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Materials Testing
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PAVEMENT DESIGN REPORT

Ponderosa at Lorson Ranch Filing No. 3
El Paso County, Colorado

SF-20-016

PREPARED FOR:

Landhuis Company
212 N. Wahsatch Ave. Ste 301
Colorado Springs, CO

JOB NO. 178680

Original Issue date 11-13-2020
Revised November 16, 2020

Respectfully Submitted,

RMG – Rocky Mountain Group

Brian Griffith, E.I.
Geotechnical Staff Engineer

Reviewed by,

RMG – Rocky Mountain Group

Geoff Webster, P.E.
Sr. Geotechnical Project Engineer

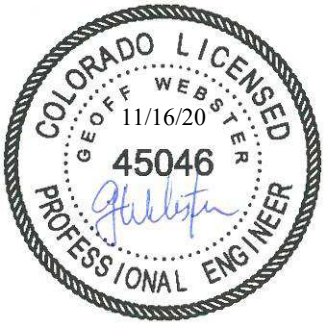


TABLE OF CONTENTS

GENERAL SITE AND PROJECT DESCTIPTION

Location

Ponderosa at Lorson Ranch Filing No. 3 is located along Old Glory Drive, north of Fontaine Boulevard, in Colorado Springs, Colorado. The location of the site is shown on the Site Vicinity Map, Figure 1.

Existing Conditions

At the time of our field investigation, the proposed streets were close to grade and utility mains and services had been installed. Curb and gutter had not been installed.

Project Description

This Pavement Design Report was performed to determine the subsurface conditions present along the roadway alignments and to develop recommendations for the design and construction of the proposed flexible pavements.

The proposed streets included in this investigation are shown on Figure 2. The Development Plans indicate the roadways are to be *Private*, but for pavement design, the streets considered below are classified as Residential Local. Streets include Winter Gem Grove and Whitewolf Point as shown on Figure 2. White Gem Grove is classified as Residential Local with a 50-foot Right-of-Way (ROW) and two 15-foot drive lanes. Whitewolf Point is classified as Residential Local – Low Volume, with a 40-foot ROW and two 12-foot drive lanes. A portion of Whitewolf Point serving Lots 37 through 44 shall be constructed with concrete pavement.

FIELD INVESTIGATION AND SUBSURFACE CONDITIONS

Drilling

The subsurface conditions on the site were investigated by drilling five (5) exploratory test borings. The approximate locations of the test borings are presented in the Test Boring Location Plan, Figure 2.

The test borings were advanced with a power-driven, continuous-flight auger drill rig to depths of about 5 to 10 feet below the existing ground surface. Samples were obtained in general accordance with ASTM D-3550 utilizing a 2½-inch OD modified California sampler. Representative bulk samples of subsurface materials were obtained from each boring at a depth of approximately 0 to 2-feet below the existing ground surface. An Explanation of Test Boring Logs is presented in Figure 3. The Test Boring Logs are presented in Figures 4 through 6.

Subsurface Materials

The subsurface materials encountered in the test borings consisted of lean sandy clay. Combined bulk samples of the material classified as CL according to the Unified Classification System. For pavement

design, the combined bulk soil samples classified as A-7-6 in accordance with the American Association of State Highway and Transportation Officials (ASSHTO) classification system. This soil classification is considered "fair" as subgrade material.

Groundwater

Groundwater was not encountered in the test borings at the time of drilling. Groundwater is not expected to affect the construction of the pavements. Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in precipitation and other factors not readily apparent at this time. Development of the property and adjacent properties may also affect groundwater levels.

LABORATORY TESTING

Laboratory Testing

The moisture content for the recovered samples was obtained in the laboratory. Grain-size analysis and Atterberg Limits tests were performed on selected samples to classify the soil and to develop pertinent engineering properties. A Summary of Laboratory Test Results is presented in Figure 7. Soil Classification Data are presented in Figure 8. Swell/Consolidation Test Results are presented in Figure 9 through 11.

A combined bulk sample of A-7-6 soil was tested to determine the optimum moisture-density relationship in accordance with ASTM D698 (Standard Proctor compaction test). California Bearing Ratio, CBR tests were performed at varying densities with moisture content near optimum. At 95% of the Maximum Modified Proctor density (97.6 pcf), the CBR of the bulk sample was **4**. The Moisture-Density Relation Curve is presented in Figure 12. The CBR Test Results are presented in Figures 13 and 14.

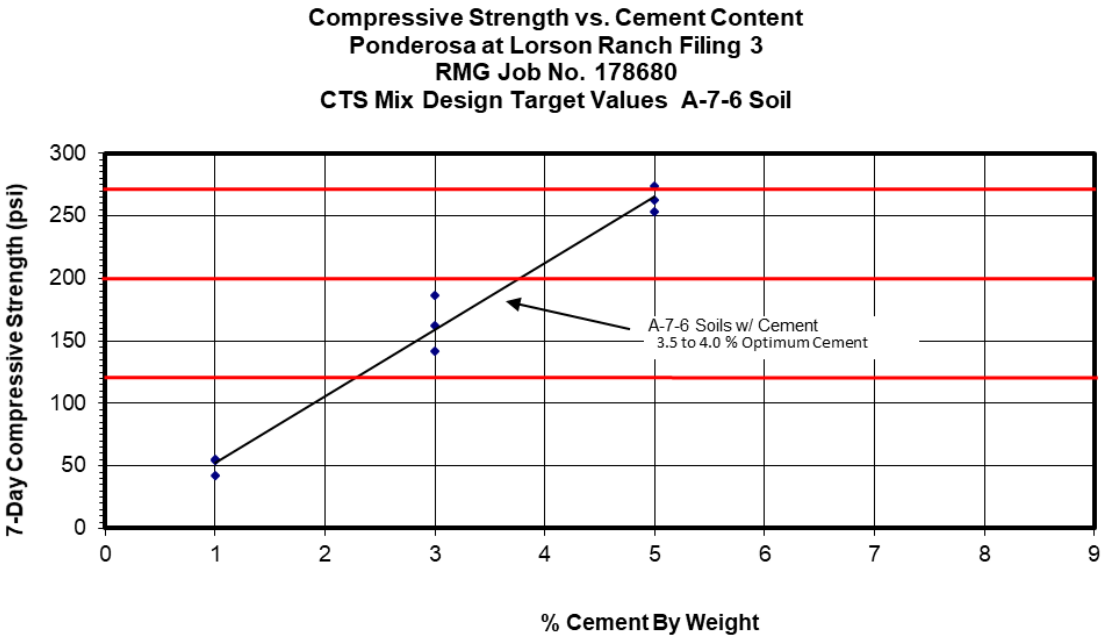
The developer intends to install a composite roadway section consisting of Hot Mix Asphalt (HMA) over Cement-Treated Subgrade (CTS). RMG performed Mix Design calculations for the CTS composite section.

CTS: Specimens of soil composed of the A-7-6 subgrade materials and Portland cement were prepared by varying the "percent cement by weight" at target values of 1, 3, and 5 percent cement. Three specimens (pucks) were prepared for each target cement value, compacted to 95% of the maximum Standard Proctor density and cured in a saturated condition for 7-days. The compressive strength of each specimen was then determined upon completion of the 7-day curing process. The compressive strengths are presented in the table below:

A-7-6 Soil Compressive Strength Calculations

CTS Puck	Age/Day	Cap & Plate	Area of Sample	Dial Reading	Load LBF	Total Load	PSI
1A	7	2.12	12.566	67	677.8	680.0	54
1B	7	2.12	12.566	68	688.0	690.1	55
1C	7	2.12	12.566	52	526.1	528.2	42
3A	7	2.12	12.566	176	1780.6	1782.7	142
3B	7	2.12	12.566	231	2337.0	2339.1	186
3C	7	2.12	12.566	201	2033.5	2035.6	162
5A	7	2.12	12.566	340	3439.8	3441.9	274
5B	7	2.12	12.566	326	3298.1	3300.3	263
5C	7	2.12	12.566	315	3186.9	3189.0	254

The data values were then plotted as a function of "7-day Compressive Strength versus Percent Cement by Weight". In accordance with the El Paso County Engineering Criteria Manual, a target CTS Strength Coefficient = 0.11 is used for CTS soil in the pavement design procedure presented below. Based upon an evaluation of the test data, a target range of **3.5 to 4** percent cement is recommended to maintain strengths above 160-psi and below a 275-psi threshold. Results are presented below.



PAVEMENT DESIGN

The discussion presented below is based on the subsurface conditions encountered in the test borings, laboratory test results and the project characteristics previously described. If the subsurface conditions are different from those described in this report or the project characteristics change, RMG should be retained to review our recommendations and modify them, if necessary. The conclusions and recommendations presented in this report should be verified by RMG during construction.

The pavement design was performed using the El Paso County Engineering Criteria Manual. The pavement design parameters and design calculations are presented below.

Street Classification – Local Residential

1) Winter Gem Grove, Whitewolf Point
   ESAL = 292,000 (Table D-2)
   Serviceability Index = 2.0 (Table D-1)
   Reliability = 80% (Table D-1)

2) Strength coefficients (Table D-3)
   Asphalt (HMA): $a_1 = 0.44$
   Cement Stabilized Subgrade (CTS): $a_2 = 0.11$

3) Subgrade
   M_r = CBR x 1500 = 4 x 1500 = 6,000 psi

4) Structural number (SN) = 2.85 (1993 AASHTO Empirical Equation for Flexible Pavements)

5) Composite asphalt/base course section
   Minimum HMA thickness = D_1 = 4 inches (Table D-2)
   CTS thickness = $D_2 = \{SN – (D_1 \times a_1)\} / a_2 = \{2.85 – (4 \times 0.44)\} / 0.11 = 9.9$ inches
   Use CTS thickness = 10 inches
   SN = (4 x 0.44) + (10 x 0.11) = 2.86 > 2.85 (Min. SN required) => OK
   Use 4-inches HMA over 10-inches CTS

6) See below for Concrete Pavement thickness recommendations.

Pavement Thickness

Based on the design calculations and practical construction practices, the recommended pavement sections are presented below, and on Figure 2.1.

Recommended Pavement Sections

Winter Gem Grove, Whitewolf Point	4" HMA	10" CTS
Whitewolf Point (Lots 37 – 44) and (Lots 1-6, 65-68)	5" PCCP	10" Stabilized Subgrade
Optimal CTS Percent Cement by Weight = 3.5 to 4 %		

Notes: PCCP = Portland Cement Concrete Pavement
PCCP Not required to be placed on CTS

Pavement Materials

Pavement materials should be selected, prepared, and placed in accordance with El Paso County specifications and the *Pikes Peak Region Asphalt Paving Specifications*. Tests should be performed in accordance with the applicable procedures presented in the specifications.

Soil Mitigation

The Engineering Criteria Manual notes that mitigation measures may be required for expansive soils, shallow ground water, subgrade instability, etc. The average swell potential as determined by laboratory testing was 1.2 percent. Groundwater or wet soils were not encountered in the borings. Therefore, special mitigation measures do not appear to be necessary for subgrade preparation.

Subgrade Preparation

<u>CTS Option</u>

Subgrade for Ponderosa at Lorson Ranch Filing 3 shall be Cement Treated Subgrade (CTS) composed of a mixture of local soil, water, and Portland cement compacted at optimum moisture. Prior to CTS construction, the existing soil should be proof-rolled to a firm and unyielding condition. Areas that deform under wheel loads should be removed and replaced. The soil should then be scarified, pulverized, mixed with cement and water, compacted, finished and cured in lengths that allow the full roadway width to be completed in not more than 4 hours from the time that cement is exposed to water.

The quantity of cement shall be by weight as a percentage of the dry weight of the soil as specified herein (3.5 to 4% optimum), and should be applied uniformly on the soil to create a cement and water mixture for the full design width and depth. Mixing should be continuous until the mixture is at optimum moisture and ready for compacting and finishing. Compaction should begin within 30 minutes of mixing. CTS should be maintained in a moist condition during the curing process, and all traffic

except for necessary construction equipment should be kept off the CTS for a minimum of 7 days or until the final pavement layers are placed.

CTS testing shall be in accordance with El Paso County Engineering Criteria Manual. CTS compressive strength test results shall be submitted to the County prior to the placement of the asphalt, in part to confirm the requirement for micro fracturing (MF). Micro fracturing of the CTS shall be performed when 7-day compressive strength test results indicate CTS strength in excess of 275 psi. The subgrade should be kept in a moist cured condition for 48 to 72 hours before any micro fracturing is performed by a heavy (12-ton) steel drum vibratory roller operating at maximum amplitude. After satisfactory completion of micro fracturing, the subgrade should continue to be moist cured by sprinkling or other means.

Stabilized Subgrade

5-inches of PCCP may be placed directly atop 10-inches of stabilized subgrade. Stabilized subgrade may be any granular non-plastic material that will strengthen and stabilize the native soil. Materials such as recycled concrete, crushed rock or gravel, recycled asphalt, are suitable. Before installing stabilizing material, the upper 6 inches of exposed soil should be scarified and moisture conditioned to facilitate compaction (usually within 2 percent of the optimum moisture content) and compacted to firm and unyielding condition. 10-inches of stabilizing material should then be installed. The subgrade should then be proof-rolled with a heavy, pneumatic tired vehicle, and any areas that deform under wheel loads should be removed and replaced with clean material and recompacted. Subgrade construction should continue until 10-inches of prepared subgrade has been placed.

Surface Drainage

Surface drainage is important for the satisfactory performance of pavement. Wetting of the subgrade soils or base course will cause a loss of strength that can result in pavement distress. Surface drainage should provide for efficient removal of storm-water runoff. Water should not pond on the pavement or at the edges of the pavement.

Subgrade Observations and Testing

The pavement thicknesses presented above assume pavement construction is completed in accordance with El Paso County specifications and the *Pikes Peak Region Asphalt Paving Specifications*. RMG should be present at the site during subgrade preparation, placement of fill, and construction of pavements to perform site observations and testing.

CLOSING

This report has been prepared for the exclusive purpose of providing geotechnical engineering information and recommendations for development described in this report. RMG should be retained to review the final construction documents prior to construction to verify our findings, conclusions and recommendations have been appropriately implemented.

This report has been prepared for the exclusive use by the **Landhuis Company** for application as an aid in the design and construction of the proposed development in accordance with generally accepted geotechnical engineering practices. The analyses and recommendations in this report are based in part upon data obtained from test borings, site observations and the information presented in referenced reports. The nature and extent of variations may not become evident until construction. If variations then become evident, RMG should be retained to review the recommendations presented in this report considering the varied condition, and either verify or modify them in writing.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers practicing in this or similar localities. RMG does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report. No warranty, express or implied is made by the preparation of this report. Third parties reviewing this report should draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

The scope of services for this project does not include, either specifically or by implication, environmental assessment of the site or identification of contaminated or hazardous materials or conditions. Development of recommendations for the mitigation of environmentally related conditions, including but not limited to biological or toxicological issues, are beyond the scope of this report. If the Client desires investigation into the potential for such contamination or conditions, other studies should be undertaken.

If we can be of further assistance in discussing the contents of this report or analysis of the proposed development, from a geotechnical engineering point-of-view, please feel free to contact us.

FIGURES

NOT TO SCALE

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SITE VICINITY MAP

PONDEROSA AT LORSON RANCH,
FILING NO. 3
EL PASO COUNTY, COLORADO
LANDHUIS COMPANY

JOB No. 178680

FIG No. 1

DATE 11-16-2020

NOT TO SCALE

DENOTES LOTS WHERE TEST BORINGS WERE PERFORMED

BASE MAP PROVIDED BY CORE ENGINEERING GROUP

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Pueblo / Canon City:
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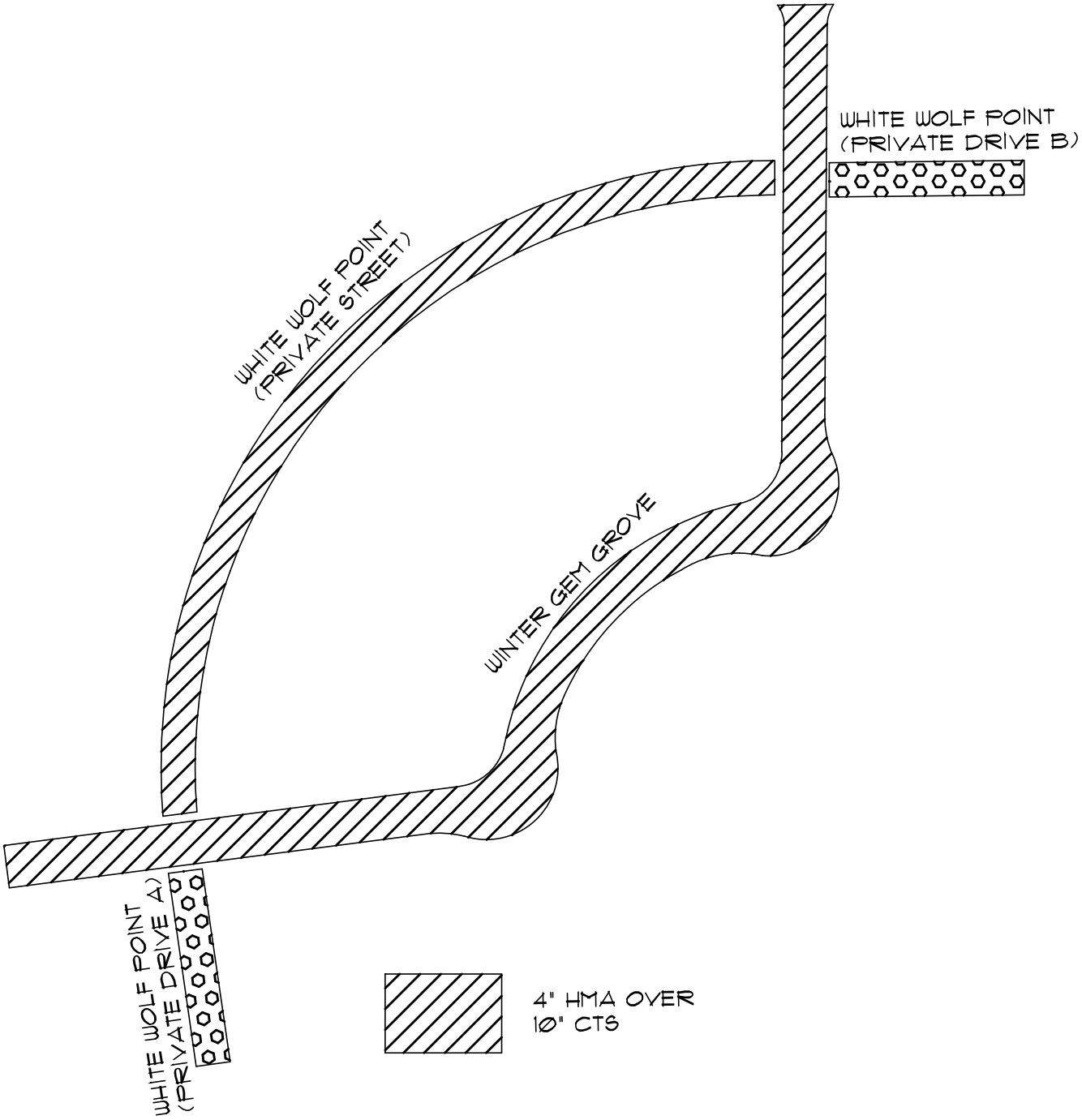
PONDEROSA AT LORSON RANCH, FILING NO. 3
EL PASO COUNTY, COLORADO
LANDHUIS COMPANY

ENGINEER:	GW
DRAWN BY:	BG
CHECKED BY:	GW
ISSUED:	11-16-2020

TEST BORING LAYOUT PLAN

SHEET No.
FIG-2



NOT TO SCALE

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RECOMMENDED PAVEMENT SECTION

PONDEROSA AT LORSON RANCH,
FILING NO. 3
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FIG No. 2.1

DATE 11-16-2020

SOILS DESCRIPTION


FILL: SAND, SILTY TO CLAYEY


FILL: CLAY, SANDY

UNLESS NOTED OTHERWISE, ALL LABORATORY
TESTS PRESENTED HEREIN WERE PERFORMED BY:
RMG - ROCKY MOUNTAIN GROUP
2910 AUSTIN BLUFFS PARKWAY
COLORADO SPRINGS, COLORADO

SYMBOLS AND NOTES


XX — STANDARD PENETRATION TEST - MADE BY DRIVING A SPLIT-BARREL SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-1586. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).


XX — UNDISTURBED CALIFORNIA SAMPLE - MADE BY DRIVING A RING-LINED SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-3550. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).


FREE WATER TABLE


DEPTH AT WHICH BORING CAVED


BULK — DISTURBED BULK SAMPLE


AUG — AUGER "CUTTINGS"

4.5 — WATER CONTENT (%)

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EXPLANATION OF TEST BORING LOGS

JOB No. 178680

FIGURE No. 3

DATE Nov/16/2020

TEST BORING: **1** DATE DRILLED: 10/16/20 REMARKS: NO GROUNDWATER ON 10/16/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: CLAY, SANDY, tan, stiff to very stiff, moist				16	9.8
				19	8.7
	5				

TEST BORING: **2** DATE DRILLED: 10/16/20 REMARKS: NO GROUNDWATER ON 10/16/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: CLAY, SANDY, brown to dark brown, stiff, moist				10	22.3
				12	18.7
	5				

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TEST BORING LOGS

JOB No. 178680

FIGURE No. 4

DATE Nov/16/2020

TEST BORING: **3** DATE DRILLED: 10/16/20 REMARKS: NO GROUNDWATER ON 10/16/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: CLAY, SANDY, brown to dark brown, medium stiff to very stiff, moist				9	20.2
				28	16.6
	5				
FILL: SAND, CLAYEY, tan, loose, moist					
				15	4.1
	10				

TEST BORING: **4** DATE DRILLED: 10/16/20 REMARKS: NO GROUNDWATER ON 10/16/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: CLAY, SANDY, dark brown, very stiff to hard, moist				40	14.9
				50/11"	15.9
	5				

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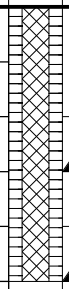
TEST BORING LOGS

JOB No. 178680

FIGURE No. 5

DATE Nov/16/2020

TEST BORING: **5** DATE DRILLED: 10/16/20 REMARKS: NO GROUNDWATER ON 10/16/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	
FILL: CLAY, SANDY, brown to dark brown, very stiff, moist				36	19.6	
				26	20.3	
	5					

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TEST BORING LOGS

JOB No. 178680

FIGURE No. 6

DATE Nov/16/2020

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.10 Sieve	% Retained No.40 Sieve	% Passing No. 200 Sieve	% Swell @ 100 psf	AASHTO Classification
1	2.0	9.8	97.0	36	18		3.0	59.9	0.3	A-6 (8)
1	4.0	8.7								
2	2.0	22.3	88.2	46	26	0.2	1.8	60.1	3.5	A-7-6 (13)
2	4.0	18.7								
3	2.0	20.2	73.8	48	30	0.2	1.2	61.0	0.7	A-7-6 (15)
3	4.0	16.6								
3	9.0	4.1								
4	2.0	14.9	78.1	53	32	0.2	2.8	71.5	0.3	A-7-6 (22)
4	4.0	15.9								
5	2.0	19.6	72.8	45	28	0.2	2.3	55.9	- 1.2	A-7-6 (12)
5	4.0	20.3								

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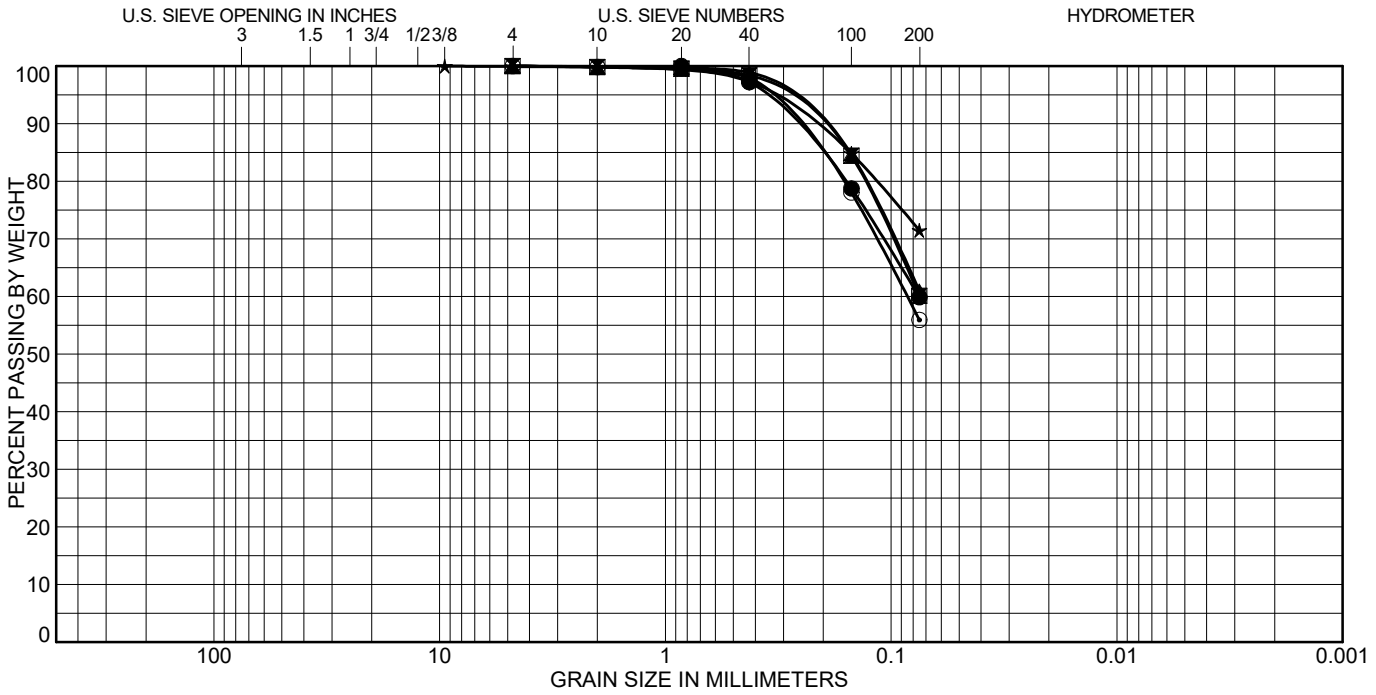
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 178680
FIGURE No. 7
PAGE 1 OF 1
DATE Nov/16/2020



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring		Depth (ft)	Classification	LL	PL	PI	Cc	Cu
●	1	2.0	A-6 (8)	36	18	18		
⧓	2	2.0	A-7-6 (13)	46	20	26		
▲	3	2.0	A-7-6 (15)	48	18	30		
★	4	2.0	A-7-6 (22)	53	21	32		
⊙	5	2.0	A-7-6 (12)	45	17	28		

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	2.0	0.0	40.1	59.9	
⧓	2	2.0	0.0	39.9	60.1	
▲	3	2.0	0.0	39.0	61.0	
★	4	2.0	0.1	28.4	71.5	
⊙	5	2.0	0.0	44.1	55.9	

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SOIL CLASSIFICATION DATA

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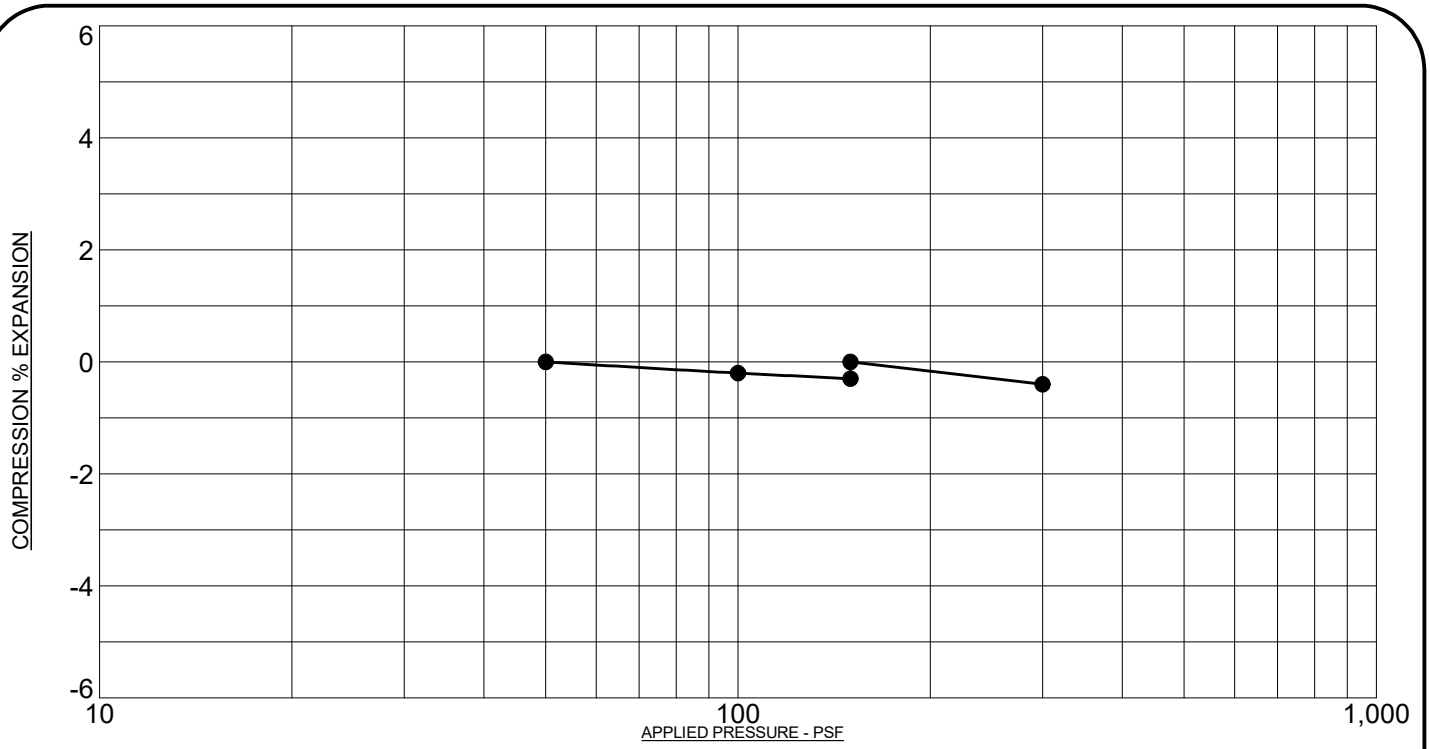
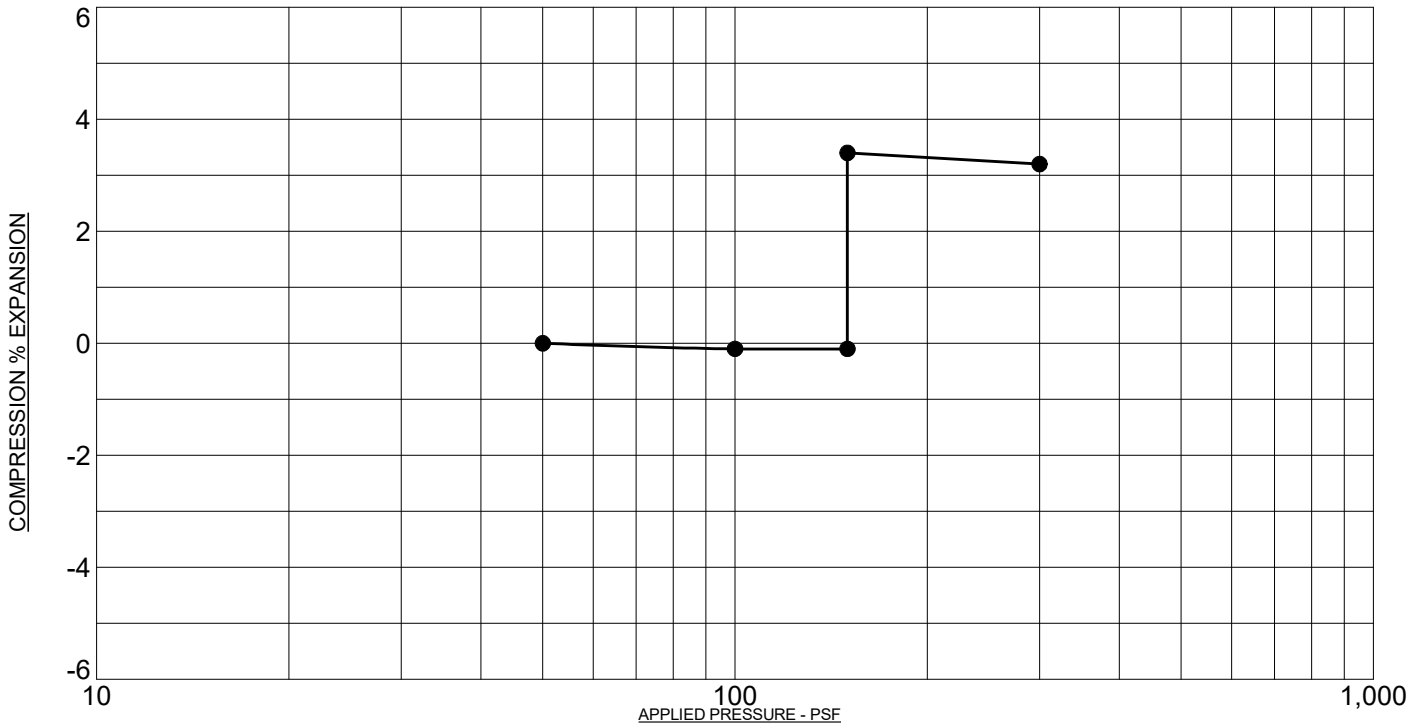
FIGURE No. 8

DATE Nov/16/2020



PROJECT: **Ponderosa at Lorson Ranch, Filing No. 3, El Paso County, Colorado**
SAMPLE DESCRIPTION: **FILL: CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 150 PSF

SAMPLE LOCATION: **1 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **97.0 PCF**
NATURAL MOISTURE CONTENT: **9.8%**
PERCENT SWELL/COMPRESSION: **0.3**



PROJECT: **Ponderosa at Lorson Ranch, Filing No. 3, El Paso County, Colorado**
SAMPLE DESCRIPTION: **FILL: CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 150 PSF

SAMPLE LOCATION: **2 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **88.2 PCF**
NATURAL MOISTURE CONTENT: **22.3%**
PERCENT SWELL/COMPRESSION: **3.5**

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SWELL/CONSOLIDATION TEST RESULTS

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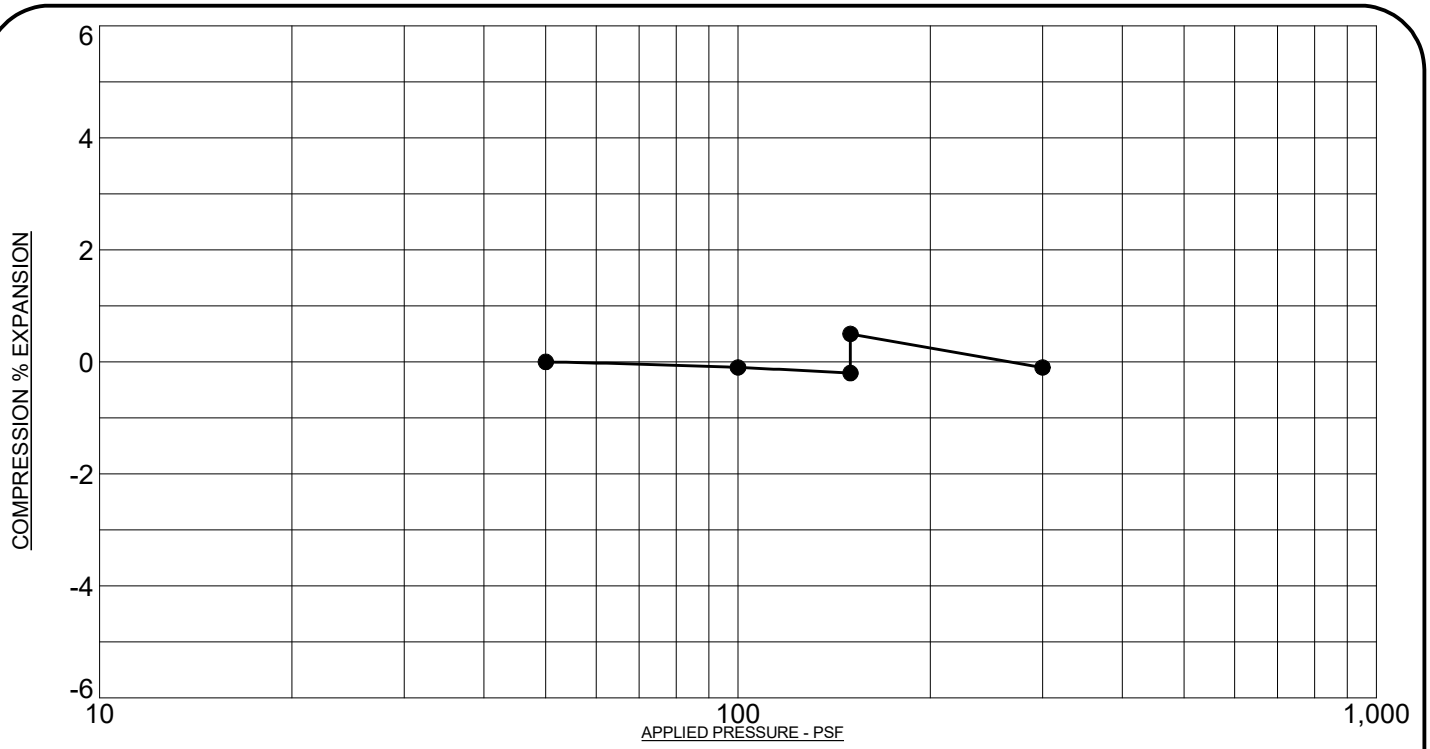
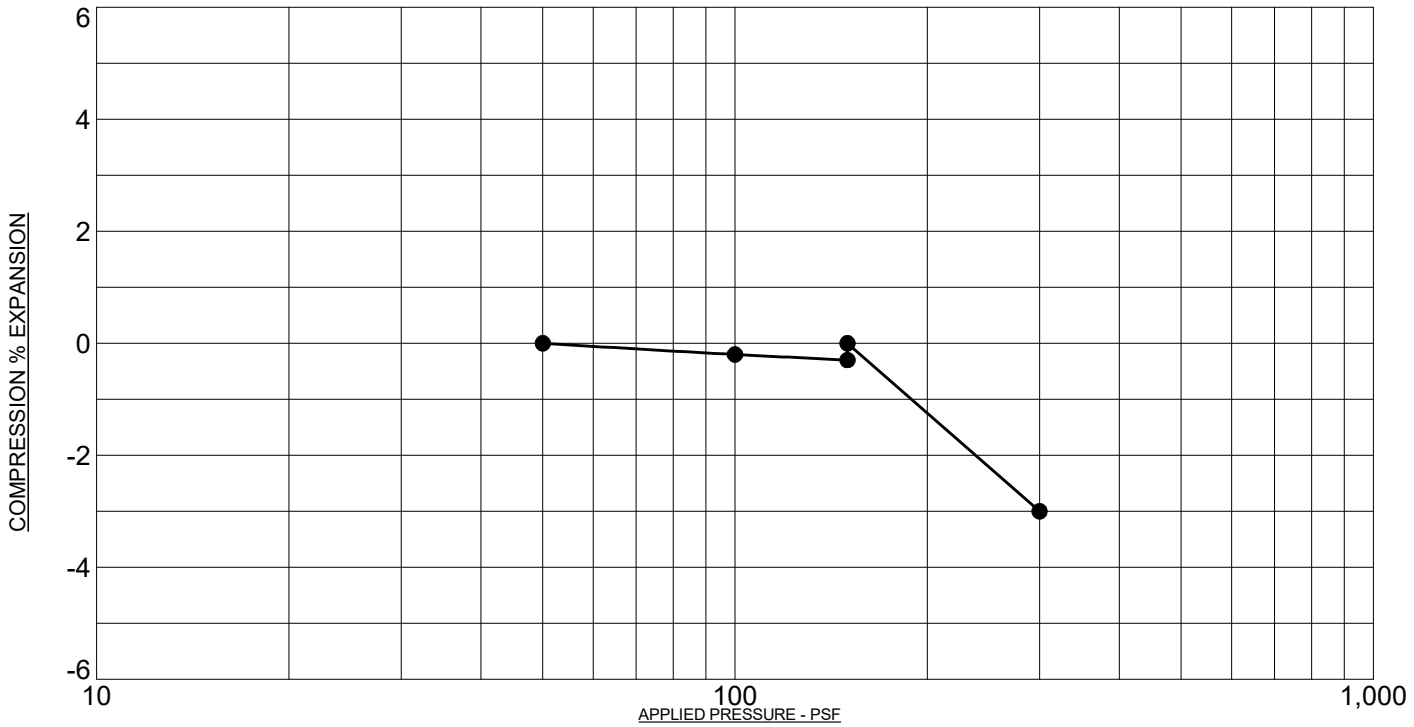
FIGURE No. 9

DATE Nov/16/2020



PROJECT: **Ponderosa at Lorson Ranch, Filing No. 3, El Paso County, Colorado**
SAMPLE DESCRIPTION: **FILL: CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 150 PSF

SAMPLE LOCATION: **3 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **73.8 PCF**
NATURAL MOISTURE CONTENT: **20.2%**
PERCENT SWELL/COMPRESSION: **0.7**



PROJECT: **Ponderosa at Lorson Ranch, Filing No. 3, El Paso County, Colorado**
SAMPLE DESCRIPTION: **FILL: CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 150 PSF

SAMPLE LOCATION: **4 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **78.1 PCF**
NATURAL MOISTURE CONTENT: **14.9%**
PERCENT SWELL/COMPRESSION: **0.3**

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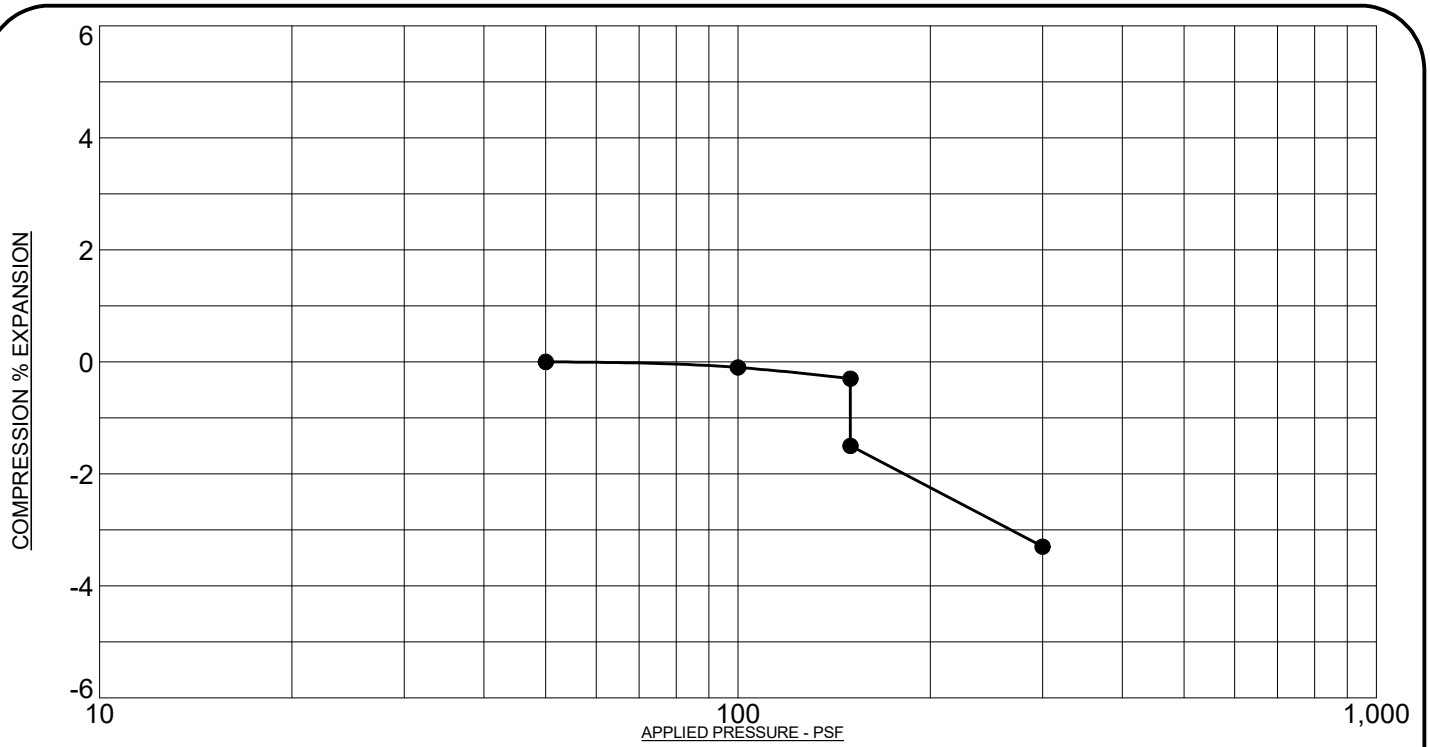
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 178680

FIGURE No. 10

DATE Nov/16/2020



PROJECT: **Ponderosa at Lorson Ranch, Filing No. 3, El Paso County, Colorado**
SAMPLE DESCRIPTION: **FILL: CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 150 PSF

SAMPLE LOCATION: **5 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **72.8 PCF**
NATURAL MOISTURE CONTENT: **19.6%**
PERCENT SWELL/COMPRESSION: **- 1.2**

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SWELL/CONSOLIDATION TEST RESULTS

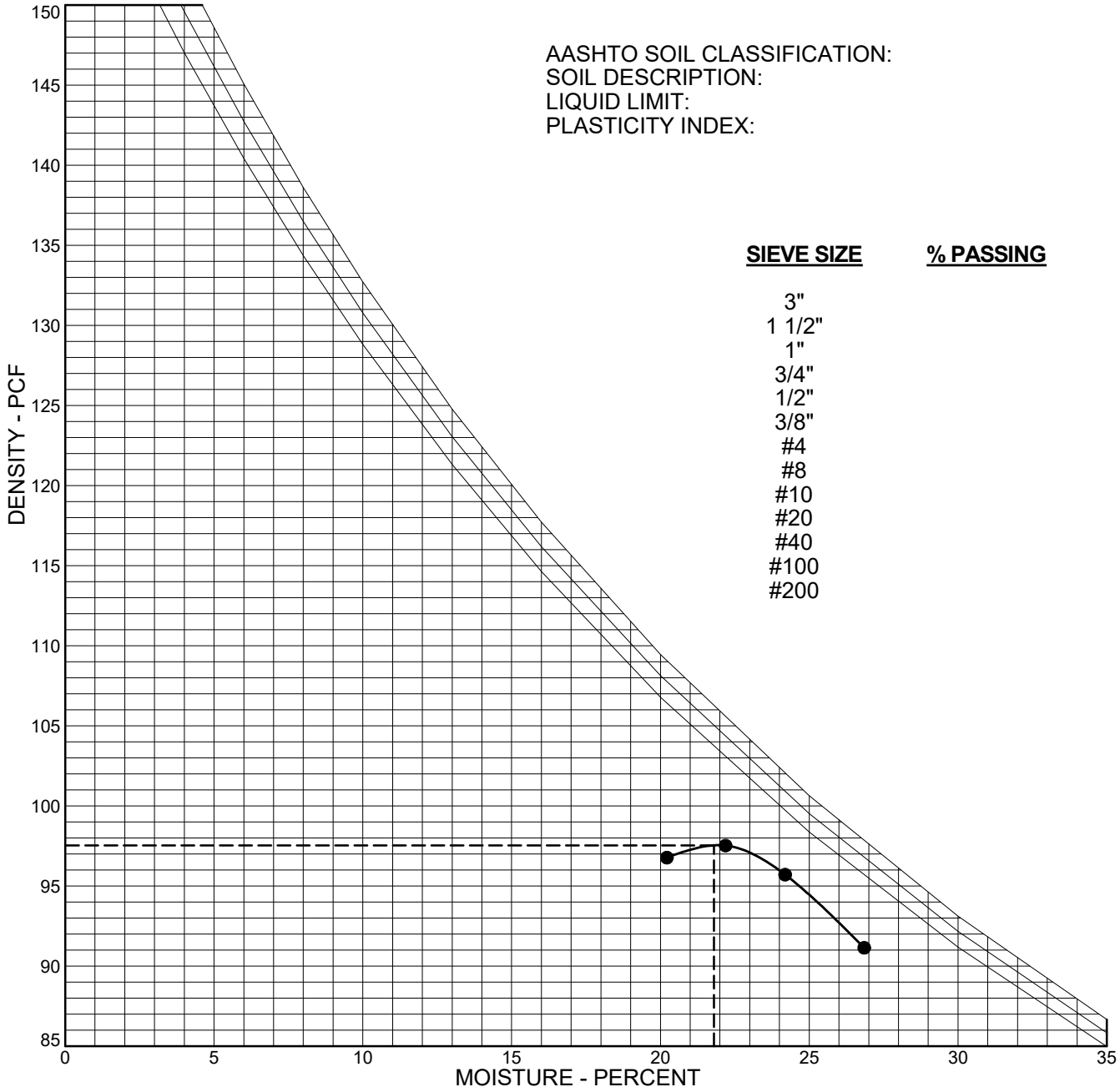
JOB No. 178680

FIGURE No. 11

DATE Nov/16/2020

CLIENT: **Landhuis Company** SAMPLE NUMBER: **A-7-6 PROCTOR**

PROJECT: Ponderosa at Lorson Ranch, Filing No. 3, El Paso County, Colorado



AASHTO SOIL CLASSIFICATION:
SOIL DESCRIPTION:
LIQUID LIMIT:
PLASTICITY INDEX:

SIEVE SIZE	% PASSING
3"	
1 1/2"	
1"	
3/4"	
1/2"	
3/8"	
#4	
#8	
#10	
#20	
#40	
#100	
#200	

DESIGNATION **AASHTO 698A**
MAX. DRY DENSITY **97.6 pcf**
OPTIMUM MOISTURE **21.8 %**
FRACTION USED **#4**
MOLD VOLUME **0.0332 cu.ft.**

NOTE:
ZERO AIR VOIDS CURVES PLOTTED FOR:
Gs = 2.60
Gs = 2.65
Gs = 2.70

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MOISTURE-DENSITY RELATION CURVE

JOB No. 178680

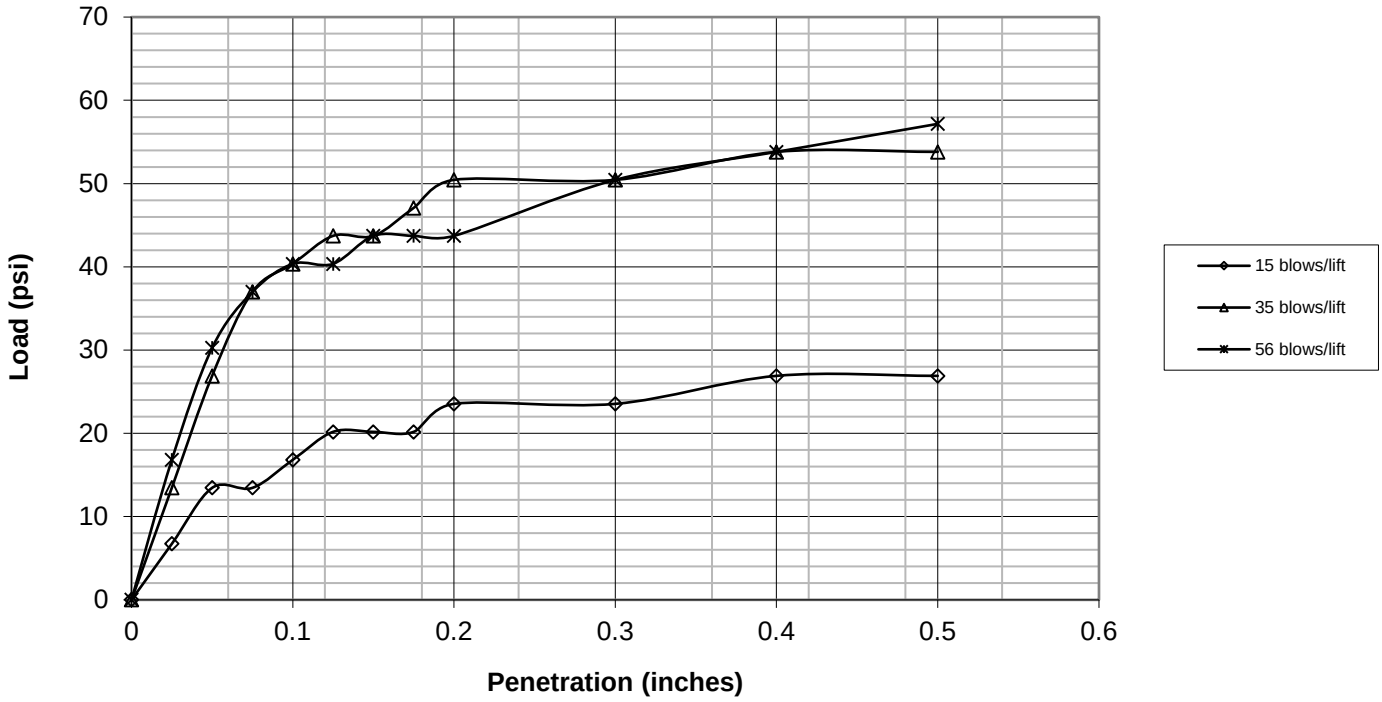
FIGURE No. 12

DATE Nov/16/2020

CALIFORNIA BEARING RATIO TEST RESULTS

PROJECT: Ponderosa at Lorson Ranch Filing No. 3
JOB NUMBER: 173661 TEST DATE: 11/5/2020
AASHTO A-7-6
SAMPLE NUMBER: CBR
SAMPLE LOCATION: Combined Bulk Sample
SOIL DESCRIPTION: Lean Sandy Clay

Penetration (in)	15 blows/lift Load (psi)	35 blows/lift Load (psi)	56 blows/lift Load (psi)
0.000	0.0	0.0	0.0
0.025	6.7	13.5	16.8
0.050	13.5	26.9	30.3
0.075	13.5	37.0	37.0
0.100	16.8	40.4	40.4
0.125	20.2	43.7	40.4
0.150	20.2	43.7	43.7
0.175	20.2	47.1	43.7
0.200	23.5	50.4	43.7
0.300	23.5	50.4	50.4
0.400	26.9	53.8	53.8
0.500	26.9	53.8	57.2



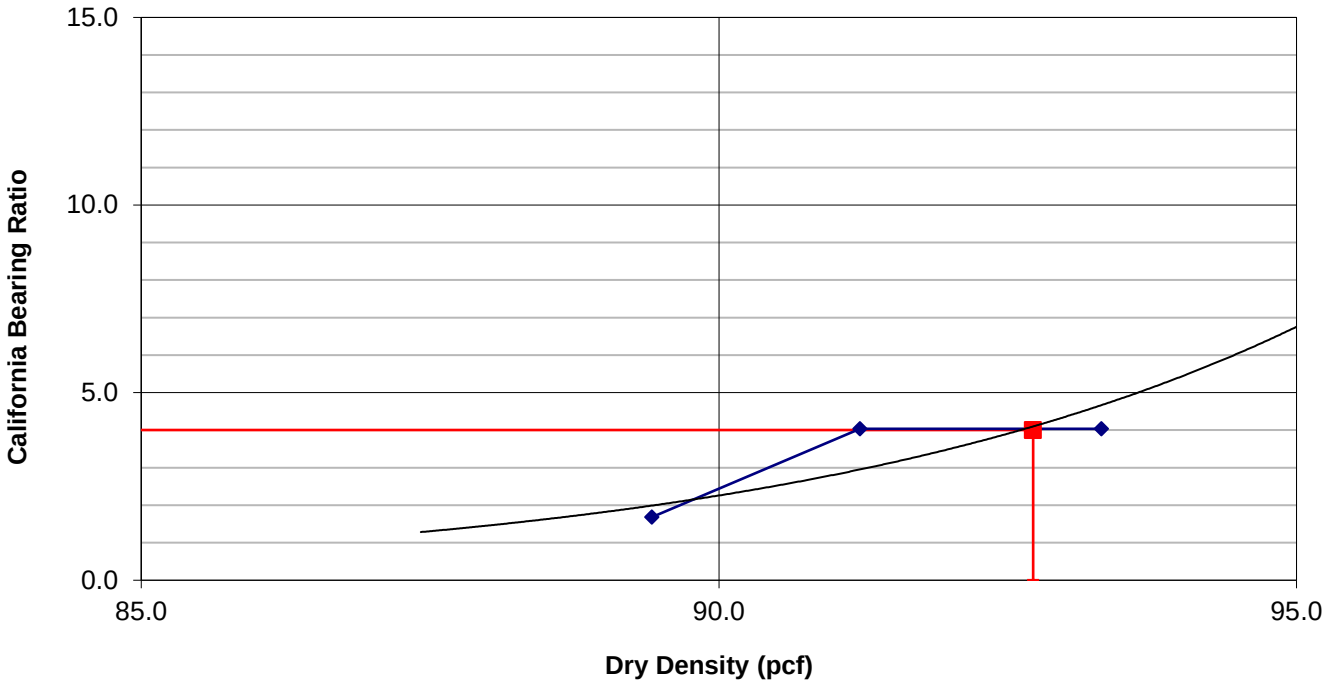
Corrected Penetration (in)	15 blows/lift Corrected Load (psi)	35 blows/lift Corrected Load (psi)	56 blows/lift Corrected Load (psi)
0.1	1.7	4.0	4.0
0.2	1.6	3.4	2.9

Figure No. 13

CALIFORNIA BEARING RATIO TEST RESULTS

PROJECT:	Ponderosa at Lorson Ranch Filing No. 3
JOB NUMBER:	173661 TEST DATE: 11/5/2020
AASHTO CLASSIFICATION:	A-7-6
SAMPLE NUMBER:	CBR
SAMPLE LOCATION:	Combined Bulk Sample
SOIL DESCRIPTION:	Lean Sandy Clay

	15 blows/lift	35 blows/lift	56 blows/lift
Corrected California Bearing Ratio	1.7	4.0	4.0
Dry Density (pcf)	89.4	91.2	93.3
Percent Compaction	92	93	96
Percent Moisture After Soaking	41.4	35.3	33.9
Percent Expansion/Compression	3.1	2.2	2.2
Surcharge Weight (lbs)	12.60	12.60	12.60



California Bearing Ratio	**4.0**
Dry Density (pcf)	97.6
Percent Compaction	95.00%
Target Dry Density	92.7
Compaction Test Method	ASTM D-698
Condition of sample	Soaked

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Figure No. 14

APPENDIX A

1993 AASHTO Empirical Equation for Flexible Pavements

Equation Solver | Variable Descriptions and Typical Values | Precautions

Type in data in the grey boxes and click the calculate button to see the output. To make additional calculations, change the desired input data and click the calculate button again. Click on the text descriptions of the input or output variables for more information.

INPUT

1. Loading

Total Design ESALs (W_{18}): 292000

2. Reliability

Reliability Level in percent (R): 80

Combined Standard Error (S_0): 0.44

3. Serviceability

Initial Serviceability Index (p_i): 4.2

Terminal Serviceability Index (p_t): 2

4. Layer Parameters

Number of Base Layers: 0

	a	m	M_R	Min. Depth
Surface	0.44	1.0	N/A	0
Subgrade	N/A	N/A	6000	N/A

OUTPUT

1. Calculation Parameters

Standard Normal Deviate (z_R): -0.841

ΔPSI: 2.2

Design Structural Number (SN): 2.845

2. Layer Depths (to the nearest 1/2 inch)

Surface: 6.5

Total SN based on layer depths: 2.86

See Solution Details

Comments

Calculate