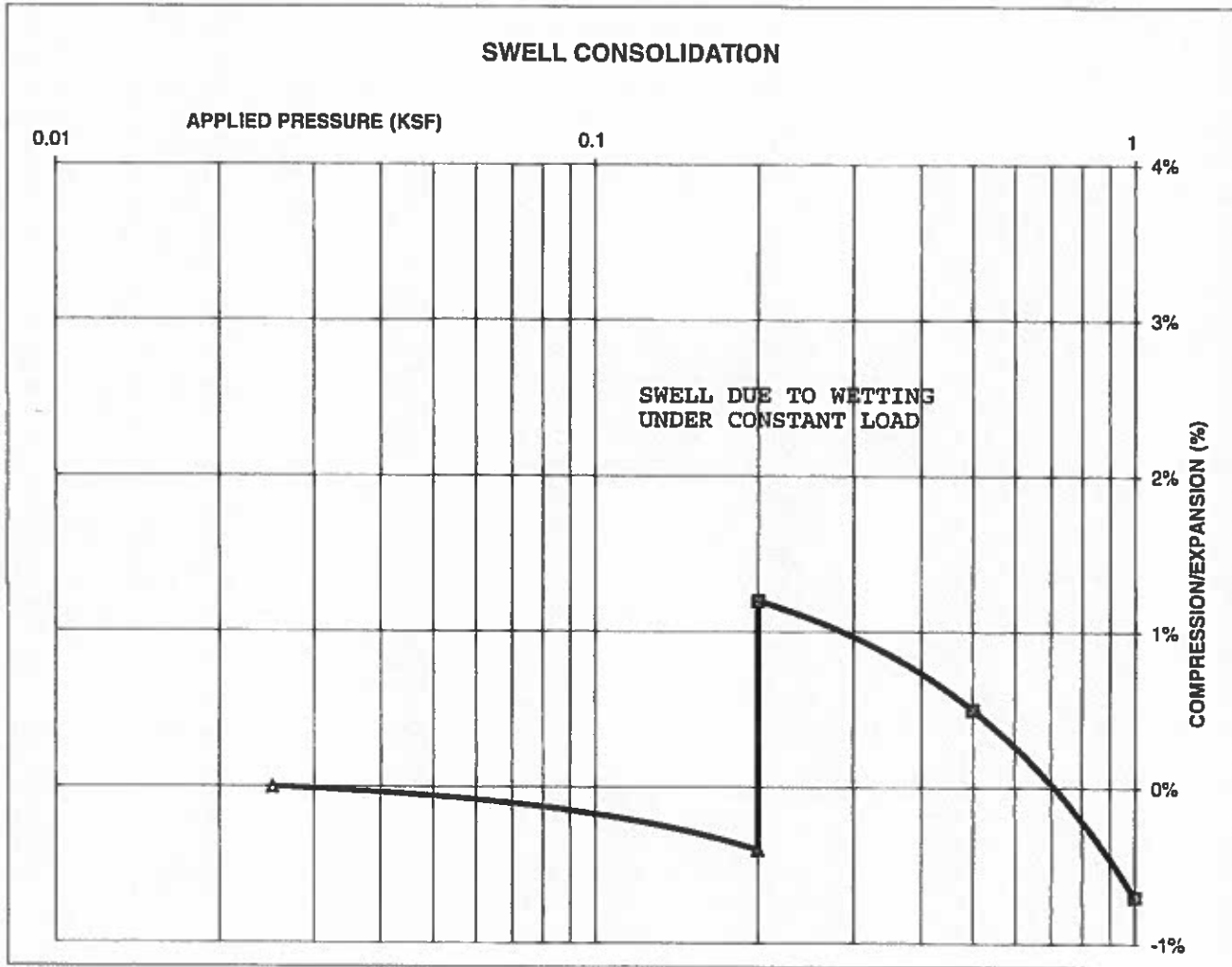
JOB NO.:
 171671

FIG NO.:
B-13

CONSOLIDATION TEST RESULTS

TEST BORING #	15	DEPTH(ft)	0-3
DESCRIPTION	SC	SOIL TYPE	3, CBR #3
NATURAL UNIT DRY WEIGHT (PCF)			115
NATURAL MOISTURE CONTENT			15.3%
SWELL/CONSOLIDATION (%)			1.6%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

CHECKED:

DATE:

SEC

2/19/18

JOB NO.:

171671

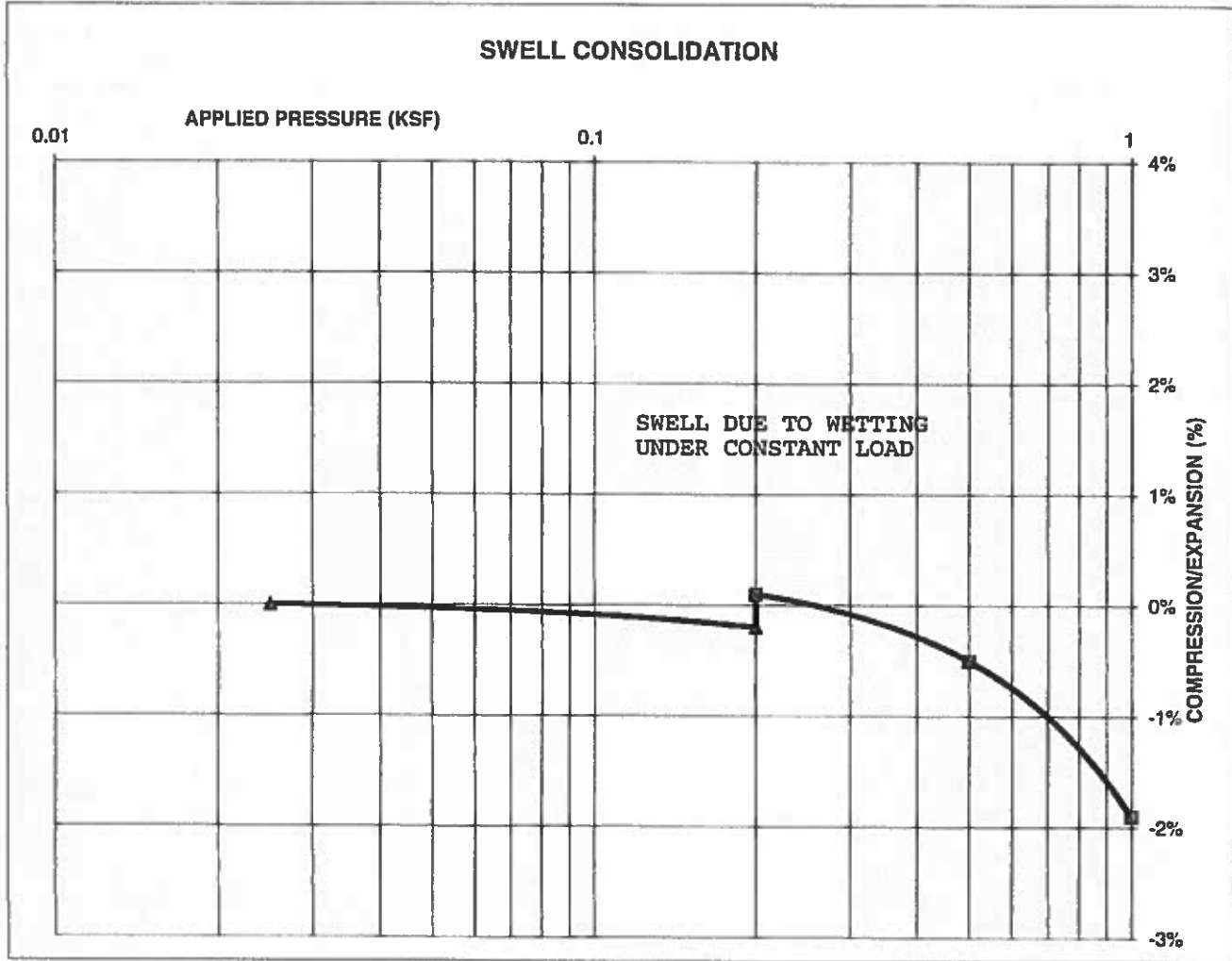
FIG NO.:

B-74

CONSOLIDATION TEST RESULTS

TEST BORING #	22	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			107
NATURAL MOISTURE CONTENT			10.8%
SWELL/CONSOLIDATION (%)			0.3%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



ENTECH
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SWELL CONSOLIDATION TEST RESULTS

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DATE:

CHECKED: *SCC*

DATE: *2/19/18*

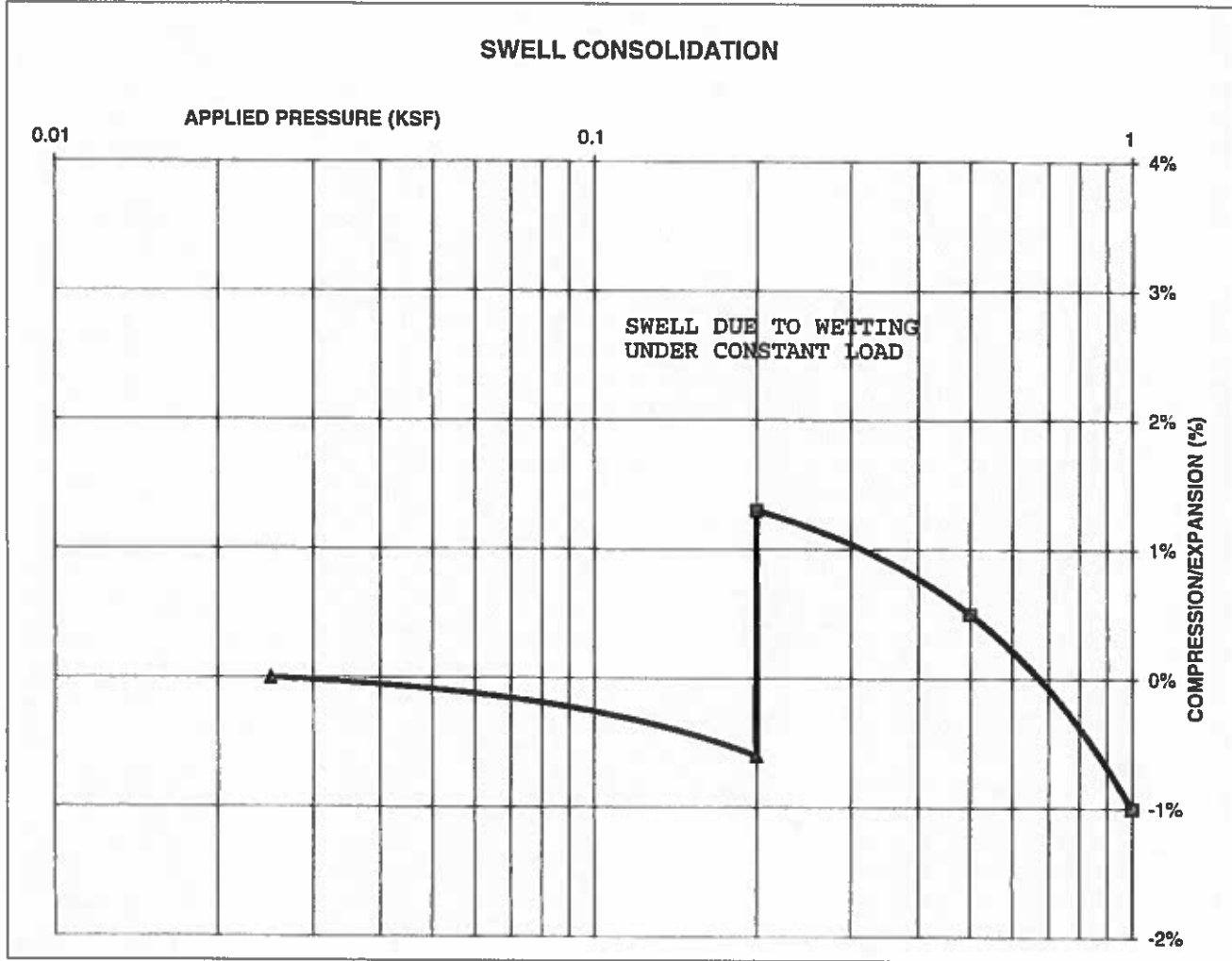
JOB NO:
171671

FIG NO:
B-75

CONSOLIDATION TEST RESULTS

TEST BORING #	25	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			140
NATURAL MOISTURE CONTENT			8.1%
SWELL/CONSOLIDATION (%)			1.9%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



ENTECH
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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

CHECKED: *SEC*

DATE: *2/19/18*

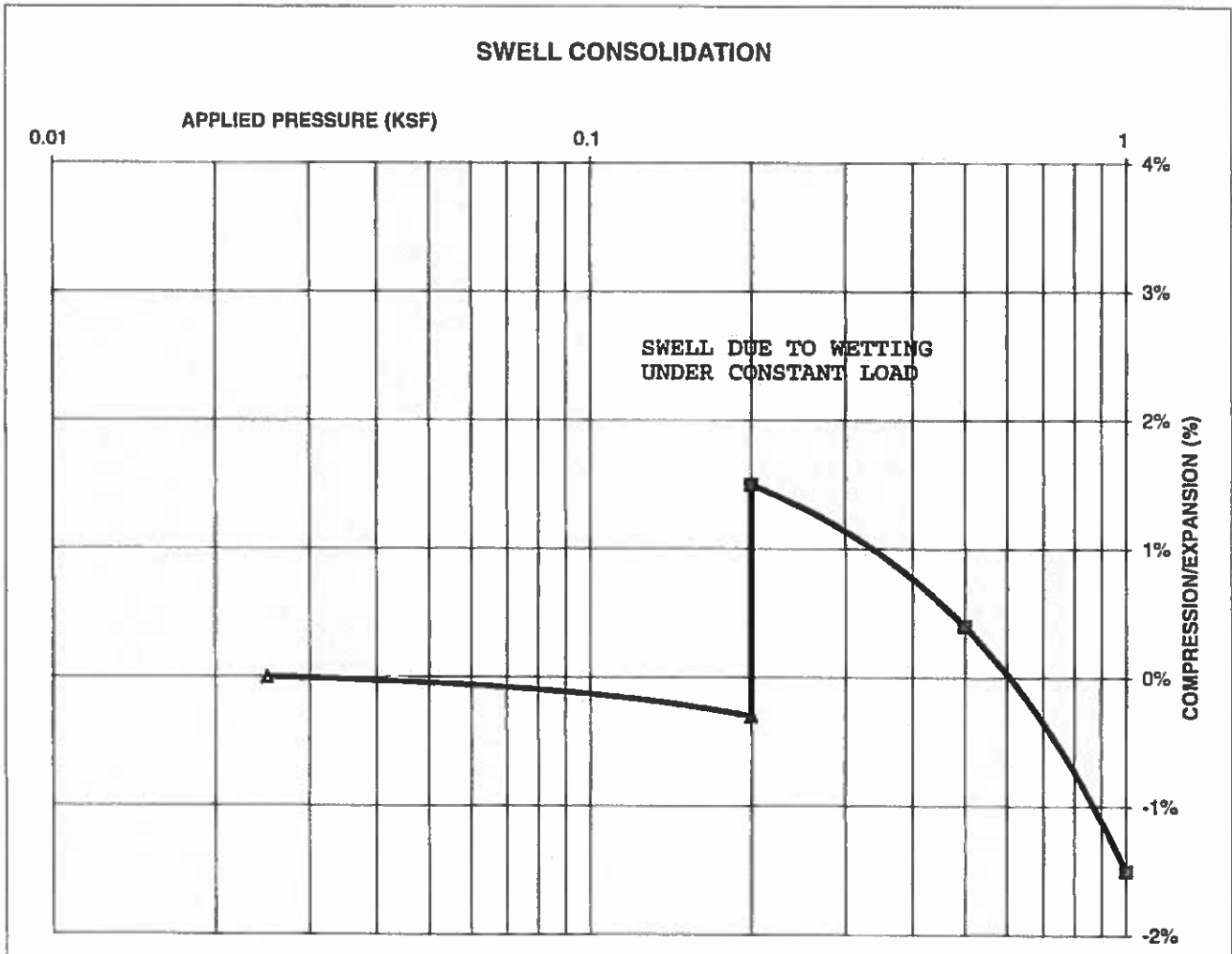
JOB NO.:
 171671

FIG NO.:
 B-76

CONSOLIDATION TEST RESULTS

TEST BORING #	26	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			113
NATURAL MOISTURE CONTENT			11.8%
SWELL/CONSOLIDATION (%)			1.8%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

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DATE: 2/19/18

SCC

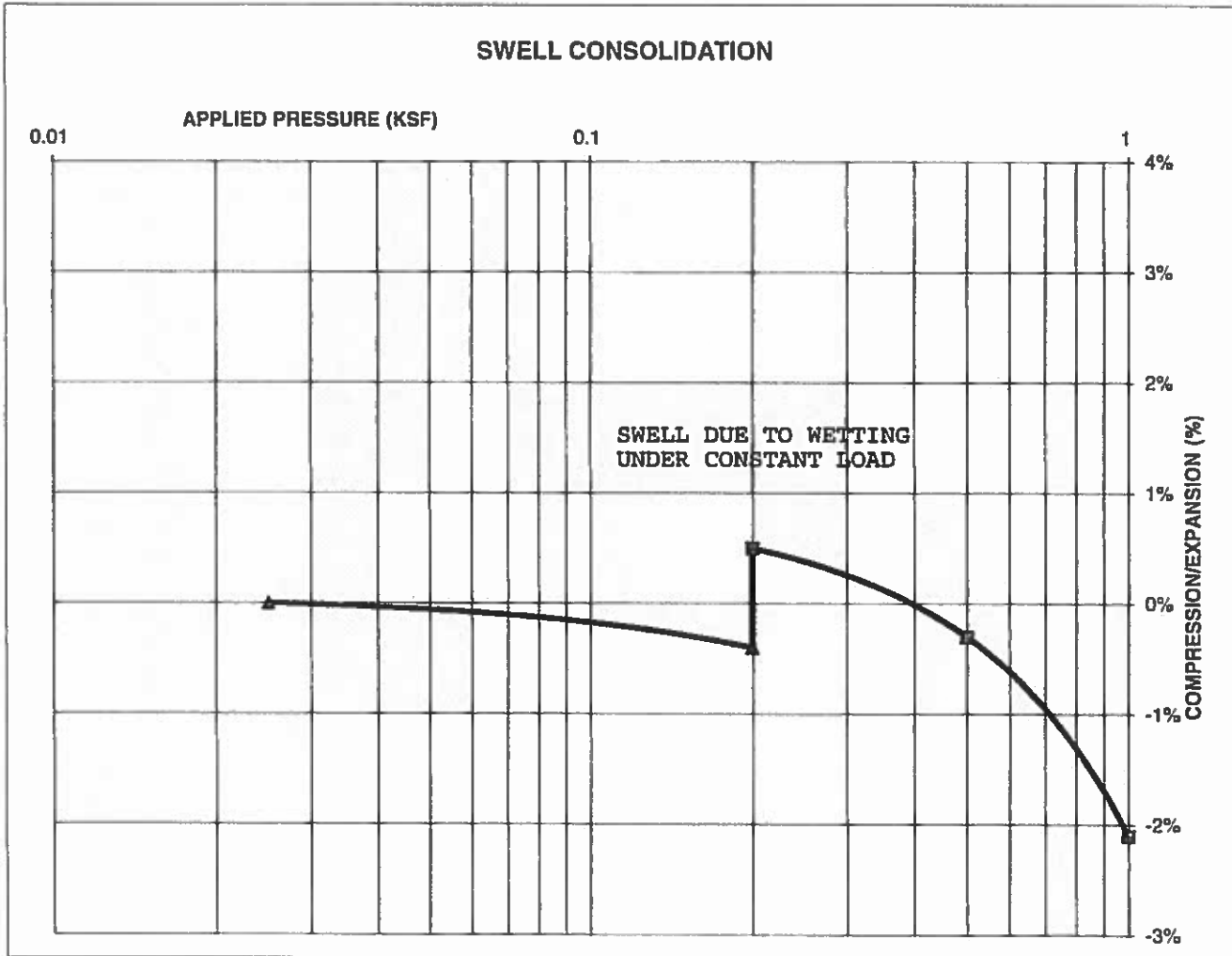
JOB NO:
 171671

FIG NO:
 B-77

CONSOLIDATION TEST RESULTS

TEST BORING #	27	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			108
NATURAL MOISTURE CONTENT			9.3%
SWELL/CONSOLIDATION (%)			0.9%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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505 ELKTON DRIVE
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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

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DATE: 2/19/18

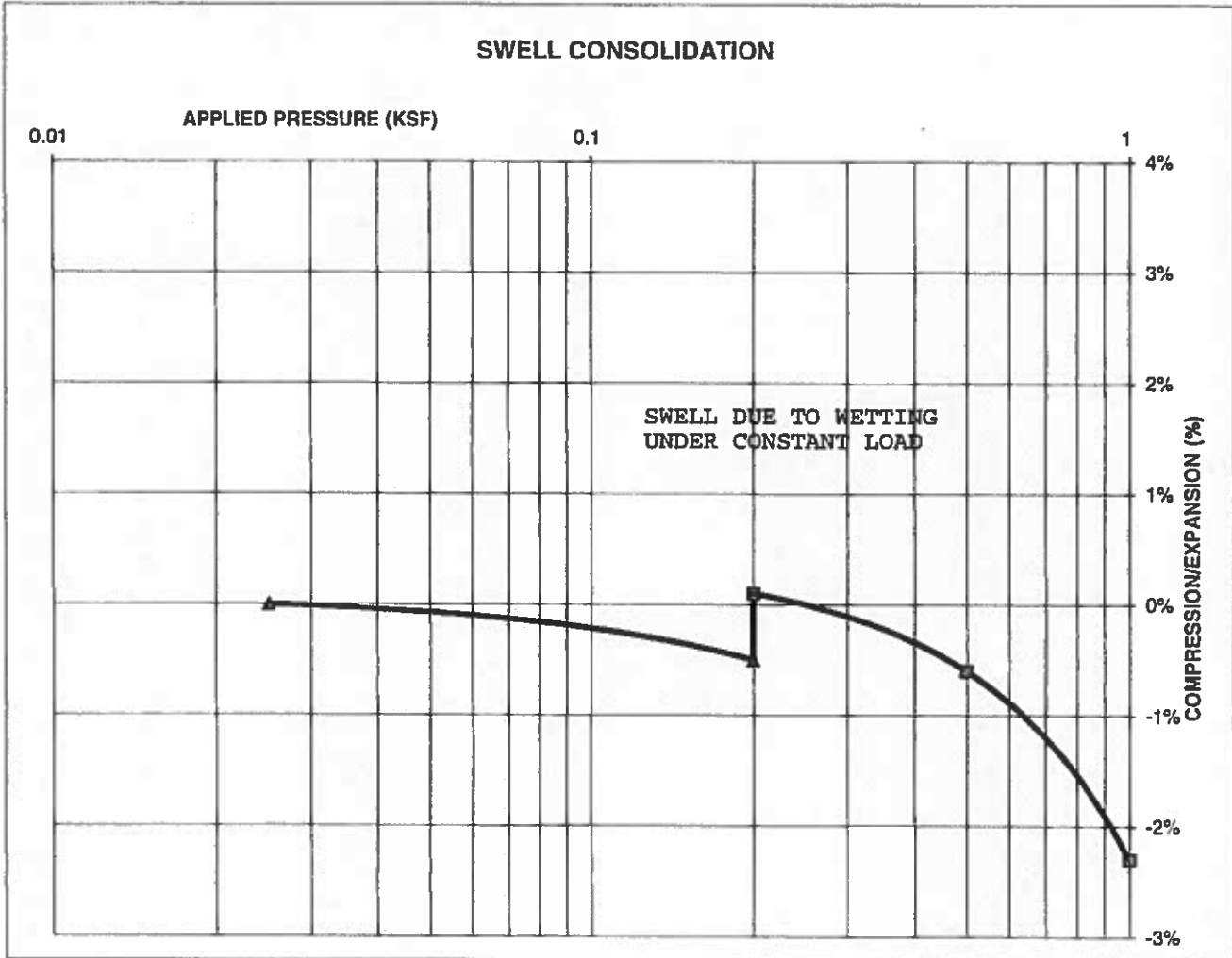
JOB NO.:
 171671

FIG NO.:
 B-78

CONSOLIDATION TEST RESULTS

TEST BORING #	28	DEPTH(ft)	1-2
DESCRIPTION	SC-SM	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)	118		
NATURAL MOISTURE CONTENT	8.7%		
SWELL/CONSOLIDATION (%)	0.6%		

JOB NO. 171671
CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1



ENTECH
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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

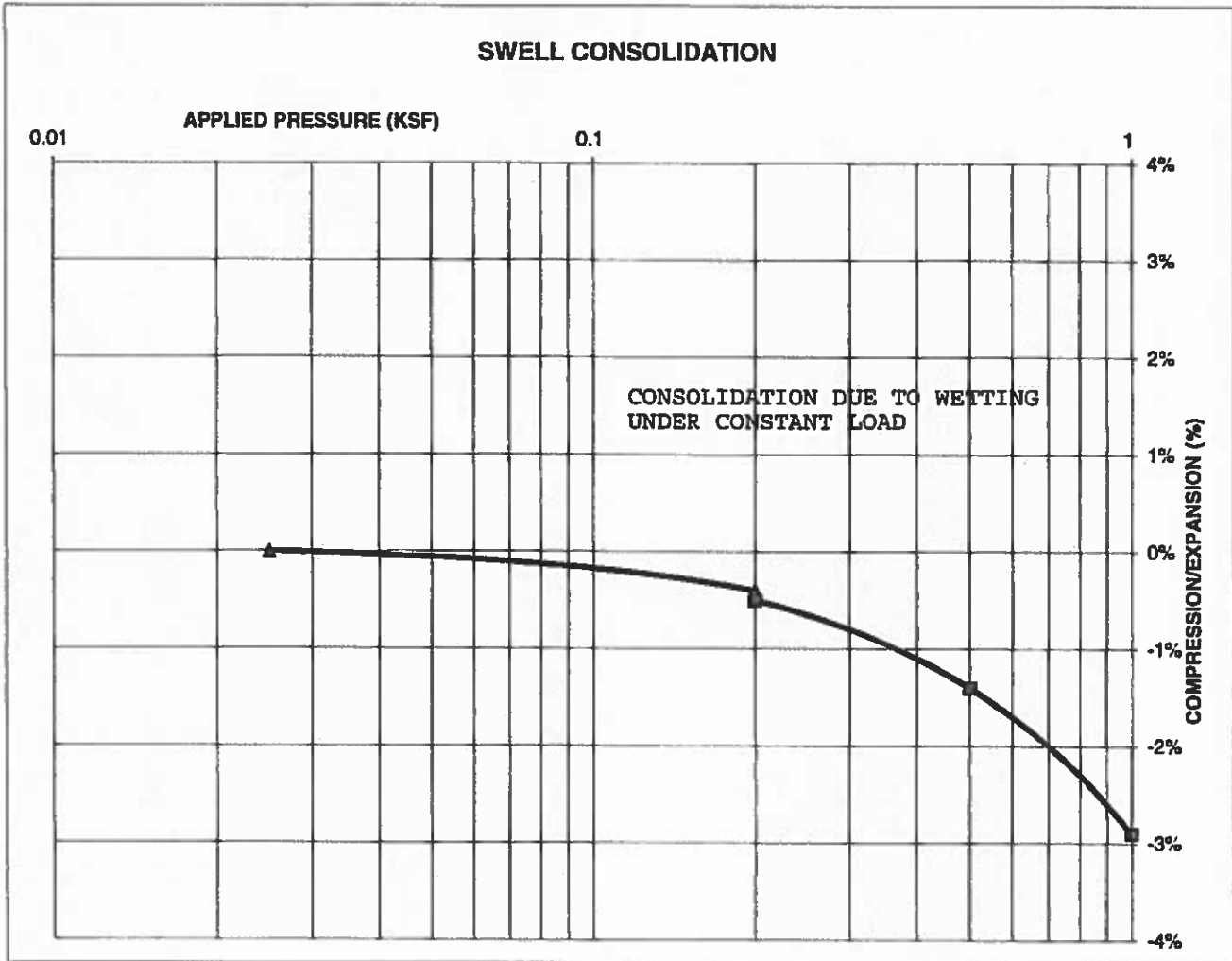
JOB NO.:
 171671

FIG NO.:
 B-79

CONSOLIDATION TEST RESULTS

TEST BORING #	28	DEPTH(ft)	5
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)	117		
NATURAL MOISTURE CONTENT	8.8%		
SWELL/CONSOLIDATION (%)	-0.1%		

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

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DATE: 2/19/18

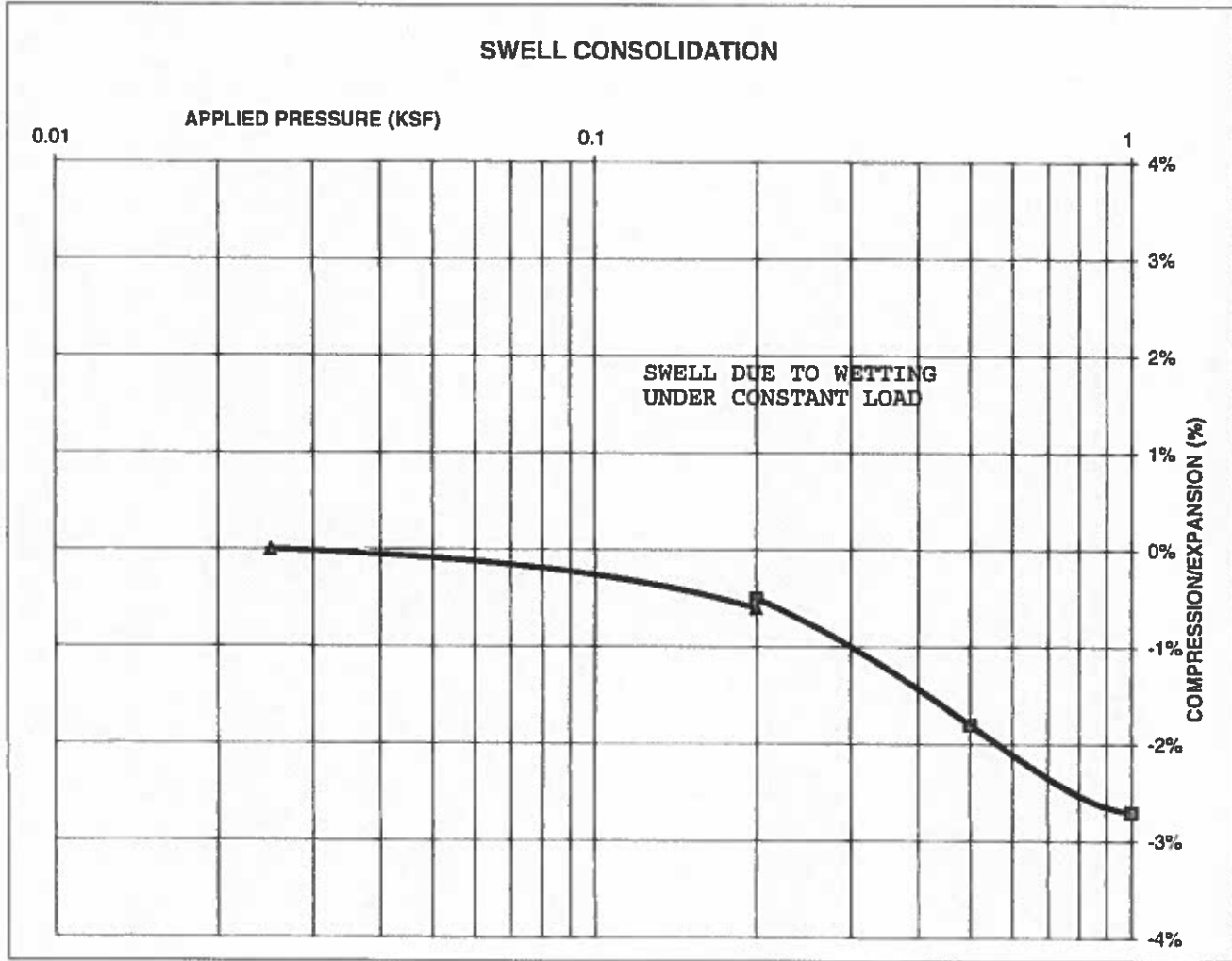
JOB NO.:
 171671

FIG NO.:
 B-80

CONSOLIDATION TEST RESULTS

TEST BORING #	29	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			119
NATURAL MOISTURE CONTENT			11.2%
SWELL/CONSOLIDATION (%)			0.1%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

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DATE: 2/19/18

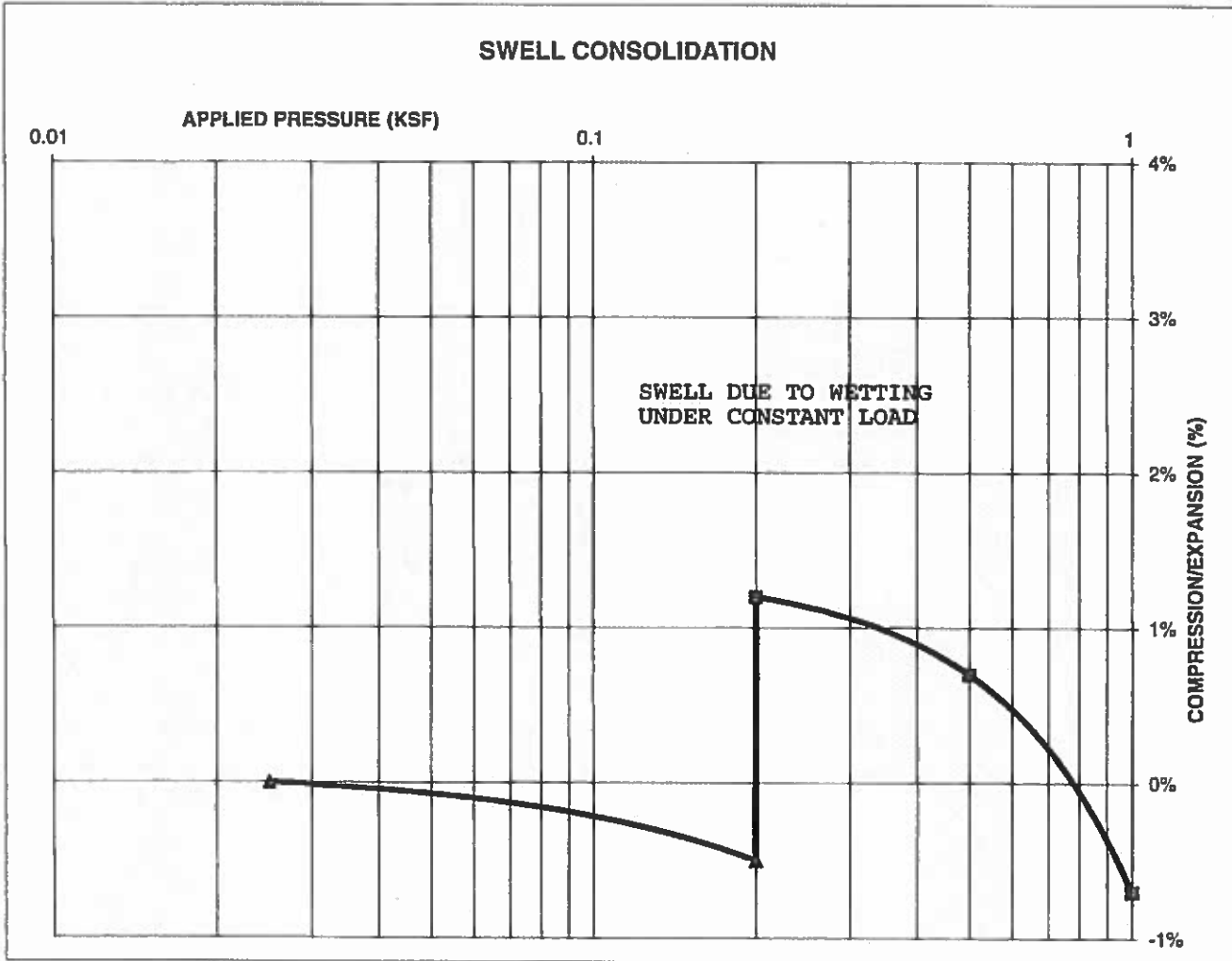
JOB NO:
 171671

FIG NO:
 B-81

CONSOLIDATION TEST RESULTS

TEST BORING #	29	DEPTH(ft)	5
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			110
NATURAL MOISTURE CONTENT			17.2%
SWELL/CONSOLIDATION (%)			1.7%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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505 ELKTON DRIVE
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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

SLC

2/19/18

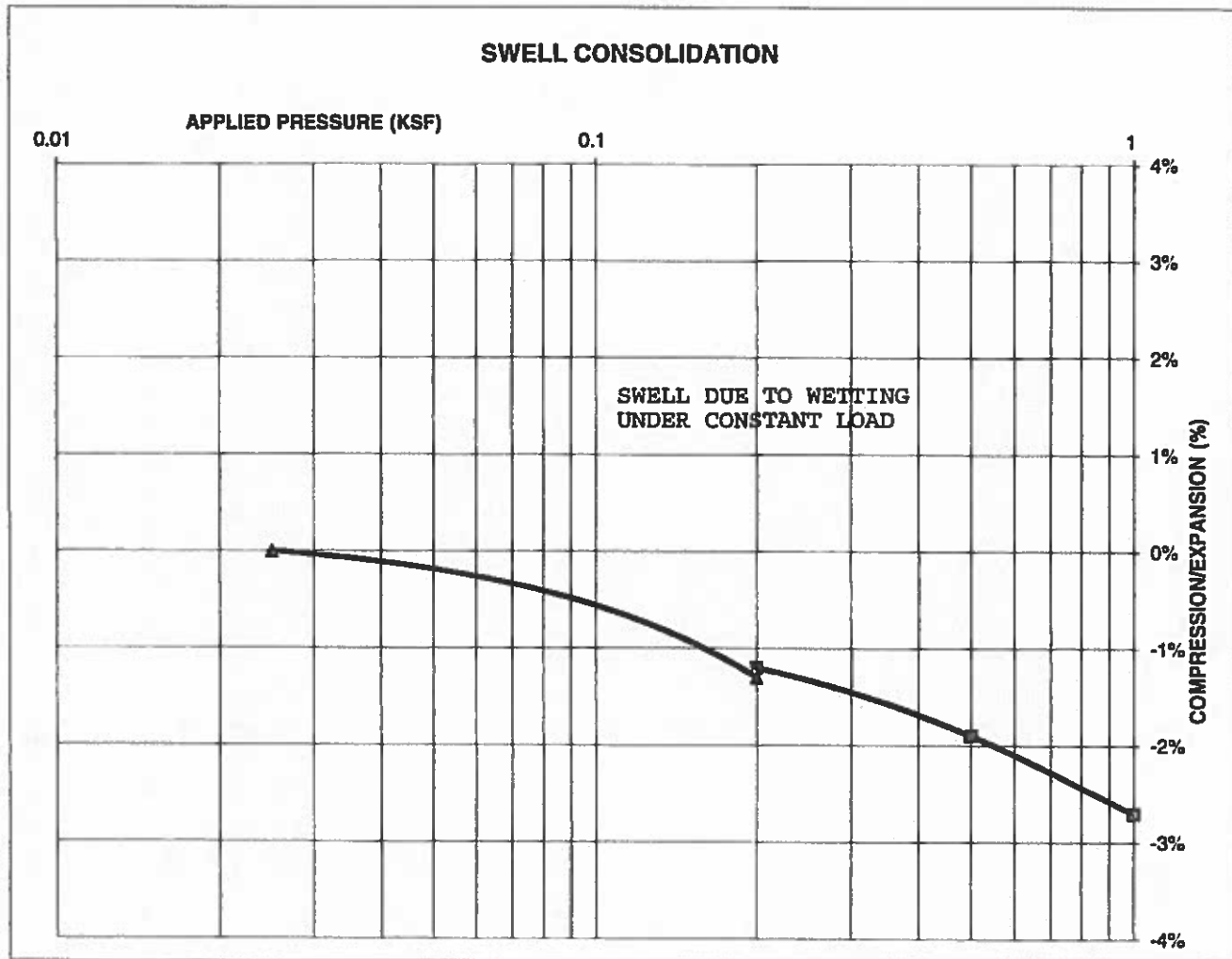
JOB NO.:
 171671

FIG NO.:
 B-82

CONSOLIDATION TEST RESULTS

TEST BORING #	30	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			114
NATURAL MOISTURE CONTENT			7.5%
SWELL/CONSOLIDATION (%)			0.1%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

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DATE: 2/19/18

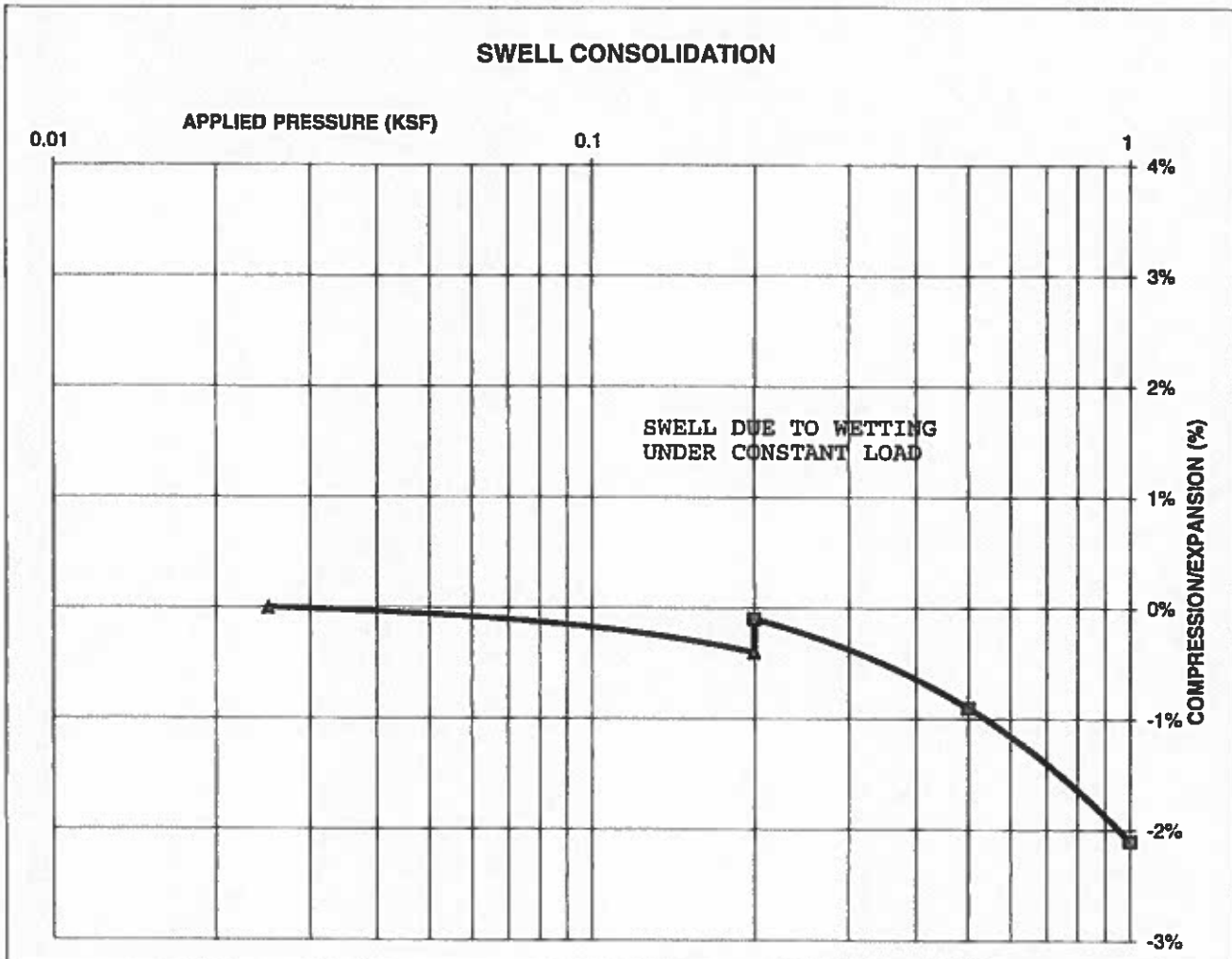
JOB NO.:
 171671

FIG NO.:
 B-83

CONSOLIDATION TEST RESULTS

TEST BORING #	32	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			112
NATURAL MOISTURE CONTENT			10.7%
SWELL/CONSOLIDATION (%)			0.3%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

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DATE: 2/19/18

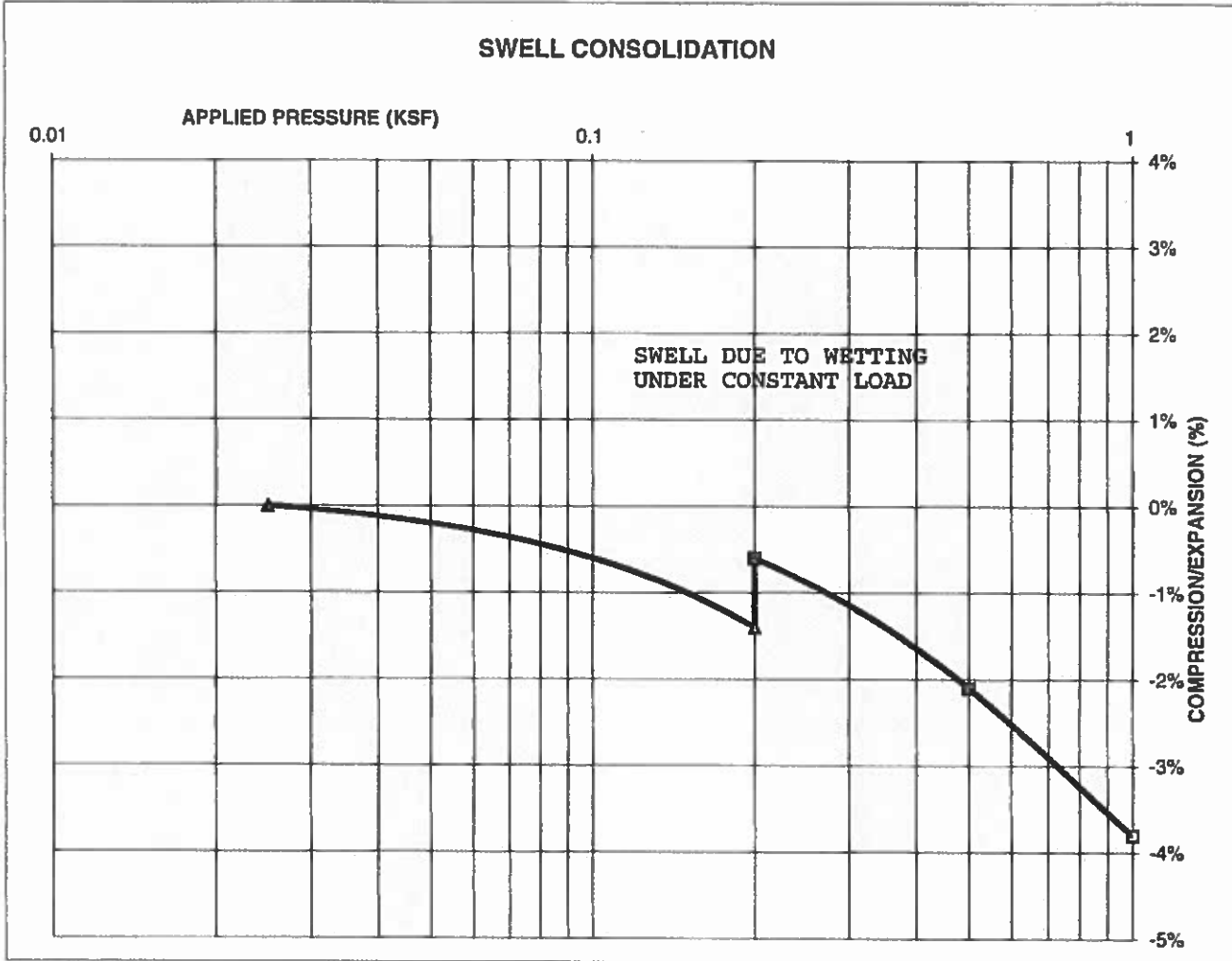
JOB NO.:
 171671

FIG NO.:
 B-84

CONSOLIDATION TEST RESULTS

TEST BORING #	33	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			105
NATURAL MOISTURE CONTENT			14.4%
SWELL/CONSOLIDATION (%)			0.8%

JOB NO. 171671
CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

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DATE: 2/19/18

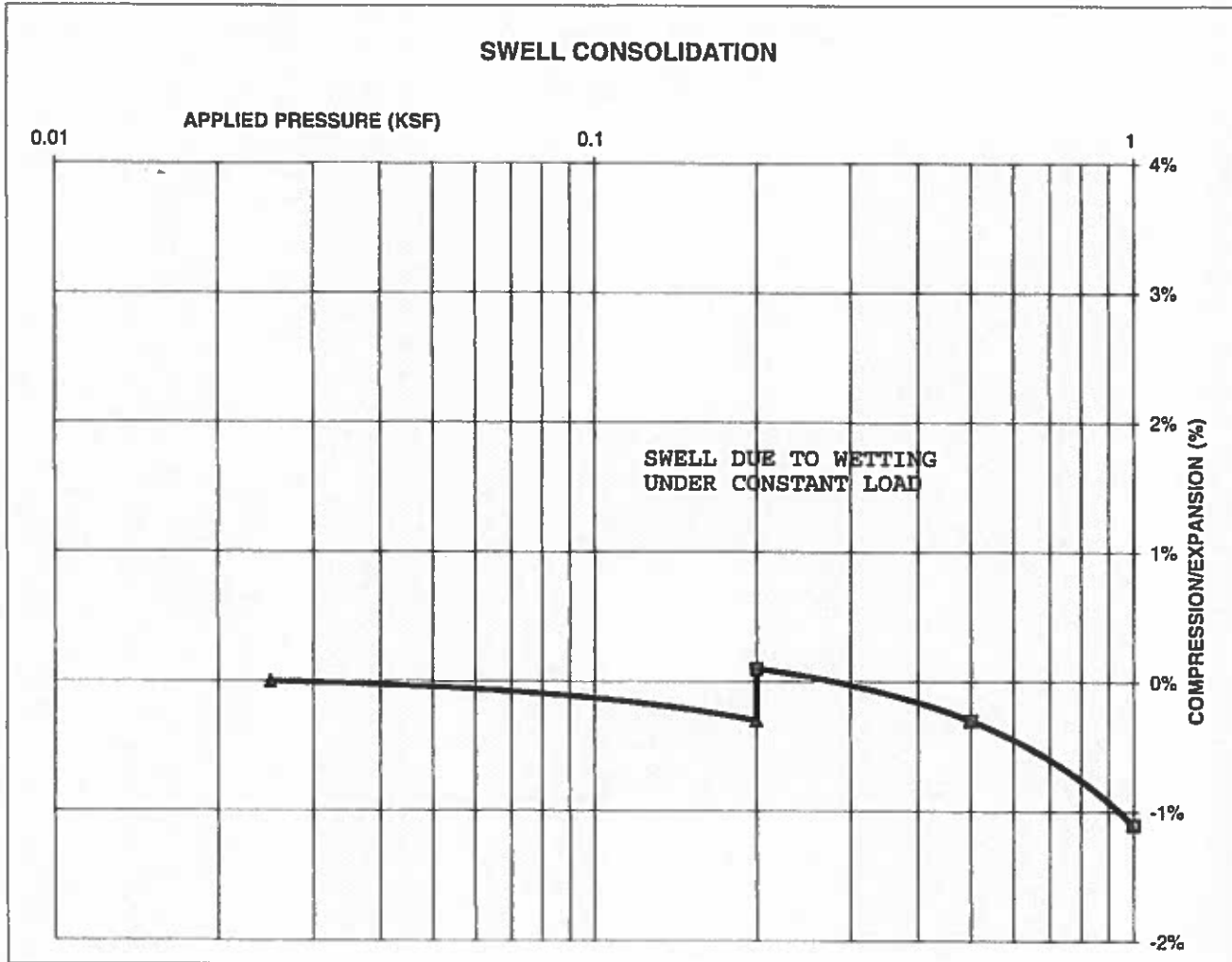
JOB NO:
171671

FIG NO:
B-85

CONSOLIDATION TEST RESULTS

TEST BORING #	34	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)	114		
NATURAL MOISTURE CONTENT	7.6%		
SWELL/CONSOLIDATION (%)	0.4%		

JOB NO. 171671
CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

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DATE:

2/19/18

JOB NO.:

171671

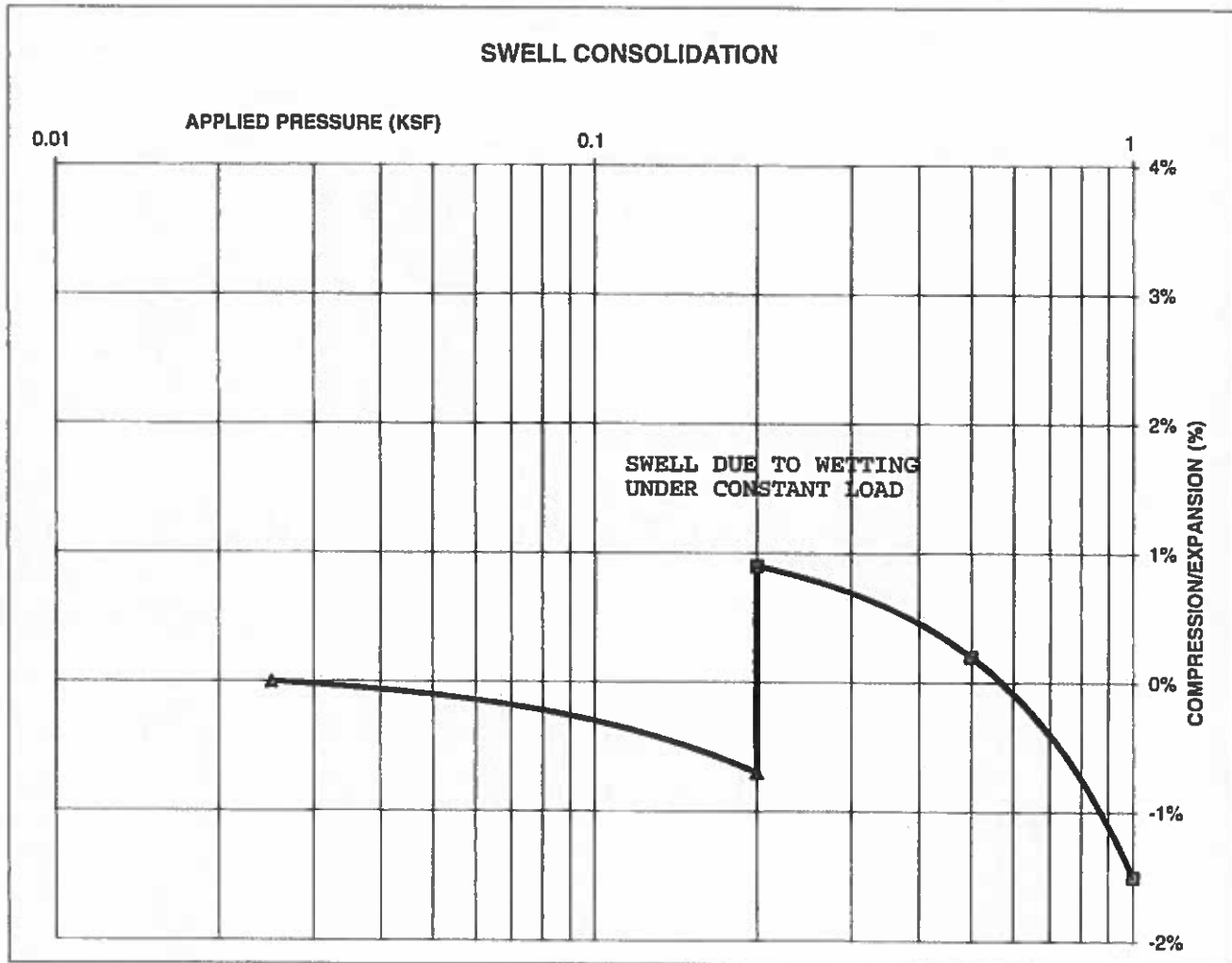
FIG NO.:

B-86

CONSOLIDATION TEST RESULTS

TEST BORING #	37	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			108
NATURAL MOISTURE CONTENT			16.3%
SWELL/CONSOLIDATION (%)			1.6%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

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BCC

DATE
 2/19/18

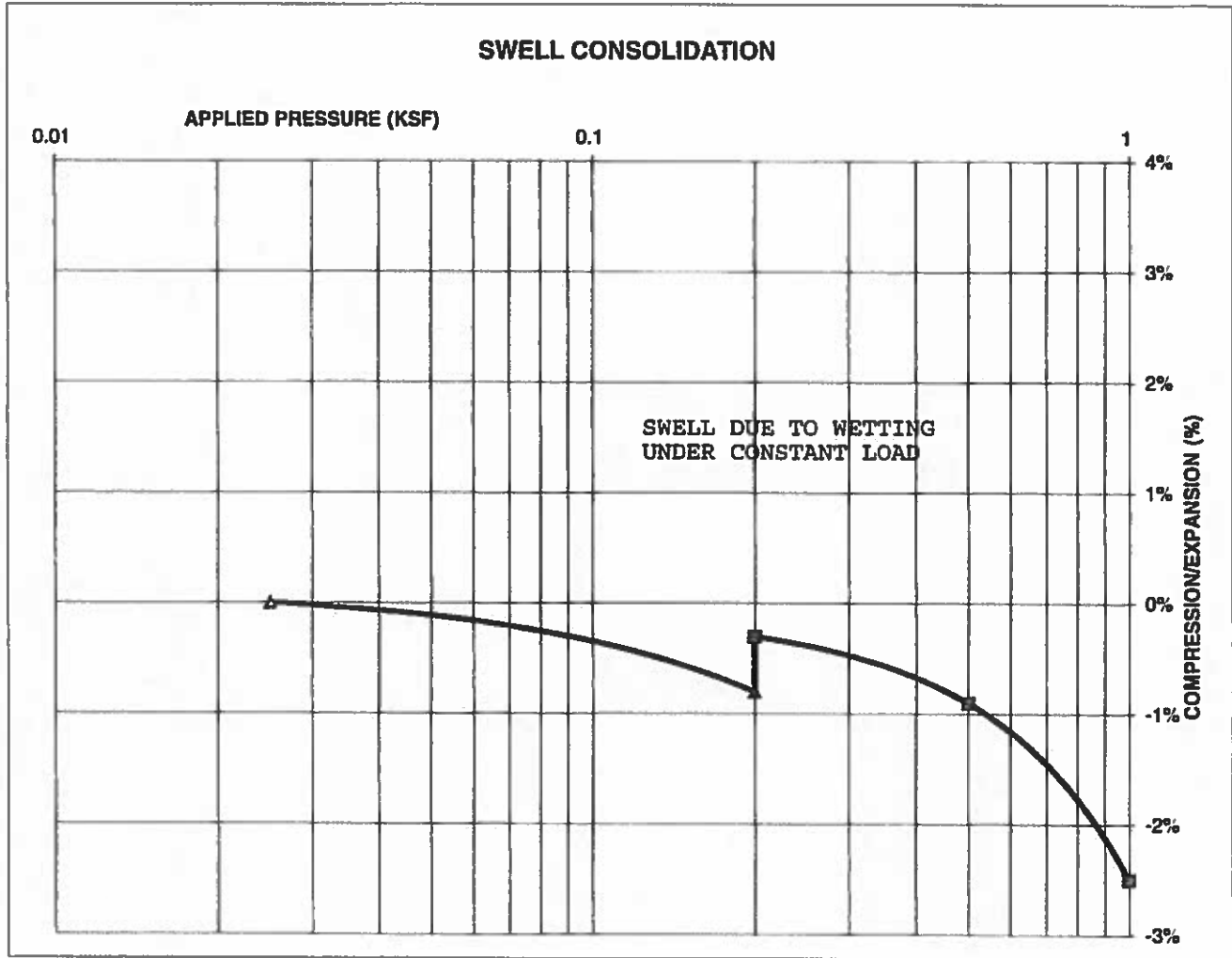
JOB NO.:
 171671

FIG NO.:
 B-87

CONSOLIDATION TEST RESULTS

TEST BORING #	38	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			118
NATURAL MOISTURE CONTENT			11.3%
SWELL/CONSOLIDATION (%)			0.5%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		SLC	2/19/18

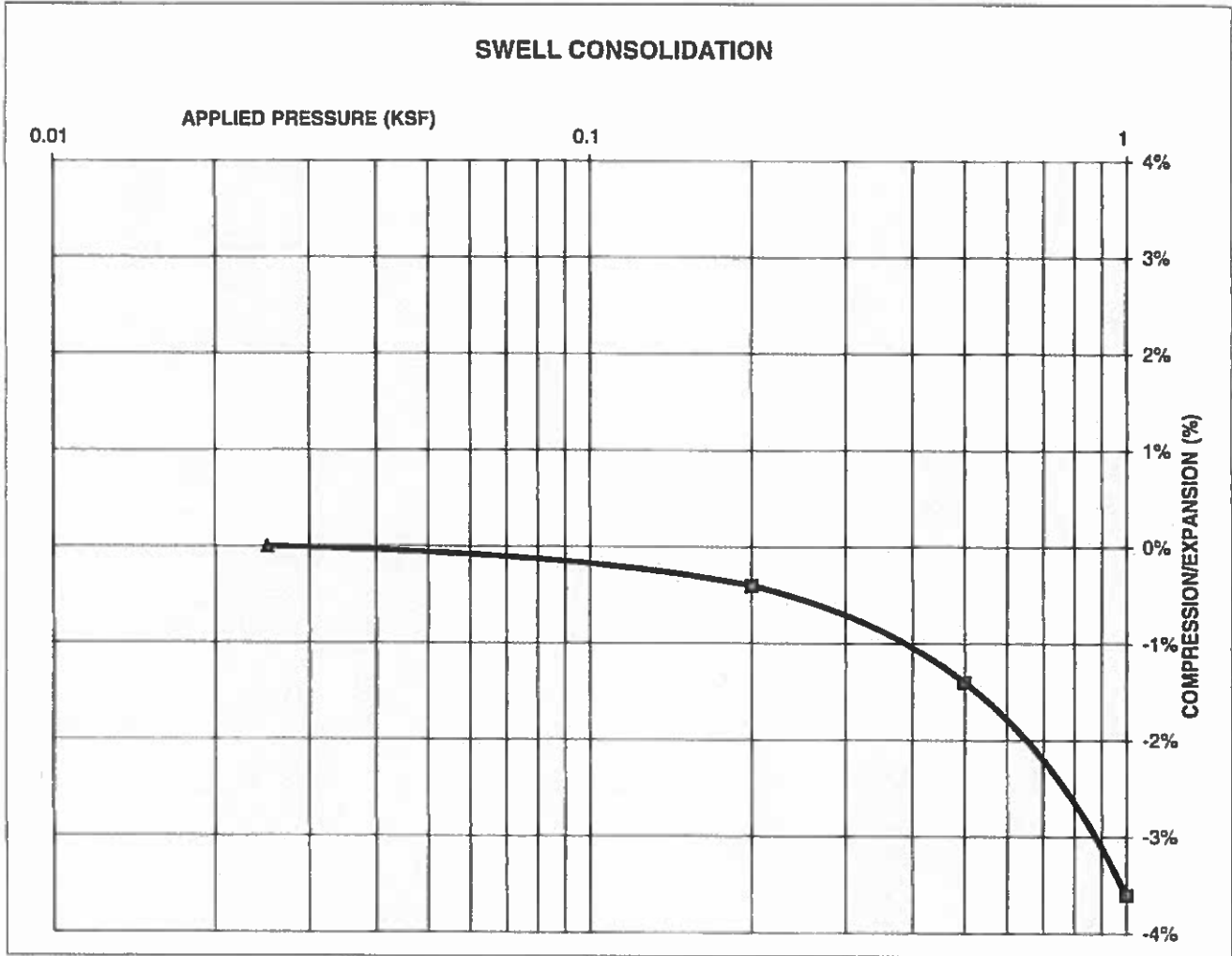
JOB NO.:
 171671

FIG NO.:
 B-88

CONSOLIDATION TEST RESULTS

TEST BORING #	39	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			116
NATURAL MOISTURE CONTENT			7.4%
SWELL/CONSOLIDATION (%)			0.0%

JOB NO. 171671
CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1



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 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

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DATE: 2/19/18

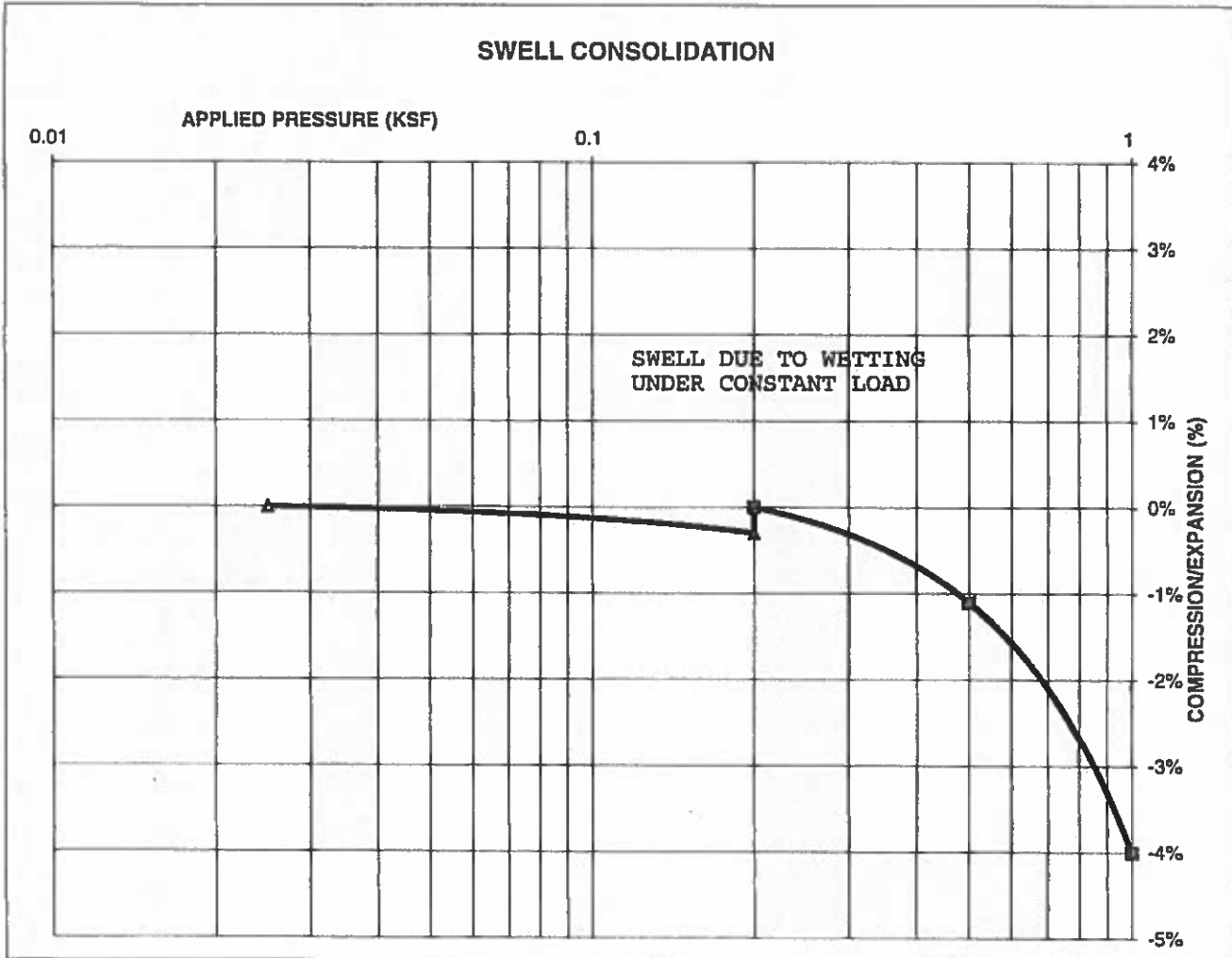
JOB NO:
 171671

FIG NO:
 B-89

CONSOLIDATION TEST RESULTS

TEST BORING #	40	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			121
NATURAL MOISTURE CONTENT			7.5%
SWELL/CONSOLIDATION (%)			0.3%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

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DATE: 7/11/18

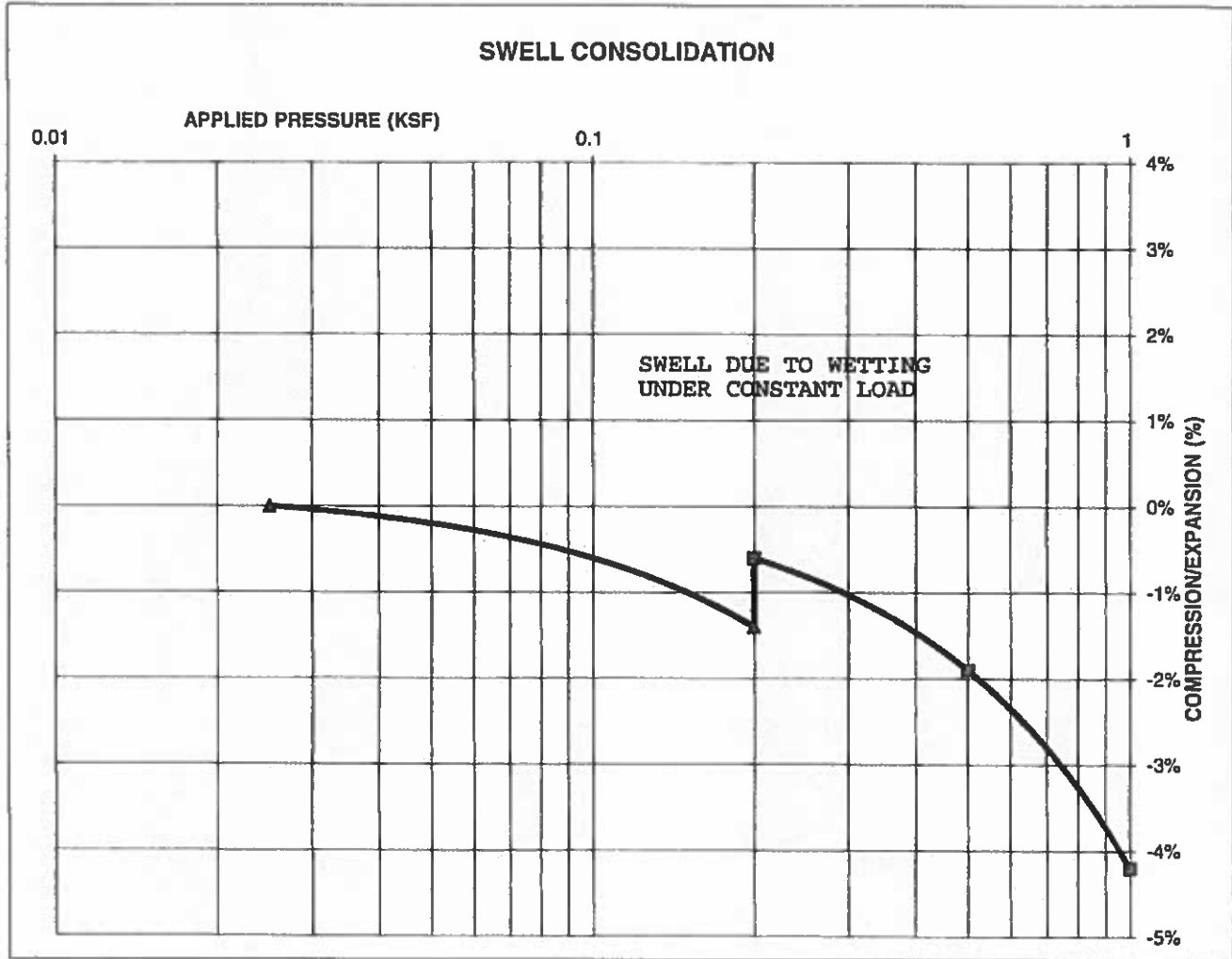
JOB NO:
 171671

FIG NO:
 B-90

CONSOLIDATION TEST RESULTS

TEST BORING #	41	DEPTH(ft)	1-2
DESCRIPTION	CL-MI	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)	114		
NATURAL MOISTURE CONTENT	16.3%		
SWELL/CONSOLIDATION (%)	0.8%		

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

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DATE: 2/19/18

SCC

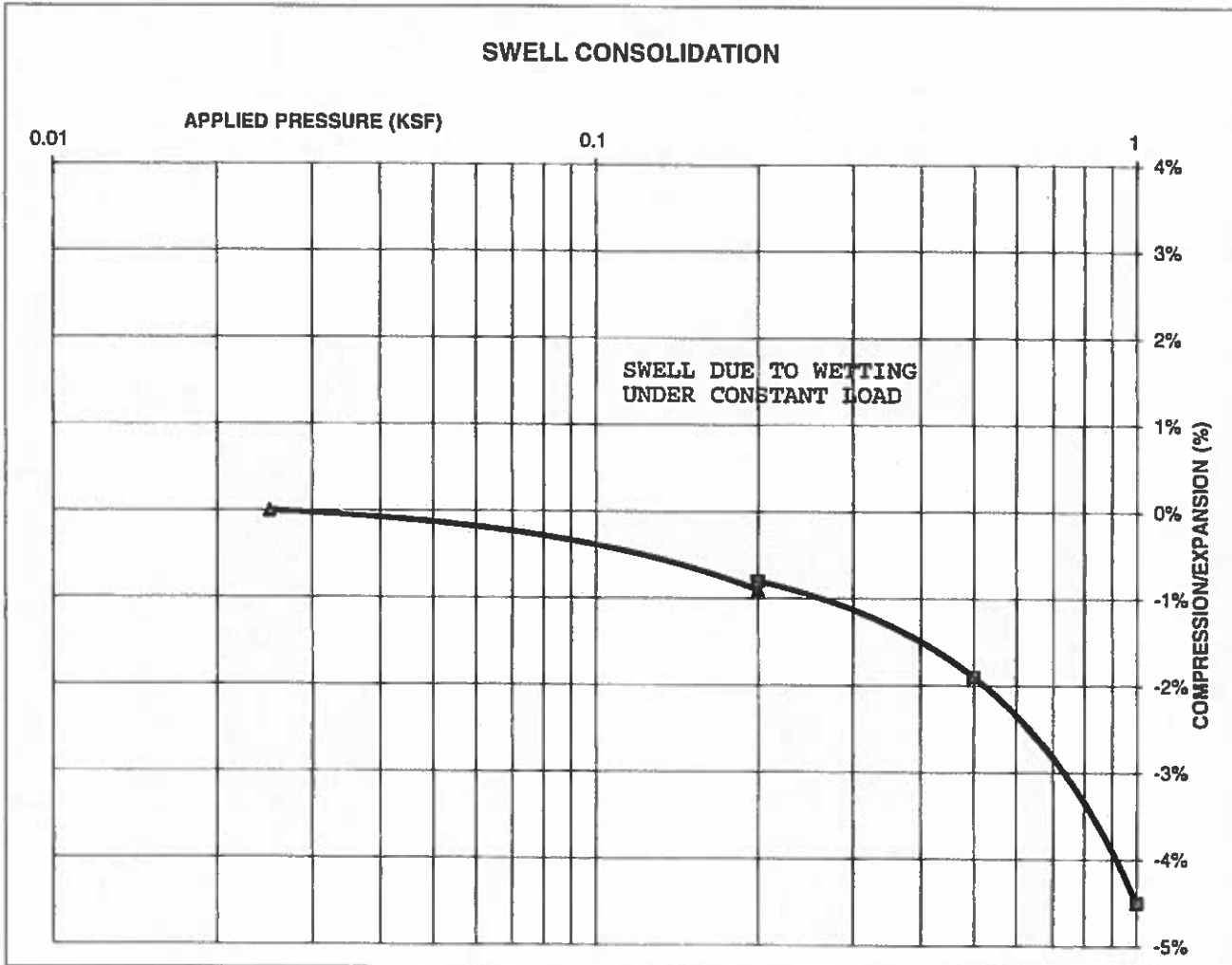
JOB NO.:
 171671

FIG NO.:
 B-91

CONSOLIDATION TEST RESULTS

TEST BORING #	42	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			115
NATURAL MOISTURE CONTENT			10.8%
SWELL/CONSOLIDATION (%)			0.1%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

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DATE: 7/19/18

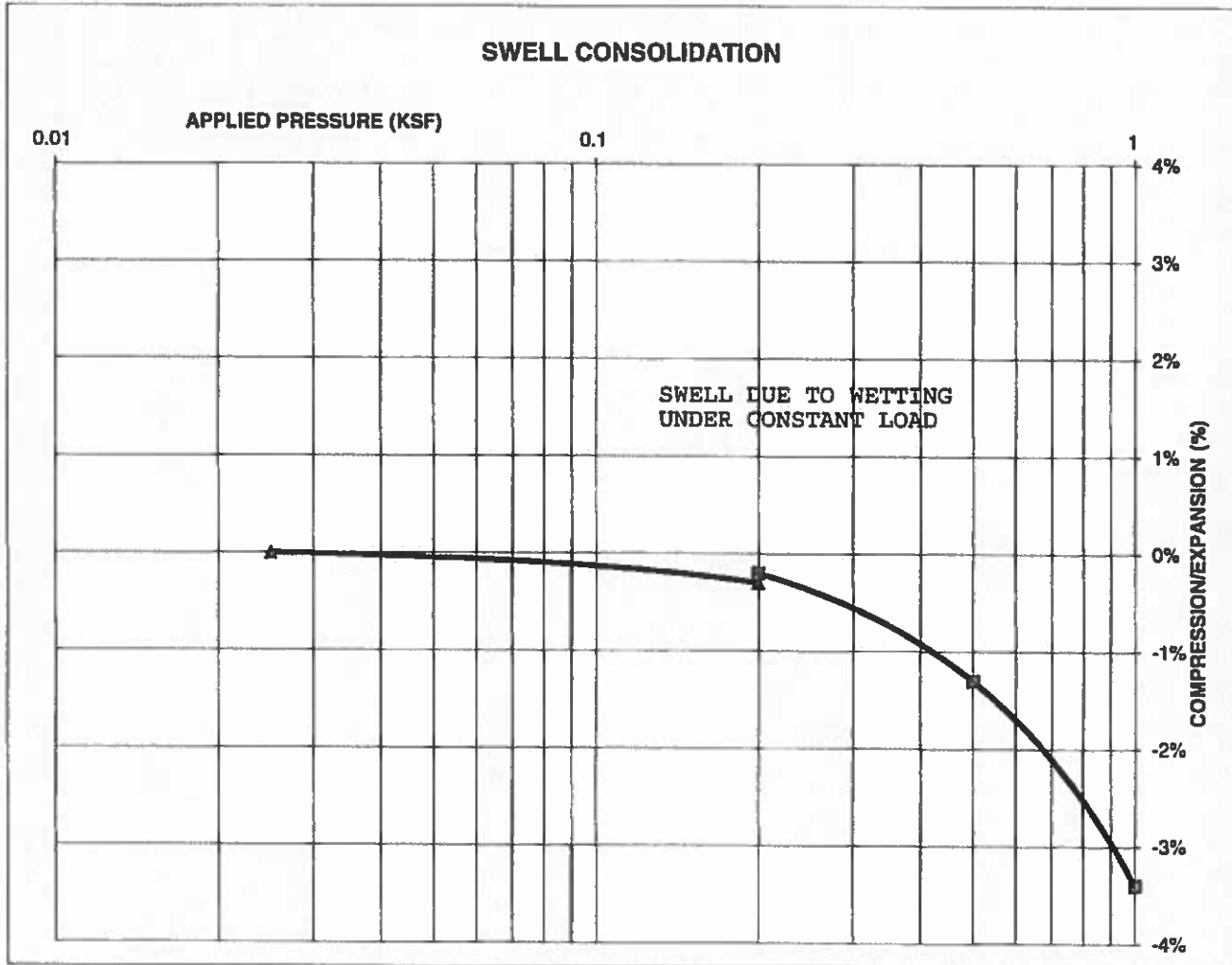
JOB NO.:
 171671

FIG NO.:
 B-92

CONSOLIDATION TEST RESULTS

TEST BORING #	15	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			110
NATURAL MOISTURE CONTENT			7.6%
SWELL/CONSOLIDATION (%)			0.1%

JOB NO. 171671
CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1



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 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN	DATE	CHECKED <i>SCC</i>	DATE <i>7/18/18</i>
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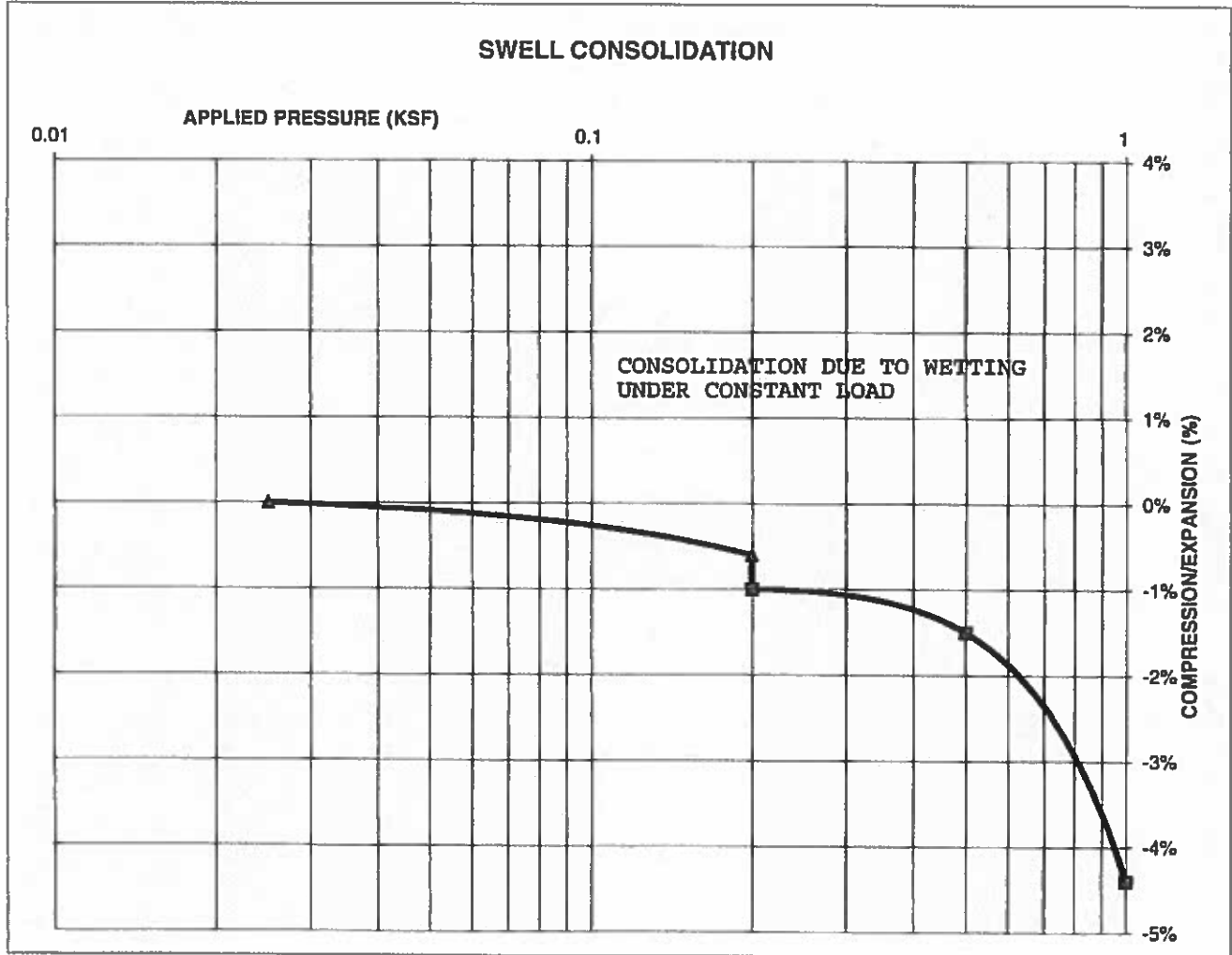
JOB NO.:
171671

FIG NO.:
B-93

CONSOLIDATION TEST RESULTS

TEST BORING #	23	DEPTH(ft)	10
DESCRIPTION	SC	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			113
NATURAL MOISTURE CONTENT			12.9%
SWELL/CONSOLIDATION (%)			-0.4%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

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DATE:

SCC

2/19/18

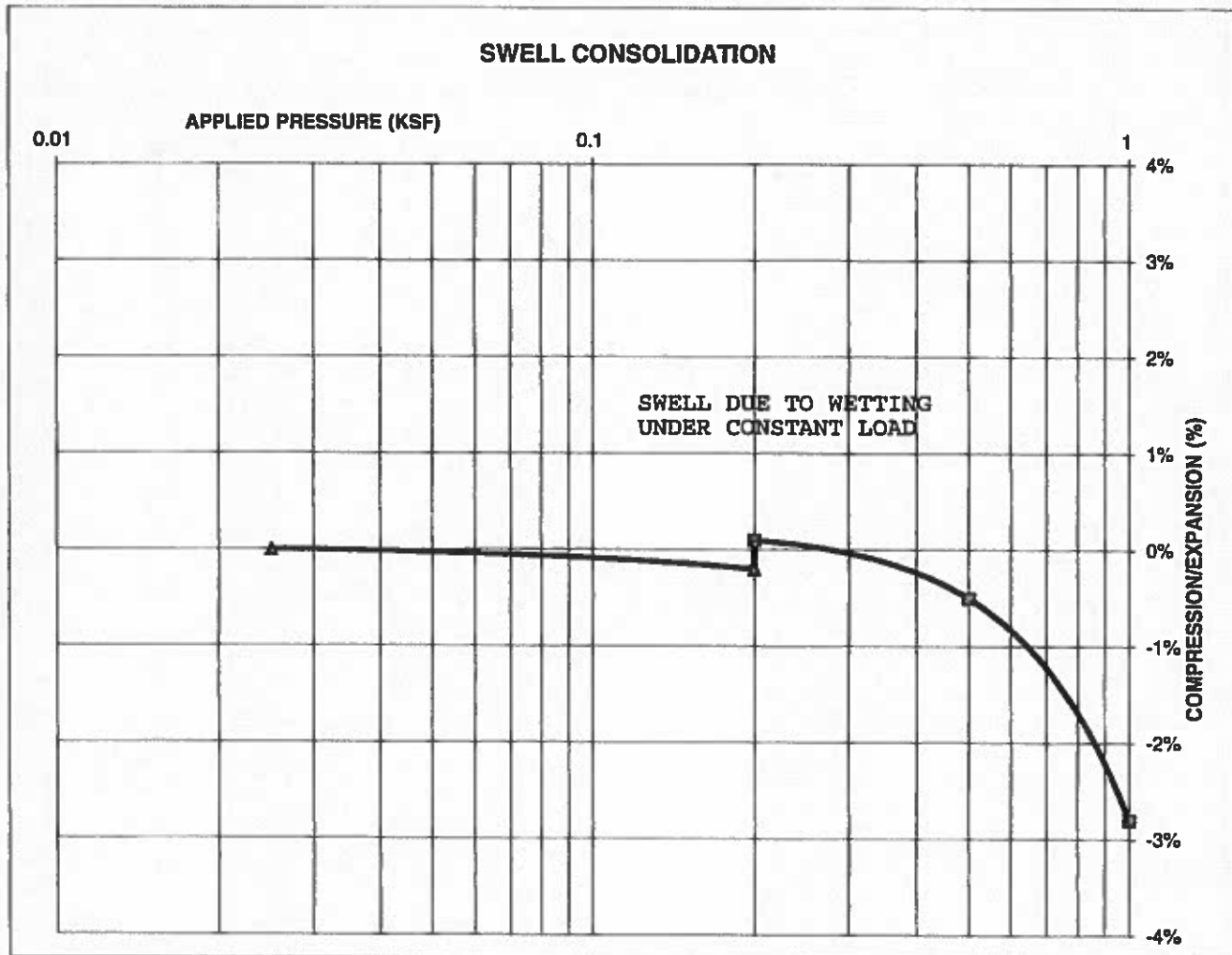
JOB NO.:
 171671

FIG NO.:
B-94

CONSOLIDATION TEST RESULTS

TEST BORING #	26	DEPTH(ft)	10
DESCRIPTION	SC	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			112
NATURAL MOISTURE CONTENT			13.4%
SWELL/CONSOLIDATION (%)			0.3%

JOB NO. 171671
CLIENT PULPIT ROCK, LLC
PROJECT FLYING HORSE NORTH, F-1



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**SWELL CONSOLIDATION
 TEST RESULTS**

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DATE:

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DATE:

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2/19/18

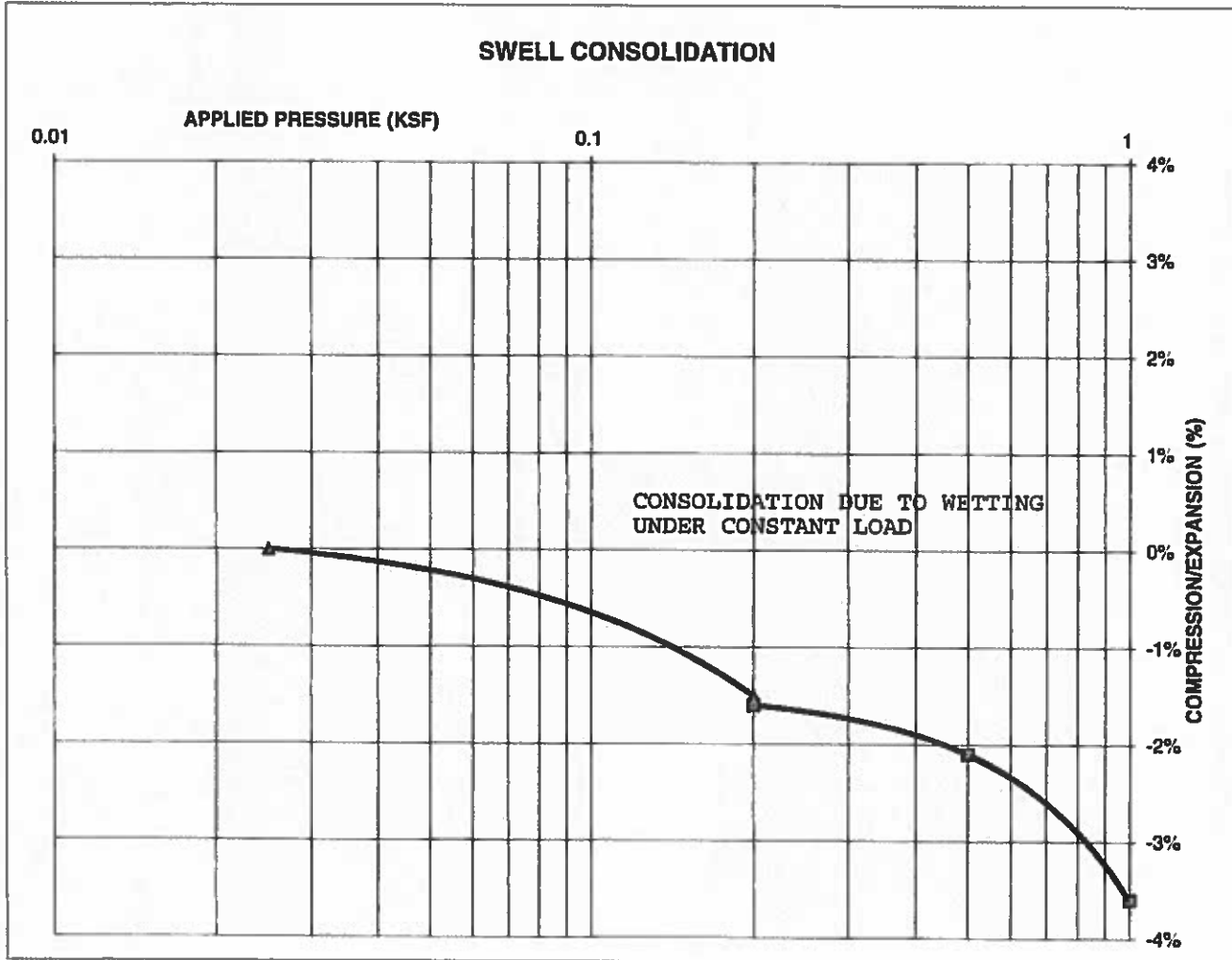
JOB NO:
 171671

FIG NO:
 B-95

CONSOLIDATION TEST RESULTS

TEST BORING #	36	DEPTH(ft)	10
DESCRIPTION	SM	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			114
NATURAL MOISTURE CONTENT			12.3%
SWELL/CONSOLIDATION (%)			-0.1%

JOB NO. 171671
 CLIENT PULPIT ROCK, LLC
 PROJECT FLYING HORSE NORTH, F-1



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION
 TEST RESULTS**

DRAWN:

DATE:

CHECKED:

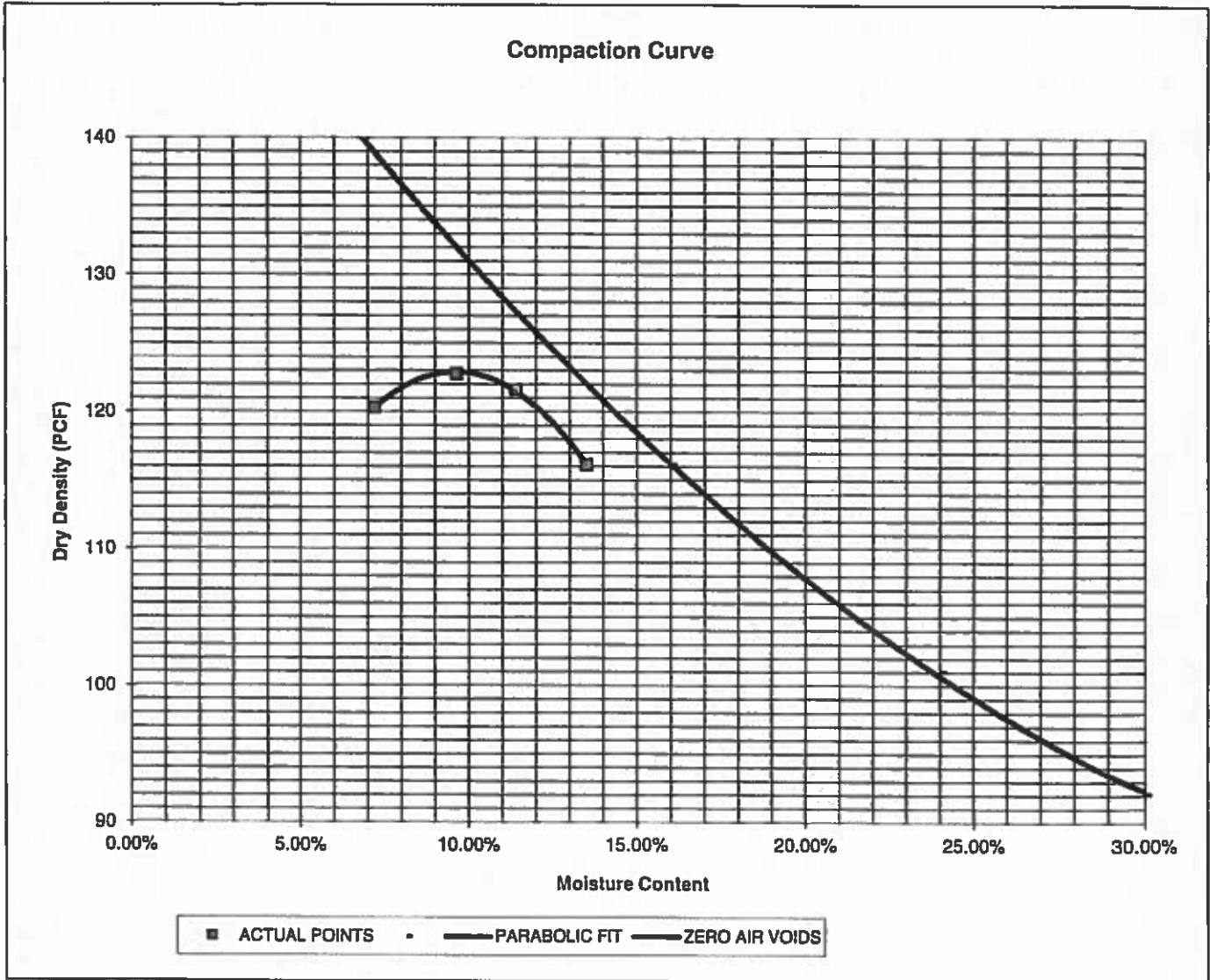
DATE: 2/19/18

JOB NO:
 171671

FIG NO:
 B-96

PROJECT	FLYING HORSE NORTH, F-1	CLIENT	PULPIT ROCK, LLC
SAMPLE LOCATION	TB-4 @ 0-3'	JOB NO.	171671
SOIL DESCRIPTION	FILL, SAND, SILTY, BROWN	DATE	02/07/18

IDENTIFICATION	SM	COMPACTION TEST #	1, SOIL TYPE #1
TEST DESIGNATION / METHOD	ASTM D-1557-A	TEST BY	DC
MAXIMUM DRY DENSITY (PCF)	122.9	OPTIMUM MOISTURE	9.7%



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MOISTURE DENSITY RELATION

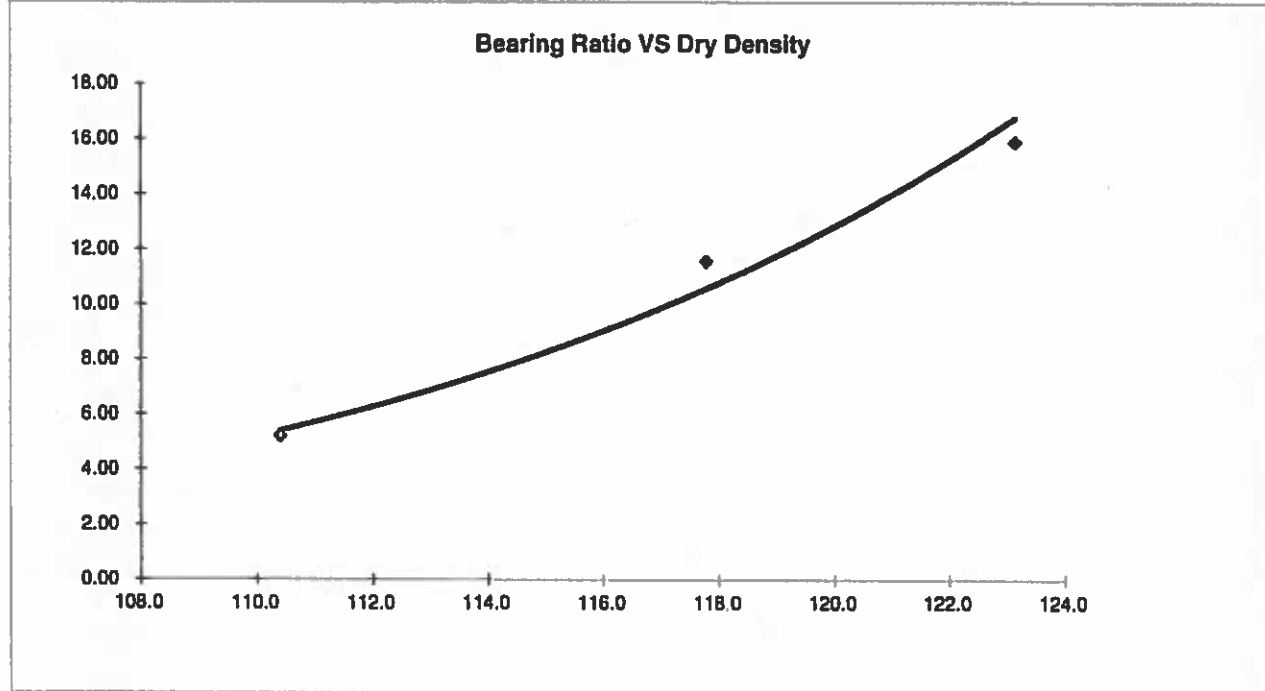
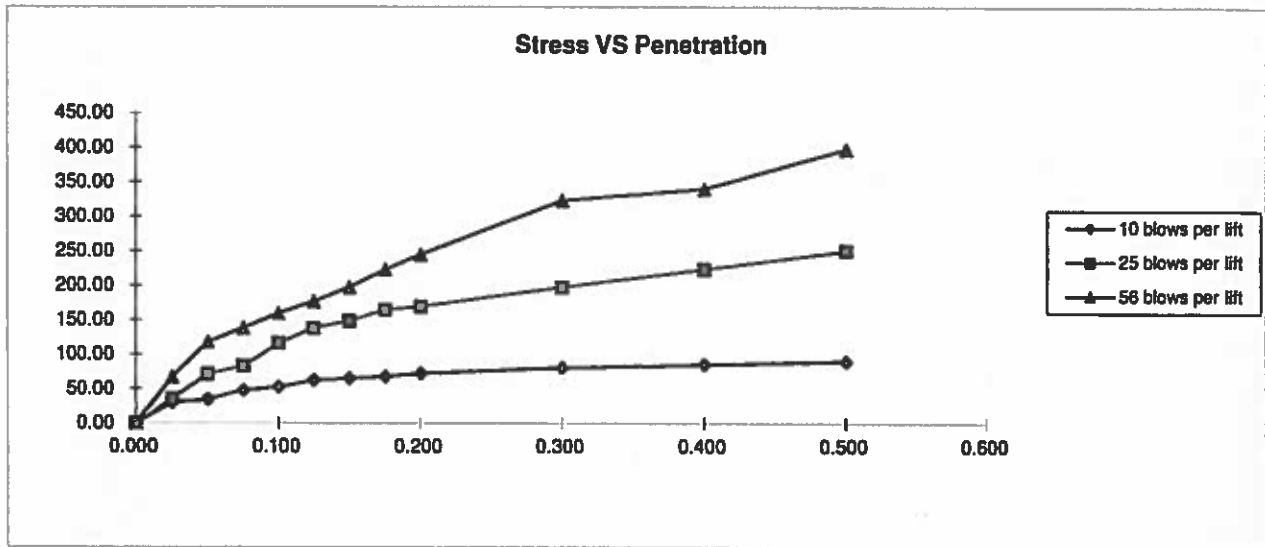
DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/9/18

JOB NO.:

171671

FIG NO.:

B-97



BEARING RATIO AT 90% OF MAX	5.40 - R VALUE	12.00
BEARING RATIO AT 95% OF MAX	10.69 - R VALUE	30.00

JOB NO: 171671
 SOIL TYPE: 1, CBR #1



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CALIFORNIA BEARING RATIO

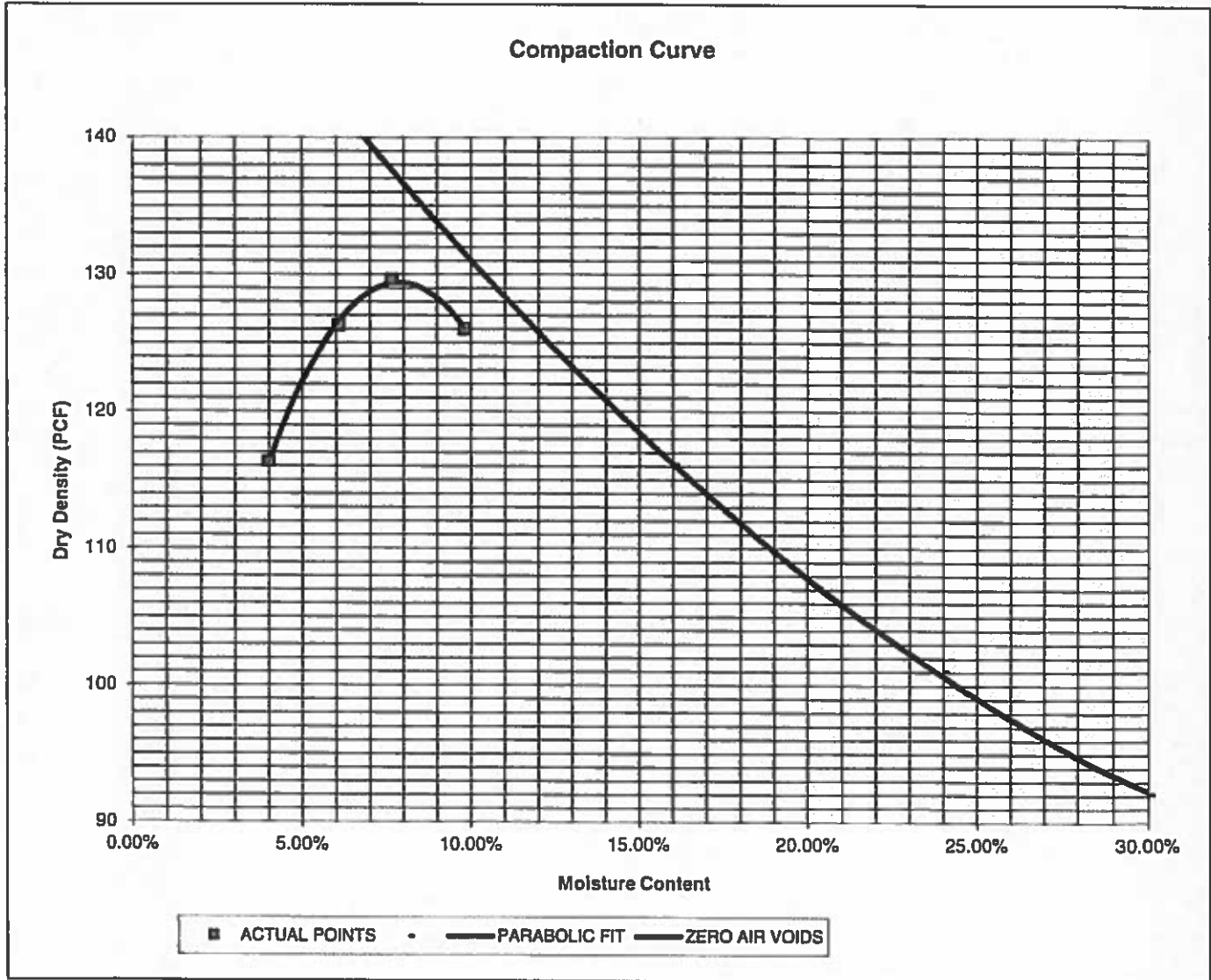
DRAWN:	DATE:	CHECKED: <i>SCC</i>	DATE: <i>2/19/18</i>
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JOB NO: 171671

FIG NO: *B-99*

PROJECT	FLYING HORSE NORTH, F-1	CLIENT	PULPIT ROCK, LLC
SAMPLE LOCATION	TB-10 @ 0-3'	JOB NO.	171671
SOIL DESCRIPTION	SAND, CLAYEY, BROWN	DATE	10/25/17

IDENTIFICATION	SC	COMPACTION TEST #	2, SOIL TYPE #2
TEST DESIGNATION / METHOD	ASTM D-1557-A	TEST BY	AS
MAXIMUM DRY DENSITY (PCF)	129.6	OPTIMUM MOISTURE	7.9%

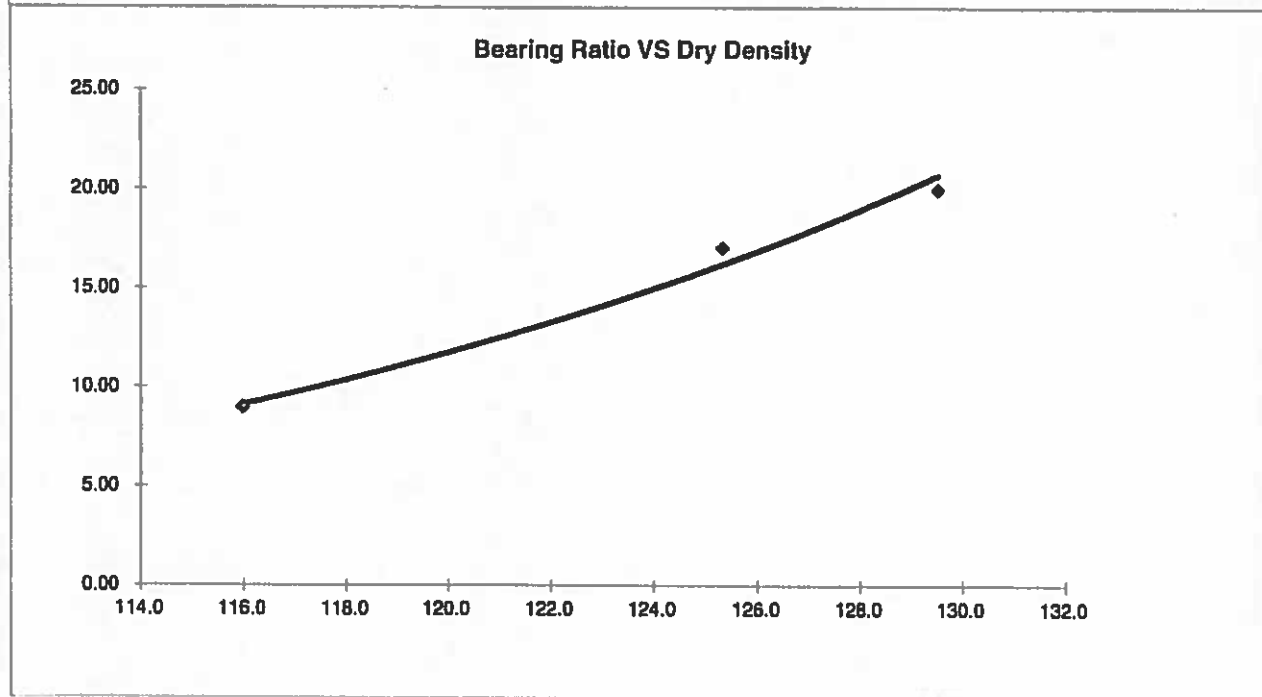
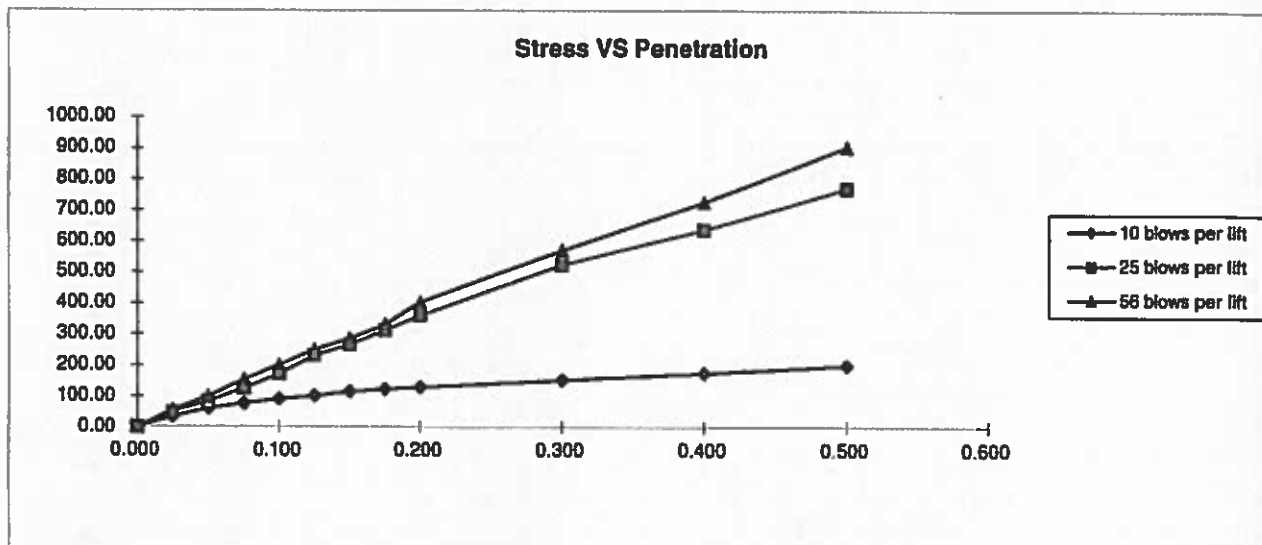



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

MOISTURE DENSITY RELATION

DRAWN:	DATE:	CHECKED: <i>SCC</i>	DATE: <i>2/19/18</i>
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JOB NO.:
171671
FIG NO.:
B-100



BEARING RATIO AT 90% OF MAX	9.57 ~ R VALUE	26.00
BEARING RATIO AT 95% OF MAX	15.15 ~ R VALUE	50.00

JOB NO: 171671
 SOIL TYPE: 2, CBR #2



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CALIFORNIA BEARING RATIO

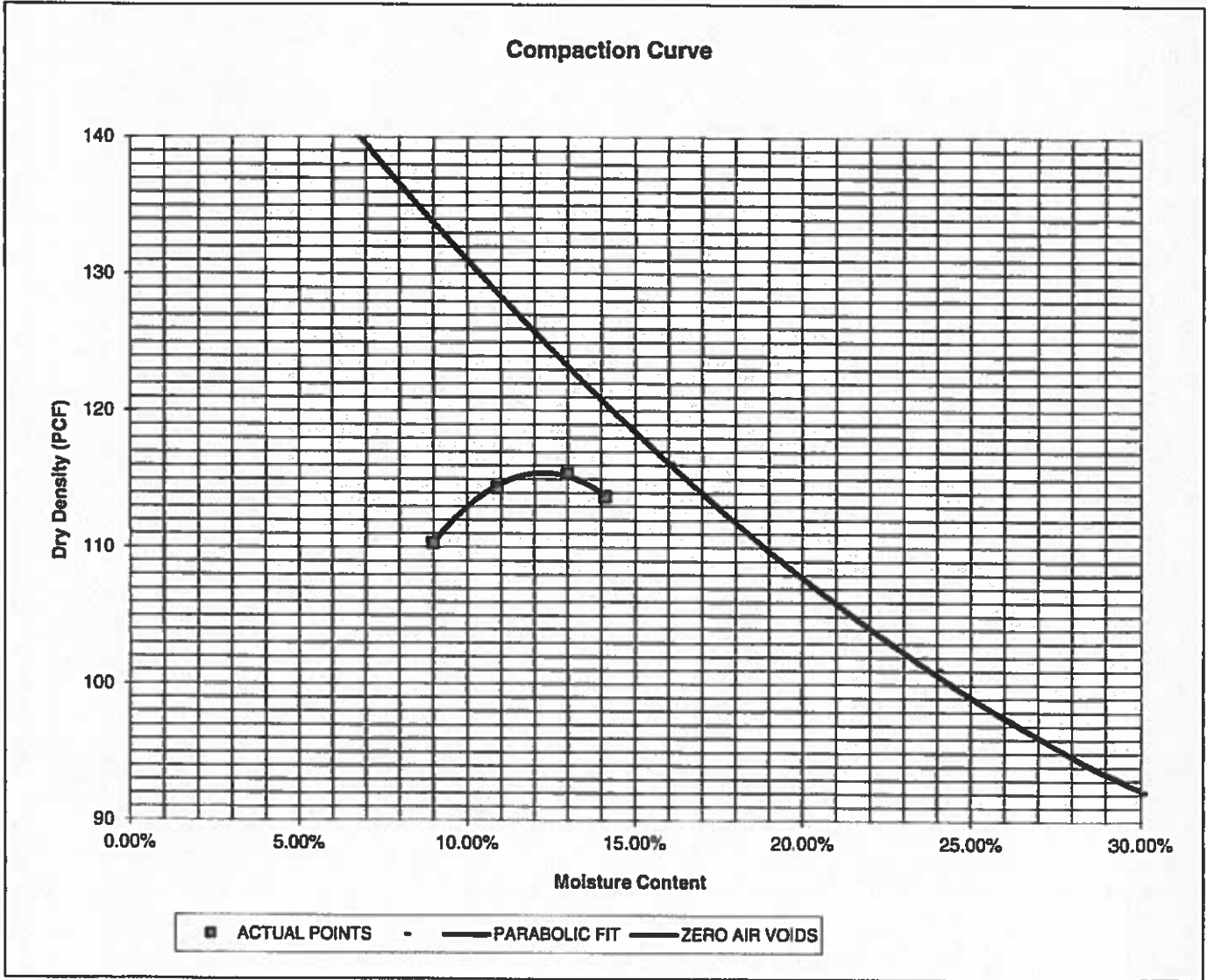
DRAWN	DATE	CHECKED <i>SCC</i>	DATE <i>2/19/18</i>
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JOB NO:
171671

FIG NO:
B-102

PROJECT	FLYING HORSE NORTH, F-1	CLIENT	PULPIT ROCK, LLC
SAMPLE LOCATION	TB-15 @ 0-3'	JOB NO.	171671
SOIL DESCRIPTION	0	DATE	11/16/17

IDENTIFICATION	SC	COMPACTION TEST #	3, SOIL TYPE #3
TEST DESIGNATION / METHOD	ASTM D-698-A	TEST BY	
MAXIMUM DRY DENSITY (PCF)	115.8	OPTIMUM MOISTURE	12.6%



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MOISTURE DENSITY RELATION

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO:

171671

FIG NO:

B-103

CBR TEST LOAD DATA

JOB NO: 171671
 CLIENT: PULPIT ROCK, LLC
 PROJECT: FLYING HORSE NORTH, F-1
 SOIL TYPE: 3, CBR #3

PISTON		PISTON					
DIAMETER (cm)		AREA (in ²)					
4.958		2.99250919					
PENETRATION DEPTH (INCHES)	10 BLOWS		25 BLOWS		56 BLOWS		
	MOLD # 1		MOLD # 15		MOLD # 11		
	LOAD(LBS)	STRESS (PSI)	LOAD(LBS)	STRESS (PSI)	LOAD(LBS)	STRESS (PSI)	
0.000	0	0.00	0	0.00	0	0.00	
0.025	14	4.68	51	17.04	66	22.06	
0.050	23	7.69	73	24.39	83	27.74	
0.075	38	12.70	88	29.41	98	32.75	
0.100	46	15.37	98	32.75	111	37.09	
0.125	51	17.04	118	39.43	124	41.44	
0.150	59	19.72	126	42.11	138	46.12	
0.175	64	21.39	134	44.78	144	48.12	
0.200	76	25.40	139	46.45	149	49.79	
0.300	84	28.07	171	57.14	182	60.82	
0.400	93	31.08	206	68.84	212	70.84	
0.500	101	33.75	231	77.19	242	80.87	

FINAL MOISTURE CONTENT

	MOLD # 1	MOLD # 15	MOLD # 11
<u>CAN #</u>	350	349	350
<u>WT. CAN</u>	6.79	6.84	6.79
<u>WT. CAN+WET</u>	187.54	198.93	194.697
<u>WT. CAN+DRY</u>	163.32	175.42	172.39
<u>WT. H2O</u>	24.22	23.51	22.307
<u>WT. DRY SOIL</u>	156.53	168.58	165.6
<u>MOISTURE CONTENT</u>	15.47%	13.95%	13.47%

<u>WET DENSITY (PCF)</u>	120.4	126.3	128.3
<u>DRY DENSITY (PCF)</u>	106.9	112.2	113.9

BEARING RATIO 1.54 3.27 3.71

90% OF DRY DENSITY 104.2

95% OF DRY DENSITY 110.0

<u>BEARING RATIO AT 90% OF MAX</u>	1.00 - R VALUE	1
<u>BEARING RATIO AT 95% OF MAX</u>	2.56 - R VALUE	6



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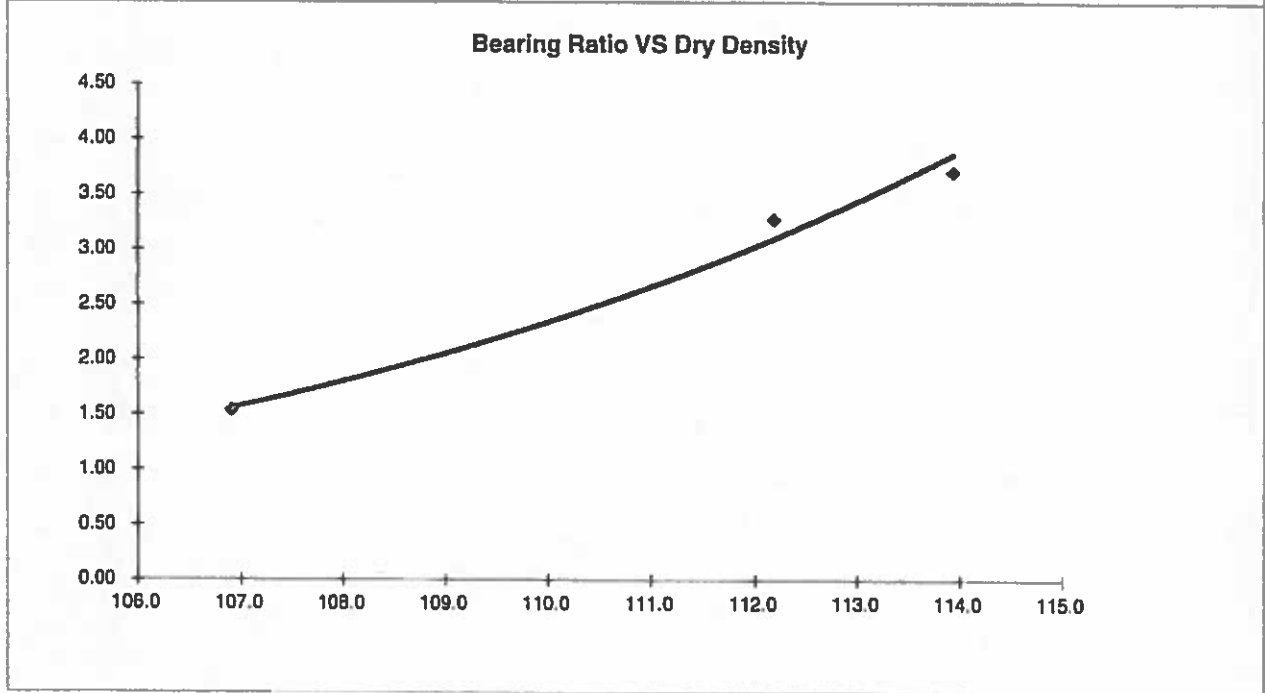
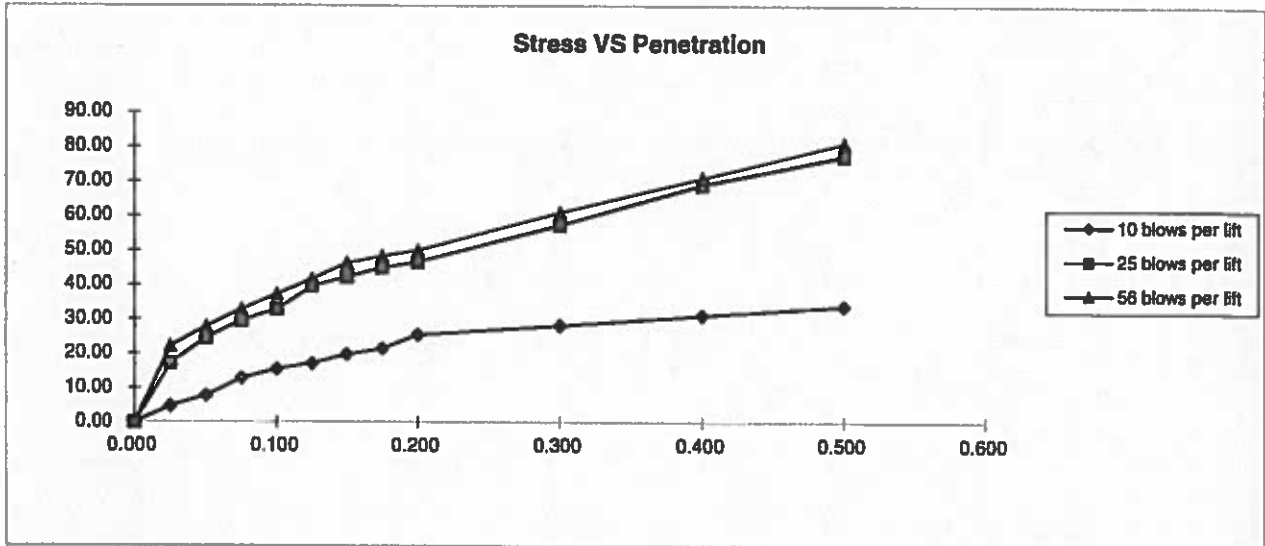
CBR TEST DATA

DRAWN:	DATE:	CHECKED:	DATE:
		SCC	2/19/18

JOB NO:
 171671

FIG NO:

B-104



BEARING RATIO AT 90% OF MAX	1.00 - R VALUE	1.00
BEARING RATIO AT 95% OF MAX	2.56 - R VALUE	6.00

JOB NO: 171671
 SOIL TYPE: 3, CBR #3



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CALIFORNIA BEARING RATIO

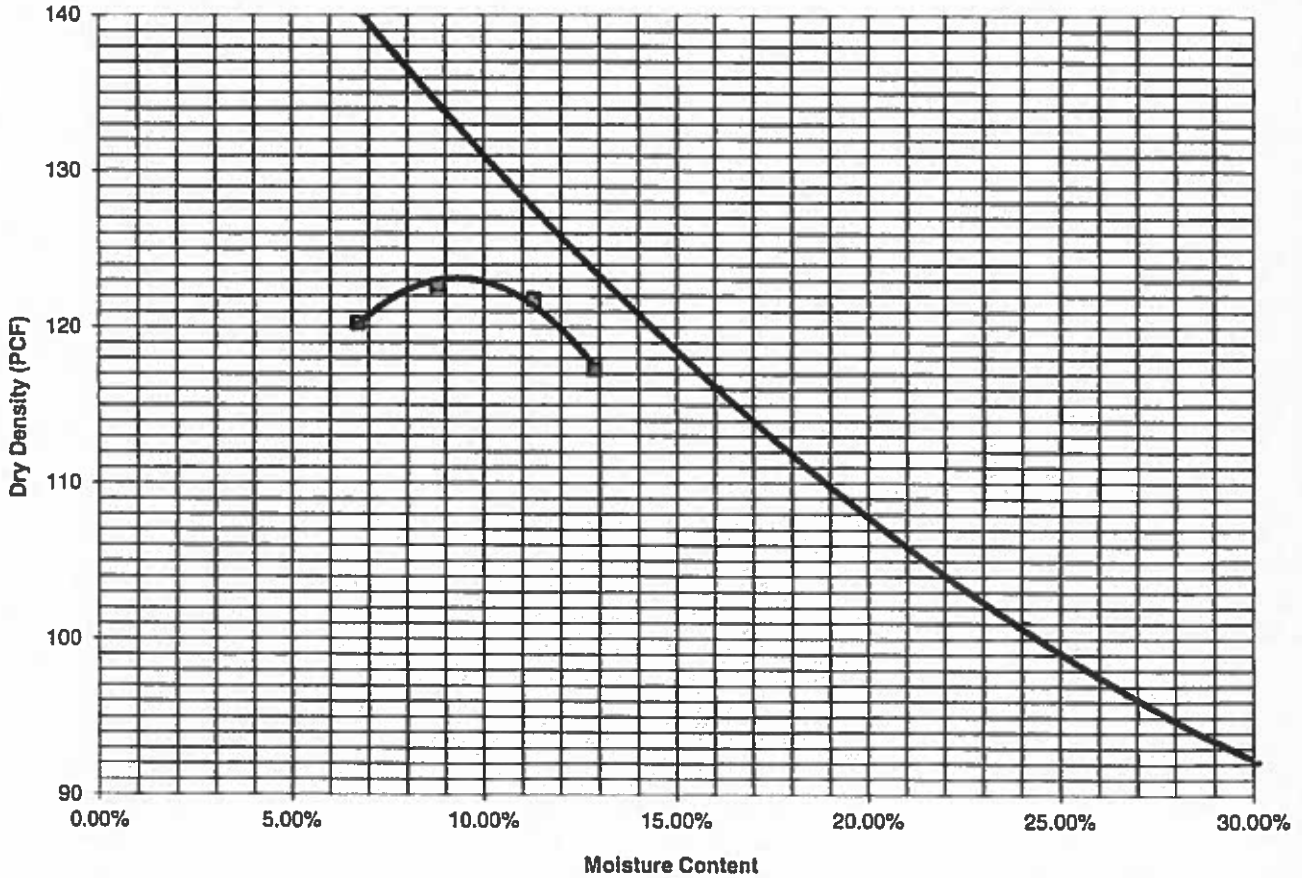
DRAWN:	DATE:	CHECKED: <i>SCC</i>	DATE: <i>7/19/10</i>
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JOB NO: 171671
 FIG NO: *B-105*

PROJECT	FLYING HORSE NORTH, F-1	CLIENT	PULPIT ROCK, LLC
SAMPLE LOCATION	TB-32 @ 0-3'	JOB NO.	171671
SOIL DESCRIPTION	FILL, SAND, CLAYEY, BROWN	DATE	01/02/18

IDENTIFICATION	SC	COMPACTION TEST #	4
TEST DESIGNATION / METHOD	ASTM D-1557-A	TEST BY	AS
MAXIMUM DRY DENSITY (PCF)	123.1	OPTIMUM MOISTURE	9.3%

Compaction Curve



ACTUAL POINTS
 -
 PARABOLIC FIT
 ZERO AIR VOIDS



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COLORADO SPRINGS, COLORADO 80907

MOISTURE DENSITY RELATION

DRAWN:

DATE:

CHECKED:

DATE:

SLC

3/19/18

JOB NO.:

171671

FIG NO.:

B-106

APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

**PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - RURAL LOCAL - SOIL TYPE 1**

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
Hveem Stabilometer (R Value) Results:	R =	20
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.0
Reliability	Reliability =	75
Reliability (z-statistic)	Z_R =	-0.67
Soil Resilient Modulus	M_R =	4940

Weighted Structural Number (WSN): ➔ WSN = 2.10

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)
75	-0.67
80	-0.84
85	-1.04
90	-1.28
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
4.56	4.56	0.0

Job No. 171671
Fig. No. 1

DESIGN CALCULATIONS

DESIGN DATA PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - RURAL LOCAL - SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 36,500
Hveem Stabilometer (R Value) Results:	R = 20
Weighted Structural Number (WSN):	WSN = 2.10

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)

$D_1 = (WSN)/C_1 = 4.8$ inches of Full Depth Asphalt
Use 5.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 3.5 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 5.1$ 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 Asphalt

Job No. 171671
Fig. No. 2

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS - RURAL LOCAL

DESIGN DATA: PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - RURAL LOCAL - SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	36,500
Hveem Stabilometer (R Value) Results:	R =	20
Weighted Structural Number (WSN):	WSN =	2.1

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt
 $C_2 = 0.12$ 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
 $D_2 = ((WSN) - (t)(C_1))/C_2 = 2.8$ inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 5.0 inches of Full Depth Asphalt

Job No. 171671
Fig. No. C-3

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

PULPIT ROCK, LLC

FLYING HORSE NORTH, FILING 1 - RURAL LOCAL - SOIL TYPE 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
Hveem Stabilometer (R Value) Results:	R =	38
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.0
Reliability	Reliability =	75
Reliability (z-statistic)	Z_R =	-0.67
Soil Resilient Modulus	M_R =	8896

Weighted Structural Number (WSN): ➔ WSN = 1.67

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)

75	-0.67
80	-0.84
85	-1.04
90	-1.28
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

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

Left	Right	Difference
4.56	4.56	0.0

Job No. 171671
Fig. No. 4

DESIGN CALCULATIONS

DESIGN DATA PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - RURAL LOCAL - SOIL TYPE 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 36,500
Hveem Stabilometer (R Value) Results:	R = 38
Weighted Structural Number (WSN):	WSN = 1.67

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)

$D_1 = (WSN)/C_1 = 3.8$ inches of Full Depth Asphalt
Use 5.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 3.2$ 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. 5.0 inches of Asphalt

Job No. 171671

Fig. No. 5

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS - RURAL LOCAL

DESIGN DATA: PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - RURAL LOCAL - SOIL TYPE 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	36,500
Hveem Stabilometer (R Value) Results:	R =	38
Weighted Structural Number (WSN):	WSN =	1.67

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt
 $C_2 = 0.12$ 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)

$D_1 = (WSN)/C_1 = 3.8$ inches of Full Depth Asphalt
Use 5.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches
 $D_2 = ((WSN) - (t)(C_1))/C_2 = -0.8$ inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 5.0 inches of Full Depth Asphalt

Job No. 171671
Fig. No. C-6

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

PULPIT ROCK, LLC

FLYING HORSE NORTH, FILING 1 - RURAL LOCAL - SOIL TYPE 3

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
Hveem Stabilometer (R Value) Results:	R =	6
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.0
Reliability	Reliability =	75
Reliability (z-statistic)	Z_R =	-0.67
Soil Resilient Modulus	M_R =	3126

Weighted Structural Number (WSN): ➔ WSN = 2.50

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)
75	-0.67
80	-0.84
85	-1.04
90	-1.28
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

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

Left	Right	Difference
4.56	4.56	0.0

Job No. 171671
Fig. No. 7

DESIGN CALCULATIONS

DESIGN DATA PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - RURAL LOCAL - SOIL TYPE 3

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 36,500
Hveem Stabilometer (R Value) Results:	R = 6
Weighted Structural Number (WSN):	WSN = 2.50

DESIGN EQUATION

$$WSN = C_1 D_1 + C_2 D_2$$

$C_1 = 0.44$ 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)

$$D_1 = (WSN)/C_1 = 5.7 \text{ inches of Full Depth Asphalt}$$

Use 6.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = inches

$$D_2 = ((WSN) - (t)(C_1))/C_2 = 6.7 \text{ inches of Aggregate}$$

Base Course, use 7.0 inches

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 7.0 inches of Aggregate Base Course, or
2. 6.0 inches of Asphalt

Job No. 171671

Fig. No. 8

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS - RURAL LOCAL

DESIGN DATA: PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - RURAL LOCAL - SOIL TYPE 3

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	36,500
Hveem Stabilometer (R Value) Results:	R =	6
Weighted Structural Number (WSN):	WSN =	2.5

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt
 $C_2 = 0.12$ 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)

$D_1 = (WSN)/C_1 = 5.7$ inches of Full Depth Asphalt
Use 6.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches
 $D_2 = ((WSN) - (t)(C_1))/C_2 = 6.2$ inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 3.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 6.0 inches of Full Depth Asphalt

Job No. 171671
Fig. No. C-9

FLEXIBLE PAVEMENT DESIGN

STANDARD SECTIONS - RURAL MINOR COLLECTOR

DESIGN DATA

PULPIT ROCK, LLC

FLYING HORSE NORTH, FILING 1 - SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	109,500
Hveem Stabilometer (R Value) Results:	R =	20
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.5
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	4940

Weighted Structural Number (WSN): WSN = 2.53

DESIGN TABLES AND EQUATIONS

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

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

$$M_R = 2555 \cdot CBR^{0.64}$$

$$k = M_R / 19.4$$

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

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

Left	Right	Difference
5.04	5.03	0.0

Job No. 171671

Fig. No. C-10

DESIGN CALCULATIONS

STANDARD SECTIONS - RURAL MINOR COLLECTOR

DESIGN DATA PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 109,500
Hveem Stabilometer (R Value) Results:	R = 20
Weighted Structural Number (WSN):	WSN = 2.53

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

$D_1 = (WSN)/C_1 = 5.7$ inches of Full Depth Asphalt
Use 6.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 4 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 7.0$ inches of Aggregate
Base Course, use 7.0 inches

Asphalt Thickness (t) = 4.5 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 5.0$ inches of Aggregate
Base Course, use 6.0 inches

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 7.0 inches of Aggregate Base Course, or
2. 4.5 inches of Asphalt + 6.0 inches of Aggregate Base Course, or
3. 6.0 inches of Asphalt

Job No. 171671
Fig. No. C-11

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS - RURAL MINOR COLLECTOR

DESIGN DATA: PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 109,500
Hveem Stabilometer (R Value) Results:	R = 20
Weighted Structural Number (WSN):	WSN = 2.53

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt
 $C_2 = 0.12$ 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)

$D_1 = (WSN)/C_1 = 5.8$ inches of Full Depth Asphalt
Use 6.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches
 $D_2 = ((WSN) - (t)(C_1))/C_2 = 6.4$ inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 6.0 inches of Full Depth Asphalt

Job No. 171671
Fig. No. C-12

FLEXIBLE PAVEMENT DESIGN

STANDARD SECTIONS - RURAL MINOR COLLECTOR

DESIGN DATA

PULPIT ROCK, LLC

FLYING HORSE NORTH, FILING 1 - SOIL TYPE 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	109,500
Hveem Stabilometer (R Value) Results:	R =	38
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.5
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	8896

Weighted Structural Number (WSN): ➔ WSN = 2.05

DESIGN TABLES AND EQUATIONS

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

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

$$M_R = 2555 * CBR^{0.64}$$

$$k = M_R / 19.4$$

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
5.04	5.04	0.0

Job No. 171671
Fig. No. C-13

DESIGN CALCULATIONS

STANDARD SECTIONS - RURAL MINOR COLLECTOR

DESIGN DATA PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 109,500
Hveem Stabilometer (R Value) Results:	R = 38
Weighted Structural Number (WSN):	WSN = 2.05

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

$D_1 = (WSN)/C_1 = 4.7$ inches of Full Depth Asphalt
Use 5.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 3 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 6.6$ inches of Aggregate
Base Course, use 7.0 inches

Asphalt Thickness (t) = 3.5 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 4.6$ inches of Aggregate
Base Course, use 6.0 inches

RECOMMENDED ALTERNATIVES

1. 3.0 inches of Asphalt + 7.0 inches of Aggregate Base Course, or
2. 3.5 inches of Asphalt + 6.0 inches of Aggregate Base Course, or
3. 5.0 inches of Asphalt

Job No. 171671
Fig. No. C-14

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS - RURAL MINOR COLLECTOR

DESIGN DATA: PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	109,500
Hveem Stabilometer (R Value) Results:	R =	38
Weighted Structural Number (WSN):	WSN =	2.05

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt
 $C_2 = 0.12$ 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)

$D_1 = (WSN)/C_1 = 4.7$ inches of Full Depth Asphalt
Use 5.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches
 $D_2 = ((WSN) - (t)(C_1))/C_2 = 2.4$ inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 5.0 inches of Full Depth Asphalt

Job No. 171671
Fig. No. C-15

FLEXIBLE PAVEMENT DESIGN

STANDARD SECTIONS - RURAL MINOR COLLECTOR

PULPIT ROCK, LLC

FLYING HORSE NORTH, FILING 1 - SOIL TYPE 3

DESIGN DATA

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	109,500
Hveem Stabilometer (R Value) Results:	R =	6
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.5
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	3126

Weighted Structural Number (WSN): ➔ WSN = 2.96

DESIGN TABLES AND EQUATIONS

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

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

$$M_R = 2555 \cdot CBR^{0.64}$$

$$k = M_R / 19.4$$

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

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

Left	Right	Difference
5.04	5.03	0.0

Job No. 171671
Fig. No. C-16

DESIGN CALCULATIONS

STANDARD SECTIONS - RURAL MINOR COLLECTOR

DESIGN DATA PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 3

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 109,500
Hveem Stabilometer (R Value) Results:	R = 6
Weighted Structural Number (WSN):	WSN = 2.96

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

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

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 4.5 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 8.9$ inches of Aggregate
Base Course, use 9.0 inches

Asphalt Thickness (t) = 5 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 6.9$ inches of Aggregate
Base Course, use 7.0 inches

RECOMMENDED ALTERNATIVES

1. 4.5 inches of Asphalt + 9.0 inches of Aggregate Base Course, or
2. 5.0 inches of Asphalt + 7.0 inches of Aggregate Base Course, or
3. 7.0 inches of Asphalt

Job No. 171671
Fig. No. C-17

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS - RURAL MINOR COLLECTOR

DESIGN DATA: PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 3

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 109,500
Hveem Stabilometer (R Value) Results:	R = 6
Weighted Structural Number (WSN):	WSN = 2.96

DESIGN EQUATION

$$WSN = C_1 D_1 + C_2 D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt
 $C_2 = 0.12$ 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 inches
 $D_2 = ((WSN) - (t)(C_1))/C_2 = 10.0$ inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 7.0 inches of Full Depth Asphalt

Job No. 171671
Fig. No. C-18

FLEXIBLE PAVEMENT DESIGN

STANDARD SECTIONS - RURAL MAJOR COLLECTOR

DESIGN DATA

PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	273,750
Hveem Stabilometer (R Value) Results:	R =	20
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.5
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	4940

Weighted Structural Number (WSN): ➔ WSN = 2.91

DESIGN TABLES AND EQUATIONS

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

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

$$M_R = 2555 * CBR^{0.64}$$

$$k = M_R / 19.4$$

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
5.44	5.44	0.0

Job No. 171671
Fig. No. C-19

DESIGN CALCULATIONS

STANDARD SECTIONS - RURAL MAJOR COLLECTOR

DESIGN DATA

PULPIT ROCK, LLC

FLYING HORSE NORTH, FILING 1 - SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 273,750
Hveem Stabilometer (R Value) Results:	R = 20
Weighted Structural Number (WSN):	WSN = 2.91

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

$$D_1 = (WSN)/C_1 = 6.6 \text{ inches of Full Depth Asphalt}$$

Use 7.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 4.5 inches

$$D_2 = ((WSN) - (t)(C_1))/C_2 = 8.4 \text{ inches of Aggregate}$$

Base Course, use 8.5 inches

RECOMMENDED ALTERNATIVES

1. 4.5 inches of Asphalt + 8.5 inches of Aggregate Base Course, or
3. 7.0 inches of Asphalt

Job No. 171671
Fig. No. C-20

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS - RURAL MAJOR COLLECTOR

DESIGN DATA: PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 273,750
Hveem Stabilometer (R Value) Results:	R = 20
Weighted Structural Number (WSN):	WSN = 2.91

DESIGN EQUATION

$$WSN = C_1 D_1 + C_2 D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt
 $C_2 = 0.12$ 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)

$D_1 = (WSN)/C_1 = 6.6$ inches of Full Depth Asphalt
Use 7.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches
 $D_2 = ((WSN) - (t)(C_1))/C_2 = 9.6$ inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 7.0 inches of Full Depth Asphalt

Job No. 171671
Fig. No. C-21

FLEXIBLE PAVEMENT DESIGN

STANDARD SECTIONS - RURAL MAJOR COLLECTOR

DESIGN DATA

PULPIT ROCK, LLC

FLYING HORSE NORTH, FILING 1 - SOIL TYPE 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	273,750
Hveem Stabilometer (R Value) Results:	R =	38
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.5
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	8896

Weighted Structural Number (WSN): ➔ WSN = 2.37

DESIGN TABLES AND EQUATIONS

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

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

$$M_R = 2555 * CBR^{0.64}$$

$$k = M_R / 19.4$$

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
5.44	5.44	0.0

Job No. 171671
Fig. No. C-22

DESIGN CALCULATIONS

STANDARD SECTIONS - RURAL MAJOR COLLECTOR

DESIGN DATA PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 273,750
Hveem Stabilometer (R Value) Results:	R = 38
Weighted Structural Number (WSN):	WSN = 2.37

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

$D_1 = (WSN)/C_1 = 5.4$ inches of Full Depth Asphalt
Use 5.5 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 3.5 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 7.5$ inches of Aggregate
Base Course, use 8.0 inches

RECOMMENDED ALTERNATIVES

1. 3.5 inches of Asphalt + 8.0 inches of Aggregate Base Course, or
2. 5.5 inches of Asphalt

Job No. 171671
Fig. No. C-23

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS - RURAL MAJOR COLLECTOR

DESIGN DATA: PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 2

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 273,750
Hveem Stabilometer (R Value) Results:	R = 38
Weighted Structural Number (WSN):	WSN = 2.37

DESIGN EQUATION

$$WSN = C_1 D_1 + C_2 D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt
 $C_2 = 0.12$ 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)

$D_1 = (WSN)/C_1 = 5.4$ inches of Full Depth Asphalt
Use 5.5 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches
 $D_2 = ((WSN) - (t)(C_1))/C_2 = 5.1$ inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 5.5 inches of Full Depth Asphalt

Job No. 171671
Fig. No. C-24

FLEXIBLE PAVEMENT DESIGN

STANDARD SECTIONS - RURAL MAJOR COLLECTOR

PULPIT ROCK, LLC

FLYING HORSE NORTH, FILING 1 - SOIL TYPE 3

DESIGN DATA

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	273,750
Hveem Stabilometer (R Value) Results:	R =	6
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.5
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	3126

Weighted Structural Number (WSN): ➔ WSN = 3.39

DESIGN TABLES AND EQUATIONS

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

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

$$M_R = 2555 * CBR^{0.64}$$

$$k = M_R / 19.4$$

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
5.44	5.44	0.0

Job No. 171671
Fig. No. C-25

DESIGN CALCULATIONS

STANDARD SECTIONS - RURAL MAJOR COLLECTOR

DESIGN DATA PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 3

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 273,750
Hveem Stabilometer (R Value) Results:	R = 6
Weighted Structural Number (WSN):	WSN = 3.39

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

$D_1 = (WSN)/C_1 = 7.7$ inches of Full Depth Asphalt
Use 8.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 5 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 10.8$ inches of Aggregate
Base Course, use 11.0 inches

Asphalt Thickness (t) = 5.5 inches

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

RECOMMENDED ALTERNATIVES

1. 5.0 inches of Asphalt + 11.0 inches of Aggregate Base Course, or
2. 5.5 inches of Asphalt + 9.0 inches of Aggregate Base Course, or
3. 8.0 inches of Asphalt

Job No. 171671
Fig. No. C-26

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS - RURAL MAJOR COLLECTOR

DESIGN DATA: PULPIT ROCK, LLC
FLYING HORSE NORTH, FILING 1 - SOIL TYPE 3

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 273,750
Hveem Stabilometer (R Value) Results:	R = 6
Weighted Structural Number (WSN):	WSN = 3.39

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt
 $C_2 = 0.12$ 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)

$D_1 = (WSN)/C_1 = 7.7$ inches of Full Depth Asphalt
Use 8.0 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 5 inches
 $D_2 = ((WSN) - (t)(C_1))/C_2 = 9.9$ inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 5.0 inches of Asphalt + 10 inches of Cement Treated Subgrade.
2. 8.0 inches of Full Depth Asphalt

Job No. 171671
Fig. No. C-27

**APPENDIX D: Flying Horse North Traffic Study by
LSC Transportation Consultants, Inc.,
dated July 21, 2016, Job No. 164050**




LSC TRANSPORTATION CONSULTANTS, INC.
545 East Pikes Peak Ave., Suite 210
Colorado Springs, CO 80903
(719) 633-2868
FAX (719) 633-5430
E-mail: lsc@lscctrans.com
Website: <http://www.lscctrans.com>


Flying Horse North
Updated Traffic Impact Analysis
(LSC #164050)

July 21, 2016

Traffic Engineer's Statement

This traffic report and supporting information were prepared under my responsible charge and they comport with the standard of care. So far as is consistent with the standard of care, said report was prepared in general conformance with the criteria established by the County for traffic reports.



Jeffrey C. Hodsdon, P.E. #31684

A circular seal with a rope-like border. The text inside the seal reads "COLORADO LICENSED" at the top, "JEFFREY C. HODSDON" in the middle, "31684" in the center, and "PROFESSIONAL ENGINEER" at the bottom.

Date 7/21/16

Developer's Statement

I, the Developer, have read and will comply with all commitments made on my behalf within this report.


Drew Balsick
PRI #2, LLC
6385 Corporate Drive
Colorado Springs, CO 80919

Date 7-21-16



LSC TRANSPORTATION CONSULTANTS, INC.
545 East Pikes Peak Avenue, Suite 210
Colorado Springs, CO 80903
(719) 633-2868
FAX (719) 633-5430
E-mail: lsc@lscs.com
Website: <http://www.lscs.com>

July 21, 2016

Mr. Drew Balsick
PRI #2, LLC
6385 Corporate Drive
Colorado Springs, CO 80919

RE: Flying Horse North
El Paso County, Colorado
Updated Traffic Impact Analysis
LSC #164050

Dear Drew:

LSC Transportation Consultants, Inc. has prepared this updated traffic impact study for the proposed Flying Horse North at Shamrock Ranch development. As shown in Figure 1, the site is located generally south of Hodgen Road and west of Black Forest Road in El Paso County, Colorado.

LAND USE AND ACCESS

The Flying Horse North at Shamrock Ranch site is located south of Hodgen Road and west of Black Forest Road. A narrow portion of the site extends west to State Highway 83/Stagecoach Road. At buildout, the site is planned to contain 283 single-family homes and an 18-hole golf course. The site plan is shown in Figure 2a.

Access

Access is proposed via a new east/west road (Stagecoach Road) that would extend from SH 83 at an existing full-movement access for the Westcott Fire Station No. 2, which aligns with Stagecoach Road, to Black Forest Road aligning with the north intersection of Terra Ridge Circle. Access would also be provided via an extension of Holmes Road into the site.

Additionally, full-movement access is proposed to Hodgen Road about 1,340 feet west of Black Forest Road. Three full-movement access points are proposed to Black Forest Road aligning with Monty Place, aligning with Alpaca Heights, and about 725 feet south of Black Forest/Terra Ridge Circle (south). Per the *El Paso County Engineering Criteria Manual (ECM)* the minimum intersection spacing on both Hodgen Road and Black Forest Road is 1,320 feet. The south access point to Black Forest Road will require a deviation to this criteria.

Phasing

The project would be completed in phases. The phasing plan is shown in Figure 2b. Stagecoach Road is initially planned to be built east from SH 83 about two miles to serve Phase 1 and west from Black Forest Road about 1,600 feet to serve Phase 2. An emergency road will be constructed between these two sections. Stagecoach Road will be improved adjacent to Phase 3 with that phase and completed with Phase 4.

The extension of Holmes Road north through the site to Stagecoach Road is not planned until Phase 9. The proposed south full-movement access to Black Forest Road is not planned until Phase 11. The proposed full-movement site access to Hodgen Road is not planned until Phase 12. The proposed full-movement access points to Black Forest Road aligning with Alpaca Heights and Monty Place are not planned until Phase 13.

ROADWAY AND TRAFFIC CONDITIONS

Area Roadways

The area roadways in the site's vicinity are shown on Figure 1 and are described below.

- **Hodgen Road** is a two-lane paved Rural Minor Arterial road that extends east from the intersection of Roller Coaster Road/Baptist Road to Eastonville Road. The speed limit on Hodgen Road is generally 55 miles per hour (mph) east of SH 83.
- **State Highway (SH) 83** extends from Colorado Springs north to Parker and areas of southeast Denver. In the vicinity of the site, SH 83 is classified as a Regional Highway (R-A). At this location, SH 83 is a two-lane rural highway with two- to four-foot shoulders and a speed limit of 55 miles per hour (mph). The intersection with Hodgen Road is signalized.
- **Shoup Road** is a two-lane, paved Rural Minor Arterial road that extends east from SH 85 Highway (US) 83 to just east of Vollmer Road. The posted speed limit on Shoup Road is 45 mph.
- **Black Forest Road** is a two-lane, paved Rural Minor Arterial road that extends north from Woodmen Road to County Line Road. Black Forest Road is offset about one-quarter mile to the east at Hodgen Road. In the vicinity of the site the posted speed limit on Black Forest Road is 45 mph.
- **Holmes Road** is a rural local paved two-lane road that extends north from Shoup Road to just north of Vessey Road. Holmes Road is planned to be extended north into the site as part of this development. The posted speed limit on Homes Road is 30 mph.
- **Vessey Road** is a rural local paved two-lane road that extends east from the Cathedral Pines development to Black Forest Road.

Existing Traffic Conditions

Figure 3 shows the existing traffic volumes at the intersection of SH 83/Stagecoach based on traffic counts conducted by LSC in January 2016 and at the intersection of Hodgen/Black Forest (west) based on traffic counts conducted by LSC in December 2014. The traffic counts at Hodgen/Black Forest have not been recounted in 2016 due to the closure of Black Forest Road at Kettle Creek. The traffic count reports are attached. Figure 3 also shows CDOT annual average daily traffic volumes and LSC estimates of average daily traffic on County roads.

Existing Level of Service

Level of service (LOS) is a quantitative measure of the level of delay at an intersection. Level of service is indicated on a scale from "A" to "F." LOS A represents control delay of less than 10 seconds for unsignalized and signalized intersections. LOS F represents control delay of more than 50 seconds for unsignalized intersections and more than 80 seconds for signalized intersections. Table 1 shows the level of service delay ranges.

Table 1 Intersection Levels of Service Delay Ranges		
Level of Service	Signalized Intersections	Unsignalized Intersections
	Control Delay (seconds per vehicle)	
A	10 sec or less	10 sec or less
B	10-20 sec	10-15 sec
C	20-35 sec	15-25 sec
D	35-55 sec	25-35 sec
E	55-80 sec	35-50 sec
F	80 sec or more	50 sec or more

The intersections of SH 83/Stagecoach and Hodgen/Black Forest (west) were analyzed to determine the existing levels of service during the peak hours based on the unsignalized method of analysis procedures outlined in the *Highway Capacity Manual, 2010 Edition* by the Transportation Research Board. The results of the level of service analysis are shown in Figure 2. The level of service reports are attached.

As shown on Figure 3, all movements at the intersections of SH 83/Stagecoach and Hodgen/Black Forest (west) are currently operating at level of service C or better during the peak hours.

BACKGROUND TRAFFIC

Background traffic is the traffic estimated for the existing and planned future roadways in the study area. These include the new roadways planned for Flying Horse North including Stagecoach Road

between SH 83 and Black Forest Road (completed with Phase 4) and the Holmes Road extension north to Stagecoach Road (not until Phase 9). Although background traffic estimates include the new on-site roadways, they do not include traffic to be generated by the site land uses (283 single-family homes and the golf course). Background traffic has been presented in this manner to clearly show estimates of non-site traffic volumes on the new roadway connections through this proposed development. Most of the traffic using the on-site roads—Stagecoach and Holmes north of its current terminus—represents a shift of local traffic volume from other current travel routes with the new routes through the Flying Horse North site. LSC does not anticipate use of the new on-site road connections by non-local-area traffic/through traffic.

Short Term

Flying Horse North is projected to plat about 10 to 20 lots per year. Based on this rate of development Phases One through Six are estimated to be built out between six and fourteen years, therefore a short-term horizon of 10 years was selected for the traffic analysis. Figure 4 shows the short-term (year 2026) background traffic volumes on the area roadway segments and at the intersections in the vicinity of the site. The short-term background traffic volumes assume Stagecoach Road built east from SH 83 about two miles to serve Phase 1 and west from Black Forest Road about 1,600 feet to serve Phase 2 only with a gravel pilot road/ungated emergency road between these two sections. The short-term background volumes also assume Holmes Road has not been extended north to Stagecoach Road. The background traffic volumes on SH 83 are estimates by LSC based on the Colorado Department of Transportation (CDOT) twenty-year growth factors for the section of SH 83 adjacent to the site. The background traffic volumes on Hodgen Road and Black Forest Road assume a growth rate of two percent per year. The short-term background traffic volumes on Hodgen Road and Black Forest assume the existing alignment of Black Forest Road at Hodgen Road.

Long Term

Figure 5 shows the 2040 background traffic volumes on the roadway segments and the intersections in the study area. The 2040 background traffic volumes assume completion of Stagecoach Road from SH 83 to Black Forest Road and the extension of Holmes Road north to Stagecoach Road. The background traffic volumes on SH 83 are estimates by LSC based on the Colorado Department of Transportation (CDOT) twenty-year growth factors for the section of SH 83 adjacent to the site. The background traffic volumes on Hodgen Road and Black Forest Road assume a growth rate of two percent per year. The 2040 background traffic volumes on Hodgen Road and Black Forest assume the existing alignment of Black Forest Road at Hodgen Road.

Level of Service Analysis

Figures 4 and 5 also present the results of the background traffic level of service analysis. The figures indicate LSC assumptions for the background condition, intersection traffic control, and lane geometry.

TRIP GENERATION

The site-generated vehicle-trips were estimated using the nationally published trip generation rates from *Trip Generation, 9th Edition, 2012* by the Institute of Transportation Engineers (ITE). Table 2 shows the site's average weekday, morning peak-hour, and afternoon peak-hour trip generation estimates for Phases 1 and 2, Phases 1 through 6, and at buildout.

At buildout, the Flying Horse North at Shamrock Ranch site could be expected to generate about 3,337 new vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak hour, which typically occurs for one hour between 6:30 and 8:30 a.m., about 82 vehicles would enter and 167 vehicles would exit the site. During the afternoon peak hour, which typically occurs for one hour between 4:30 and 6:30 p.m., about 205 vehicles would enter and 130 vehicles would exit the site.

DIRECTIONAL DISTRIBUTION AND ASSIGNMENT

The directional distribution of the site-generated trips on the area roadway network is an important factor in determining the site's traffic impacts. Figure 6 shows directional distribution estimates for the site-generated trips. The estimates have been based on the following factors: the site's land uses, the roadway network and access connections, and the site's location with respect to the nearby employment, commercial centers, other residential areas, and the balance of the Colorado Springs metropolitan area.

When the distribution percentages in Figure 6 are applied to the trip generation estimates shown in Table 2, the site-generated traffic volumes on the area roadways can be determined. The site-generated traffic volumes are shown in Figures 7, 8, 9a, and 9b. The figures also show average weekday traffic volumes on the internal and off-site roadways.

Figure 7 shows the Phase 1 and Phase 2 site-generated traffic volumes. The Phase 1 and Phase 2 site-generated traffic volume estimates assume Stagecoach Road built east from SH 83 about two miles to serve Phase 1 and west from Black Forest Road about 1,600 feet to serve Phase 2 with a gravel pilot road/ungated emergency road between these two sections. No traffic was estimated to use the gravel pilot road. These volumes assume no direct access to Hodgen Road and access to Black Forest Road via Stagecoach Road only. Figure 8 shows the site-generated traffic volumes through Phase 6 (including the golf course). The Phase 1 to Phase 6 site-generated traffic volume estimates assume Stagecoach Road has been completed between SH 83 and Black Forest Road but assumes Holmes Road has not been extended north through the site to Stagecoach Road. These volumes also assume no direct access to Hodgen Road or access to Black Forest Road via Stagecoach Road only.

Figure 9a shows the buildout site-generated traffic volumes at all of the proposed site access points and at the adjacent intersections. Figure 9b shows the buildout site-generated traffic volumes at three off-site intersections: Black Forest Road/Vessey Road, Vessey Road/Holmes Road, and Shoup Road/Holmes Road. The buildout site-generated traffic volumes assume Stagecoach Road has been extended from SH 83 to Black Forest Road and Holmes Road has been extended north through the

site to Stagecoach Road. These volumes also assume the full-movement access to Hodgen Road and the three full-movement access points to Black Forest Road are all constructed and open.

EXISTING PLUS PHASE 1 AND 2 SITE-GENERATED TRAFFIC

Figure 10 shows the sum of the existing traffic volumes from Figure 3 plus the Phase 1 and Phase 2 site-generated traffic volumes from Figure 7. These volumes represent the short-term Phase 1 and Phase 2-only impacts of this development.

SHORT-TERM TOTAL TRAFFIC

Figure 11 shows the short-term total traffic volumes at the intersections in the vicinity of the site assuming buildout of Phases 1 through 6 of the Flying Horse North at Shamrock Ranch and the golf course (assumed to occur during Phase 3). These volumes are the sum of the short-term background traffic volumes from Figure 4 plus the Phase 1 through Phase 6 site-generated traffic volumes from Figure 8.

2040 TOTAL TRAFFIC

Figure 12 shows the 2040 total traffic volumes at the intersection in the vicinity of the site. These volumes are the sum of the 2040 background volumes from Figure 5 plus the buildout site-generated traffic volumes from Figure 9a.

PROJECTED LEVEL OF SERVICE

The intersections in the vicinity of the site have been analyzed to determine the projected level of service based on the unsignalized method of analysis procedures outlined in the *Highway Capacity Manual, 2010 Edition* by the Transportation Research Board.

The intersections of Hogden/Black Forest, the full-movement site access to Hodgen Road, and both full-movement access points to Black Forest Road are all projected to operate at level of service C or better during the peak hours for all movements as Stop-sign-controlled intersections based on the projected existing plus Phase 1 and Phase 2 site-generated, short-term total, and 2040 total traffic volumes.

All movements at the Stop-sign-controlled intersection of SH 83/Stagecoach are projected to operate at level of service C or better during the peak hours based on the existing plus Phase 1 and Phase 2 site-generated traffic. Prior to completion of Phase 6 a southbound left-turn acceleration lane will be required on SH 83 at Stagecoach Road. A simulation was performed using Synchro/SimTraffic to determine the impact of this lane. The simulation was run five times and the results averaged. The average delay for each movement was then compared to the delay showed in Table 1 to determine the projected level of service. The 2040 analysis indicates the westbound approach left-turn movement at this intersection is projected to operate at LOS E during the afternoon peak hour. It is unlikely a traffic signal warrant will be met based on the projected traffic volumes and assuming the intersection laneage shown in Figure 12.

TRAFFIC SIGNAL WARRANT ANALYSIS

The intersection of SH 83/Stagecoach was analyzed to determine if a Four-Hour Vehicular Volume Traffic Signal Warrant would be met or close to being met based on the projected 2040 total traffic volumes and lane geometry. As shown in Figure 13 this intersection is not projected to meet the thresholds for a Four-Hour Vehicular Volume Traffic Signal Warrant during the morning and afternoon peak hours based on the short-term scenario.

AVERAGE DAILY TRAFFIC IMPACTS

At buildout, Flying Horse North is projected to add about 185 vehicles per day to Holmes Road just south of Vessey Road. However, with the extension of Holmes Road north to Stagecoach Road about 400 trips generated by the existing land uses south of the site are projected to be rerouted to use this new connection. The net impact to Holmes Road south of Vessey Road is therefore negligible.

CONCLUSIONS

Trip Generation

- At buildout the Flying Horse North at Shamrock Ranch site could be expected to generate about 3,337 new vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak hour about 82 vehicles would enter and 167 vehicles would exit the site. During the afternoon peak hour about 205 vehicles would enter and 130 vehicles would exit the site.

Traffic Volume Impacts

- At buildout the site is projected to add about 185 vehicle-trips per day to Holmes Road just north of Shoup Road. However, a portion of the existing traffic using Holmes Road just north of Shoup would instead use the new Phase 9 extension of Holmes to Stagecoach through Flying Horse North at Shamrock Ranch.
- At buildout the site is projected to add about 1,340 vehicle trips per day to SH 83 just south of Stagecoach Road. This represents an increase of about seven percent above the projected 2040 background traffic volume.
- At buildout the site is projected to add about 400 vehicle-trips per day to Hodgen Road just west of the proposed site access point. This represents an increase of about 4.3 percent above the projected 2040 background traffic volume.
- At buildout the site is projected to add about 345 vehicle-trips per day to Black Forest Road just south of Hodgen Road. This represents an increase of about 10.6 percent above the projected 2040 background traffic volume.

Level of Service

- The intersections of Hogden/Black Forest, the full-movement site access to Hodgen Road, and both full-movement access points to Black Forest Road are all projected to operate at level of service C or better during the peak hours for all movements as Stop-sign-controlled intersections based on the projected existing plus Phase 1 site-generated, short-term total, and 2040 total traffic volumes.
- All movements at the Stop-sign-controlled intersection of SH 83/Stagecoach are projected to operate at level of service C or better during the peak hours based on the existing plus Phase 1 and Phase 2 site-generated traffic and short-term total traffic (through Phase 6). The 2040 analysis indicates the westbound approach left-turn movement at this intersection is projected to operate at LOS E during the afternoon peak hour. It is unlikely a traffic signal warrant will be met based on the projected traffic volumes and assuming the intersection laneage shown in Figure 12 including a southbound left-turn acceleration lane on SH 83.

Traffic Signal Warrants

- The projected 2040 peak-hour total traffic volumes and lane geometry at the intersection of SH 83/Stagecoach Road are not projected to meet the thresholds for a Four-Hour Vehicular Volume Traffic Signal Warrant.

Auxiliary Turn Lanes

- Table 3 shows a summary of the auxiliary turn lanes that will be required by phase of this project.

Phases 1 and 2

- No auxiliary turn lanes will be required based on the projected existing plus Phase 1 and Phase 2 site-generated traffic volumes.

Phase 3

- Based on the projected short-term total traffic volumes and the criteria contained in the *State of Colorado Highway Access Code*, a northbound right-turn deceleration lane would be required on SH 83 approaching Stagecoach Road. The short-term total traffic volumes assume buildout of Flying Horse North at Shamrock Ranch through Phase 6 and the golf course and assumes the construction of Stagecoach Road from SH 83 to Black Forest Road. This lane should be 378 feet long plus a 222-foot-long taper.
- Based on the short-term total traffic volumes and the criteria contained in the *State of Colorado Highway Access Code*, a northbound right-turn acceleration lane would be required on SH 83 at Stagecoach Road. The short-term total assumes buildout of Flying Horse North at Shamrock

Ranch through Phase 6 and the golf course and assumes the construction of Stagecoach Road from SH 83 to Black Forest Road. This lane should be 738 feet long plus a 222-foot-long taper.

- Based on the projected short-term total site-generated traffic volumes and the criteria contained in the *State of Colorado Highway Access Code*, a southbound left-turn lane would be required on SH 83 approaching Stagecoach Road. This lane should be 418 feet long plus a 222-foot-long taper.
- Based on comments received from the Colorado Department of Transportation a southbound left-turn acceleration lane will be required on SH 83 from Stagecoach Road. This lane should be 738 feet long plus a 222 foot taper (adjusted for grades as necessary).

Phase 7

- Based on the projected 2040 total traffic volumes and on the criteria contained in the *El Paso County Engineering Criteria Manual* a northbound left-turn lane would be required on Black Forest Road approaching the north full-movement site access (Stagecoach Road). The 2040 total volumes assume buildout of Flying Horse North at Shamrock Ranch, the construction of Stagecoach Road from SH 83 to Black Forest Road, and the extension of Holmes Road north to Stagecoach Road. Based on a design speed of 60 mph for a Rural Minor Arterial, this lane should be 340 feet long plus a 240-foot-long taper.

Buildout

- Based the projected existing plus Phase 1 and Phase 2 site-generated traffic, short-term total, and 2040 total volumes and on the criteria contained in the *El Paso County Engineering Criteria Manual* no auxiliary turn lanes would be required on Hodgen Road approaching the proposed full-movement site access just west of Black Forest Road.
- There is an existing eastbound right-turn deceleration lane and westbound left-turn lane on Hodgen Road approaching Black Forest Road. Based on the criteria contained in the *El Paso County Engineering Criteria Manual* no additional turn lanes would be required at this intersection based on the projected existing plus Phase 1 and Phase 2 site-generated traffic, short-term total, and 2040 total traffic volumes.
- Based on the projected existing plus Phase 1 and Phase 2 site-generated traffic, short-term total, and 2040 total volumes and the criteria contained in the *El Paso County Engineering Criteria Manual* southbound right-turn deceleration lanes would not be required on Black Forest Road approaching the proposed full-movement site access points.
- Based on the projected existing plus Phase 1 and Phase 2 site-generated traffic, short-term total, and 2040 total volumes and the criteria contained in the *El Paso County Engineering Criteria Manual* no auxiliary turn lanes would be required on Black Forest Road approaching the proposed full-movement site access points.

Roadway Classifications

- Stagecoach Road should be classified as a Rural Minor Residential Collector from SH 83 to Black Forest Road. The projected traffic volume for the west portion of this roadway would exceed the *Engineering Criteria Manual* design average daily traffic criteria for Rural Minor Residential Collector roadways. A deviation request will be submitted separately.
- LSC recommends all other roadways within Flying Horse North at Shamrock Ranch be classified as Rural Local.

Other Deviations

- The proposed full-movement access to Black Forest Road, about 725 feet south of Black Forest/Terra Ridge Circle (south) proposed for Phase 11, will require a deviation to the *El Paso County Engineering Criteria Manual* (ECM) as the proposed spacing is less than the minimum intersection spacing for Minor Arterials. The proposed location was selected for the best sight distance. A deviation request will be submitted separately.

Countywide Road Impact Fee Program

- The Flying Horse North at Shamrock Ranch development will be required to participate in the Countywide Road Impact Fee program. The specific PID option (or opt-out option) as well as the specific calculated fee amount will be provided with the submittal of the Preliminary Plan or Final Plat. The fee per residential dwelling unit will be payable at the time of the building permit.

* * * * *

Please contact me if you have any questions regarding this report.

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.

By 

Jeffrey C. Hodsdon, P.E., PTOE
Principal

JCH:KDF:bjwb

Enclosures: Tables 2 and 3
Figures 1-13
Traffic Count Reports
Level of Service Reports