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PAVEMENT DESIGN REPORT

The Hills at Lorson Ranch - Area "B"

El Paso County, Colorado

SF Number 21-010

PREPARED FOR:

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

JOB NO. 181479

June 7, 2021

Respectfully Submitted,

RMG – Rocky Mountain Group

COLORADO LICENSED
GEOFF WEBSTER
6/7/21
45046
PROFESSIONAL ENGINEER

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

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GENERAL SITE AND PROJECT DESCTIPTION

Location

The Hills at Lorson Ranch Area "B" is located north of Lorson Ranch Boulevard and east of Lamprey Drive in El Paso County, 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. Development Plans for The Hills at Lorson Ranch divide the development into three portions designated Area "B", Area "C", and Area "E/G". This Pavement Design Report covers the portion designated *Area "B"* as shown on Sheet C0.1 of the approved Street – Storm Sewer Construction Plans.

The proposed streets included in this investigation are shown on Figure 2. Grayling Drive is classified a Residential Urban Collector with a 60-foot Right-of-Way and two 18-foot wide travel lanes. Anhinga Court, Murrelet Drive, Bufflehead Lane, House Finch Lane, Bobolink Terrace, and Yellowthroat Terrace are classified as Residential Urban Local streets with 50-foot wide Right-of-Ways and two 15-foot wide travel lanes.

FIELD INVESTIGATION AND SUBSURFACE CONDITIONS

Drilling

The subsurface conditions on the site were investigated by drilling eleven (11) exploratory test borings at maximum 500-foot spacing along the roadways. 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 9.

Subsurface Materials

The subsurface materials encountered in the test borings consisted primarily of lean clay. Combined bulk samples of the material classified as CL according to the Unified Classification System. For pavement design, the soil classified in accordance with the American Association of State Highway and Transportation Officials (ASSHTO) classification system as A-7-6 soil with varying Group Indices. A-7-6 soil typically has high fines (+200 sieve) content, and will require improvement to prepare it to provide adequate subgrade support. Subgrade improvement recommendations are included herein.

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. Swell/consolidation tests were performed to determine the expansive potential of the soil. A Summary of Laboratory Test Results is presented in Figure 10. Soil Classification Data are presented in Figures 11 through 13.

Swell potential evaluation based upon laboratory testing showed the subgrade soil to have nil swell potential. Swell test results are presented in Figures 14 through 16.

California Bearing Ratio tests (CBR) were performed. A Combined bulk sample of A-7-6 soil was tested to determine the optimum moisture-density relationship in accordance with ASTM D-698 (Standard Proctor compaction test). CBR tests were performed at varying densities with moisture content near optimum. At 95% of the maximum Standard Proctor Density, the CBR of the A-7-6 soil was 1.8. The Moisture-Density Relation Curve is presented in Figure 17. CBR Test Results are presented in Figures 18 and 19.

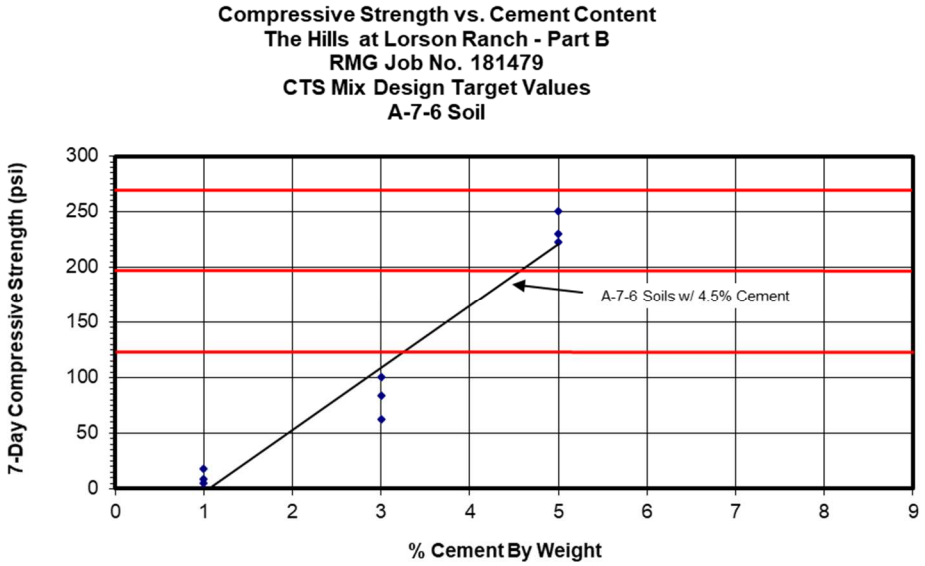
The developer intends to install a composite roadway section consisting of Hot Mix Asphalt over Cement-Treated Subgrade (CTS). RMG performed a Mix Design for this composite section.

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 Modified 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 A-7-6 soil compressive strengths are presented in the table below:

The Hills at Lorson Ranch - Part B - CTS Worksheet

CTS Puck	Age/Day	Cap & Plate	Area of Sample	Dial Reading	Load LBF	Total Load	PSI
1A	7	2.82	12.566	6	60.0	62.8	5
1B	7	2.82	12.566	22	219.9	222.8	18
1C	7	2.82	12.566	11	110.0	112.8	9
3A	7	2.82	12.566	78	779.8	782.6	62
3B	7	2.82	12.566	105	1049.7	1052.5	84
3C	7	2.82	12.566	126	1259.6	1262.4	100
5A	7	2.82	12.566	315	3149.1	3151.9	251
5B	7	2.82	12.566	289	2889.1	2892.0	230
5C	7	2.82	12.566	280	2799.2	2802.0	223

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, the target "percent cement by weight" was selected to obtain strengths in the lower Strength Coefficient (SC) categories (SC = 0.11, 125-200 psi; SC = 0.12, 200-275 psi). A target SC = 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 4.5 percent cement is recommended in all roadway sections to maintain strengths below the 275-psi threshold stipulated in the Engineering Criteria Manual.



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 in accordance with the El Paso County Engineering Criteria Manual, Appendix D. Pavement design parameters and design calculations are presented below utilizing the CBR value for A-7-6 soil. The recommended pavement sections shown on Figure 2.1 are supported by the calculations below.

Street Classification – Residential Urban Collector

1) Grayling Drive
   ESAL = 821,000 (Table D-2)
   Serviceability Index = 2.0 (Table D-1)
   Reliability = 85% (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 = 1.8 x 1500 = 2,700 psi

4) Structural number (SN) = 4.4 (Flexible Pvm't Nomograph, Appendix A)

5) Composite asphalt/base course section
   Minimum HMA thickness = $D_1 = 4$ inches (Table D-2)
   CTS thickness = $D_2 = \{SN – (D_1 \times a_1)\} / a_2 = \{4.4 – (4 \times 0.44)\} / 0.11 = 24$ inches

6) In accordance with El Paso County ECM, Section D.4, Paragraph F, *The base course thickness selected cannot exceed 2.5 times the HMA thickness selected.*

   Therefore, use Asphalt thickness = 6.25-inches and CTS thickness = 15-inches
   Check SN = (6.25 x 0.44) + (15 x 0.11) = 4.4 = 4.4 (Min. SN required) => OK

Street Classification – Residential Urban Local

1) Anhinga Court, Murrelet Drive, Bufflehead Lane, House Finch Lane, Bobolink Terrace, Yellowthroat Terrace
   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 = 1.8 x 1500 = 2,700 psi

4) Structural number (SN) = 3.7 (Flexible Pvm't Nomograph, Appendix A)

5) Composite asphalt/base course section
   Minimum HMA thickness = D_1 = 3 inches (Table D-2)
   CTS thickness = $D_2 = \{SN – (D_1 \times a_1)\} / a_2 = \{3.7 – (3 \times 0.44)\} / 0.11 = 21.6$ inches

6) In accordance with El Paso County ECM, Section D.4, Paragraph F, *The base course thickness selected cannot exceed 2.5 times the HMA thickness selected.*

   Therefore, use Asphalt thickness = 5.25-inches and CTS thickness = 13-inches
   Check SN = (5.25 x 0.44) + (13 x 0.11) = 3.7 = 3.7 (Min. SN required) => OK

Pavement Thickness

Based on the soil types and the design calculations, the recommended pavement sections are presented below and on Figure 2.1.

Recommended Pavement Sections

Streets	HMA (in)	CTS (in)
Grayling Drive	6.5	15
Anhinga Court, Murrelet Drive, Bufflehead Lane, House Finch Lane, Bobolink Terrace, and Yellowthroat Terrace	5.25	13
Optimal CTS Percent Cement by Weight = 4.5%		

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 PDCM notes that mitigation measures may be required for expansive soils, shallow ground water, subgrade instability, etc. Based on the AASHTO classification of the soils in the subdivision and laboratory swell testing, the subgrade soils evaluated for this pavement design are expected to exhibit nil to low expansive potential. Groundwater or wet and unstable soils were not encountered in the borings. Therefore, special mitigation measures do not appear to be necessary for subgrade preparation.

Subgrade Preparation

Subgrade for The Hills at Lorson Ranch Area "B" 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 (4.5% 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 the 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.

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.

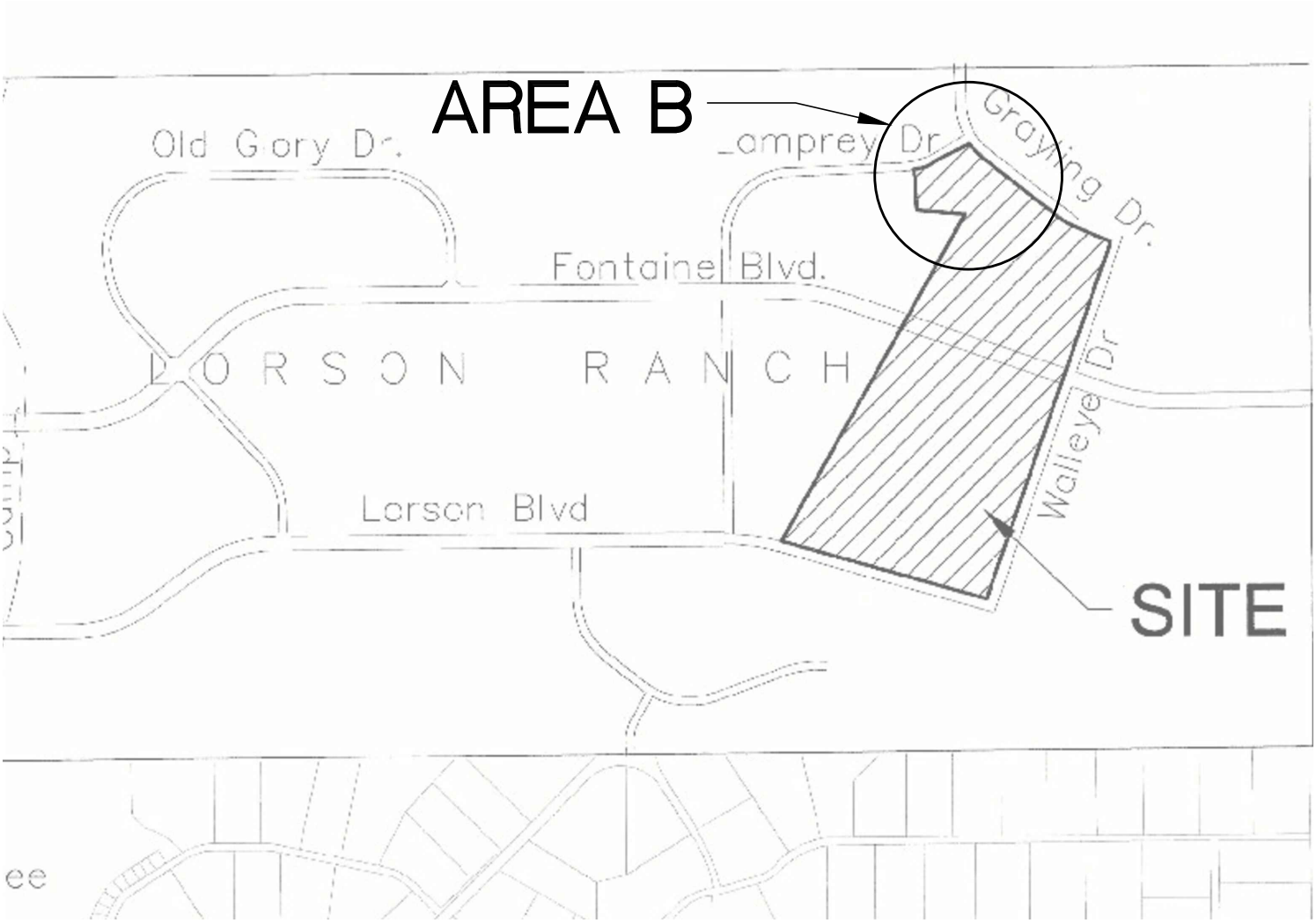
This report has been prepared for the exclusive use by the **Landhuis Company** for application as an aid in the design and construction of the proposed development in accordance with generally accepted geotechnical engineering practices. The analyses and recommendations in this report are based in part 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



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ROCKY MOUNTAIN GROUP

Southern Office
Colorado Springs,CO 80918
(719) 548-0600
Central Office:
Englewood, CO 80112
(303) 688-9475
Northern Office:
Greeley / Evans, CO 80620
(970) 330-1071

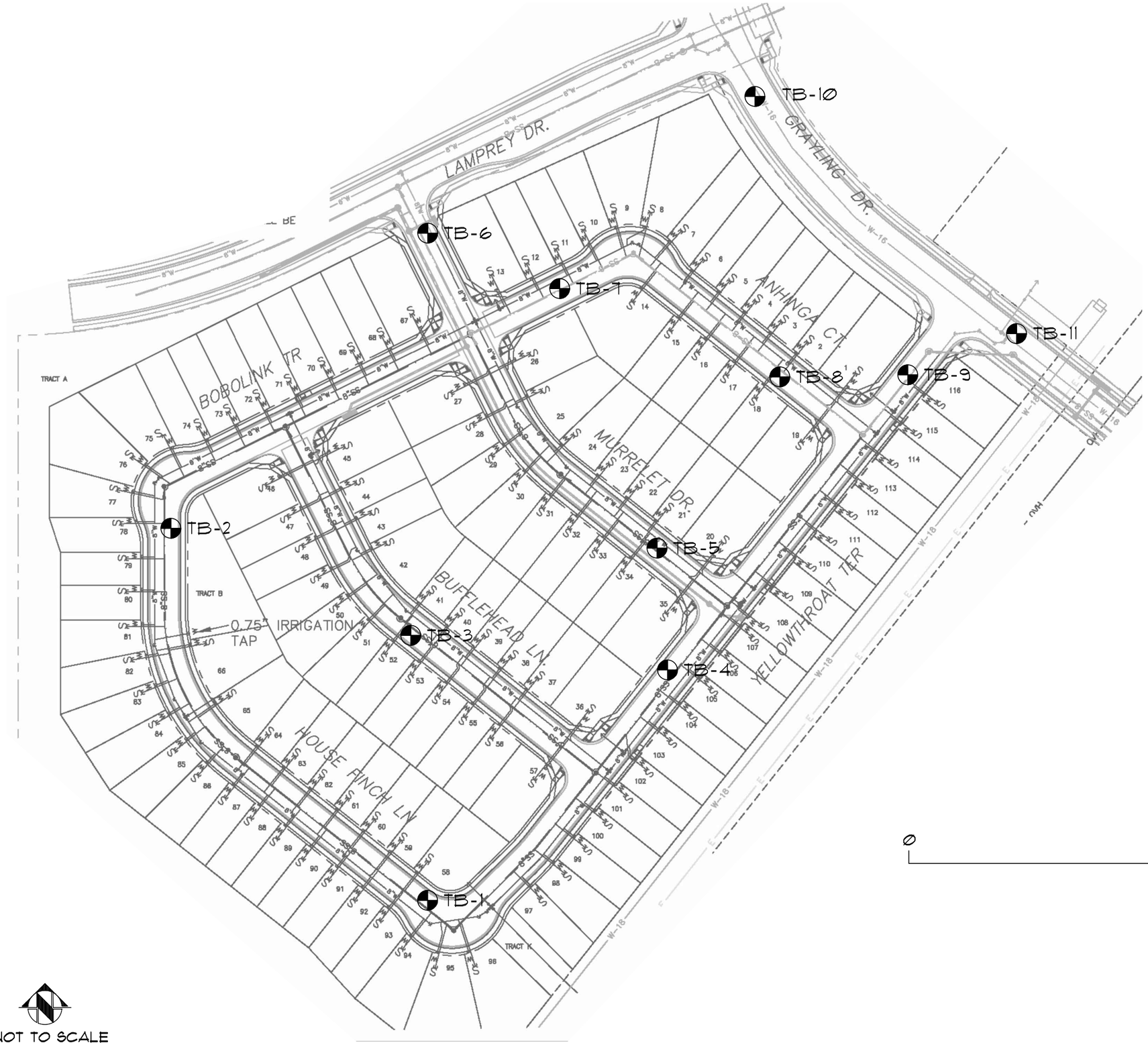
SITE VICINITY MAP

THE HILLS AT LORSON RANCH
EL PASO COUNTY, COLORADO
LANDHUIS COMPANY

JOB No. 181479

FIG No. 1

DATE 06-07-2021



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DENOTES APPROXIMATE LOCATION OF TEST BORINGS

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Colorado Springs, CO
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(719) 548-0600
Central Office:
Englewood, CO 80112
(303) 688-9475
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Monument Office:
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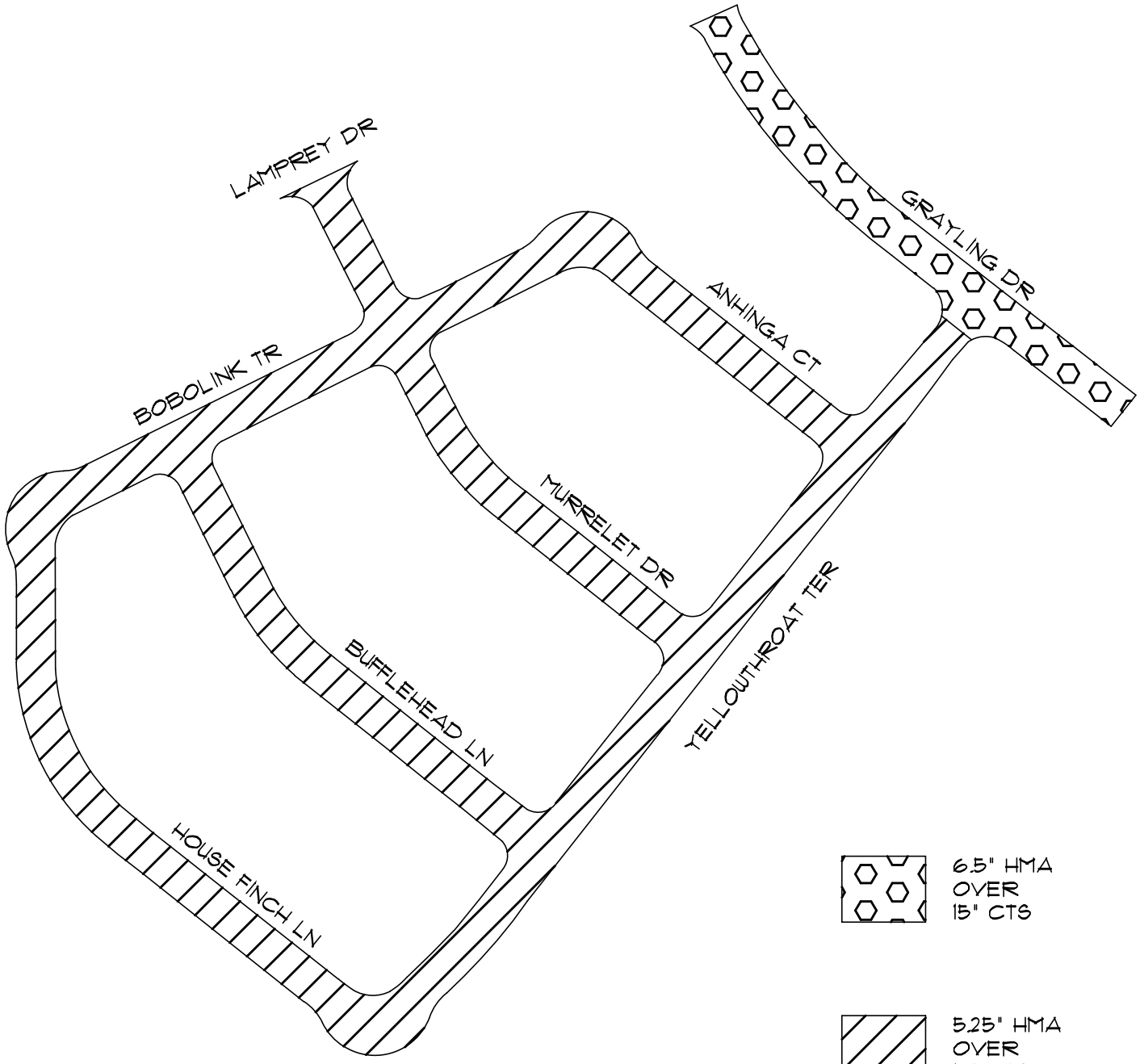
THE HILLS AT LORSON RANCH
EL PASO COUNTY, COLORADO
LANDHUIS COMPANY

ENGINEER:	TM
DRAWN BY:	BG
CHECKED BY:	TM
ISSUED:	06-07-2021

TEST BORING LAYOUT PLAN

SHEET No.
FIG-2



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ROCKY MOUNTAIN GROUP

Southern Office
Colorado Springs,CO
80918
(719) 548-0600
Central Office:
Englewood, CO 80112
(303) 688-9475
Northern Office:
Greeley / Evans, CO 80620
(970) 330-1071

PAVEMENT DESIGN

THE HILLS AT LORSON RANCH
EL PASO COUNTY, COLORADO
LANDHUIS COMPANY

JOB No. 181479

FIG No. 2.1

DATE 6-7-2021

SOILS DESCRIPTION


CLAYSTONE


FILL: CLAY, SANDY


SANDY CLAY

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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(719) 548-0600
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EXPLANATION OF TEST BORING LOGS

JOB No. 181479

FIGURE No. 3

DATE Jun/07/2021

TEST BORING: **1** DATE DRILLED: 5/10/21 NO GROUNDWATER ON 5/10/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: CLAY, SANDY, brown to gray, very stiff, moist	2.5			29	14.5
				20	17.1
	5.0				

TEST BORING: **2** DATE DRILLED: 5/11/21 NO GROUNDWATER ON 5/11/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, dark brown to gray, with rust staining, stiff to very stiff, moist	2.5			11	20.9
	5.0			20	16.4
	7.5			11	16.5
	10.0				

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TEST BORING LOG

JOB No. 181479

FIGURE No. 4

DATE Jun/07/2021

TEST BORING: **3** DATE DRILLED: 5/12/21 NO GROUNDWATER ON 5/12/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: CLAY, SANDY, dark brown, stiff to very stiff, moist	2.5			12	16.5
				21	18.4
	5.0				

TEST BORING: **4** DATE DRILLED: 5/13/21 NO GROUNDWATER ON 5/13/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: CLAY, SANDY, dark brown, with rust staining, very stiff, moist	2.5			35	9.9
				22	15.6
	5.0				

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TEST BORING LOG

JOB No. 181479

FIGURE No. 5

DATE Jun/07/2021

TEST BORING: **5** DATE DRILLED: 5/14/21 NO GROUNDWATER ON 5/14/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: CLAY, SANDY, dark brown to gray, with rust staining, stiff to hard, moist	2.5			16	17.9
CLAYSTONE, SANDY, dark brown to gray, medium hard, moist	5.0			48	10.7
	7.5			50/11"	12.4
	10.0				

TEST BORING: **6** DATE DRILLED: 5/15/21 NO GROUNDWATER ON 5/15/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, dark brown, with rust staining, stiff, moist	2.5			12	16.2
	5.0			15	19.0

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Colorado Spings, CO 80918
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TEST BORING LOG

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FIGURE No. 6

DATE Jun/07/2021

TEST BORING: **7** DATE DRILLED: 5/16/21 NO GROUNDWATER ON 5/16/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: CLAY, SANDY, dark brown, with rust staining, stiff, moist	2.5			14	22.6
CLAY, SANDY, brown, very stiff, moist	5.0			28	9.2

TEST BORING: **8** DATE DRILLED: 5/17/21 NO GROUNDWATER ON 5/17/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: CLAY, SANDY, dark brown, with rust staining, very stiff, moist	2.5			24	15.6
	5.0			19	15.7

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TEST BORING LOG

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FIGURE No. 7

DATE Jun/07/2021

TEST BORING: **9**

DATE DRILLED:
5/18/21
NO GROUNDWATER ON
5/18/21

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown to dark brown, with rust staining, very stiff, moist				
2.5			38	13.3
			25	20.3
5.0				

TEST BORING: **10**

DATE DRILLED:
5/19/21
NO GROUNDWATER ON
5/19/21

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, light brown to brown, with rust staining, hard, moist				
2.5			46	9.7
CLAYSTONE, SANDY, light brown, with rust staining, medium hard, moist				
			50/9"	12.4
5.0				
7.5			50/8"	11.8
10.0				

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TEST BORING LOG

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FIGURE No. 8

DATE Jun/07/2021

TEST BORING: **11**

DATE DRILLED:
5/20/21
NO GROUNDWATER ON
5/20/21

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, dark brown, hard, moist				
2.5			50	12.5
			45	10.2
5.0				

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2910 Austin Bluffs Parkway
Colorado Spings, CO 80918
(719) 548-0600
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TEST BORING LOG

JOB No. 181479

FIGURE No. 9

DATE Jun/07/2021

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	14.5	78.1	40	23	0.5	1.3	91.5	- 5.2	A-6 (21)
1	4.0	17.1								
2	2.0	20.9	73.3	44	27	0.3	1.1	93.4	- 7.7	A-7-6 (26)
2	4.0	16.4								
3	2.0	16.5		38	25	0.3	0.8	88.8		A-6 (21)
3	4.0	18.4								
4	2.0	9.9	81.9	44	31	1.3	2.5	89.9	- 2.3	A-7-6 (28)
4	4.0	15.6								
4	9.0	16.3								
5	2.0	17.9		43	29	0.8	1.3	91.5		A-7-6 (27)
5	4.0	10.7								
5	9.0	12.4								
6	2.0	16.2	77.0	42	29	0.4	1.3	90.3	- 2.0	A-7-6 (26)
6	4.0	19.0								
7	2.0	22.6		44	31	0.3	1.2	91.4		A-7-6 (28)
7	4.0	9.2								
8	2.0	15.6		43	31	0.0	0.8	89.3		A-7-6 (27)
8	4.0	15.7								
9	2.0	13.3		44	29	1.4	2.1	90.0		A-7-6 (26)
9	4.0	20.3								
10	2.0	9.7	81.8	40	27	0.4	1.3	88.5	- 3.9	A-6 (23)
10	4.0	12.4								
10	9.0	11.8								
11	2.0	12.5		45	31	0.1	0.5	92.1		A-7-6 (29)
11	4.0	10.2								

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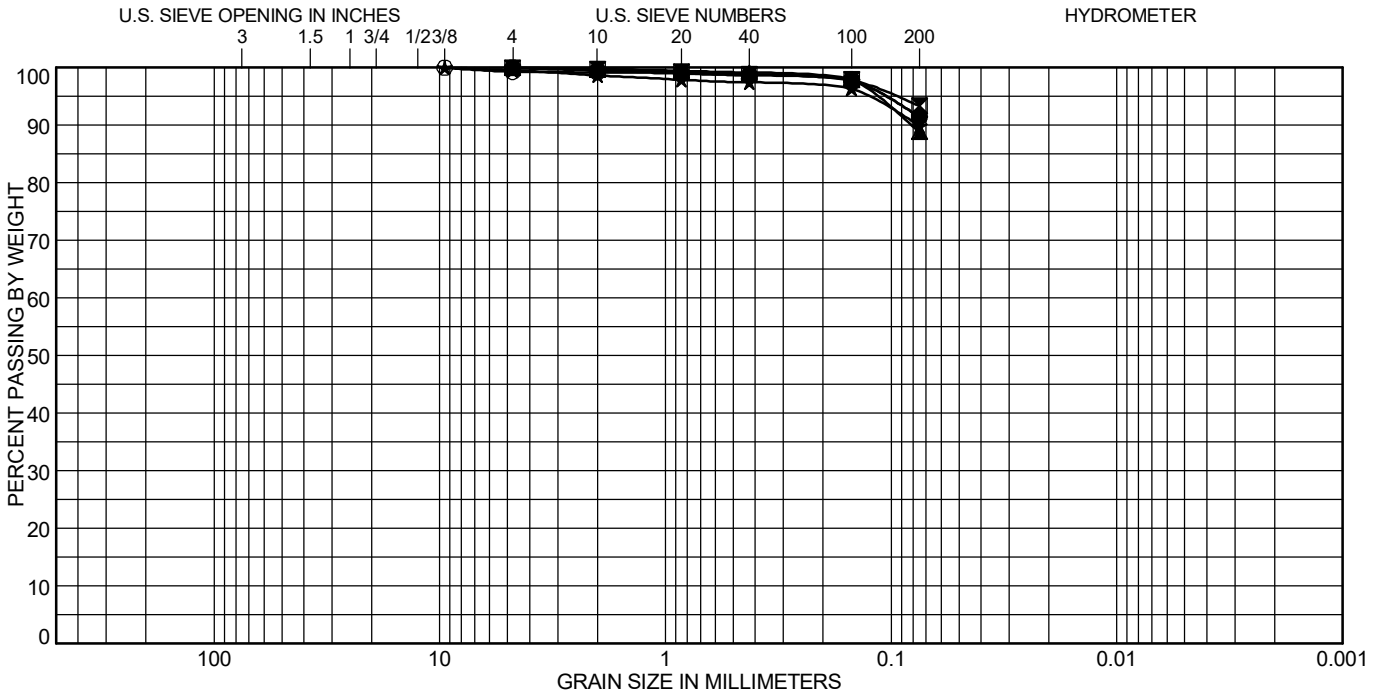
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 181479
FIGURE No. 10
PAGE 1 OF 1
DATE Jun/07/2021



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 (21)	40	17	23		
⊠	2	2.0	A-7-6 (26)	44	17	27		
▲	3	2.0	A-6 (21)	38	13	25		
★	4	2.0	A-7-6 (28)	44	13	31		
⊙	5	2.0	A-7-6 (27)	43	14	29		

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	2.0	0.0	8.5	91.5	
⊠	2	2.0	0.0	6.6	93.4	
▲	3	2.0	0.0	11.2	88.8	
★	4	2.0	0.4	9.7	89.9	
⊙	5	2.0	0.7	7.8	91.5	

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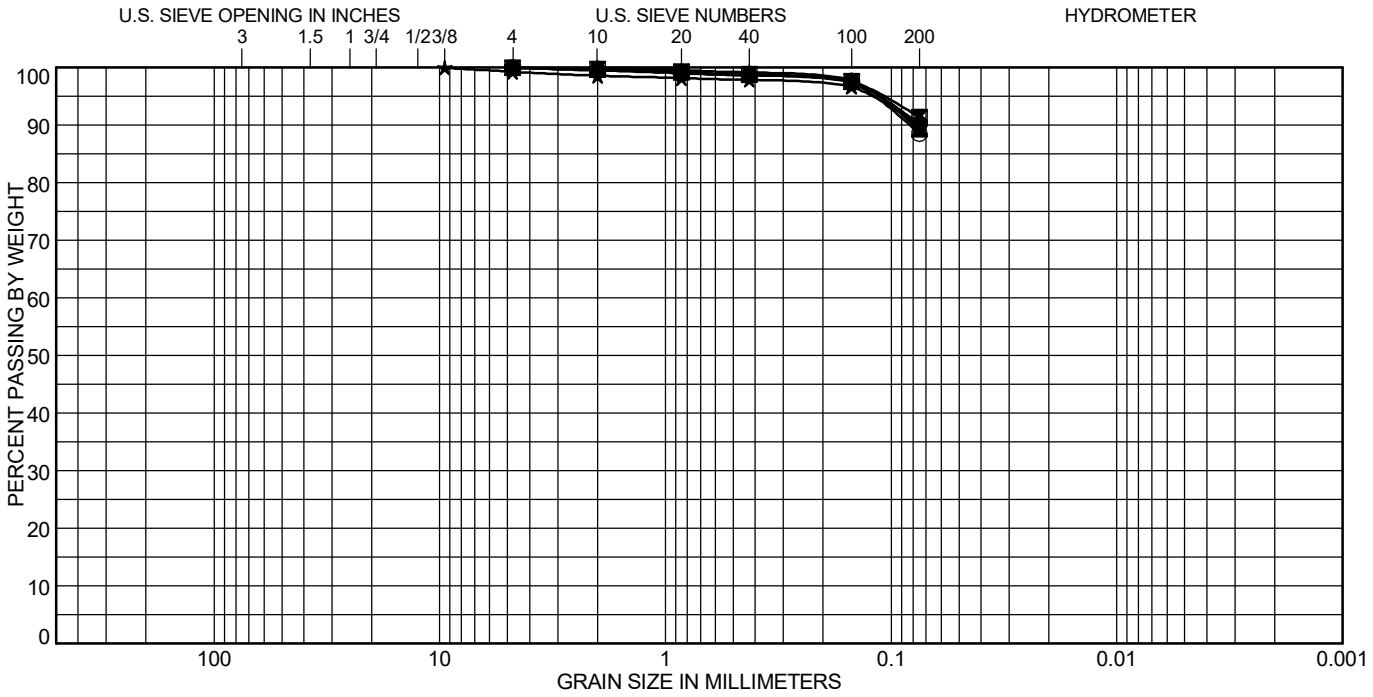
SOIL CLASSIFICATION DATA

JOB No. 181479

FIGURE No. 11

DATE Jun/07/2021



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring		Depth (ft)	Classification	LL	PL	PI	Cc	Cu
●	6	2.0	A-7-6 (26)	42	13	29		
⊠	7	2.0	A-7-6 (28)	44	13	31		
▲	8	2.0	A-7-6 (27)	43	12	31		
★	9	2.0	A-7-6 (26)	44	15	29		
⊙	10	2.0	A-6 (23)	40	13	27		

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	6	2.0	0.0	9.7	90.3	
⊠	7	2.0	0.0	8.6	91.4	
▲	8	2.0	0.0	10.7	89.3	
★	9	2.0	0.7	9.3	90.0	
⊙	10	2.0	0.0	11.5	88.5	

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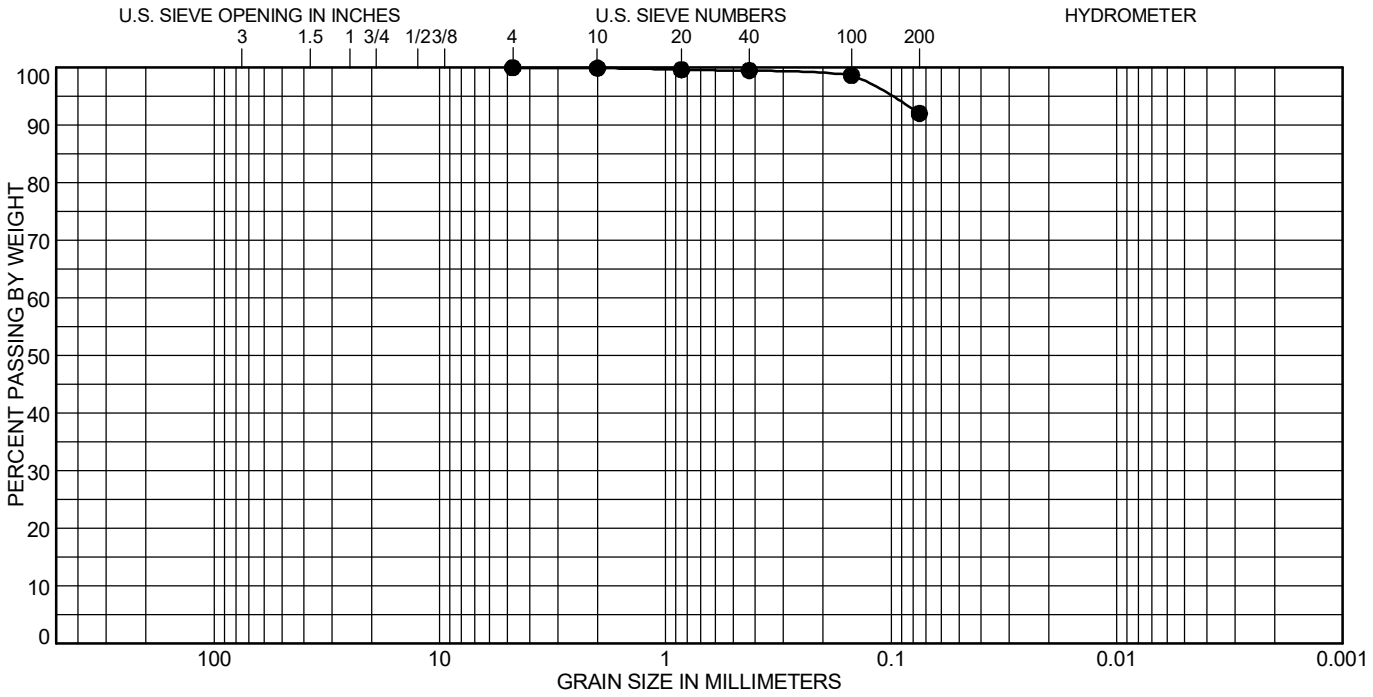
SOIL CLASSIFICATION DATA

JOB No. 181479

FIGURE No. 12

DATE Jun/07/2021



Test Boring	Depth (ft)	Classification	LL	PL	PI	Cc	Cu
● 11	2.0	A-7-6 (29)	45	14	31		

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● 11	2.0	0.0	7.9	92.1	

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SOIL CLASSIFICATION DATA

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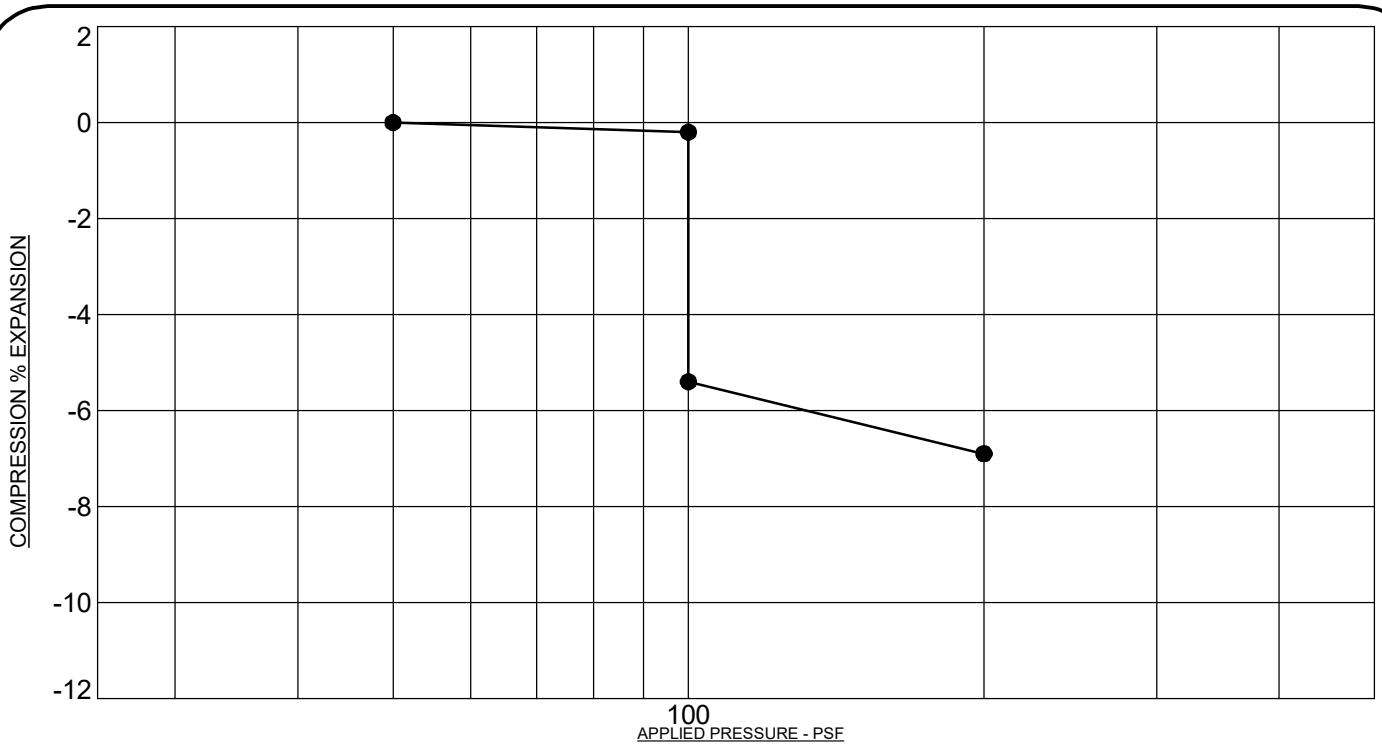
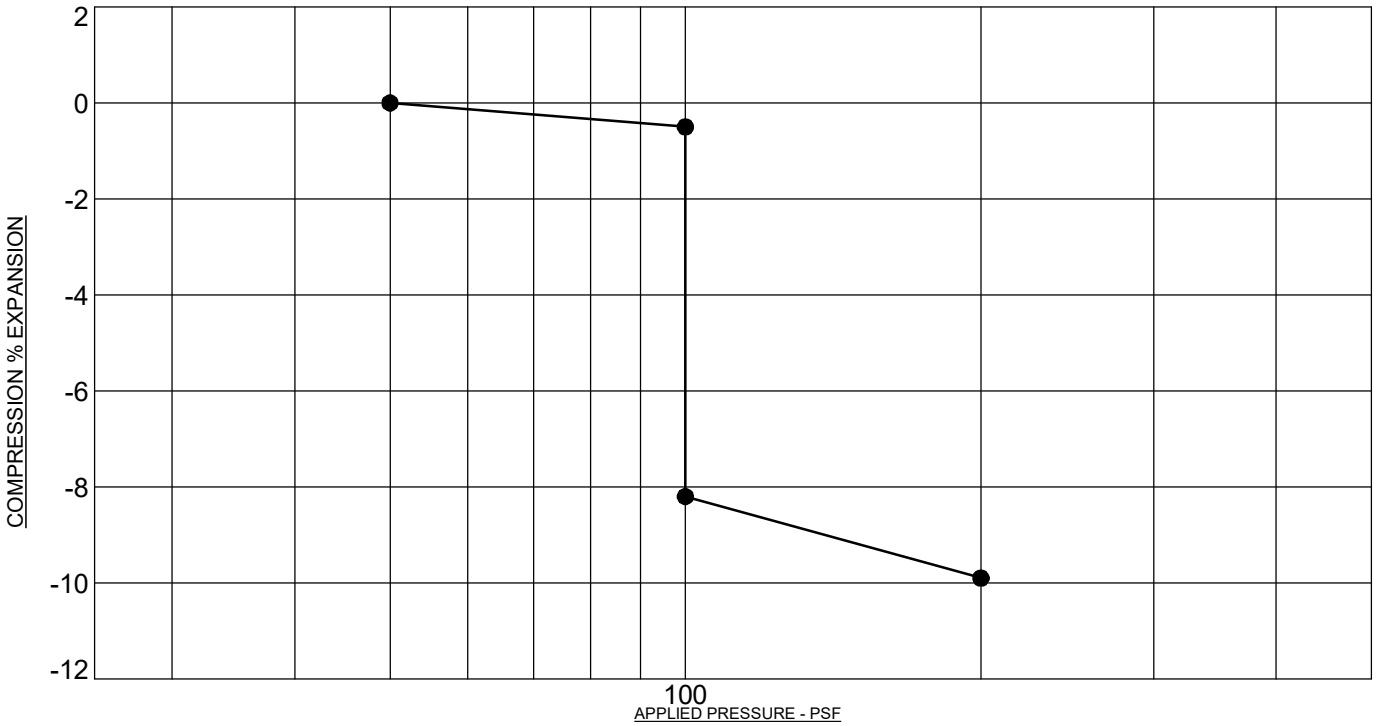
FIGURE No. 13

DATE Jun/07/2021



PROJECT: **The Hills at Lorson Ranch Colorado Springs, Colorado**
SAMPLE DESCRIPTION: **FILL: CLAY, SAND**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 100 PSF

SAMPLE LOCATION: **1 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **78.1 PCF**
NATURAL MOISTURE CONTENT: **14.6%**
PERCENT SWELL/COMPRESSION: **- 5.2**



PROJECT: **The Hills at Lorson Ranch Colorado Springs, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY, dar**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 100 PSF

SAMPLE LOCATION: **2 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **73.3 PCF**
NATURAL MOISTURE CONTENT: **20.9%**
PERCENT SWELL/COMPRESSION: **- 7.7**

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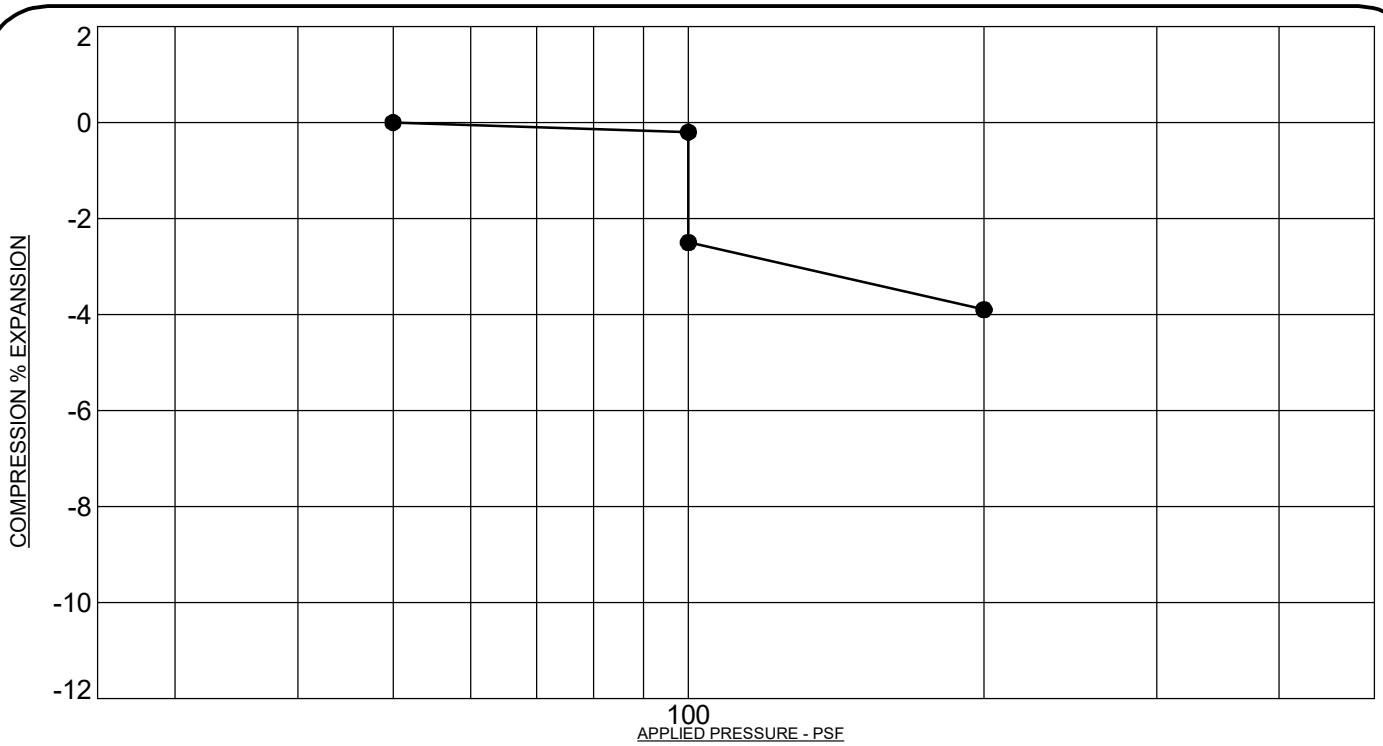
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 181479

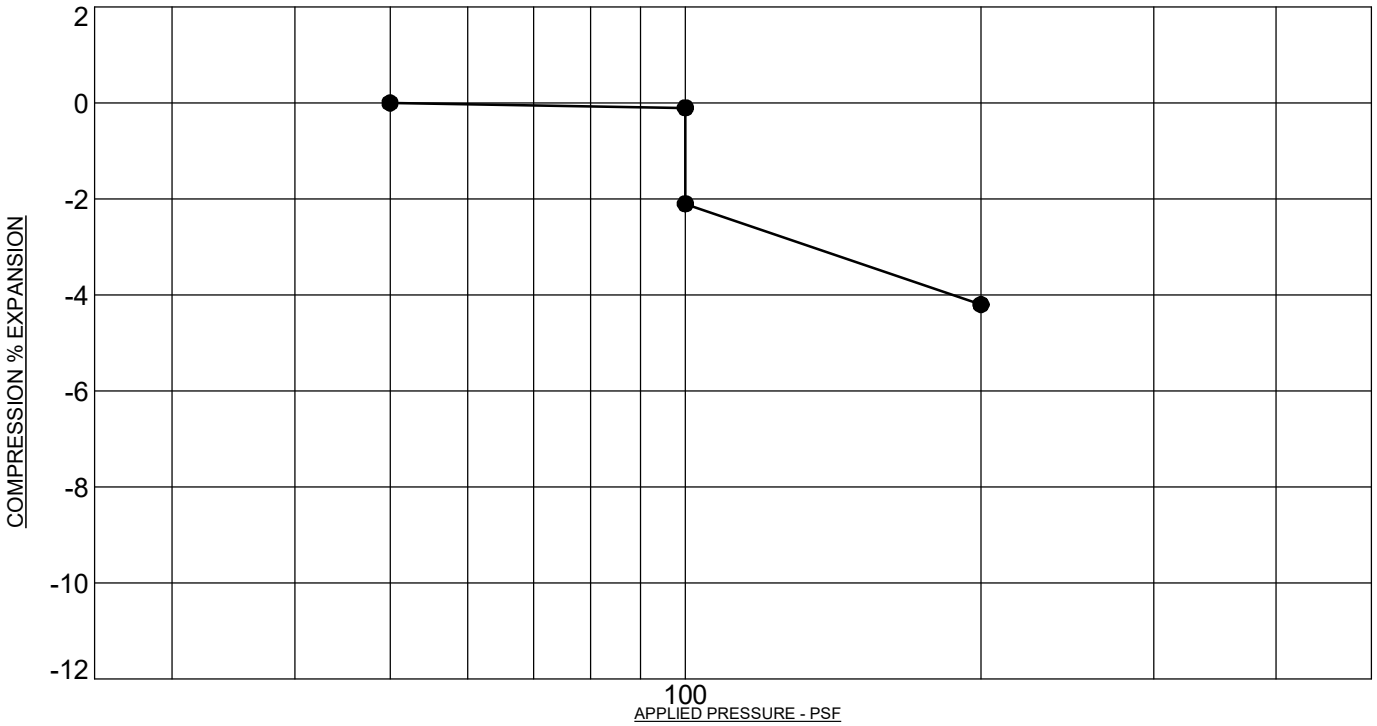
FIGURE No. 14

DATE Jun/07/2021



PROJECT: **The Hills at Lorson Ranch Colorado Springs, Colorado**
SAMPLE DESCRIPTION: **FILL: CLAY, SAND**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 100 PSF

SAMPLE LOCATION: **4 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **81.9 PCF**
NATURAL MOISTURE CONTENT: **9.9%**
PERCENT SWELL/COMPRESSION: **- 2.3**



PROJECT: **The Hills at Lorson Ranch Colorado Springs, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY, dar**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 100 PSF

SAMPLE LOCATION: **6 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **77.0 PCF**
NATURAL MOISTURE CONTENT: **16.2%**
PERCENT SWELL/COMPRESSION: **- 2.0**

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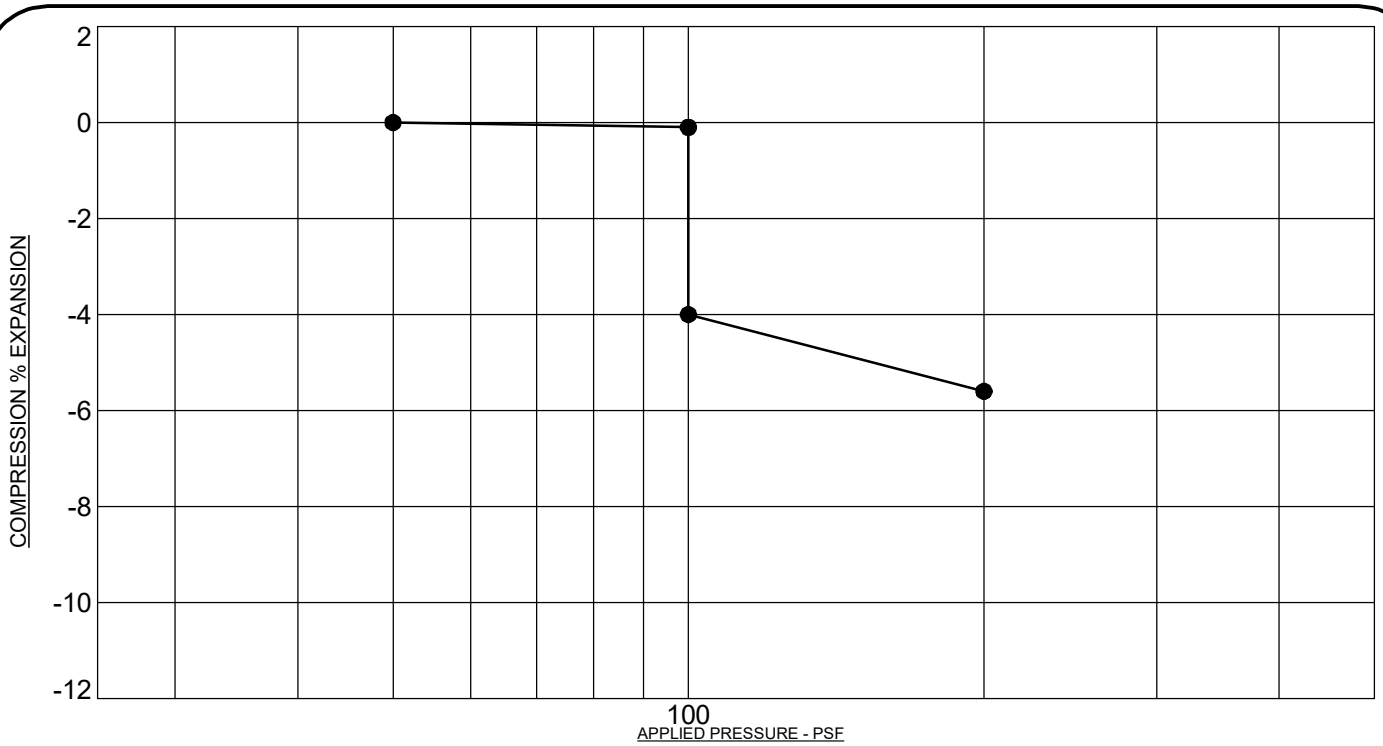
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 181479

FIGURE No. 15

DATE Jun/07/2021



PROJECT: **The Hills at Lorson Ranch Colorado Springs, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY, lig**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 100 PSF

SAMPLE LOCATION: **10 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **81.8 PCF**
NATURAL MOISTURE CONTENT: **9.7%**
PERCENT SWELL/COMPRESSION: **- 3.9**

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SWELL/CONSOLIDATION TEST RESULTS

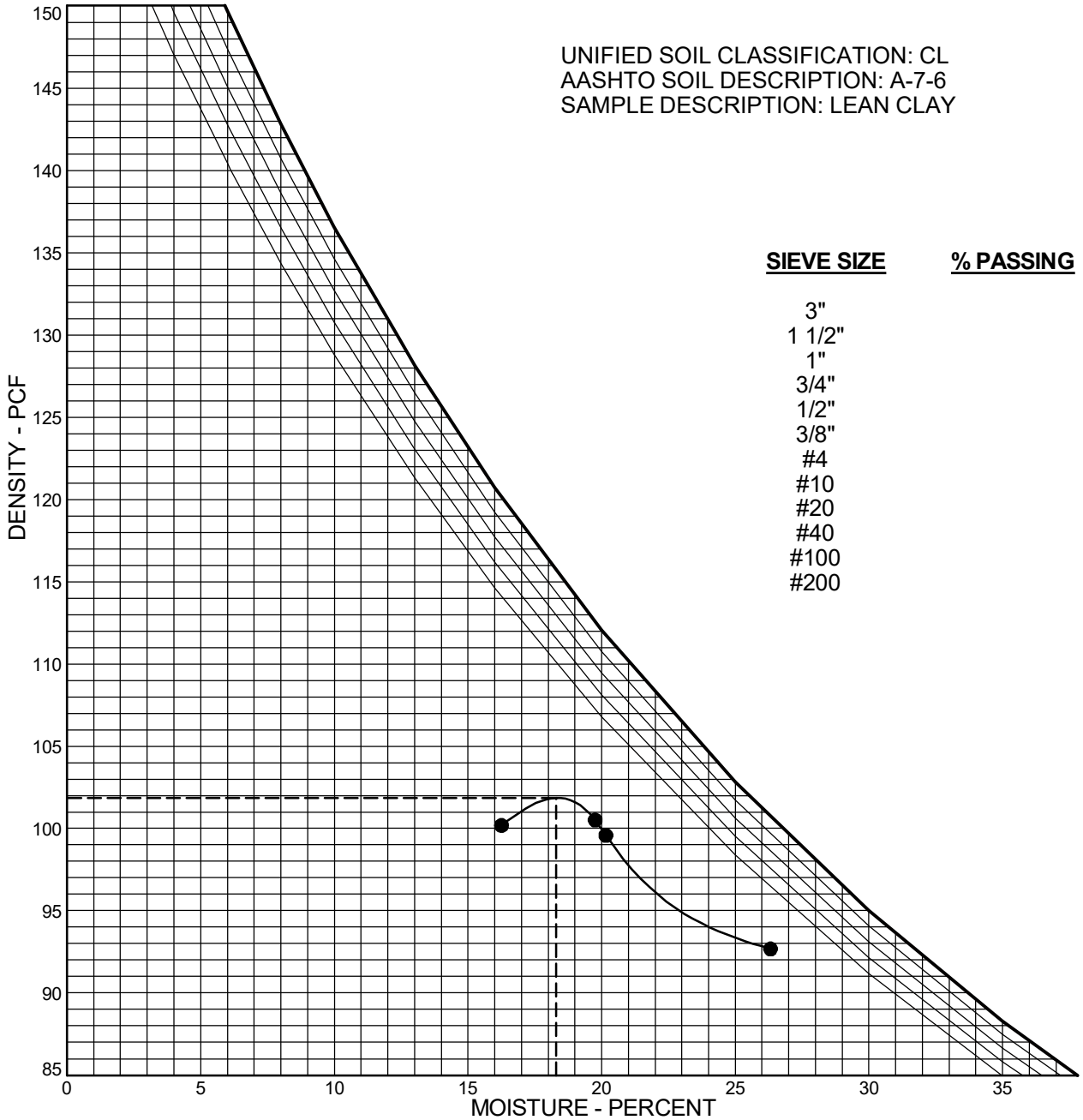
JOB No. 181479

FIGURE No. 16

DATE Jun/07/2021

CLIENT: Landhuis Company **SAMPLE NUMBER:** COMBINED PROCTOR

PROJECT: **The Hills at Lorson Ranch, El Paso County, Colorado**



UNIFIED SOIL CLASSIFICATION: CL
AASHTO SOIL DESCRIPTION: A-7-6
SAMPLE DESCRIPTION: LEAN CLAY

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

DESIGNATION **ASTM D-698A**
MAX. DRY DENSITY **101.2 pcf**
OPTIMUM MOISTURE **18.3 %**
FRACTION USED **#4**
MOLD VOLUME **0.0333 cu.ft.**

NOTE: ZERO AIR VOIDS CURVES PLOTTED FOR:
Gs = 2.60
Gs = 2.65
Gs = 2.70
Gs = 2.75
Gs = 2.80

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MOISTURE-DENSITY RELATION CURVE

JOB No. 181479

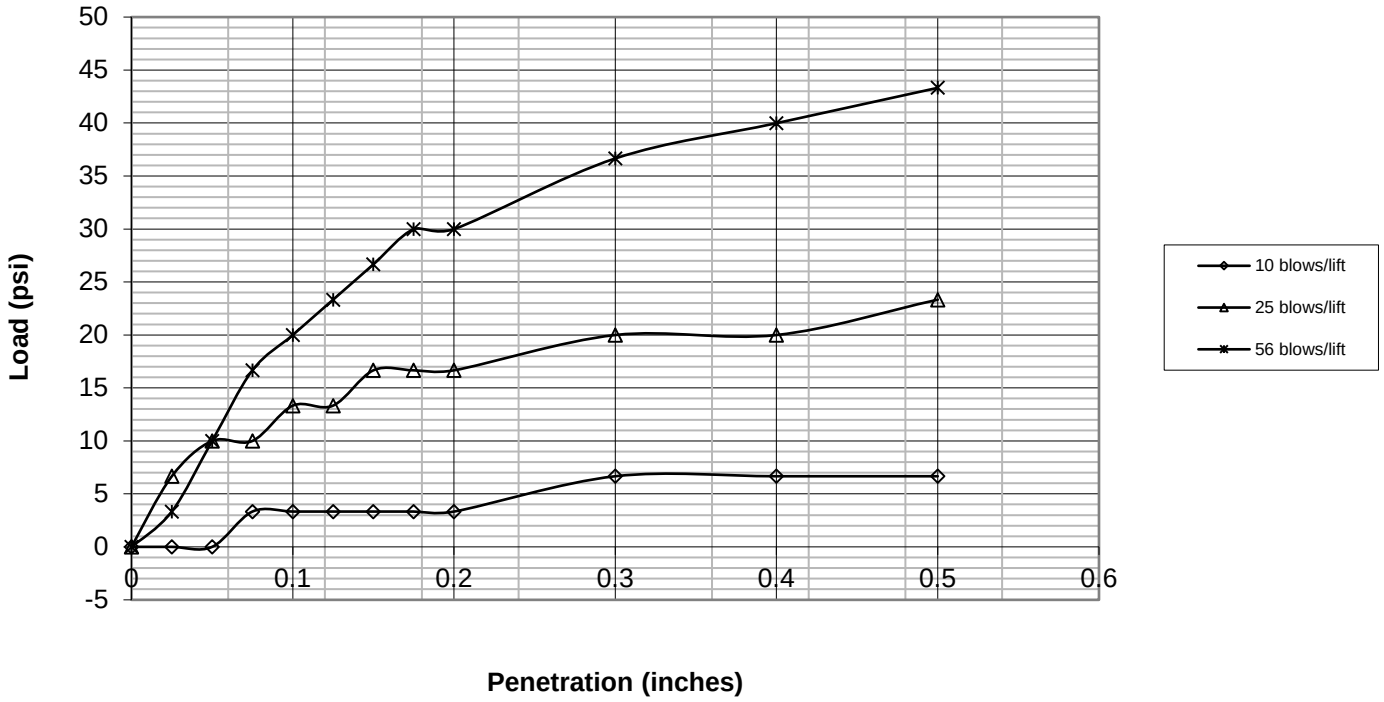
FIGURE No. 17

DATE Jun/07/2021

CALIFORNIA BEARING RATIO TEST RESULTS

PROJECT: The Hills at Lorson Ranch - Area B
JOB NUMBER: 181479 TEST DATE: 5/17/2021
AASHTO A-7-6
SAMPLE NUMBER: CBR
SAMPLE LOCATION: Combined Bulk Sample
SOIL DESCRIPTION: Lean Clay

	10 blows/lift	25 blows/lift	56 blows/lift
Penetration (in)	Load (psi)	Load (psi)	Load (psi)
0.000	0.0	0.0	0.0
0.025	0.0	6.7	3.3
0.050	0.0	10.0	10.0
0.075	3.3	10.0	16.7
0.100	3.3	13.3	20.0
0.125	3.3	13.3	23.3
0.150	3.3	16.7	26.7
0.175	3.3	16.7	30.0
0.200	3.3	16.7	30.0
0.300	6.7	20.0	36.7
0.400	6.7	20.0	40.0
0.500	6.7	23.3	43.3



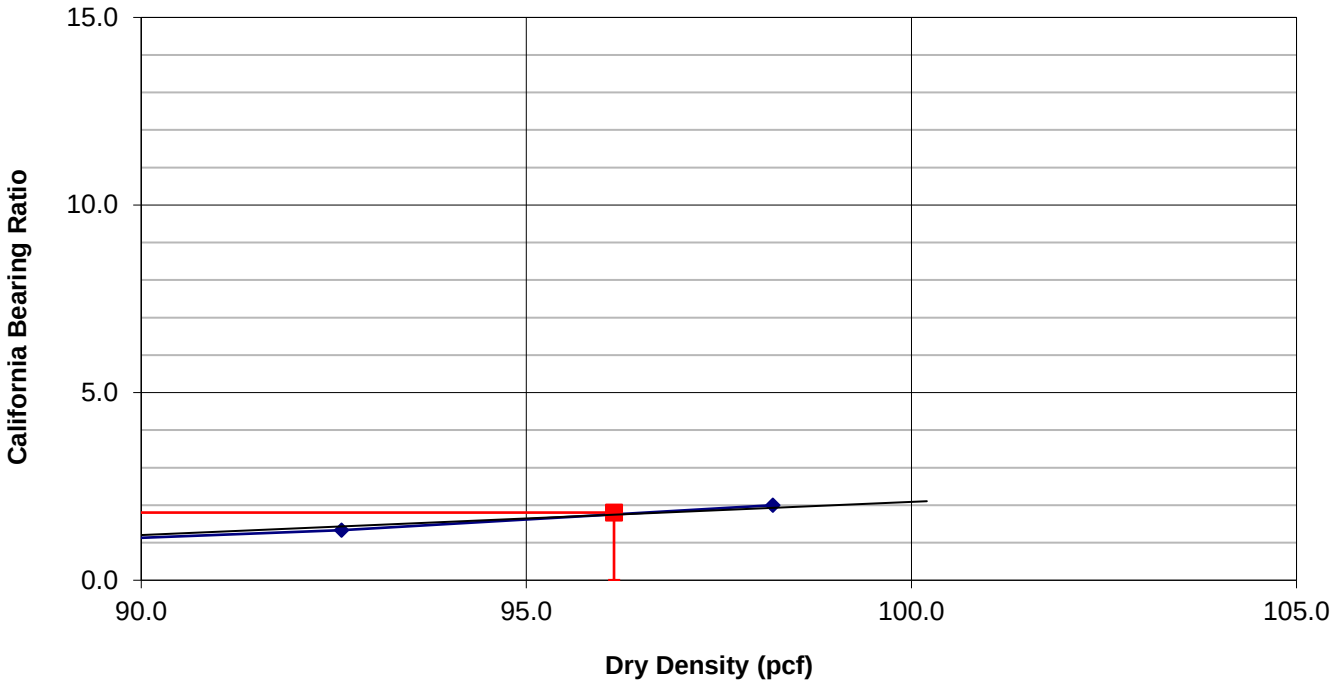
	10 blows/lift	25 blows/lift	56 blows/lift
Corrected Penetration (in)	Corrected Load (psi)	Corrected Load (psi)	Corrected Load (psi)
0.1	0.3	1.3	2.0
0.2	0.2	1.1	2.0

Figure No.18

CALIFORNIA BEARING RATIO TEST RESULTS

PROJECT:	The Hills at Lorson Ranch - Area B
JOB NUMBER:	181479
TEST DATE:	5/17/2021
AASHTO CLASSIFICATION:	A-7-6
SAMPLE NUMBER:	CBR
SAMPLE LOCATION:	Combined Bulk Sample
SOIL DESCRIPTION:	Lean Clay

	10 blows/lift	25 blows/lift	56 blows/lift
Corrected California Bearing Ratio	0.3	1.3	2.0
Dry Density (pcf)	79.8	92.6	98.2
Percent Compaction	79	92	97
Percent Moisture After Soaking	35.5	40.6	33.1
Percent Expansion/Compression	1.3	1.3	1.3
Surcharge Weight (lbs)	12.60	12.60	12.60



California Bearing Ratio	**1.8**
Dry Density (pcf)	101.2
Percent Compaction	95.00%
Target Dry Density	96.1
Compaction Test Method	ASTM D-698
Condition of sample	Soaked

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Figure No. 19

APPENDIX A

Figure D-1. Flexible Pavement Nomograph