11/6/2024

Geology and Soils Evaluation Report

Proposed Skye Vista Subdivision

16850 Steppler Road

El Paso County, Colorado

VIVID Project No.: D24-2-807

VIVID Engineering Group

November 6, 2024

Report prepared for:

Bill Herebic
Herebic Homes
Herebic5@msn.com

GEOLOGY AND SOILS EVALUATION REPORT
Proposed Skye Vista Subdivision
16850 Steppler Road
El Paso County, Colorado
VIVID Project No. D24-2-807

Prepared by:

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11/6/24

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Table of Contents

1.0 INTRODUCTION

1.1 General

This report presents the results of a geology and soils evaluation report performed for the proposed Skye Vista Subdivision to be developed at 16850 Steppler Road in El Paso County, Colorado. An attached Vicinity Map (Figure 1) shows the general location of the project. Our evaluation was performed for Herebic Homes and was authorized by Mr. Bill Herebic.

1.2 Project Description

The proposed project includes the development of an approximately 35-acre parcel into a residential subdivision. Thirteen lots are planned, that will be approximately 2.5 acres in size. A home is currently on the property with horse stables and a small barn. The development will include construction of access roadways and utilities. Residential lots will require individual water well and septic systems. A preliminary site layout is shown on Figure 3, attached to this report.

1.3 Purpose and Scope

The purpose of this evaluation was to assess the site geology and potential geologic hazards for the proposed development. VIVID's efforts are also supplemented by a "Preliminary Soils Report and Investigation" prepared by others (see Appendix C) that provides additional information to address the County requirements for a Geology and Soils Evaluation and Report. This report is part of the submittal of the Preliminary Development Plan for this proposed subdivision to El Paso County.

VIVID's scope of services included:

- A visual reconnaissance to observe surface and geologic conditions at the project site and locating the test pit sites;
- The review of boring logs from the previous Preliminary Soils Report and Investigation performed by A Better Soil Solution (Job #24-0181) dated June 23, 2024;
- The excavation and logging of four test pits for tactile evaluation of the soils;
- Laboratory testing of selected samples obtained during the test pit explorations to evaluate relevant physical, geologic, and engineering properties of the soil; and
- Preparation of this report, which includes a description of the proposed project, a description of the surface and subsurface site conditions based on review of previous reports, and conditions found during our investigation, geologic and geotechnical research and mapping for evaluation of challenges or hazards that may impact the development.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

Four test pits were performed with a mini excavator. Tactile observation/evaluation of the exposed soils was performed on representative samples obtained from the excavation. Bulk samples of the soils were obtained for laboratory testing purposes. Appendix A to this report includes logs of the test pits describing the subsurface conditions. Boring logs from the Preliminary Soils Report and Investigation by A Better Soil Solution dated June 23, 2024 were also reviewed for this Soils and Geology Report and are presented in Appendix C of this report.

2.2 Laboratory Testing

Laboratory tests were performed on selected soil samples to estimate their relative engineering properties. Tests were performed in general accordance with the following methods of ASTM or other recognized standards-setting bodies, and local practice:

- Description and Identification of Soils (Visual-Manual Procedure)
- Classification of Soils for Engineering Purposes
- Moisture Content
- Sieve Analysis of Fine and Coarse Aggregates
- Liquid Limit, Plastic Limit, and Plasticity Index

Results of the laboratory tests are included in Appendix B of this report. Selected test results are also shown on the boring logs in Appendix A.

3.0 GEOLOGY AND SOILS

3.1 Site Description

The site is approximately 35 acres and is currently covered with native grasses, trees, and shrubs. The topography includes rolling hills with ephemeral drainages. A residence is currently present on the southwest side of the property with a horse barn to the north. The site is bounded by residential properties and Settlers Ranch Road to the northwest.

3.2 Geologic Reconnaissance

A visual geologic reconnaissance of the site was performed. This reconnaissance was supported by the review of the Preliminary Soils Report and Investigation by A Better Soil Solution and test pit explorations, as well as geologic mapping and information from the following sources:

- CGS Geologic Map of the Monument Quadrangle, El Paso County, Colorado by Jon P. Thorson and Richard F. Madole, 2003
- CGS Geologic Map of the Black Forest Quadrangle, El Paso County, Colorado by Jon P. Thorson, 2003
- Soil Survey of El Paso County Area, Colorado Soil Conservation Service, USDA, 1979
- Review of Available Geologic Hazard Studies in the surrounding area

A geologic map is presented as Figures 5 attached to this report. An NRCS Soil Survey Map and associated Soil Descriptions are presented as Figure 6.

3.3 Site Soils and Geology

Based on our test pit exploration, review of previous preliminary investigation and geologic mapping, the following units are anticipated to be encountered on the site.

Sand and Clay

The overburden soils encountered at this site predominately consisted of clayey to silty sand and poorly to well graded sand soils. The sand soils were light to dark brown, yellowish-brown and grayish-brown in color, slightly moist to moist and medium dense to dense based on field penetration testing.

Sandy lean clay and sandy silty clay was encountered in two of the test pits and in one of the preliminary exploratory borings performed by A Better Soil Solution. The clay soils were light gray and light to dark brown in color, slightly moist to moist, and very stiff based on field penetration testing.

Bedrock

Regional Geology mapping shows sandstone of the Dawson Formation at the surface. There may be areas on the site in which bedrock is near or at the ground surface. However, bedrock was not encountered in our test pits to a depth of 8 feet below the ground surface. We interpret the dense sand encountered in the preliminary boring logs at depths of 12 to 17 feet below the existing ground surface to be uncemented sandstone bedrock of the Dawson Formation. Although not encountered in any of the borings or test pits, based on our experience within the Dawson Formation, lenses of claystone bedrock may be encountered within the sandstone. We anticipate the sandstone bedrock encountered on this site will be uncemented to moderately cemented.

3.4 Engineering Geology and Mitigation of Geologic Hazards

No geologic hazards were found that would preclude the proposed development as planned. The following presents a list of geologic hazards, their applicability to this site, and the typical mitigation techniques.

Expansive/Settlement Prone Soil

Based on lab testing performed by A Better Soil Solution, swells of the onsite soils ranged from 0.1 to 2.6 percent when wetted under 1,000 psf surcharge load and compression from 0.1 to 0.6 percent. It should be noted that expansive clay or clayey sandstone is not uncommon within the Dawson Formation. This condition, if it exists, should be evaluated at the time of final geotechnical investigations for each specific residence. Expansive soils can be mitigated through typical engineering approaches including removal of expansive layers, over-excavation and treatment or replacement, or use of deep foundations.

Erodible Soils

Soils with a sandy matrix, such as that encountered underlying the site, are susceptible to erosion when exposed. These concerns are normally addressed in an erosion control plan during construction and a long-term seeding/landscape plan that is typical for this type of development.

Corrosive Soils

The site may be underlain by soil or bedrock materials that may contain corrosive minerals. Corrosive minerals can have detrimental effects on concrete and buried metals if not identified prior to design and properly mitigated. The potential for corrosive minerals is addressed in a site-specific geotechnical investigation report.

Mine Subsidence

This project is outside of the any areas of know mining and mine subsidence.

Slope Stability

The Dawson Formation and moderate to gentle slopes on this site are not considered to be prone to slope instability and there are no published geologic maps that indicate these issues exist on this site.

Flooding Potential

As shown in Figure 4, the project site is outside of mapped flood plain areas. Based on the mapping and our site observations, flooding is not considered to be a hazard for this development. However, surface runoff water from the surrounding area is currently being directed into drainage features that cross the project site. These historical surface water flows must not be interrupted or blocked by new construction of the proposed streets, homes, or driveways.

Seismicity

The major structural feature of this region is the Rampart Range Fault System which is located approximately 7 miles west of the site along the Front Range. There is evidence of movement during the past 2 million years along this fault zone. The Rampart Range Fault is considered to be active by the Colorado Geologic Survey. This area, as is the case with most of central Colorado, is subject to a degree

of risk due to seismic activity. The Colorado Geologic Survey considers the El Paso County area to be in Seismic Risk Zone 2A. Pikes Peak Regional Building Department has adopted the International Building Code. Refer to the currently approved building codes for current design and construction practices.

Radiation

The primary radiation hazard associated with soil and bedrock commonly found in the El Paso County area is radon gas. The higher concentrations of radon gas normally occur in residential structures that have been sealed to prevent exchange of outside air. Buildup of radon gas can usually be mitigated by providing frequent exchange of air within the structure and by sealing joints and cracks that are located adjacent to the subsoil. Radon can be evaluated and mitigated utilizing common local construction practices if radon is found to exist during site specific geotechnical investigations.

Groundwater

Groundwater was not encountered in any of the borings performed by A Better Soil Solution to a depth of 20 feet below the existing ground surface nor in any of the test pits to a depth of 8 feet. Although the groundwater was not encountered during the preliminary investigation, shallower groundwater and smaller seeps are not uncommon as perched water above the bedrock, or in more permeable lenses within the Dawson Formation. If this condition is encountered during site specific geotechnical investigations for individual lots, it should be mitigated with cut-off or foundation drains that are common local design and construction techniques.

Conclusion

It is our opinion that the project site exhibits no geologic hazards that pose a significant risk to the proposed project or adjacent properties that cannot be mitigated through proper land usage planning, foundation design, engineering design, and/or construction practice generally as discussed above. Recommendations regarding mitigation of the identified potential hazards must be addressed in the lot-specific geotechnical investigation report, or through the use of current building design codes.

As discussed, a preliminary soils report was prepared by others and is included in Appendix C of this report. This report is included as part of this overall Geology and Soils Evaluation Report to fulfill the County's requirements and includes preliminary "geotechnical" information and recommendations for construction of the planned residential development that is more specifically focused on earthwork, compaction, foundation, slab design and construction recommendations for general development planning purposes. As is required by the local building department, this general information will be supplemented by a lot and house specific geotechnical investigation that will provide final geotechnical recommendations specific to the final lot layout and house plans.

3.5 Economic Mineral Resources

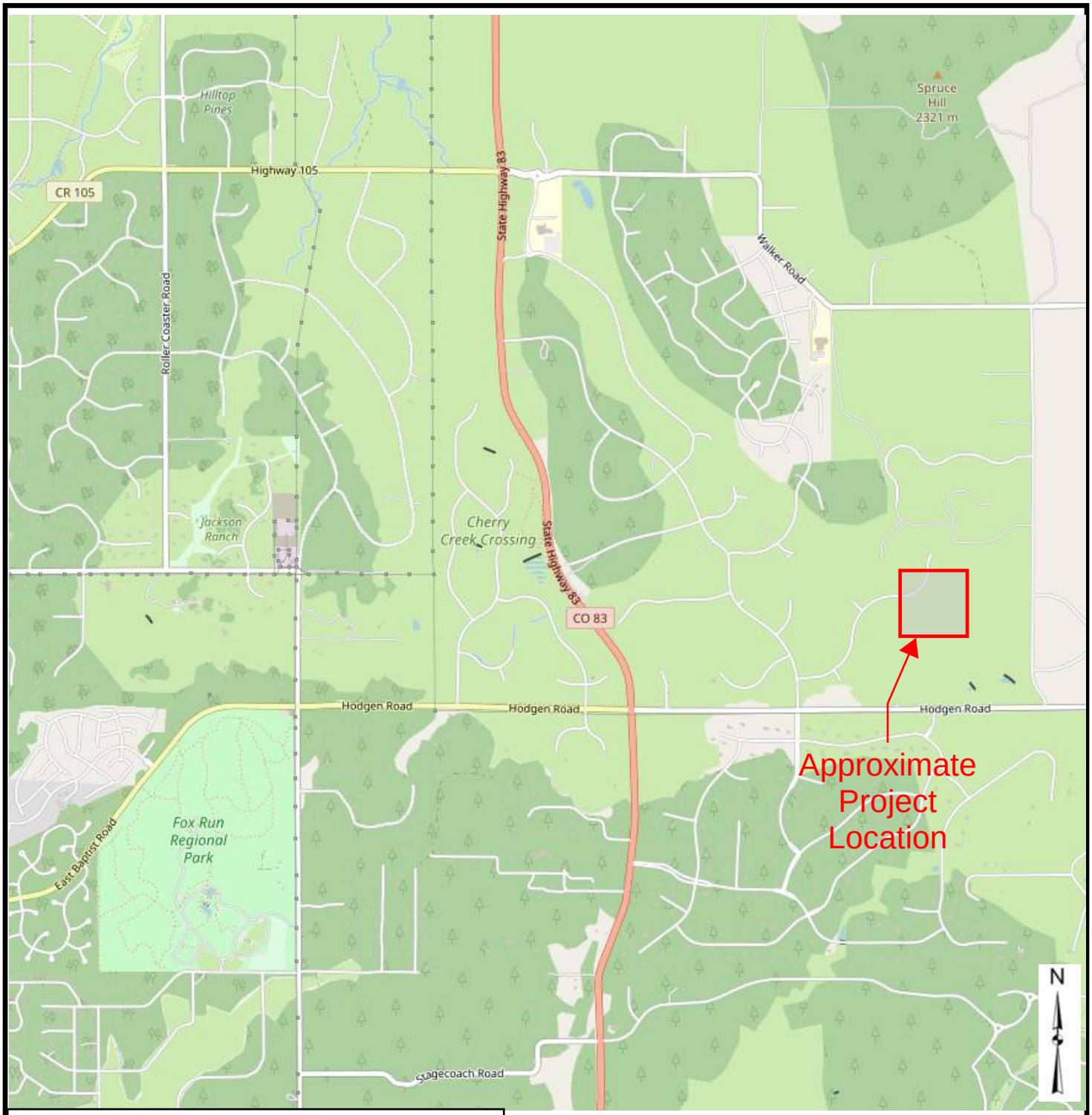
According *to El Paso County Aggregate Resource Evaluation Map*, the project site is not mapped with any viable aggregate deposits. The site is mapped as a "poor" for coal resources and "fair" for oil, according to the *Evaluation of Mineral and Mineral Fuel Potential of El Paso, State Mineral Lands.*

4.0 LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of VIVID's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. VIVID makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

This report may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two (2) years from the date of the report.

Figures



REFERENCE:

Base image obtained from OpenStreetMap, 10/4/2024

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Project No. D24-2-807

Date: 10/4/2024

Drawn by: SAM

Reviewed by: MBR

VICINITY MAP

Skye Vista Subdivision
16850 Steppler Road
El Paso County, Colorado

FIGURE

1

Note: Not to Scale.

REFERENCE
Base Image obtained from Google Earth Pro, 2024.

LEGEND
TP-1 ApproximateTest Pit Location

VIVID Engineering Group, Inc.
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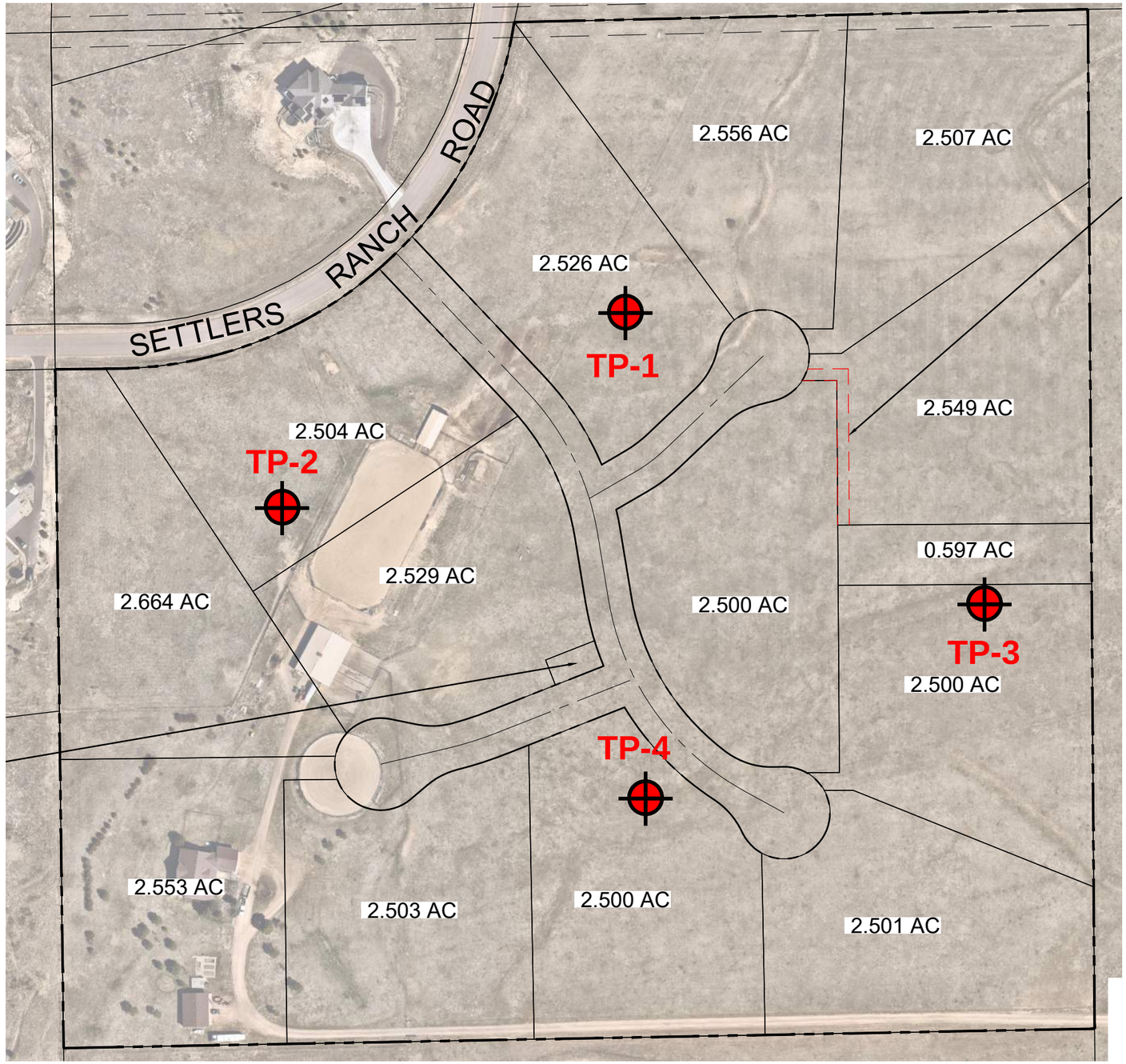
719-896-4356

Project No. D24-2-807
Date: 10/11/2024
Drawn by: SAM
Reviewed by: MBR

FIELD EXPLORATION PLAN (AERIAL)

Skye Vista Subdivision
16850 Steppler Road
El Paso County, Colorado

FIGURE 2



Note: Not to Scale.

REFERENCE
Base Image by Matrix

LEGEND
TP-1 Approximate Test Pit Location

VIVID Engineering Group, Inc.
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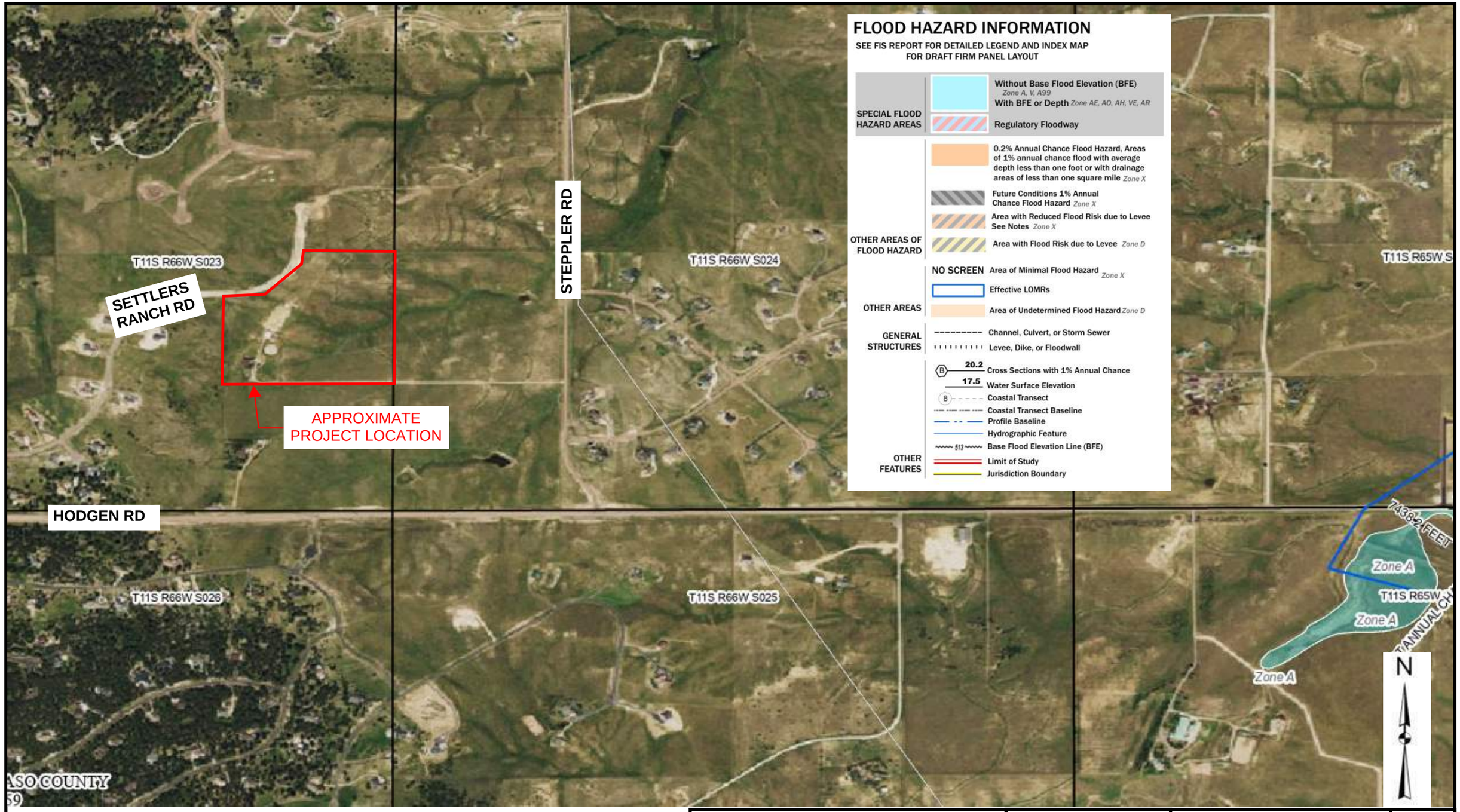
719-896-4356

Project No. D24-2-807
Date: 10/11/2024
Drawn by: SAM
Reviewed by: MBR

FIELD EXPLORATION PLAN
(CONCEPTUAL)

Skye Vista Subdivision
16850 Steppler Road
El Paso County, Colorado

FIGURE
3



Note: Not to Scale.

REFERENCE
Base Image obtained from https://msc.fema.gov/portal/home, 2024

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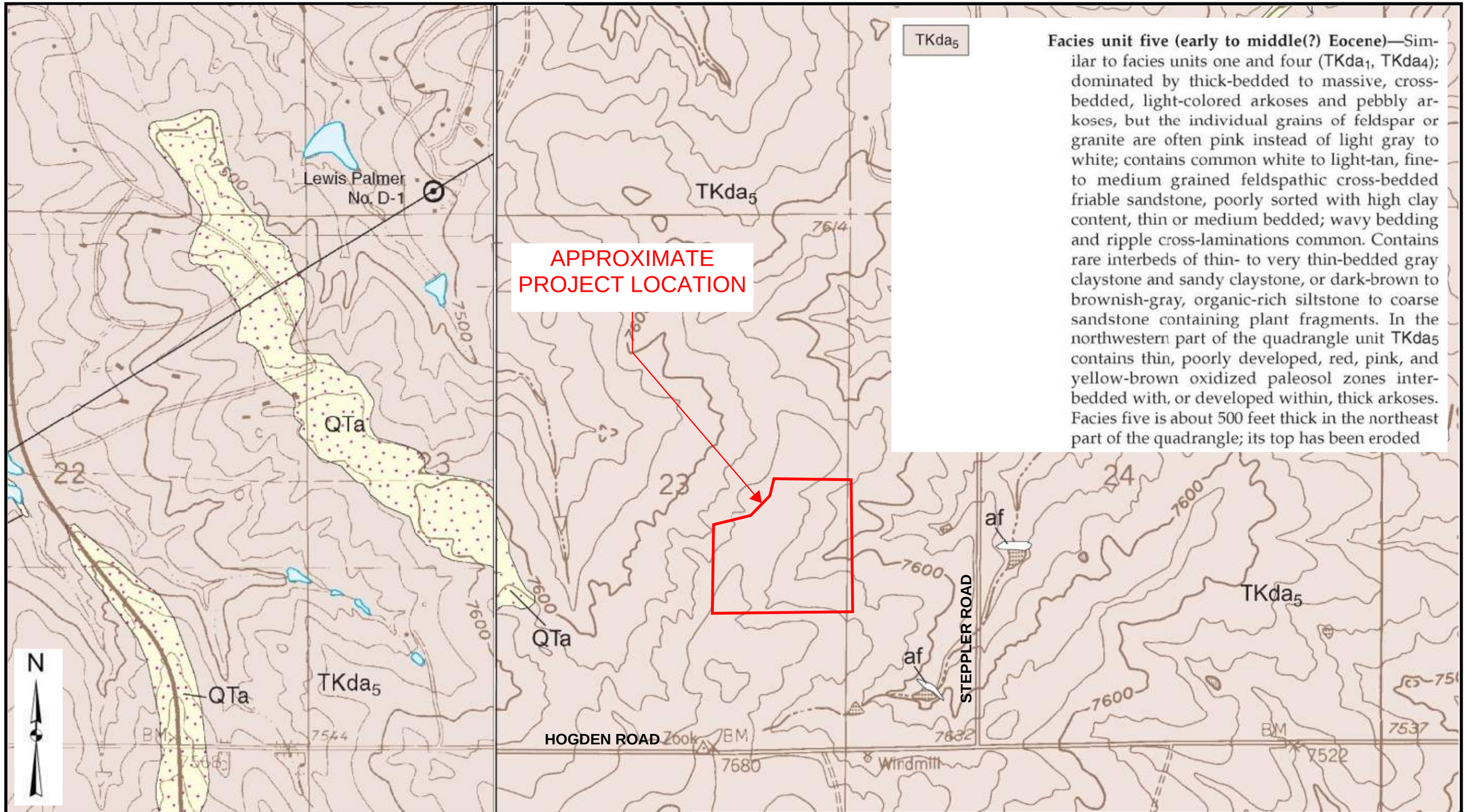
FLOOD HAZARD MAP

Skye Vista Subdivision
16850 Steppler Road
El Paso County, Colorado

FIGURE
4



TKda$_5$

Facies unit five (early to middle(?) Eocene)—Similar to facies units one and four (TKda$_1$, TKda$_4$); dominated by thick-bedded to massive, cross-bedded, light-colored arkoses and pebbly arkoses, but the individual grains of feldspar or granite are often pink instead of light gray to white; contains common white to light-tan, fine- to medium grained feldspathic cross-bedded friable sandstone, poorly sorted with high clay content, thin or medium bedded; wavy bedding and ripple cross-laminations common. Contains rare interbeds of thin- to very thin-bedded gray claystone and sandy claystone, or dark-brown to brownish-gray, organic-rich siltstone to coarse sandstone containing plant fragments. In the northwestern part of the quadrangle unit TKda$_5$ contains thin, poorly developed, red, pink, and yellow-brown oxidized paleosol zones interbedded with, or developed within, thick arkoses. Facies five is about 500 feet thick in the northeast part of the quadrangle; its top has been eroded

Note: Not to Scale.

REFERENCE

Base Image obtained from Black Forest Quadrangle Geologic Map, El Paso County, Colorado (Thorson, J.P.), 2003, Colorado Geological Survey Open-File Report OF-03-06 and from Monument Quadrangle Geologic Map, El Paso County, Colorado (Thorson, J.P. and Madole, R.F.), 2003, Colorado Geological Survey Open File Report OF-02-04.

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Reviewed by:

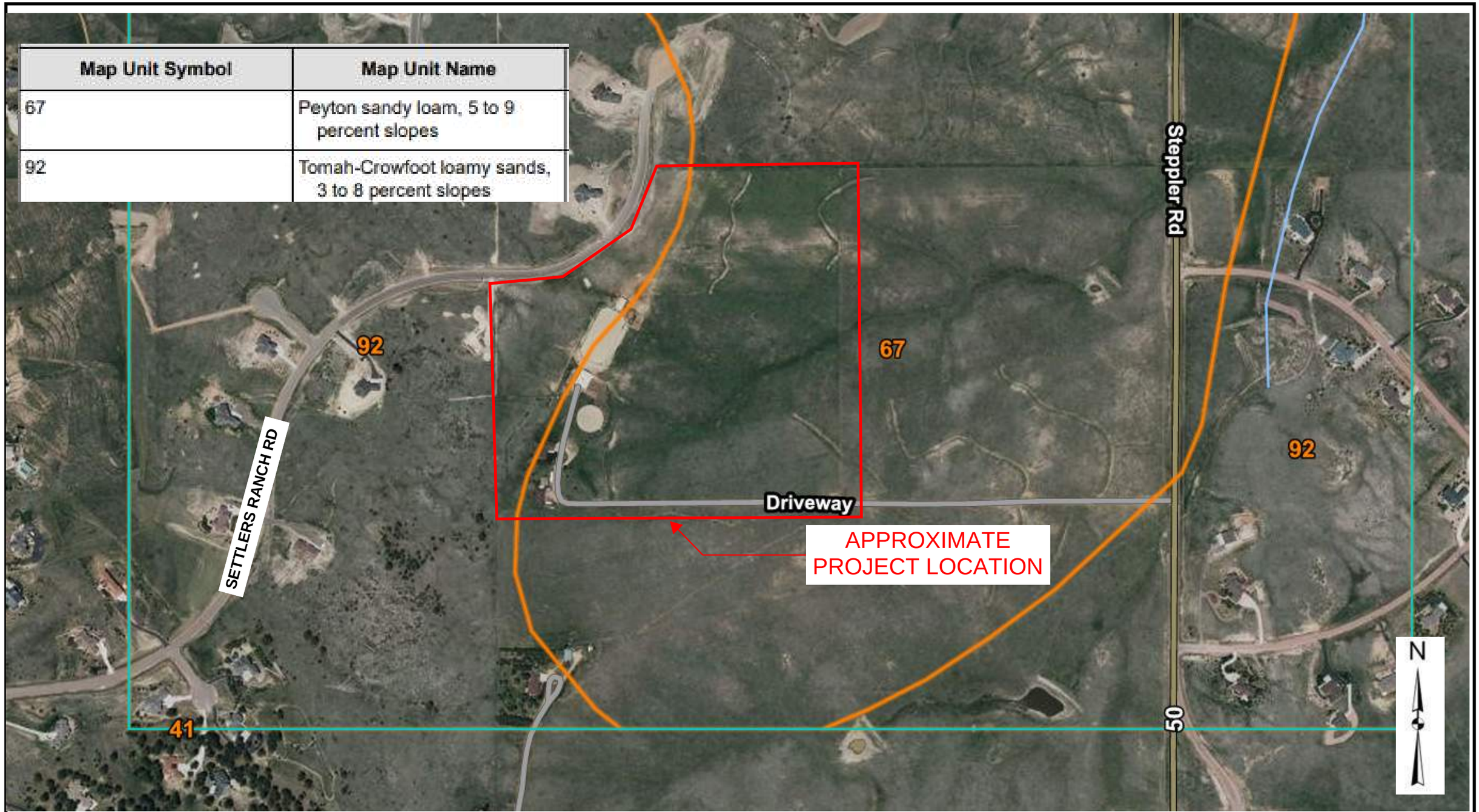
GEOLOGIC MAP

Skye Vista Subdivision
16850 Steppler Road
El Paso County, Colorado

FIGURE

5

Map Unit Symbol	Map Unit Name
67	Peyton sandy loam, 5 to 9 percent slopes
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes



Note: Not to Scale.

REFERENCE
Base Image obtained from Soil Survey of El Paso County Area, Colorado Soil Conservation Service, USDA, 1979

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Date: 10/4/2024
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Reviewed by: MBR

NRCS SOIL SURVEY MAP

Skye Vista Subdivision
16850 Steppler Road
El Paso County, Colorado

FIGURE
6

Appendix A

Logs of Test Pits

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KEY TO SYMBOLS

CLIENT Herebic Homes

PROJECT NAME Skye Vista Subdivision

PROJECT NUMBER D24-2-807

PROJECT LOCATION El Paso County, Colorado

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)


CL: USCS Low Plasticity Clay


CL-ML: USCS Low Plasticity Silty Clay


SC: USCS Clayey Sand


SC-SM: USCS Clayey Sand


TOPSOIL

SAMPLER SYMBOLS


Grab Sample

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
MC - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
FINES- PERCENT PASSING NO. 200 SIEVE

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Fax: 719-896-4357

TEST PIT NUMBER TP-1

CLIENT Herebic Homes
PROJECT NAME Skye Vista Subdivision
PROJECT NUMBER D24-2-807
PROJECT LOCATION El Paso County, Colorado
DATE STARTED 10/9/24 **COMPLETED** 10/9/24
GROUND ELEVATION **TEST PIT SIZE** inches
EXCAVATION CONTRACTOR Herebic Homes
GROUND WATER LEVELS:
EXCAVATION METHOD Test Pit
AT TIME OF EXCAVATION ---
LOGGED BY M. Ray **CHECKED BY** W. Barreire
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION --- None Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				TOPSOIL
			1.0	Clayey SAND, light brown, slightly moist to moist, USDA Soil Type: 2, Structure-type: BK, Structure Grade: 2
2.5				
				- more moist at approximately 3 feet below the existing ground surface
	GB	MC = 6.9% LL = 26 PL = 17 Fines = 39.0%		
5.0				
7.5			8.0	
				Bottom of test pit at 8.0 feet.

Vivid Engineering Group, Inc.
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TEST PIT NUMBER TP-2

CLIENT Herebic Homes
PROJECT NAME Skye Vista Subdivision
PROJECT NUMBER D24-2-807
PROJECT LOCATION El Paso County, Colorado
DATE STARTED 10/9/24 **COMPLETED** 10/9/24
GROUND ELEVATION _____ **TEST PIT SIZE** inches
EXCAVATION CONTRACTOR Herebic Homes
GROUND WATER LEVELS:
EXCAVATION METHOD Test Pit
AT TIME OF EXCAVATION ---
LOGGED BY M. Ray **CHECKED BY** W. Barreire
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION --- None Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				TOPSOIL
			1.0	
	GB	MC = 6.1% LL = 40 PL = 14 Fines = 14.0%		Clayey SAND, yellowish-brown, moist, USDA Soil Type: 1, Structure-type: Single-Grain, Structure Grade: 0
2.5				
5.0			5.0	
	GB	MC = 6.7% LL = 20 PL = 15 Fines = 28.0%		Silty, Clayey SAND, grayish-brown, brown, moist, USDA Soil Type: 2, Structure-type: GR, Structure Grade: 2
7.5				
			8.0	
				Bottom of test pit at 8.0 feet.

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TEST PIT NUMBER TP-3

CLIENT Herebic Homes
PROJECT NAME Skye Vista Subdivision
PROJECT NUMBER D24-2-807
PROJECT LOCATION El Paso County, Colorado
DATE STARTED 10/9/24 **COMPLETED** 10/9/24
GROUND ELEVATION **TEST PIT SIZE** inches
EXCAVATION CONTRACTOR Herebic Homes
GROUND WATER LEVELS:
EXCAVATION METHOD Test Pit
AT TIME OF EXCAVATION ---
LOGGED BY M. Ray **CHECKED BY** W. Barreire
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION --- None Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				TOPSOIL
1.0				Sandy Lean CLAY, USDA Soil Type: 2A, Structure-type: BK, Structure Grade: 1
2.5	GB	MC = 7.2% LL = 26 PL = 18 Fines = 52.0%		
5.0				
7.5				
8.0				Bottom of test pit at 8.0 feet.

Vivid Engineering Group, Inc.
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TEST PIT NUMBER TP-4

CLIENT Herebic Homes
PROJECT NAME Skye Vista Subdivision
PROJECT NUMBER D24-2-807
PROJECT LOCATION El Paso County, Colorado
DATE STARTED 10/9/24 **COMPLETED** 10/9/24
GROUND ELEVATION _____ **TEST PIT SIZE** inches
EXCAVATION CONTRACTOR Herebic Homes
GROUND WATER LEVELS:
EXCAVATION METHOD Test Pit
AT TIME OF EXCAVATION ---
LOGGED BY M. Ray **CHECKED BY** W. Barreire
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION --- None Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				TOPSOIL
				1.0
				Sandy Silty CLAY, dark brown, moist, USDA Soil Type: 3, Structure-type: BK, Structure Grade: 2
2.5	GB	MC = 5.8% LL = 24 PL = 18 Fines = 69.0%		
				4.0
				Sandy Lean CLAY, light brown, USDA Soil Type: 2A, Structure-type: BK, Structure Grade: 2
5.0				
	GB	MC = 6.6% LL = 25 PL = 17 Fines = 53.0%		
7.5				
				8.0
				Bottom of test pit at 8.0 feet.

Appendix B

Geotechnical Laboratory Test Results

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SUMMARY OF LABORATORY RESULTS

CLIENT Herebic Homes **PROJECT NAME** Skye Vista Subdivision

PROJECT NUMBER D24-2-807 **PROJECT LOCATION** El Paso County, Colorado

Exploration ID	Approx. Sample Depth (ft)	Sample Description	Passing 3/4" Sieve (%)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Moisture Content (%)	Dry Density (pcf)
TP-1	1.0	CLAYEY SAND(SC)		100	39	26	17	9	6.9	
TP-2	1.0	CLAYEY SAND(SC)		92	14	40	14	26	6.1	
TP-2	5.0	SILTY, CLAYEY SAND(SC-SM)		95	28	20	15	5	6.7	
TP-3	1.0	SANDY LEAN CLAY(CL)			52	26	18	8	7.2	
TP-4	1.0	SANDY SILTY CLAY(CL-ML)			69	24	18	6	5.8	
TP-4	4.0	SANDY LEAN CLAY(CL)		100	53	25	17	8	6.6	

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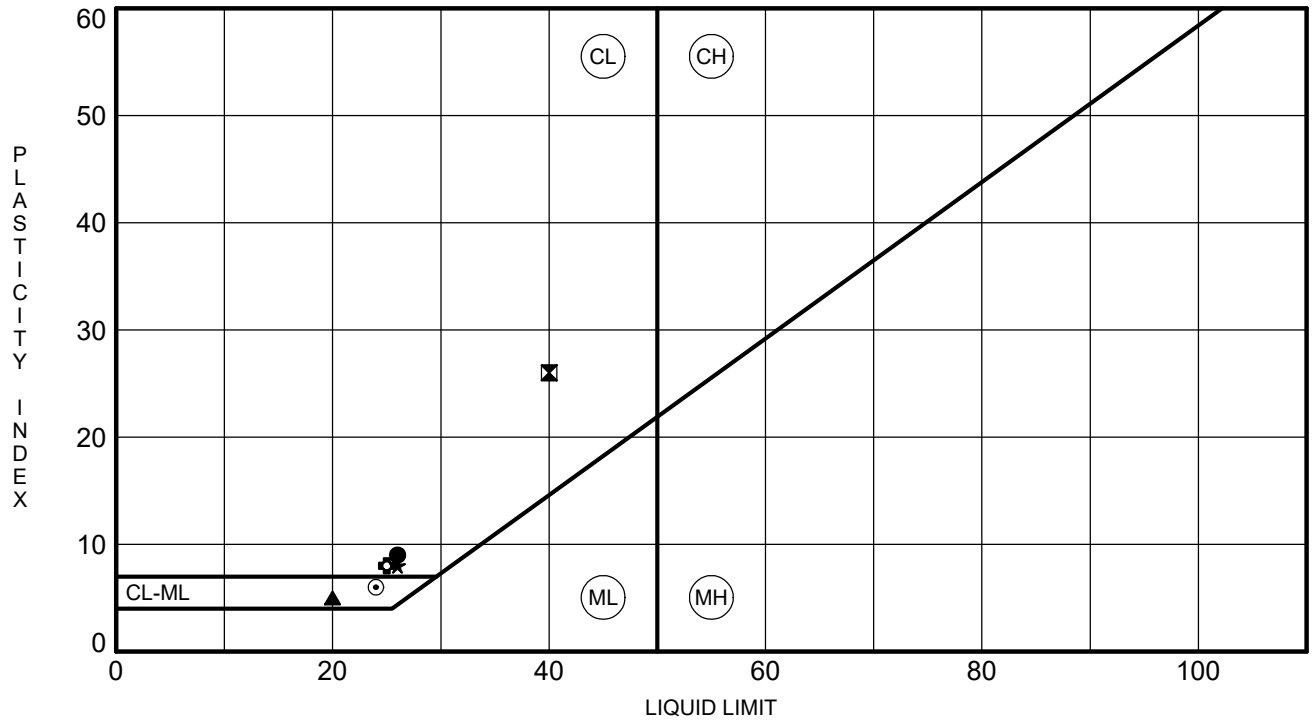
ATTERBERG LIMITS' RESULTS

CLIENT Herebic Homes **PROJECT NAME** Skye Vista Subdivision

PROJECT NUMBER D24-2-807 **PROJECT LOCATION** El Paso County, Colorado



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	TP-1	1.0	26	17	9	39	CLAYEY SAND(SC)
⊠	TP-2	1.0	40	14	26	14	CLAYEY SAND(SC)
▲	TP-2	5.0	20	15	5	28	SILTY, CLAYEY SAND(SC-SM)
★	TP-3	1.0	26	18	8	52	SANDY LEAN CLAY(CL)
⊙	TP-4	1.0	24	18	6	69	SANDY SILTY CLAY(CL-ML)
✿	TP-4	4.0	25	17	8	53	SANDY LEAN CLAY(CL)

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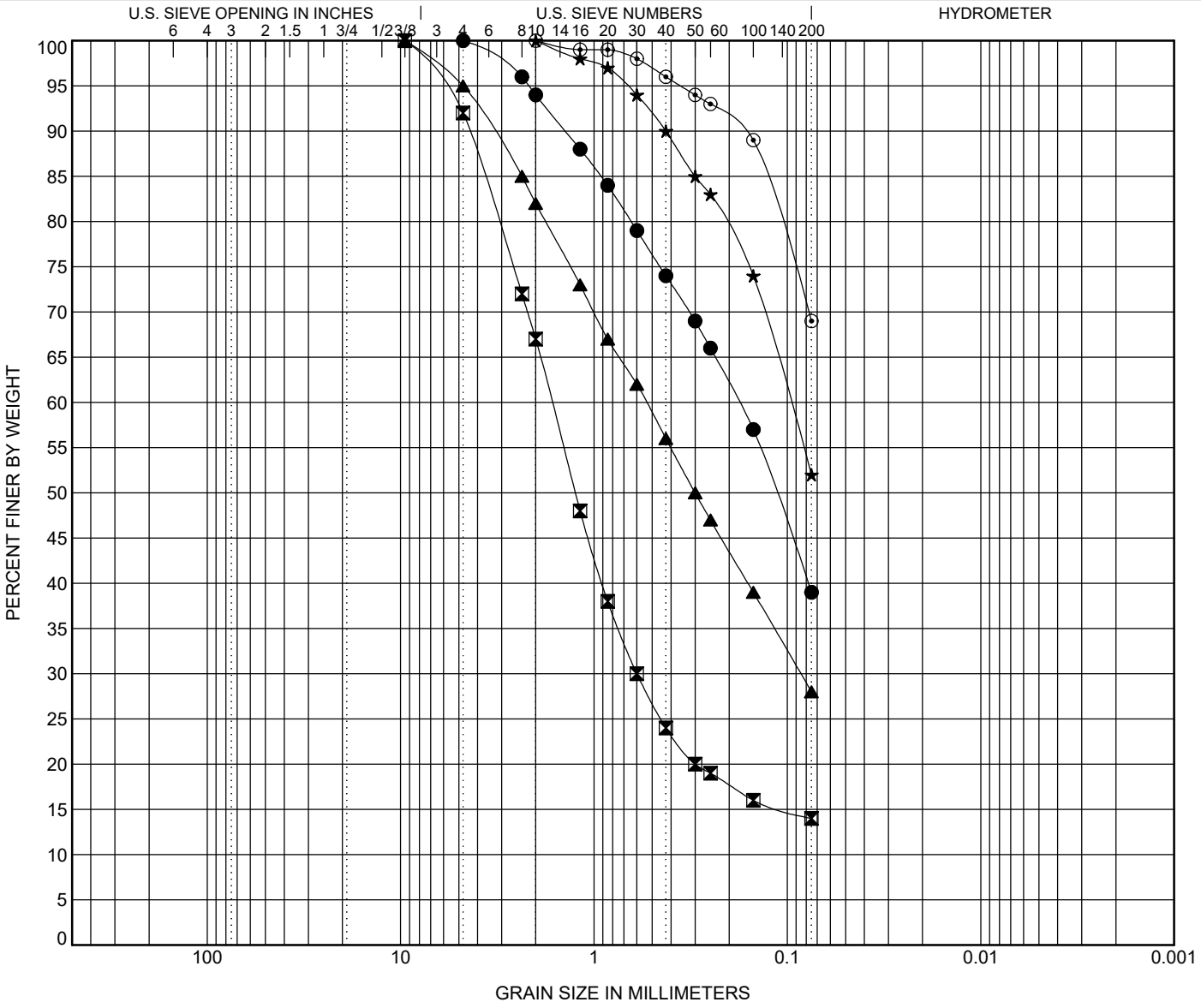
GRAIN SIZE DISTRIBUTION

CLIENT Herebic Homes
PROJECT NAME Skye Vista Subdivision
PROJECT NUMBER D24-2-807
PROJECT LOCATION El Paso County, Colorado



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● TP-1	1.0	CLAYEY SAND(SC)	26	17	9		
⊠ TP-2	1.0	CLAYEY SAND(SC)	40	14	26		
▲ TP-2	5.0	SILTY, CLAYEY SAND(SC-SM)	20	15	5		
★ TP-3	1.0	SANDY LEAN CLAY(CL)	26	18	8		
⊙ TP-4	1.0	SANDY SILTY CLAY(CL-ML)	24	18	6		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP-1	1.0	4.75	0.178			0.0	61.0	39.0	
⊠ TP-2	1.0	9.5	1.647	0.6		8.0	78.0	14.0	
▲ TP-2	5.0	9.5	0.535	0.085		5.0	67.0	28.0	
★ TP-3	1.0	2	0.096			0.0	48.0	52.0	
⊙ TP-4	1.0	2				0.0	31.0	69.0	

Vivid Engineering Group, Inc.
1053 Elkton Drive
Colorado Springs, Colorado 80907
Telephone: 719-896-4356
Fax: 719-896-4357

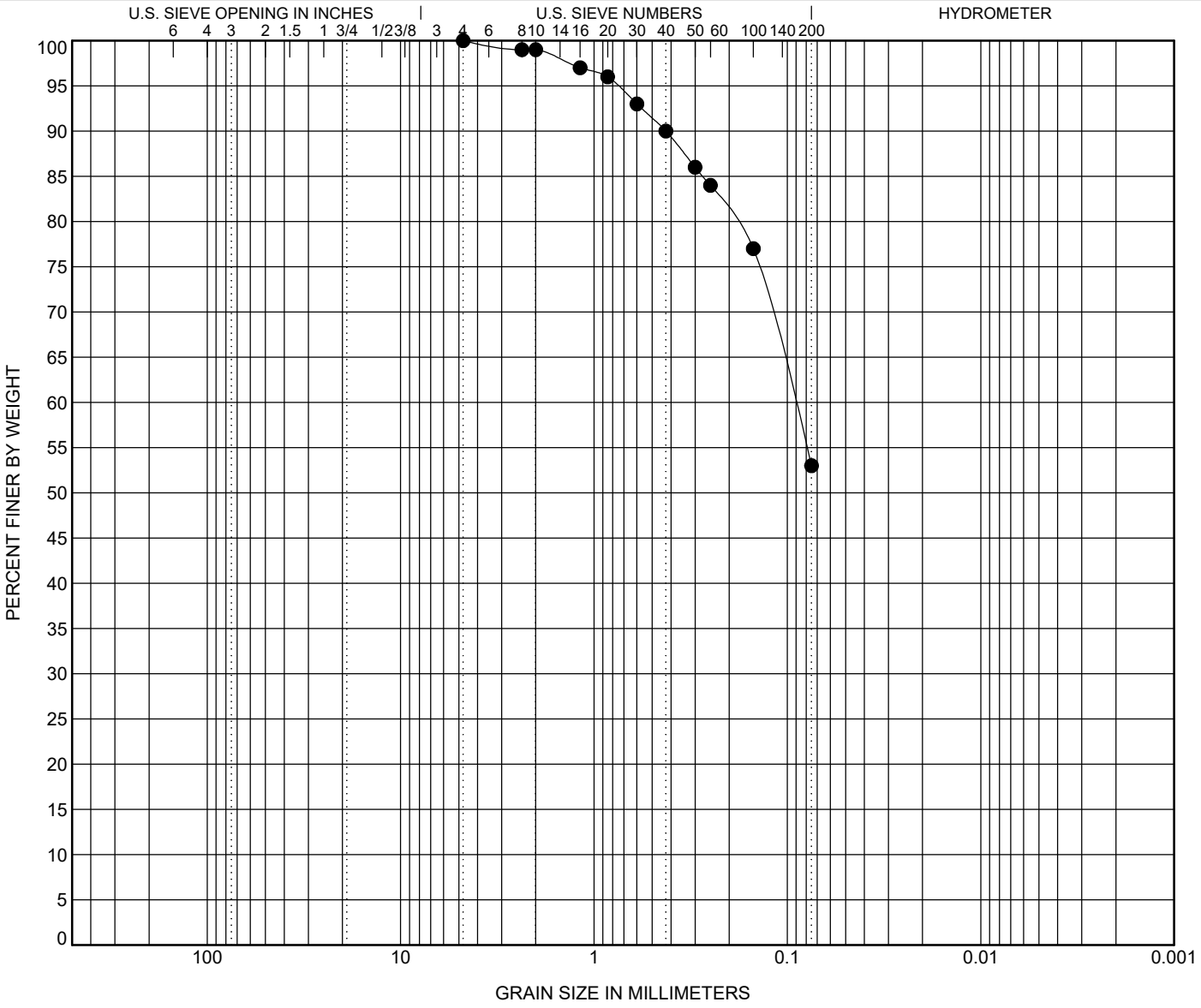
GRAIN SIZE DISTRIBUTION

CLIENT Herebic Homes

PROJECT NAME Skye Vista Subdivision

PROJECT NUMBER D24-2-807

PROJECT LOCATION El Paso County, Colorado



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● **TP-4**	**4.0**	**SANDY LEAN CLAY(CL)**	**25**	**17**	**8**		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **TP-4**	**4.0**	**4.75**	**0.092**			**0.0**	**47.0**	**53.0**	

Appendix C

Preliminary Soils Report and Investigation by A Better Soil Solution

23 June 2024

A BETTER SOIL SOLUTION

PRELIMINARY SOILS REPORT AND INVESTIGATION

FOR

HEREBIC HOMES

JOB #24-0181

16850 Steppler Road,
El Paso County,
Colorado

Sincerely,

Charles E. Milligan, P.E.

COLORADO LICENSED
CHARLES E. MILLIGAN
34608
25 JUN 24
PROFESSIONAL ENGINEER

5072 List Dr
Colorado Springs, CO 80919

abettersoilsolution@gmail.com

www.abettersoilsolution.com

TABLE OF CONTENTS

INTRODUCTION

The owners must be made aware of the contents of this report. If there are any questions or concerns regarding the information in this report, please contact A Better Soil Solution, Inc. It is the responsibility of the contractor on this project to make subsequent owners aware of the contents of this report. This is to ensure that the recommendations and requirements of the report, especially regarding the surface drainage, are acknowledged and followed. This report is prepared for **Herebic Homes, builder, on 16850 Steppler Road, El Paso County, Colorado.** This report is prepared with the understanding that several new homes are planned for this site. The site does have existing structures.

GENERAL

The investigation was made to reveal important characteristics of the soils and of the site influencing the foundation design. Also evaluated during the investigation were subsurface conditions that affect the depth of the foundation and subsequent loading design, such as ground water levels, soil types, and other factors which affect the bearing capacity of the soils. Design loadings are based on soils characteristics and represent the maximum permissible loads for these conditions. The bearing capacity is calculated with a safety factor of three.

FIELD AND LABORATORY INVESTIGATION

Seven (7) exploratory holes were drilled on May 22, 2024, at the locations shown on the enclosed site map. The location of these test holes was determined by Herebic Homes. The test holes were drilled with a 6-inch diameter hollow stem auger to a depth of 20 feet below the existing ground surface. At intervals anticipated to be the foundation depths, and as determined by the soils conditions, the drill tools were removed, and samples were taken by the use of a 2.5-inch split barrel sampler connected to a 140-pound drop-hammer. This hammer is dropped 30 inches to drive the penetration sampler into the soil (ASTM D-1586). The depths and descriptions of the materials encountered in each test boring at which the samples were taken are shown on the enclosed log sheets.

All samples were classified both in the field and in the laboratory to evaluate the physical and mechanical properties of the materials encountered. Laboratory testing included: Moisture Content determination, Dry Density, Grain-Size analysis, Atterberg Limits, and Denver Swell/Consolidation tests. The results of the laboratory testing can be seen in the appendix.

CONCLUSIONS

The laboratory testing of the overall site revealed that the on-site soil consists of a mixture of Clayey Sand (U.S.C.S. Classification Symbol: SC), Silty Sand (SM), Poorly Graded Silty Sand (SP-SM), Well Graded Silty Sand (SW-SM), and trace amounts of Low Plasticity Clay (CL) that are not anticipated to affect structure foundation construction. The exact composition and thicknesses of the soil layers vary across the site. **A soil test underneath each proposed home is recommended in order to gain a better understanding of the exact soil type and develop individual foundation recommendations for each home.**

The SPT blow counts of the site indicate that the material generally consists of a low to moderate density material. A maximum allowable bearing capacity ranging from 1,500 pounds per square foot to 2,000 pounds per square foot can be expected. Foundation components near TH-7 can be expected to be designed for a maximum allowable bearing capacity of 1,000 pounds per square foot as low density material was encountered to the depth of 14 feet. Foundation components should bear on soils of similar bearing capacity. Foundation components bearing on dissimilar soils should be avoided.

The results of the Swell/Consolidation testing revealed that there does exist some low to moderately expansive SC material on the west and northwest side of the site. This expansive material was found in Test Hole 1 (TH-1) at the depth of 4 feet, and in Test Hole 2 (TH-2) at the depth of 9 feet. The soil beneath the foundation components near these areas will need to be mitigated as outlined in the foundation recommendations section below. The swell/consolidation potential in the other Test Holes was found to be negligible and is not anticipated to affect foundation components resting on this native material.

Groundwater was not encountered in any of the test holes during the drilling for this report and is not anticipated to affect the proposed development.

ANTICIPATED FOUNDATION RECOMMENDATIONS

TEST HOLES 1 & 2

The SC material in TH-1 has a 2.64% expansion potential with a deadload of 6,600 pounds per square foot. The SC material in TH-2 has a 1.09% expansion potential with a deadload of 4,600 pounds per square foot.

Due to encountering shallow unsuitable expansive SC material, to the depth of 7 feet in TH-1 and 12 feet in TH-2, the excavation and the placement of the foundation components must penetrate the SC. If this unsuitable material is encountered, it must be removed and replaced, compaction testing will be required, and a bearing of 1,500 pounds per square foot will be used. The over-excavated area shall extend to a minimum depth of 4 feet below the bottom of the foundation elevation and 4 feet laterally from the foundation. If the bottom of the excavation becomes unstable, the use of 1' to 2' of 4" to 8" ballast rock will be required.

If the foundation will penetrate the unsuitable soil then, an anticipated satisfactory foundation for structures near TH-1 and TH-2 is a properly designed shallow foundation system consisting of foundation components resting directly on undisturbed low to moderate density native materials. Foundation components resting directly on undisturbed native materials may be designed for a loading of not greater than **1,500 pounds per square foot.** Any design by any engineer is subject to revision based on the results of the open hole observation. The compressibility of this material is low. This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The depth of foundation elements shall be determined by the foundation engineer but should be at least as deep as the minimum depth required by the governing building authority. **This material is not suitable and may not be used as backfill material around the perimeter of the foundation.**

TEST HOLES 3, 4, 5, 6

An anticipated satisfactory foundation for structures near TH-3 to TH-6 is a properly designed shallow foundation system consisting of foundation components resting directly on undisturbed low to moderate density materials. Foundation components resting directly on undisturbed native materials may be designed for a loading of not greater than **1,500 to 2,000 pounds per square foot.** The compressibility of this material is low. This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The depth of foundation elements shall be determined by the foundation engineer but should be at least as deep as the minimum depth required by the governing building authority.

TEST HOLE 7

An anticipated satisfactory foundation for structures near TH-7 is a properly designed shallow foundation system consisting of foundation components resting directly on undisturbed low density native materials. Foundation components resting directly on undisturbed native materials may be designed for a loading of not greater than **1,000 pounds per square foot.** The compressibility of this material is low to moderate. This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The depth of foundation elements shall be determined by the foundation engineer but should be at least as deep as the minimum depth required by the governing building authority.

TOPOGRAPHY

The overall topography of this site is that of an incline sloping down towards the east to southeast at from 2-10%.

WEATHER

The weather at the time of the soil examination consisted of clear skies with mild temperatures and low to moderate winds.

DESIGN AND CONSTRUCTION CONSIDERATIONS

Slabs-on-grade may move and crack. Vertical slab movement of up to one and a half inches should be expected for native soils with low expansion potential. In some cases, vertical movement may exceed this range. If movement and associated damage to basement floors and finishes cannot be tolerated, a structural floor system should be installed. If compaction is not performed, settlement may occur causing cracking of foundation walls and floors. Soil located beneath concrete walls shall be compacted to at least 95% Modified Proctor density (ASTM D-1557). Soil located beneath concrete slabs shall be compacted to at least 85% Modified Proctor density. Special care is to be taken to re-compact the material above utility lines to a minimum of 85% Modified Proctor density. During construction, conditions that could cause settlement shall be eliminated. Interior non-bearing partition walls shall be constructed such that they do not transmit floor slab movement to the roof or overlying floor. The gap or void (1.5 inch min.) installed in these non-bearing partitions may require re-construction over the life of the structure to re-establish the gap or void to allow for vertical slab movement. Stairwells, doorways, and sheeted walls should be designed for this movement.

The following are general recommendations of on-grade slabs:

1. Slabs shall be placed on well-compacted, non-expansive materials, and all soft spots shall be thoroughly excavated and replaced with non-expansive fill materials as stated above.

2. Slabs shall be separated from all foundation walls, load bearing members, and utility lines.

3. At intervals not to exceed 12 feet in each direction, provide control joints to reduce problems with shrinkage and curling as recommended by the American Concrete Institute (ACI 360R-10). Moisten the ground beneath the slab prior to the placement of concrete.

4. All concrete placed must be cured properly as recommended by the American Concrete Institute (ACI 360R-10). Separate load bearing members from slabs, as discussed above. Care must be exercised to prevent excess moisture from entering the soil under the structure, both during and after construction.

5. Due to the exposure of exterior concrete to variations in moisture fluctuations, heaving and cracking of exterior slabs-on-grade should be expected. Placement of at least 3 feet of non-expansive fill beneath the slabs can help to reduce the impact of differential movement and cracking but may not eliminate movement. Exterior concrete shall slope away from the structure a minimum of 2% grade.

6. Basement slabs, garage slabs, and all concrete floor slabs, exert a very low dead-load pressure on the soil. Since this soil contains a small to moderate amount of swell/consolidation potential, slabs will crack and heave or settle if excess water is allowed to penetrate the subgrade. For example, column openings to pads below the placed slab, if exposed to precipitation during construction, will conduct water to the subgrade, possibly causing it to expand/consolidate. Also, if the slab is placed with concrete too wet, expansion/consolidation may occur. We recommend 3,000 psi concrete placed at a maximum slump of 4 inches.

RECOMMENDATION REMARKS

The recommendations provided in this report are based upon the observed soil parameters, anticipated foundation loads, and accepted engineering procedures. The recommendations are intended to minimize differential movement resulting from the heaving of expansive soil or from the settlement induced by the application of loads. **It must be recognized that the foundation will undergo some movement on all soil types.** In addition, concrete floor slabs will move vertically, therefore, adherence to those recommendations which isolate floor slabs from columns, walls, partitions or other structural components is extremely important if damage to the superstructure is to be minimized.

Any subsequent owners should be apprised of the soil conditions and advised to maintain good practice in the future with regard to surface and subsurface drainage and partition framing, drywall and finish work above floor slabs.

A Better Soil Solution, Inc. does not assure that the contractor and/or homeowner will comply with the recommendations provided in this report. A Better Soil Solution, Inc. provides recommendations only and does not supervise, direct or control the implementation of the recommendations.

Failure to follow the recommendation provided by A Better Soil Solution, Inc. and follow observation requirements may jeopardize the construction project and A Better Soil Solution, Inc. shall be absolved from any and all responsibility for any damages arising from the failure to obtain proper site observation and follow recommendations.

COLD TEMPERATURE CONSIDERATIONS

1. Concrete shall not be placed upon wet or frozen soil.

2. Concrete shall be protected from freezing until it has been allowed to cure for at least 7 days after placement in forms.

3. Snow or other frozen water shall not be allowed in the forms during placement of concrete.

4. Concrete shall be cured in forms for at least 72 hours.

5. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.

6. The site shall be kept well drained at all times. Ponding of water should be avoided in the excavation area.

SURFACE DRAINAGE

After construction of foundation walls, the backfill material shall be well compacted to 85% Modified Proctor density, to reduce future settlement. Any areas that settle after construction shall be filled to eliminate ponding of water adjacent to the foundation walls. Foundation movement will definitely occur if surface or subsurface water is allowed to collect around the foundation wall. The finished grade shall have a positive slope away from the structure with an initial slope of 6 inch in the first 10 feet. If a 10 foot zone is not possible on the upslope side of the structure, then a well-defined swale should be created a minimum of 5 feet from the foundation and sloped parallel with the wall at a 2% grade to intercept the surface water and carry it around and away from the structure. Homeowners shall maintain the surface grading and drainage installed by the builder to prevent water from being directed in the wrong direction. All downspouts shall have extensions that will remove runoff to the outside of the backfilled areas. Shrubs and plants requiring minimal watering shall be established in this area. Irrigated grass shall not be located within 5 feet of the foundation. Sprinklers shall not discharge water within 5 feet of the foundation. Irrigation should be limited to the minimum amount sufficient to maintain vegetation. Application of more water will increase the likelihood of floor slab and foundation movement.

All exterior grading and location of downspouts and their performance shall be inspected by A Better Soil Solution, Inc. **The expansive SC material encountered in TH-1 and TH-2 is not suitable and may not be used as backfill material around the perimeter of the foundation.** If on-site soils are not suitable for the backfill, the backfill material shall consist of clean non-cohesive granular soils or road base material as described previously. Imported material is to be approved by A Better Soil Solution, Inc. prior to placement. **We recommend imported granular backfill with a maximum equivalent fluid pressure of the soil in the active state of 45 pounds per cubic foot**. It is the responsibility of the contractor to schedule all inspections**.**

SUBSURFACE DRAINAGE

Perimeter drains are required around all walls of the habitable or usable area portion of the structure that are below finished grade including all common wall(s) adjacent to the basement and crawlspaces. Slab on grade and walkout areas need not be drained unless specified at the time of the Open Hole Observation. The final determination of the necessity for perimeter drains will be made at the time of the Open Hole Observation. An Exterior Drain Detail is provided in this report. Drains should daylight away from the structure or discharge to a sump pump. Areas with a recommended drain may still experience moisture problems if unusual conditions are present in the future.

REINFORCING

The concrete foundation walls shall be properly reinforced as per the specific design for this foundation by a **Colorado Registered Professional Engineer. Exact requirements are a function of the design of the structure. Questions concerning the specific design requirements shall be referred to the design engineer.**

FOOTING DESIGN

The design for footings, pads, and/or piers for this structure is determined by applying the dead load and full live load to the foundation walls.

CONSTRUCTION DETAILS

It is necessary with any soils investigation to assume that the materials from the test holes are representative of the materials in the area. On occasion variations in the subsurface materials do occur, therefore, should such variations become apparent during construction, the owner is advised to contact this office for a determination as to whether these variations will affect the design of the structure's foundation. If anomalies are observed during the excavation for the structure, this office should be contacted to determine whether the layers will adversely affect the design.

MINIMUM MATERIALS SPECIFICATIONS

1. Minimum materials specifications of the concrete, reinforcing, etc., shall be determined by the Professional Foundation Design Engineer.
2. Compact beneath foundation walls a minimum of 95% Modified Proctor density to prevent settlement.
3. Compact all backfill material located around the perimeter of the foundation to a minimum of 80% Modified Proctor density.
4. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.
5. The site shall be kept well drained at all times.

OPEN HOLE OBSERVATION

If anyone other than A Better Soil Solution, Inc. performs the Open Hole Observation, that person/company assumes liability for the soils, and any possible changes to the foundation design.

The owner, or a representative of the construction company shall contact A Better Soil Solution, Inc. a minimum of 24 hours prior to excavating for the foundation. An Open Hole Observation must be performed on each individual structure prior to the placement of concrete, and preferably prior to the placement of forms in the excavated area. The failure to request or obtain an Open Hole Observation prior to the placement of foundation components may result in this Soils Report being declared null and void. This is to ensure that soft areas, anomalies, etc., are not present in the foundation region. At the time of the open hole observation the foundation type recommendations, maximum allowable bearing capacity may be revised according to soil conditions found at that time. If revisions are made to the Soils Report due to the soil conditions of the excavation, the Foundation Design Engineer must be notified of all revisions.

COMPACTION TESTING

A Better Soil Solution, Inc. shall perform compaction testing on any replaced material. Soil shall be compacted in maximum 6-inch lifts. Testing shall be performed at intervals not to exceed 24 inches (or as required by the design engineer). Modified Proctor Density must be provided to A Better Soil Solution, Inc. prior to compaction testing, see below.

The owner, or a representative of the construction, shall contact A Better Soil Solution, Inc. a minimum of 24 hours prior to the time the compaction test is requested. The failure to properly compact and/or obtain proper compaction testing may result in this Soils Report being declared null and void.

MODIFIED PROCTOR DENSITY TESTING

Modified Proctor Density test must be provided to A Better Soil Solution, Inc. prior to compaction testing. If a Proctor cannot be provided, a Modified Proctor Density test must be completed prior to compaction testing. Two 5-gallon valid samples of the soil to be used, must be provided for testing, at least 2 weeks prior to the placement and compaction of the material.

The failure to provide this data may result in this Soils Report being declared null and void.

FINAL OBSERVATIONS

The owner, or a representative of the construction company, shall contact A Better Soil Solution, Inc. at the time final grading and landscaping procedures are completed. This is to ensure that sprinkler systems are not installed adjacent to the structure and that only shrubs or plants that require minimal watering are established in this area. All exterior grading as well as the location of downspouts and their performance shall be inspected by A Better Soil Solution, Inc. Any additional landscaping or grading changes performed by subsequent contractors and/or owners shall be inspected and approved. It is the responsible of the contractor and/or owner to schedule all these inspections at the appropriate times. The failure to obtain this inspection may result in this Soils Report being declared null and void.

LIMITATIONS

This report is issued based on the understanding that the owner or his representative will bring the information, data, and recommendations contained in this report to the attention of the project engineer and architect, in order that they may be incorporated into the plans for the structure. It is also the owner's responsibility to ensure that all contractors and sub-contractors carry out these recommendations during the construction phase.

This report was prepared in accordance with generally accepted professional geotechnical/engineering methods. However, A Better Soil Solution, Inc. makes no other warranty, express or implied, as to the findings, data, specifications, or professional advice rendered hereunder. Due to circumstances outside of A Better Soil Solution, Inc.'s control, including improper construction, failure to follow recommendations, and unforeseen events, the Limits of Liability extend only to fees rendered for the professional services provided.

This report is considered valid as of the present date. The owner acknowledges, however, that changes in the conditions of the property might occur with the passage of time, such as those caused by natural effects or man-made changes, both on this land and on abutting properties. Further, changes in acceptable tolerances or standards might arise as the result of new legislative actions, new engineering advances, or the broadening of geotechnical knowledge. Thus, certain developments beyond our control may invalidate this report, in whole or in part.

This report and its recommendations do not apply to any other site than the one described herein and are predicated on the assumption that the soil conditions do not deviate from those described. In the event that any variations or undesirable conditions should be detected during the construction phase or if the proposed construction varies from that planned as of this report date, the owner shall immediately notify A Better Soil Solution, Inc. in order that supplemental recommendations can be provided, if so required.

This report excludes possible environmental issues, geologic hazards, flooding, or any other natural or man-made hazards that affect this site. These are outside the scope of work, for this report.

APPENDIX

Hollow Stem Auger (HSA) Log TH-1

Project Info.
Project : 16850 Steppler Rd
Client : Herebic Homes
Location : Colorado Springs, CO
Job No.: 24-0181

Borehole Info.
Depth: 20 (ft)
GWL: - (ft)
Drill Date: 5/22/24
Logged By: NB+JH

Elevation: 7653 ft
Latitude: 39.076165
Longitude: -104.742139
Method: Hollow Stem Auger

Company Info.
A Better Soil Solution

Depth (ft)	GWL (ft)	Sample Type	Field Tests (* SPT)	USCS / AASHTO	Symbol	Lithology Description	Depth (ft)	Dry Density (pcf)	w (%)	Exp. Potential (%)	Particle Analysis Test: Gravel (%)	Particle Analysis Test: Sand (%)	Particle Analysis Test: Fines (%)	Atterberg Limits: LL (%)	Atterberg Limits: PL (%)	Atterberg Limits: PI (%)	Remarks & Comments
0						**Topsoil**	0										
1–3						**Clayey Sand** *Fine-Coarse Grained, Moderate Density, Low-Moderate Moisture Content, Moderate Clay Content, Moderate Plasticity, Light Gray in Color*	1–3											
4		SPT	* 21	SC A-6(4)			4	118	9.3	2.6	0.9	56.9	42.2	32	11	21	
5–8						**Clayey Sand** *Fine-Coarse Grained, High Density, Low-Moderate Moisture Content, Low-Moderate Clay Content, Low Plasticity, Light Gray in Color*	5–8											
9		SPT	* 46	SC A-2-6(0)			9	101	8.4		3.7	65.6	30.7	27.4	13	14.4	
10–13						**Silty Sand** *Fine-Coarse Grained, Very High Density, Low Moisture Content, Low Clay Content, Non Plastic, Light Gray in Color*	10–13											
14		SPT	* (72)	SM A-1-b(0)			14	85.0	4.7		2	85.4	12.6	NLL	-	NPI	
15–18							15–18										
19		SPT	* (90)	SM A-1-b(0)			19	87.1	5.4		5.6	76.5	17.9	NLL	-	NPI	
20						End of Log @ 20 (ft)	20										

Sample Types
- ● Disturbed
- + Undisturbed
- □ Shelby / U4
- ■ Core Cutter
- SPT Sample
- Water Sample
- ▽ Groundwater Level

Abreviations
- LL : Liquid Limit
- PL : Plastic Limit
- PI : Plastic Index
- NPI : None PI
- w : Moisture Content

Hollow Stem Auger (HSA) Log TH-2

Project Info.
Project : 16850 Steppler Rd
Client : Herebic Homes
Location : Colorado Springs, CO
Job No.: 24-0181

Borehole Info.
Depth: 20 (ft)
GWL: - (ft)
Drill Date: 5/22/24
Logged By: NB+JH

Elevation: 7665 ft
Latitude: 39.077563
Longitude: -104.740765
Method: Hollow Stem Auger

Company Info.
A Better Soil Solution

Depth (ft)	GWL (ft)	Sample Type	Field Tests (* SPT)	USCS / AASHTO	Symbol	Lithology Description	Depth (ft)	Dry Density (pcf)	w (%)	Exp. Potential (%)	Particle Analysis Test: Gravel (%)	Particle Analysis Test: Sand (%)	Particle Analysis Test: Fines (%)	Atterberg Limits: LL (%)	Atterberg Limits: PL (%)	Atterberg Limits: PI (%)	Remarks & Comments
0						**Topsoil**	0										
1						**Clayey Sand** *Fine-Coarse Grained, Low-Moderate Density, Low-Moderate Moisture Content, Low-Moderate Clay Content, Low-Moderate Plasticity, Light Brown in Color*	1											
2							2										
3							3										
4		U	* 16	SC A-2-6(0)			4	103	8.2		0.5	71.3	28.3	28.8	13.7	15.1	
5							5										
6							6										
7							7										
8							8										
9		U	* 15	SC A-2-6(1)			9	102	9.1	1.1	0.4	66.8	32.8	28.8	13.7	15.1	
10							10										
11							11										
12						**Clayey Sand** *Fine-Coarse Grained, Low-Moderate Density, Low-Moderate Moisture Content, Low-Moderate Clay Content, Low Plasticity, Light Brown in Color*	12											
13							13										
14		U	* 15	SC A-2-6(0)			14	98.2	8.5	-0.6		66.7	33.3	26.2	14.1	12.1	
15							15										
16							16										
17						**Silty Sand** *Fine-Coarse Grained, Low-Moderate Density, Low-Moderate Moisture Content, Low Clay Content, Non Plastic, Light Brown in Color*	17											
18							18										
19		U	* 20	SM A-2-6(0)			19	86.5	7.2		0.3	76.4	23.3	NLL	-	NPI	
20						End of Log @ 20 (ft)	20										

Sample Types
- Disturbed
- Undisturbed
- Shelby / U4
- Core Cutter
- SPT Sample
- Water Sample
- Groundwater Level

Abreviations
- LL : Liquid Limit
- PL : Plastic Limit
- PI : Plastic Index
- NPI : None PI
- w : Moisture Content

Hollow Stem Auger (HSA) Log TH-3

Project Info.
Project : 16850 Steppler Rd
Client : Herebic Homes
Location : Colorado Springs, CO
Job No.: 24-0181

Borehole Info.
Depth: 20 (ft)
GWL: - (ft)
Drill Date: 5/22/24
Logged By: NB+JH

Elevation: 7630 ft
Latitude: 39.077471
Longitude: -104.738812
Method: Hollow Stem Auger

Company Info.
A Better Soil Solution

Depth (ft)	GWL (ft)	Sample Type	Field Tests (* SPT)	USCS / AASHTO	Symbol	Lithology Description	Depth (ft)	Dry Density (pcf)	w (%)	Exp. Potential (%)	Particle Analysis Test: Gravel (%)	Particle Analysis Test: Sand (%)	Particle Analysis Test: Fines (%)	Atterberg Limits: LL (%)	Atterberg Limits: PL (%)	Atterberg Limits: PI (%)	Remarks & Comments
0						**Topsoil**	0										
1						**Silty Sand** *Fine-Coarse Grained, Moderate Density, Low-Moderate Moisture Content, Low Clay Content, Non Plastic, Light Brown in Color*	1											
2							2										
3							3										
4		U	* 26	SM A-1-b(0)			4	97.9	4.5		1.7	76.4	21.9	NLL	-	NPI	
5							5										
6							6										
7							7										
8							8										
9		U	* 28	SM A-1-b(0)			9	95.0	5.1		21.4	66.4	12.2	NLL	-	NPI	
10							10										
11							11										
12							12										
13							13										
14		U	* 25	SM A-1-b(0)			14	101	9.9	-0.1	3.4	69.7	26.9	NLL	-	NPI	
15							15										
16						**Silty Sand** *Fine-Coarse Grained, High Density, Low-Moderate Moisture Content, Low Clay Content, Non Plastic, Light Brown in Color*	16											
17							17										
18							18										
19		U	* 49	SM A-1-b(0)			19	101	8.5		17	63.1	19.9	NLL	-	NPI	
20						End of Log @ 20 (ft)	20										

Sample Types
- ● Disturbed
- + Undisturbed
- □ Shelby / U4
- ■ Core Cutter
- SPT Sample
- Water Sample
- ▽ Groundwater Level

Abreviations
- LL : Liquid Limit
- PL : Plastic Limit
- PI : Plastic Index
- NPI : None PI
- w : Moisture Content

Hollow Stem Auger (HSA) Log TH-4

Project Info.
Project : 16850 Steppler Rd
Client : Herebic Homes
Location : Colorado Springs, CO
Job No.: 24-0181

Borehole Info.
Depth: 20 (ft)
GWL: - (ft)
Drill Date: 5/22/24
Logged By: NB+JH

Elevation: 7645 ft
Latitude: 39.076908
Longitude: -104.739986
Method: Hollow Stem Auger

Company Info.
A Better Soil Solution

Depth (ft)	GWL (ft)	Sample Type	Field Tests (* SPT)	USCS / AASHTO	Symbol	Lithology Description	Depth (ft)	Dry Density (pcf)	w (%)	Exp. Potential (%)	Particle Analysis Test: Gravel (%)	Particle Analysis Test: Sand (%)	Particle Analysis Test: Fines (%)	Atterberg Limits: LL (%)	Atterberg Limits: PL (%)	Atterberg Limits: PI (%)	Remarks & Comments
0						**Topsoil**	0										
1–3						**Silty Sand** *Fine-Coarse Grained, Low-Moderate Density, Low-Moderate Moisture Content, Low-Moderate Clay Content, Non Plastic, Dark Brown in Color*	1–3											
4		U	* 15	SM A-4(0)			4	88.0	7.9	-0.2		50.4	49.6	NLL	-	NPI	
5–8						**Silty Sand** *Fine-Coarse Grained, Moderate-High Density, Low-Moderate Moisture Content, Low Clay Content, Non Plastic, Light Brown in Color*	5–8											
9		U	* 24	SM A-1-b(0)			9	110	8.1		0.5	71.8	27.8	NLL	-	NPI	
10–13							10–13										
14		U	* 33	SM A-1-b(0)			14	108	7.8		4.3	72.8	22.8	NLL	-	NPI	
15–18						**Silty Sand** *Fine-Coarse Grained, Very High Density, Low-Moderate Moisture Content, Low Clay Content, Non Plastic, Light Brown in Color*	15–18											
19		U	* (52)	SM A-1-b(0)			19	110	8.9		4.7	70.7	24.6	NLL	-	NPI	
20						End of Log @ 20 (ft)	20										

Sample Types
- ● Disturbed
- + Undisturbed
- □ Shelby / U4
- ■ Core Cutter
- SPT Sample
- Water Sample
- ▽ Groundwater Level

Abreviations
- LL : Liquid Limit
- PL : Plastic Limit
- PI : Plastic Index
- NPI : None PI
- w : Moisture Content

Hollow Stem Auger (HSA) Log TH-5

Project Info.
Project : 16850 Steppler Rd
Client : Herebic Homes
Location : Colorado Springs, CO
Job No.: 24-0181

Borehole Info.
Depth: 20 (ft)
GWL: - (ft)
Drill Date: 5/22/24
Logged By: NB+JH

Elevation: 7617 ft
Latitude: 39.076309
Longitude: -104.738808
Method: Hollow Stem Auger

Company Info.
A Better Soil Solution

Depth (ft)	GWL (ft)	Sample Type	Field Tests (* SPT)	USCS / AASHTO	Symbol	Lithology Description	Depth (ft)	Dry Density (pcf)	w (%)	Exp. Potential (%)	Particle Analysis Test: Gravel (%)	Particle Analysis Test: Sand (%)	Particle Analysis Test: Fines (%)	Atterberg Limits: LL (%)	Atterberg Limits: PL (%)	Atterberg Limits: PI (%)	Remarks & Comments
0						**Topsoil**	0										
1–3						**Silty Sand** *Fine-Coarse Grained, Low Density, High Moisture Content, Moderate Clay Content, Non Plastic, Dark Brown in Color*	1–3											
4		SPT	* 13	SC A-6(2)			4	86.5	17.9	0.1	1.3	51.6	47.1	27.9	16.5	11.4	
5–8							5–8										
9		SPT	* 22	SM A-1-b(0)		**Silty Sand** *Fine-Coarse Grained, Moderate Density, Moderate Moisture Content, Low Clay Content, Non Plastic, Light Brown in Color*	9	105	10.6		10.5	73.3	16.2	NLL	-	NPI	
10–12							10–12										
13–14		SPT	* (59)	SP-SM A-1-b(0)		**Poorly Graded Silty Sand** *Fine-Coarse Grained, Very High Density, Low-Moderate Moisture Content, Low Clay Content, Non Plastic, Light Brown in Color*	13–14	100	7.2		17.6	71.9	10.6	NLL	-	NPI	
15–18							15–18										
19		SPT	* (55)	SM A-1-b(0)		**Silty Sand** *Fine-Coarse Grained, Very High Density, Low-Moderate Moisture Content, Low Clay Content, Non Plastic, Light Brown in Color*	19	102	9.4			84.7	15.3	NLL	-	NPI	
20						End of Log @ 20 (ft)	20										

Sample Types
- Disturbed
- Undisturbed
- Shelby / U4
- Core Cutter
- SPT Sample
- Water Sample
- Groundwater Level

Abreviations
- LL : Liquid Limit
- PL : Plastic Limit
- PI : Plastic Index
- NPI : None PI
- w : Moisture Content

Hollow Stem Auger (HSA) Log TH-6

Project Info.
Project : 16850 Steppler Rd
Client : Herebic Homes
Location : Colorado Springs, CO
Job No.: 24-0181

Borehole Info.
Depth: 20 (ft)
GWL: - (ft)
Drill Date: 5/22/24
Logged By: NB+JH

Elevation: 7637 ft
Latitude: 39.075274
Longitude: -104.738857
Method: Hollow Stem Auger

Company Info.
A Better Soil Solution

Depth (ft)	GWL (ft)	Sample Type	Field Tests (* SPT)	USCS / AASHTO	Symbol	Lithology Description	Depth (ft)	Dry Density (pcf)	w (%)	Exp. Potential (%)	Particle Analysis Test: Gravel (%)	Particle Analysis Test: Sand (%)	Particle Analysis Test: Fines (%)	Atterberg Limits: LL (%)	Atterberg Limits: PL (%)	Atterberg Limits: PI (%)	Remarks & Comments
0						**Topsoil**	0										
1–3						**Silty Sand** *Fine-Coarse Grained, Low-Moderate Density, Low-Moderate Moisture Content, Low-Moderate Clay Content, Non Plastic, Brown in Color*	1–3											
4		SPT	* 16	SM A-1-b(0)			4	102	6.3	-0.1	4.8	70.7	24.4	NLL	-	NPI	
5–8							5–8										
9		SPT	* 16	SM A-4(0)			9	91.0	6.7	-0.1		60.6	39.4	NLL	-	NPI	
10–12							10–12										
13						**Well Graded Silty Sand** *Fine-Coarse Grained, High Density, Low Moisture Content, Low Clay Content, Non Plastic, Light Brown in Color*	13											
14		SPT	* (56)	SW-SM A-1-b(0)			14	105	4.4		6.6	84.5	9	NLL	-	NPI	
15–18							15–18										
19		SPT	* 41	SW-SM A-1-b(0)			19	101	4.6		2.8	87.6	9.7	NLL	-	NPI	
20						End of Log @ 20 (ft)	20										

Sample Types
- ● Disturbed
- + Undisturbed
- □ Shelby / U4
- ■ Core Cutter
- SPT Sample
- Water Sample
- ▽ Groundwater Level

Abreviations
- LL : Liquid Limit
- PL : Plastic Limit
- PI : Plastic Index
- NPI : None PI
- w : Moisture Content

Hollow Stem Auger (HSA) Log TH-7

Project Info.
Project : 16850 Steppler Rd
Client : Herebic Homes
Location : Colorado Springs, CO
Job No.: 24-0181

Borehole Info.
Depth: 20 (ft)
GWL: - (ft)
Drill Date: 5/22/24
Logged By: NB+JH

Elevation: 7644 ft
Latitude: 39.075265
Longitude: -104.740630
Method: Hollow Stem Auger

Company Info.
A Better Soil Solution

Depth (ft)	GWL (ft)	Sample Type	Field Tests (* SPT)	USCS / AASHTO	Symbol	Lithology Description	Depth (ft)	Dry Density (pcf)	w (%)	Exp. Potential (%)	Particle Analysis Test: Gravel (%)	Particle Analysis Test: Sand (%)	Particle Analysis Test: Fines (%)	Atterberg Limits: LL (%)	Atterberg Limits: PL (%)	Atterberg Limits: PI (%)	Remarks & Comments
0						**Topsoil**	0										
1–3						**Clayey Sand** *Fine-Coarse Grained, Low Density, High Moisture Content, Moderate Clay Content, Low Plasticity, Gray in Color*	1–3											
4		U	* 13	SC A-4(1)			4	97.5	15.8	0.1		53	47	25	17	8	
5–8							5–8										
9		U	* 12	SC A-4(2)			9	94.8	18.7	-0.1	0.2	51.4	48.4	25.4	15.8	9.6	
10–12							10–12										
13						**Silty Sand** *Fine-Coarse Grained, Low-Moderate Density, Moderate Moisture Content, Low Clay Content, Non Plastic, Very Pale Brown in Color*	13											
14		U	* 14	SM A-4(2)			14	109	12		7.2	70.1	22.7	NLL	-	NPI	
15–16							15–16										
17–18						**Low Plasticity Clay** *Fine-Coarse Grained, Low-Moderate Density, Moderate Moisture Content, Moderate-High Clay Content, Low Plasticity, Light Gray in Color*	17–18											
19		U	* 17	CL A-6(7)			19	105	13.8	0.9	0.2	40.7	59.1	31.3	13.7	17.6	
20						End of Log @ 20 (ft)	20										

Sample Types
- ● Disturbed
- + Undisturbed
- □ Shelby / U4
- ■ Core Cutter
- SPT Sample
- Water Sample
- Groundwater Level

Abreviations
- LL : Liquid Limit
- PL : Plastic Limit
- PI : Plastic Index
- NPI : None PI
- w : Moisture Content

Site Map

Project:	16850 Steppler Rd
Client:	Herebic Homes
Job No.:	24-0181
Location:	Colorado Springs, CO

A Better Soil Solution

Coordinates

Bore Hole	Latitude	Longitude
TH-1	39.076165	-104.742139
TH-2	39.077563	-104.740765
TH-3	39.077471	-104.738812
TH-4	39.076908	-104.739986
TH-5	39.076309	-104.738808
TH-6	39.075274	-104.738857
TH-7	39.075265	-104.740630

Particle Analysis Test

Project : 16850 Steppler Rd
Client : Herebic Homes
Job No.: 24-0181
Location : Colorado Springs, CO

A Better Soil Solution

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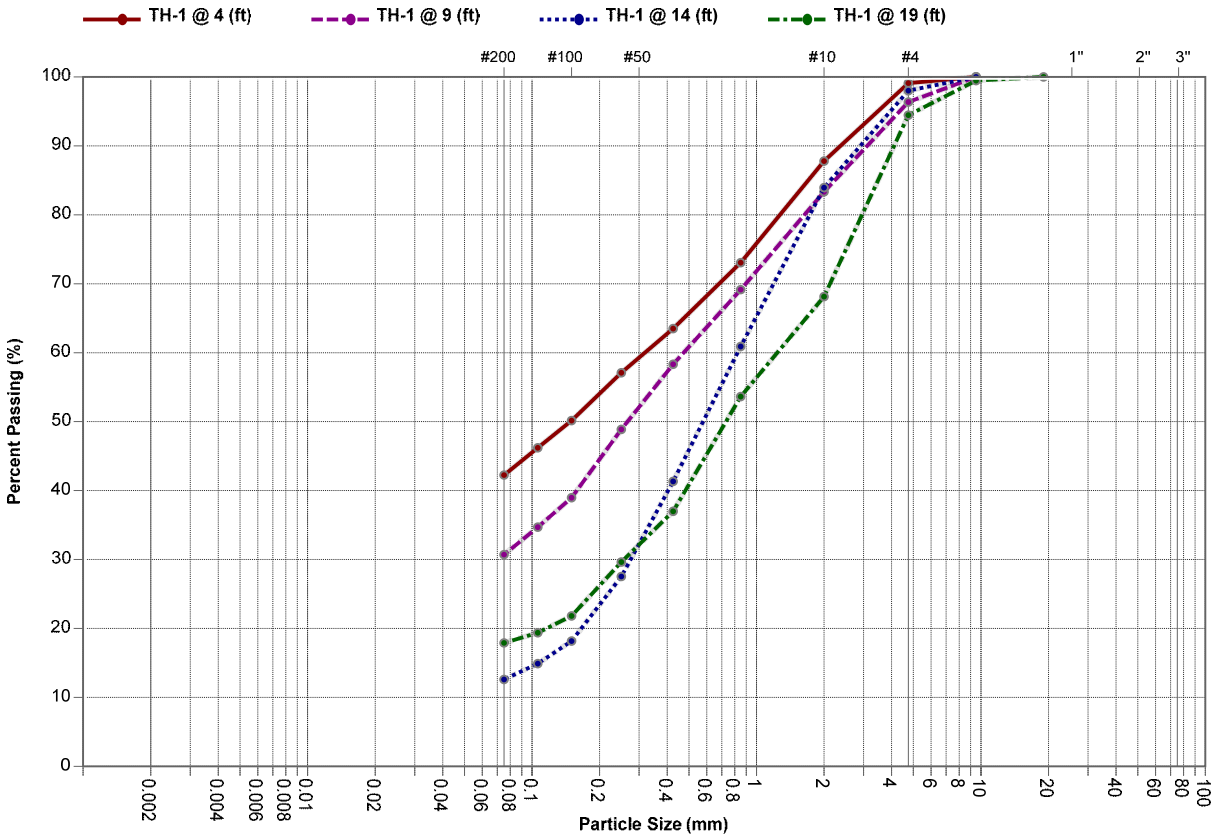

Particle Distribution (%)

Clay	Silt	Sand	Gravel	Cobbl
42.2		56.9	0.9	-
30.7		65.6	3.7	-
12.6		85.4	2	-
17.9		76.5	5.6	-

Classification

Borehole	Sample Depth (ft)	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL (%)	PI (%)	Disp. (%)	USCS	AASHTO
TH-1	4	-	-	0.148	0.318	-	-	32	21	N/A	SC	A-6(4)
TH-1	9	-	-	0.266	0.473	-	-	27.4	14.4	N/A	SC	A-2-6(0)
TH-1	14	-	0.275	0.578	0.823	91.889	-	-	-	N/A	SM	A-1-b(0)
TH-1	19	-	0.257	0.731	1.238	53.351	-	-	-	N/A	SM	A-1-b(0)

Particle Analysis Test

Project : 16850 Steppler Rd
Client : Herebic Homes
Job No.: 24-0181
Location : Colorado Springs, CO

A Better Soil Solution

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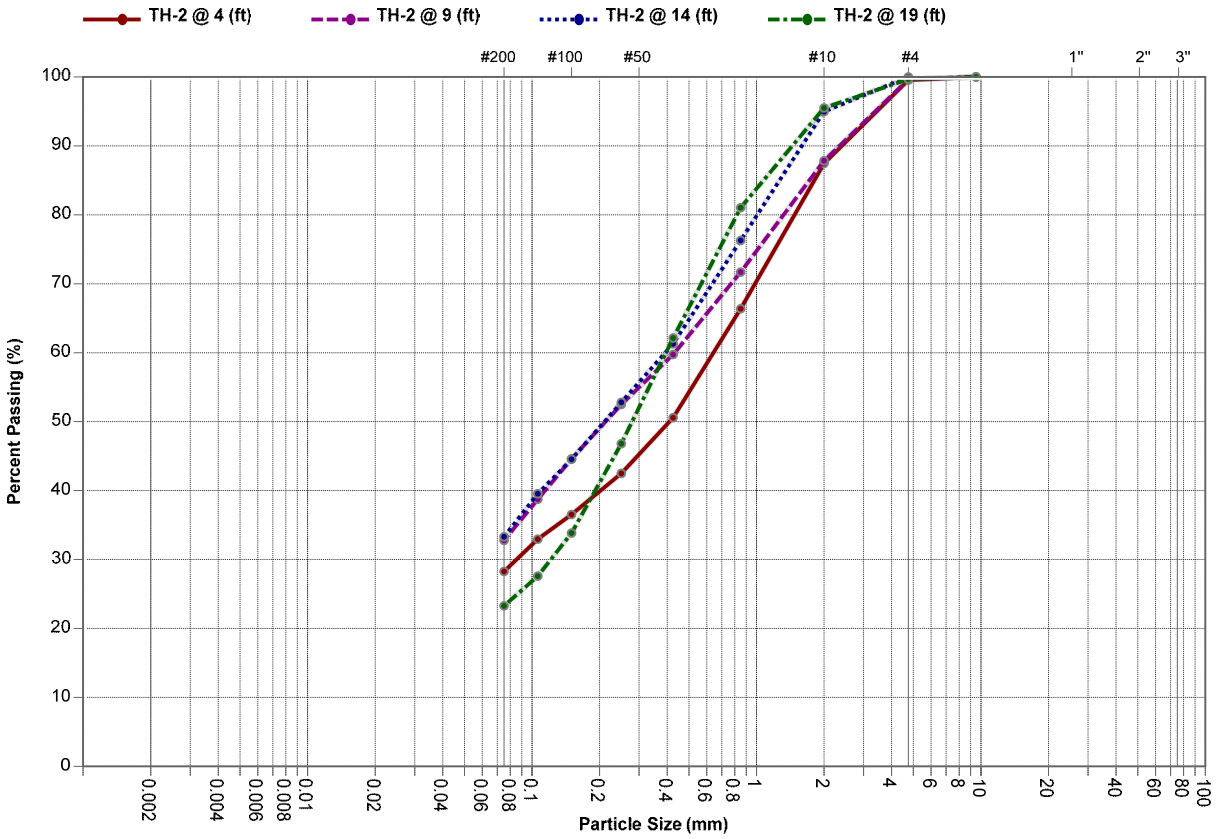

Particle Distribution (%)

Clay	Silt	Sand	Gravel	Cobbl
28.3		71.3	0.5	-
32.8		66.8	0.4	-
33.3		66.7	-	-
23.3		76.4	0.3	-

Classification

Borehole	Sample Depth (ft)	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL (%)	PI (%)	Disp. (%)	USCS	AASHTO
TH-2	4	-	0.085	0.409	0.643	11.236	-	28.8	15.1	N/A	SC	A-2-6(0)
TH-2	9	-	-	0.213	0.432	-	-	28.8	15.1	N/A	SC	A-2-6(1)
TH-2	14	-	-	0.21	0.392	-	-	26.2	12.1	N/A	SC	A-2-6(0)
TH-2	19	-	0.121	0.279	0.395	37.066	-	-	-	N/A	SM	A-2-6|0|0 (0)

Particle Analysis Test

Project : 16850 Steppler Rd
Client : Herebic Homes
Job No.: 24-0181
Location : Colorado Springs, CO

A Better Soil Solution

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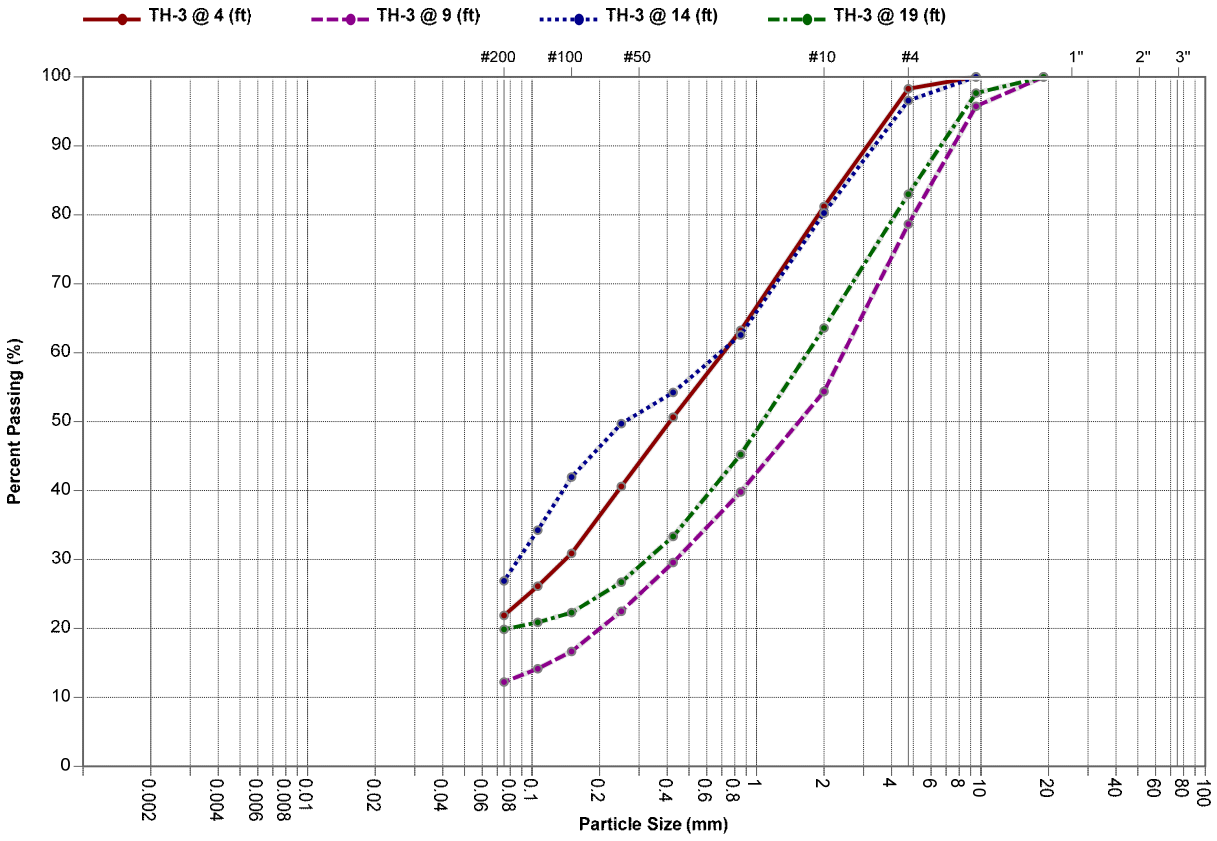

Particle Distribution (%)

Clay	Silt	Sand	Gravel	Cobbl
21.9		76.4	1.7	-
12.2		66.4	21.4	-
26.9		69.7	3.4	-
19.9		63.1	17	-

Classification

Borehole	Sample Depth (ft)	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL (%)	PI (%)	Disp. (%)	USCS	AASHTO
TH-3	4	-	0.141	0.411	0.711	27.962	-	-	-	N/A	SM	A-2-6|0|0|0|0(0)
TH-3	9	-	0.438	1.547	2.445	78.464	-	-	-	N/A	SM	A-1-b(0)
TH-3	14	-	0.087	0.259	0.687	11.017	-	-	-	N/A	SM	A-1-b|0|0(0)
TH-3	19	-	0.325	1.062	1.693	62.389	-	-	-	N/A	SM	A-1-b(0)

Particle Analysis Test

Project : 16850 Steppler Rd
Client : Herebic Homes
Job No.: 24-0181
Location : Colorado Springs, CO

A Better Soil Solution

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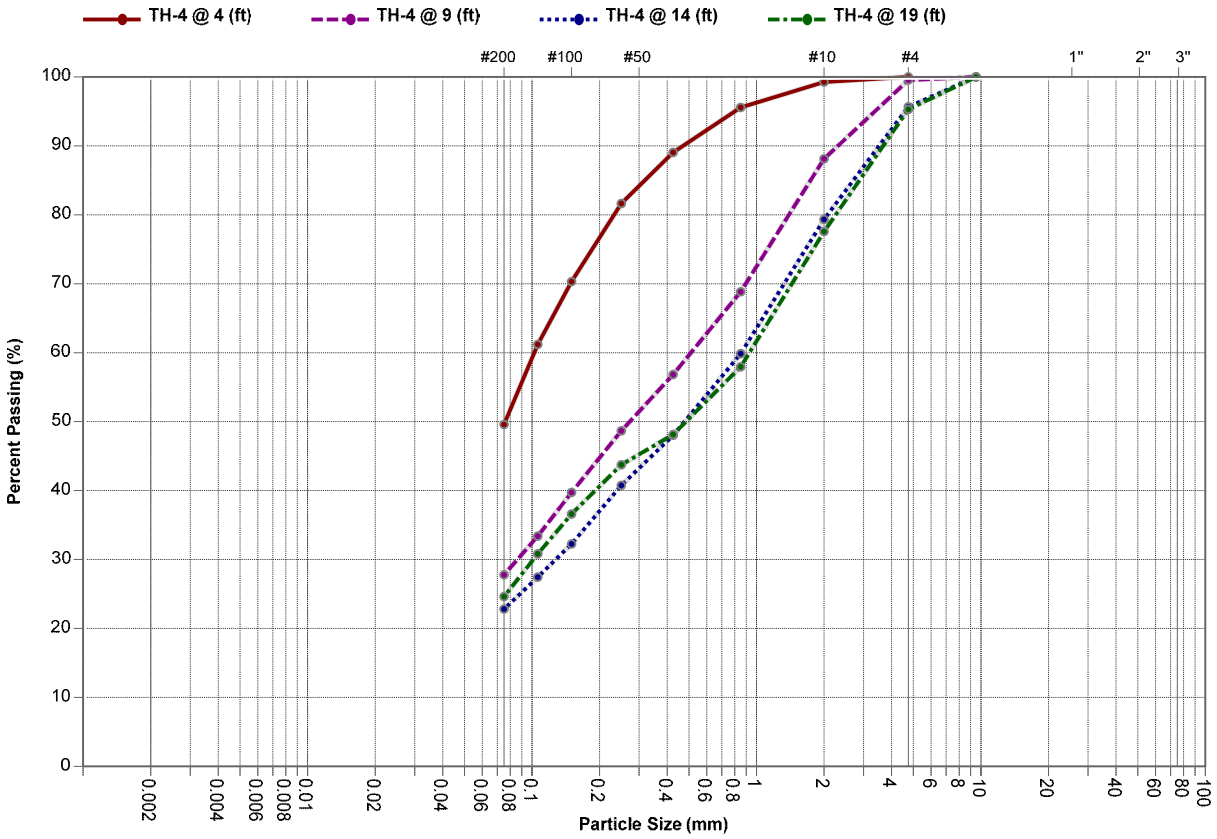

Particle Distribution (%)

Clay	Silt	Sand	Gravel	Cobbl
49.6		50.4	-	-
27.8		71.8	0.5	-
22.8		72.8	4.3	0.1
24.6		70.7	4.7	-

Classification

Borehole	Sample Depth (ft)	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL (%)	PI (%)	Disp. (%)	USCS	AASHTO
TH-4	4	-	-	0.076	0.102	-	-	-	-	N/A	SM	A-4(0)
TH-4	9	-	0.086	0.273	0.51	14.502	-	-	-	N/A	SM	A-4|0|0 (0)
TH-4	14	-	0.128	0.477	0.855	19.163	-	-	-	N/A	SM	A-1-b(0)
TH-4	19	-	0.101	0.485	0.93	10.969	-	-	-	N/A	SM	A-1-b(0)

Particle Analysis Test

Project : 16850 Steppler Rd
Client : Herebic Homes
Job No.: 24-0181
Location : Colorado Springs, CO

A Better Soil Solution

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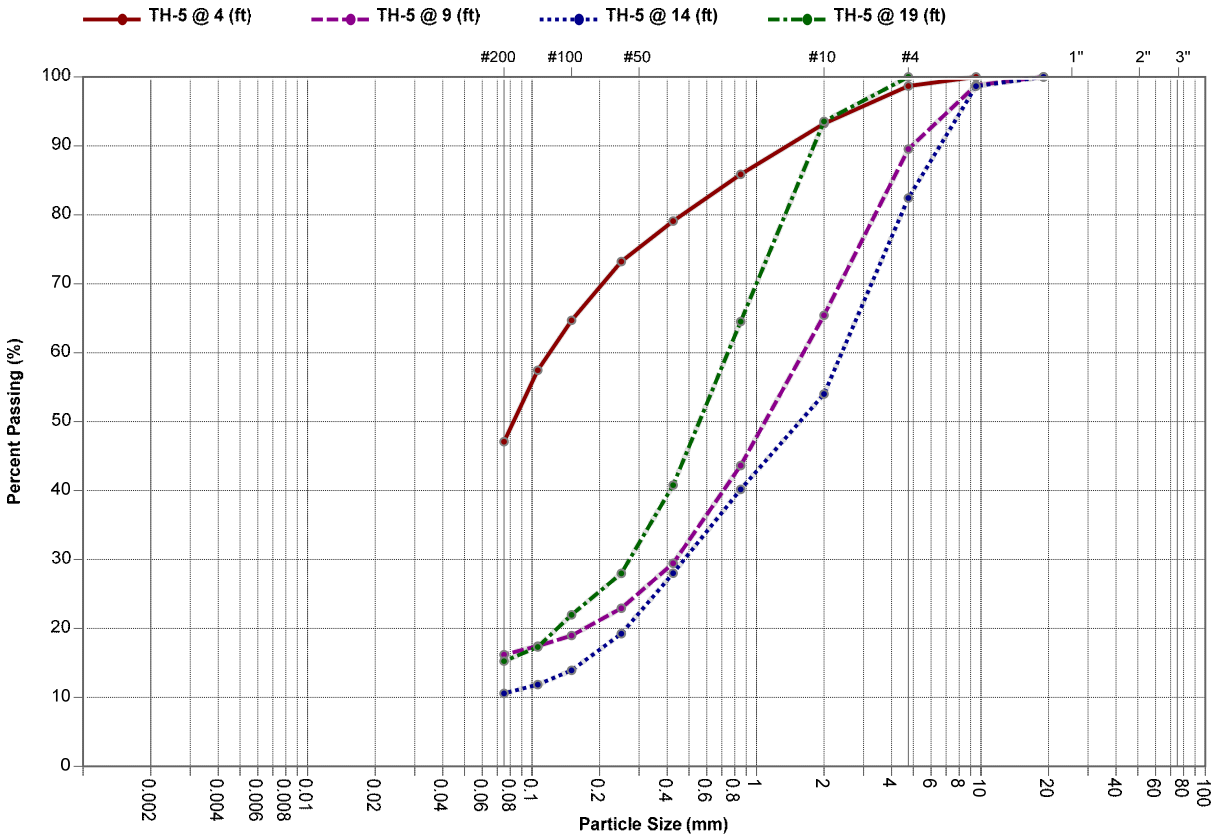

Particle Distribution (%)

Clay	Silt	Sand	Gravel	Cobbl
47.1		51.6	1.3	-
16.2		73.3	10.5	-
10.6		71.9	17.6	-
15.3		84.7	-	-

Classification

Borehole	Sample Depth (ft)	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL (%)	PI (%)	Disp. (%)	USCS	AASHTO
TH-5	4	-	-	0.083	0.12	-	-	27.9	11.4	N/A	SC	A-6(2)
TH-5	9	-	0.437	1.092	1.617	118.101	-	-	-	N/A	SM	A-1-b(0)
TH-5	14	-	0.476	1.561	2.4	94.407	-	-	-	N/A	SP-SM	A-1-b(0)
TH-5	19	-	0.272	0.556	0.745	99.307	-	-	-	N/A	SM	A-1-b(0)

Particle Analysis Test

Project : 16850 Steppler Rd
Client : Herebic Homes
Job No.: 24-0181
Location : Colorado Springs, CO

A Better Soil Solution

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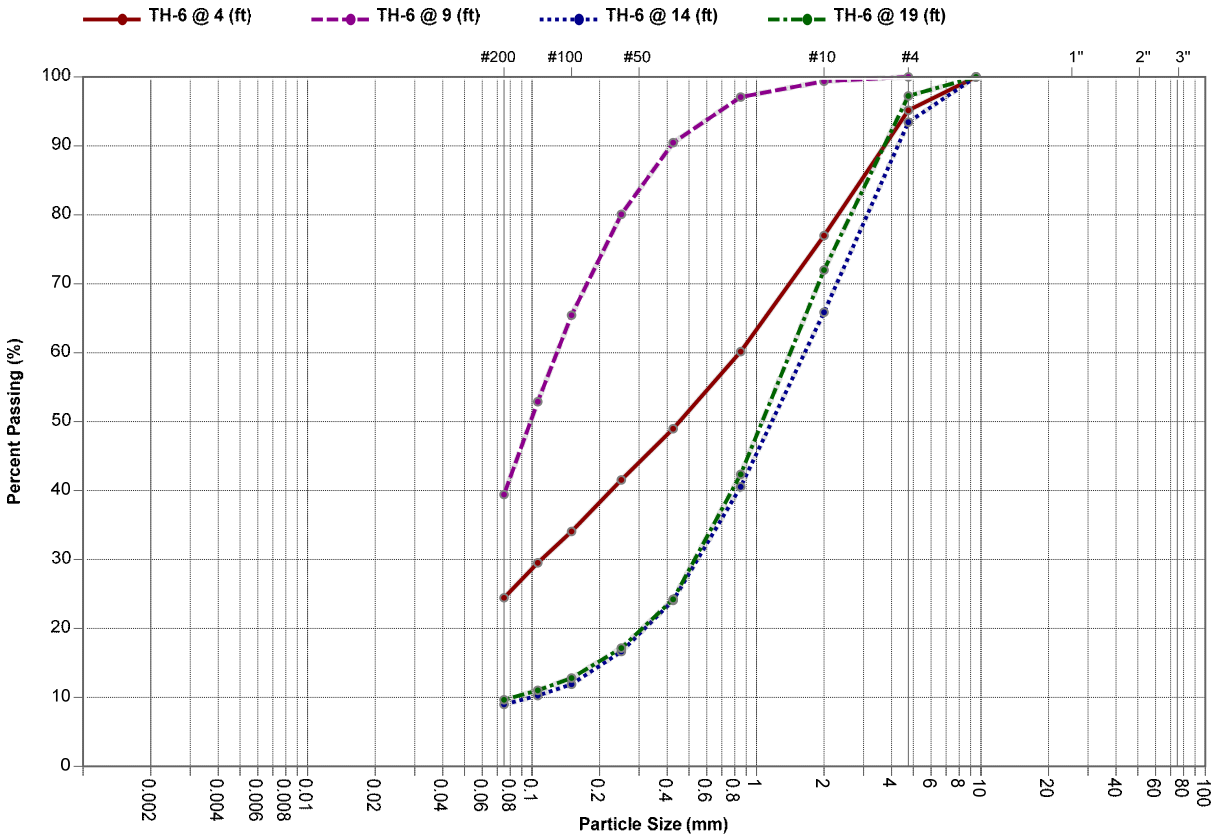


Particle Distribution (%)

Clay	Silt	Sand	Gravel	Cobbl
24.4		70.7	4.8	0.1
39.4		60.6	-	-
9		84.5	6.6	-
9.7		87.6	2.8	-

Classification

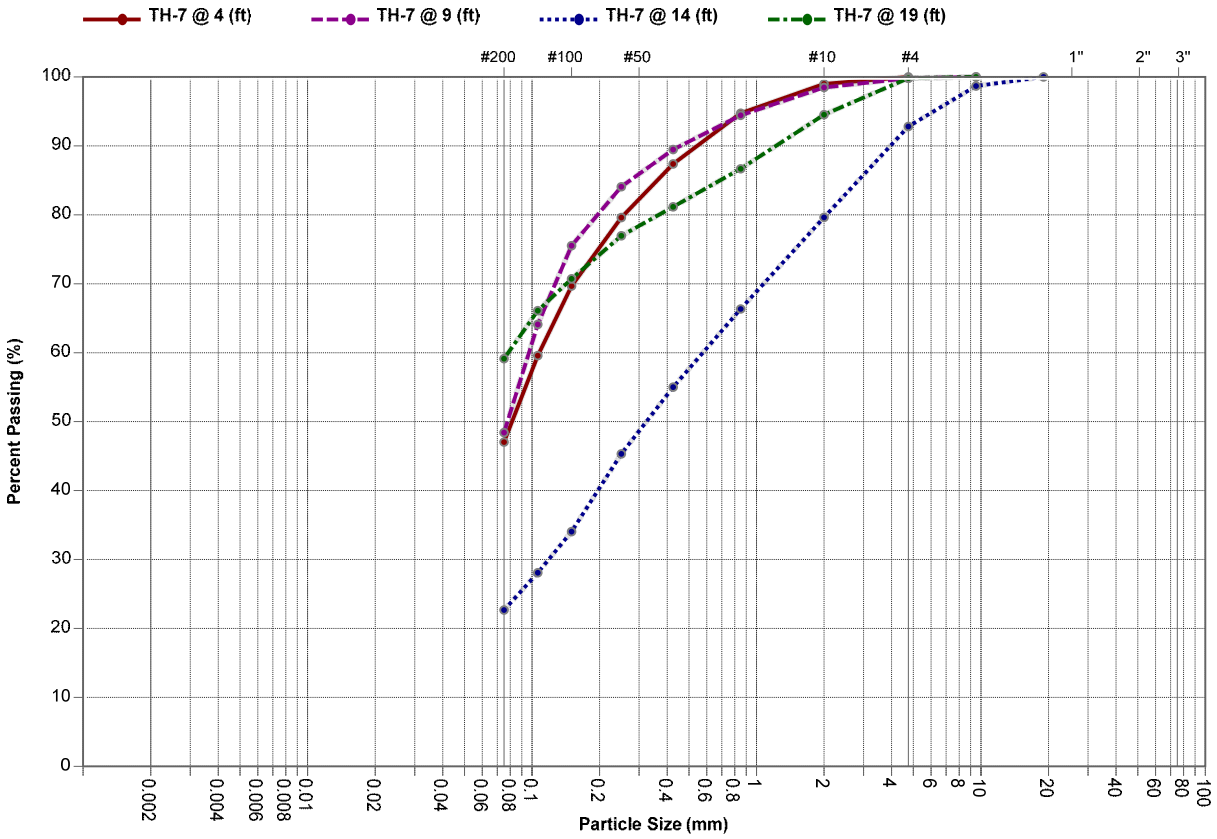
Borehole	Sample Depth (ft)	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL (%)	PI (%)	Disp. (%)	USCS	AASHTO
TH-6	4	-	0.11	0.453	0.842	14.371	-	-	-	N/A	SM	A-1-b(0)
TH-6	9	-	-	0.098	0.129	-	-	-	-	N/A	SM	A-4(0)
TH-6	14	0.099	0.545	1.17	1.641	1.828	16.576	-	-	N/A	SW-SM	A-1-b(0)
TH-6	19	0.082	0.53	1.06	1.415	2.421	17.256	-	-	N/A	SW-SM	A-1-b(0)

Particle Analysis Test

Project : 16850 Steppler Rd
Client : Herebic Homes
Job No.: 24-0181
Location : Colorado Springs, CO

A Better Soil Solution

ASTM D6913



Particle Distribution (%)

Clay	Silt	Sand	Gravel	Cobbl
47		53	-	-
48.4		51.4	0.2	-
22.7		70.1	7.2	-
59.1		40.7	0.2	-

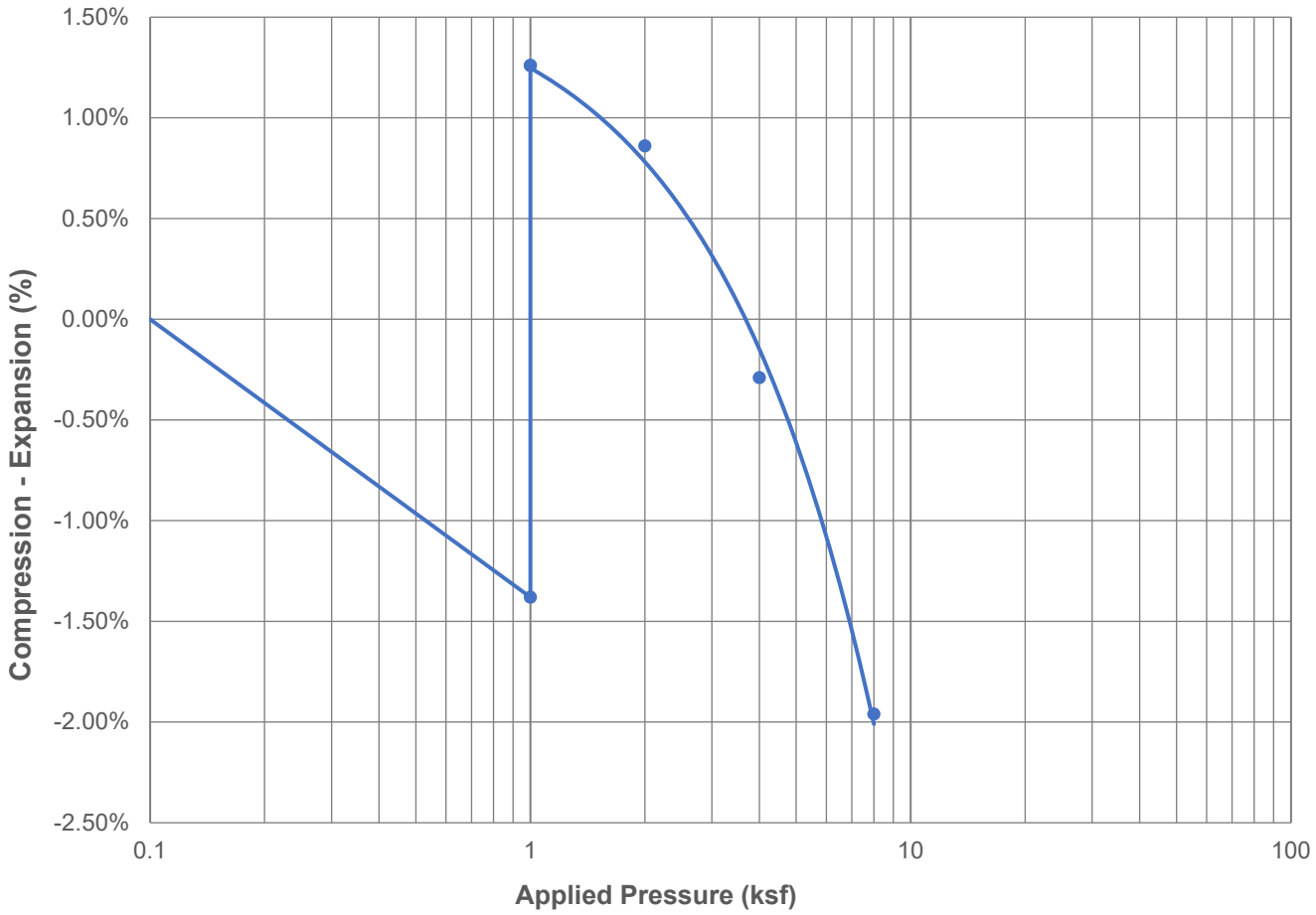
Classification

Borehole	Sample Depth (ft)	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL (%)	PI (%)	Disp. (%)	USCS	AASHTO
TH-7	4	-	-	0.081	0.108	-	-	25	8	N/A	SC	A-4(1)
TH-7	9	-	-	0.078	0.097	-	-	25.4	9.6	N/A	SC	A-4(2)
TH-7	14	-	0.119	0.323	0.577	24.542	-	-	-	N/A	SM	A-4|2|0 (0)
TH-7	19	-	-	-	0.078	-	-	31.3	17.6	N/A	CL	A-6(7)

Swell-Consolidation Test

Project:	16850 Steppler Rd	Borehole:	TH-1
Client:	Herebic Homes	Sample Depth:	4 Ft
Job No.:	24-0181	Classification:	SC
Location:	Colorado Springs, CO		

A Better Soil Solution



Values

Applied Load (lbs)	Displacement (in)
0	0.0000
1,000	-0.0138
Add Water	0.0126
2,000	0.0086
4,000	-0.0029
8,000	-0.0196

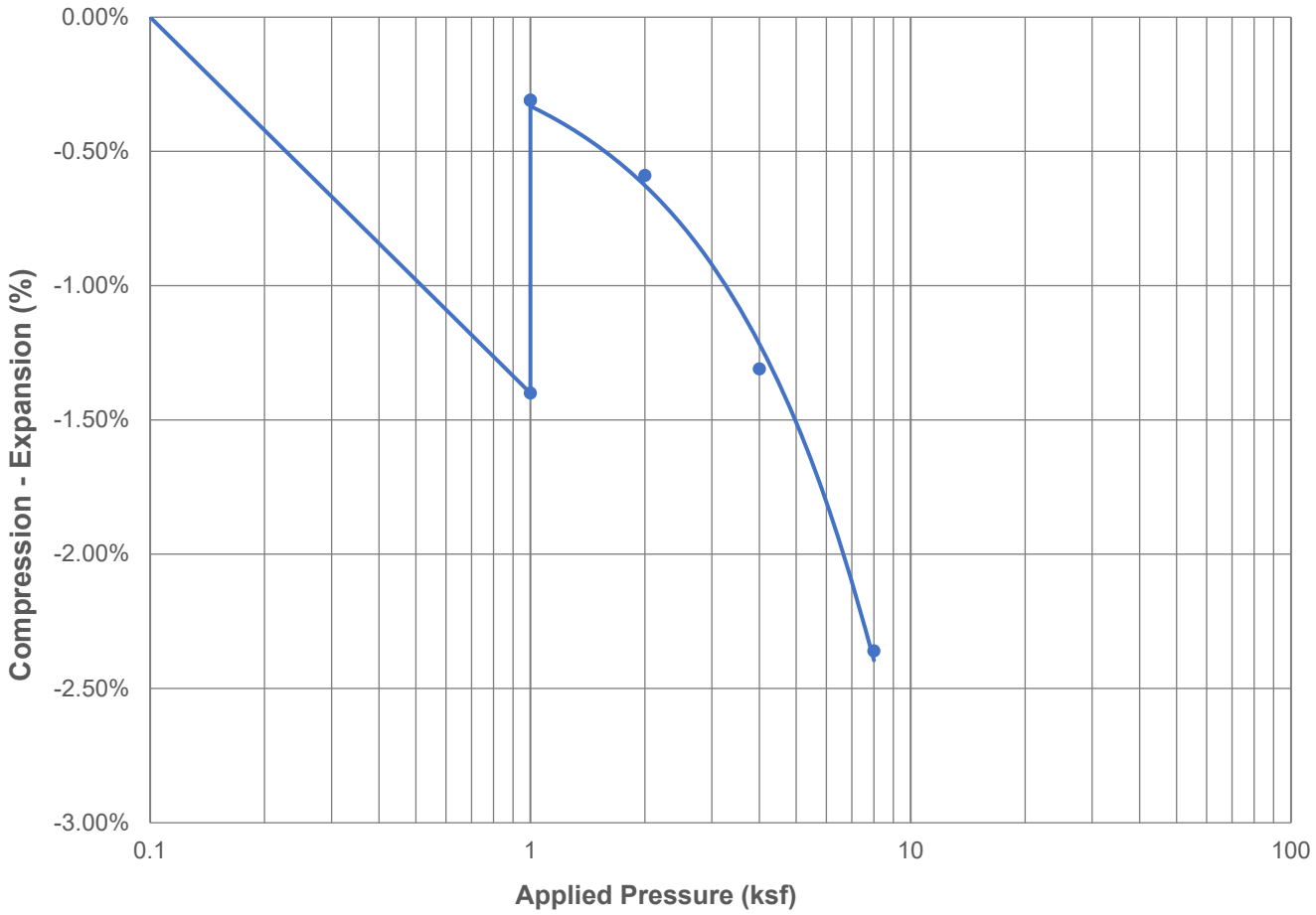
Sample Info

Native Moisture:	9.29%
Post-Test Moisture:	13.11%
Expansion Potential:	2.64%
Deadload (psf):	6,600

Swell-Consolidation Test

Project:	16850 Steppler Rd	Borehole:	TH-2
Client:	Herebic Homes	Sample Depth:	9 Ft
Job No.:	24-0181	Classification:	SC
Location:	Colorado Springs, CO		

A Better Soil Solution



Values

Applied Load (lbs)	Displacement (in)
0	0.0000
1,000	-0.0140
Add Water	-0.0031
2,000	-0.0059
4,000	-0.0131
8,000	-0.0236

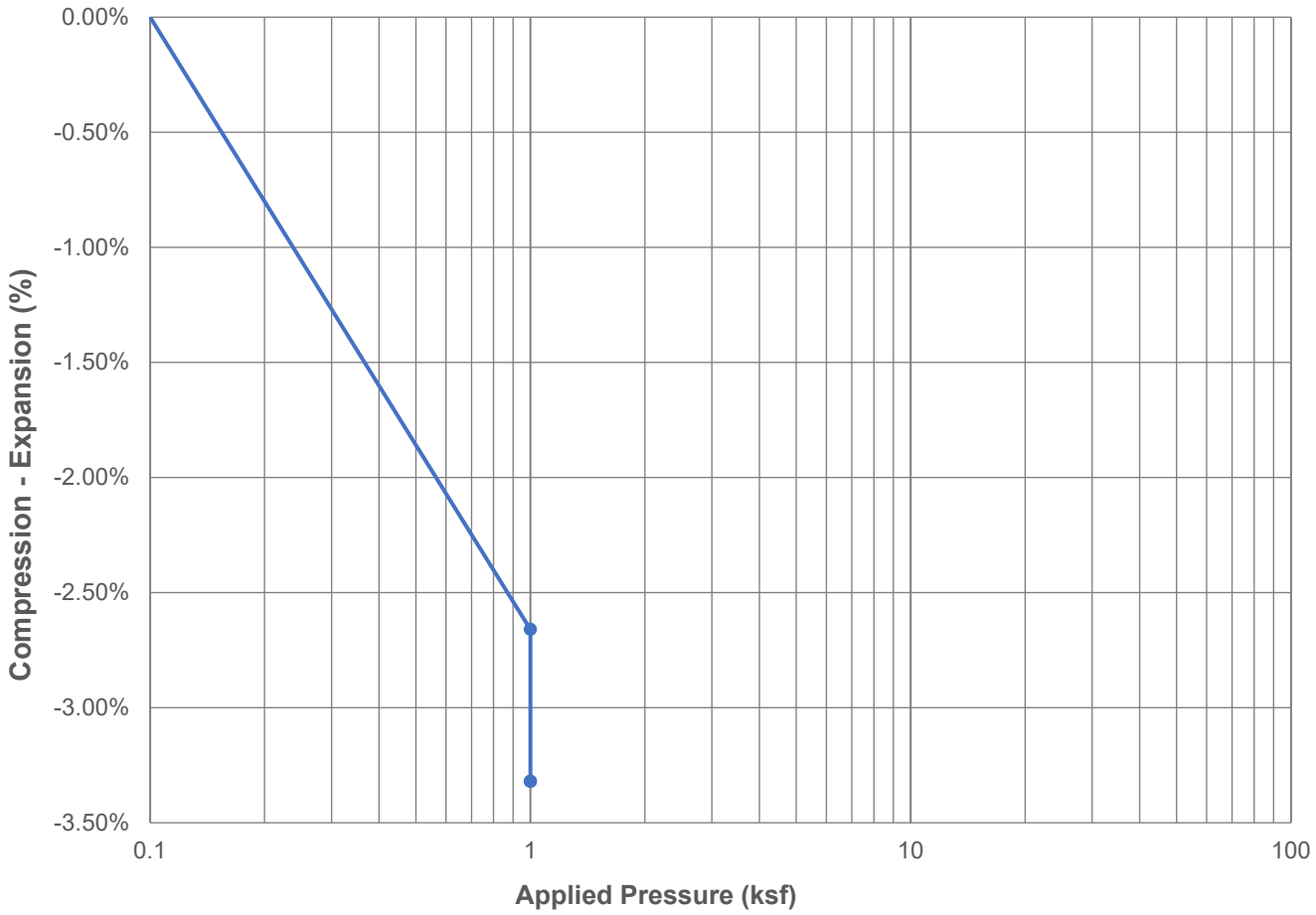
Sample Info

Native Moisture:	9.15%
Post-Test Moisture:	13.11%
Expansion Potential:	1.09%
Deadload (psf):	4,600

Swell-Consolidation Test

Project:	16850 Steppler Rd	Borehole:	TH-2
Client:	Herebic Homes	Sample Depth:	14 Ft
Job No.:	24-0181	Classification:	SC
Location:	Colorado Springs, CO		

A Better Soil Solution



Values

Applied Load (lbs)	Displacement (in)
0	0.0000
1,000	-0.0266
Add Water	-0.0332

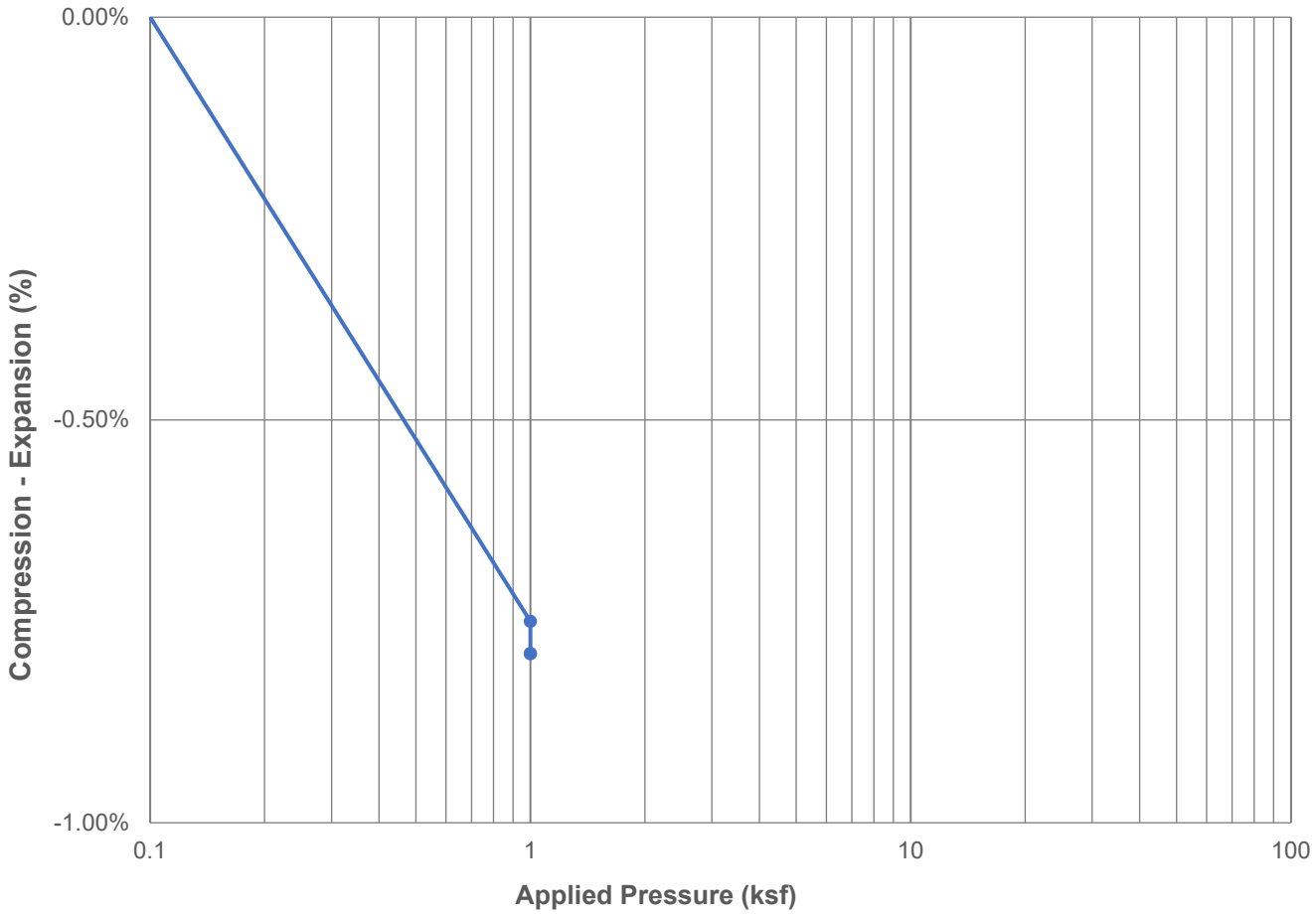
Sample Info

Native Moisture:	8.49%
Post-Test Moisture:	12.72%
Expansion Potential:	-0.66%
Deadload (psf):	1,000

Swell-Consolidation Test

Project:	16850 Steppler Rd	Borehole:	TH-3
Client:	Herebic Homes	Sample Depth:	14 Ft
Job No.:	24-0181	Classification:	SM
Location:	Colorado Springs, CO		

A Better Soil Solution



Values

Applied Load (lbs)	Displacement (in)
0	0.0000
1,000	-0.0075
Add Water	-0.0079

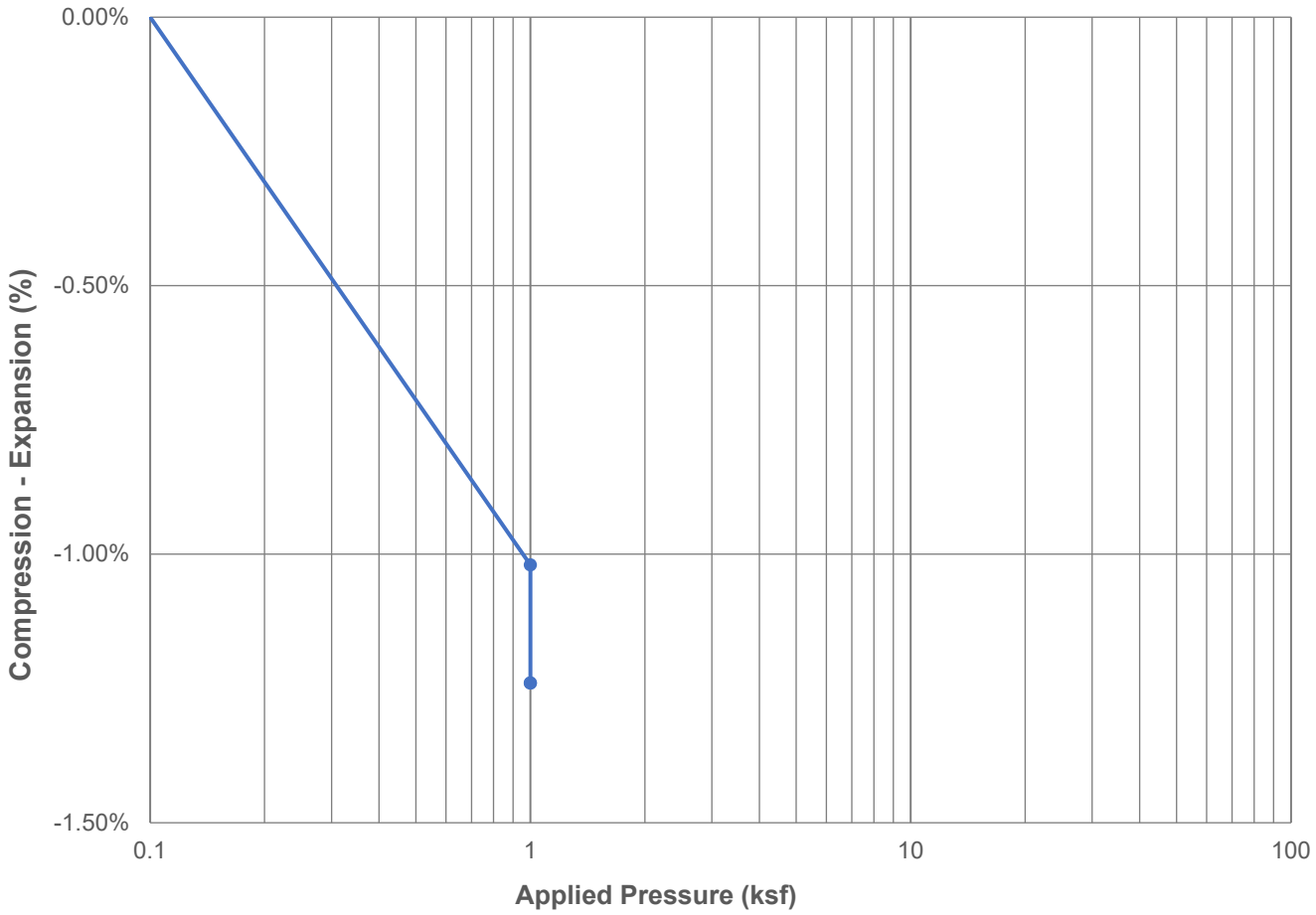
Sample Info

Native Moisture:	9.93%
Post-Test Moisture:	11.97%
Expansion Potential:	-0.04%
Deadload (psf):	1,000

Swell-Consolidation Test

Project:	16850 Steppler Rd	Borehole:	TH-4
Client:	Herebic Homes	Sample Depth:	4 Ft
Job No.:	24-0181	Classification:	SM
Location:	Colorado Springs, CO		

A Better Soil Solution



Values

Applied Load (lbs)	Displacement (in)
0	0.0000
1,000	-0.0102
Add Water	-0.0124

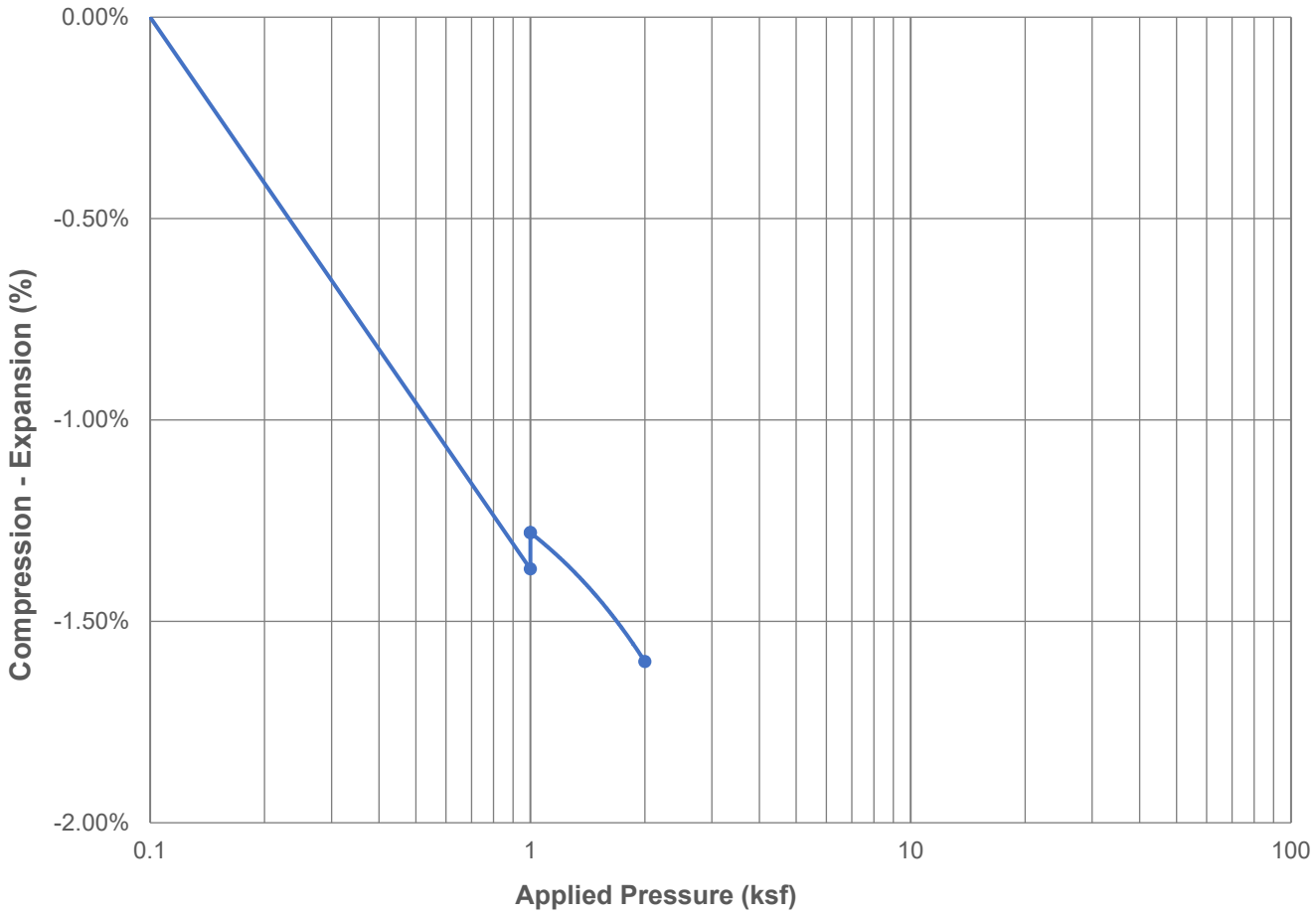
Sample Info

Native Moisture:	7.91%
Post-Test Moisture:	14.33%
Expansion Potential:	-0.22%
Deadload (psf):	1,000

Swell-Consolidation Test

Project:	16850 Steppler Rd	Borehole:	TH-5
Client:	Herebic Homes	Sample Depth:	4 Ft
Job No.:	24-0181	Classification:	SC
Location:	Colorado Springs, CO		

A Better Soil Solution



Values

Applied Load (lbs)	Displacement (in)
0	0.0000
1,000	-0.0137
Add Water	-0.0128
2,000	-0.0160

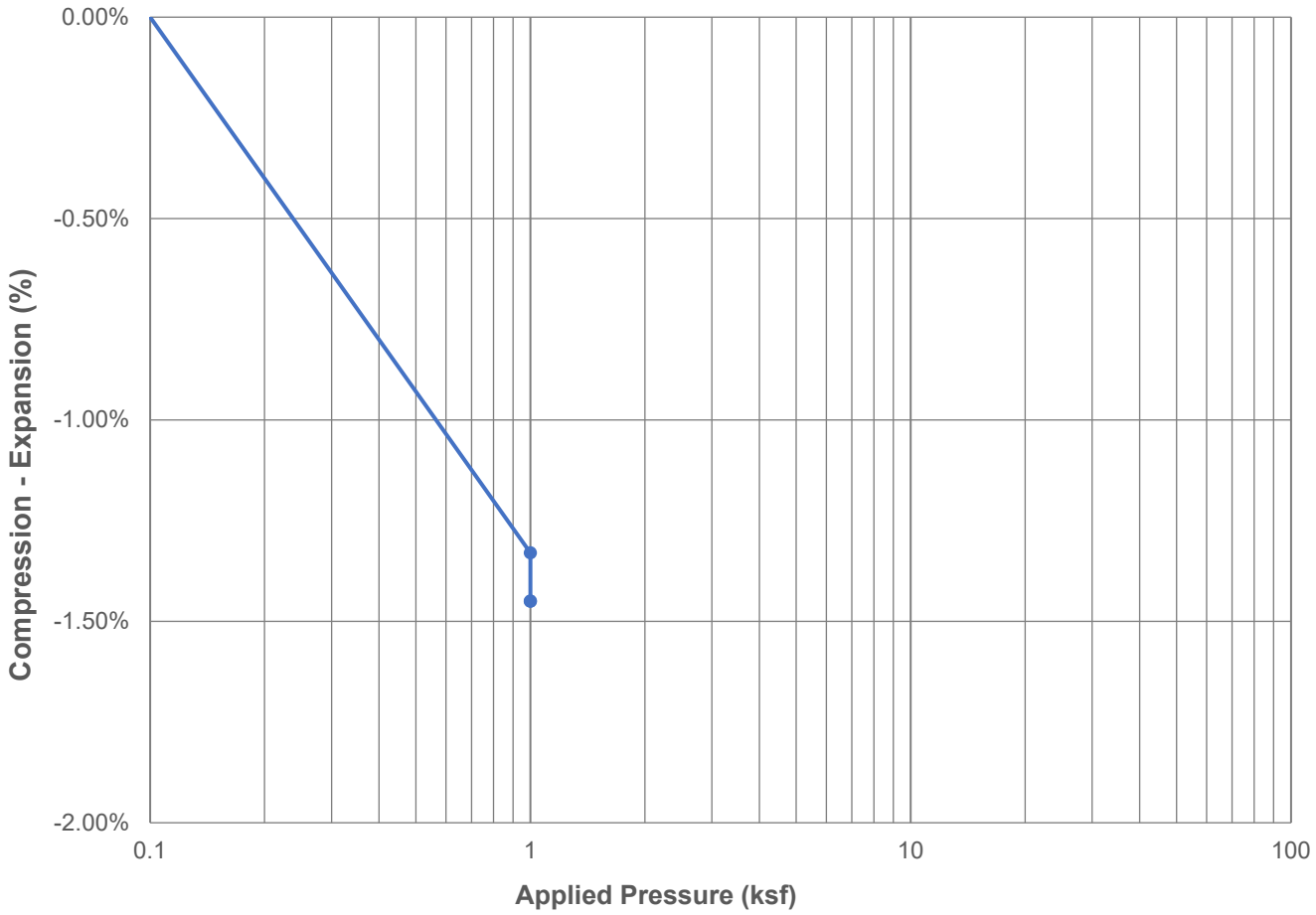
Sample Info

Native Moisture:	17.85%
Post-Test Moisture:	16.31%
Expansion Potential:	0.09%
Deadload (psf):	1,300

Swell-Consolidation Test

Project:	16850 Steppler Rd	Borehole:	TH-6
Client:	Herebic Homes	Sample Depth:	4 Ft
Job No.:	24-0181	Classification:	SM
Location:	Colorado Springs, CO		

A Better Soil Solution



Values

Applied Load (lbs)	Displacement (in)
0	0.0000
1,000	-0.0133
Add Water	-0.0145

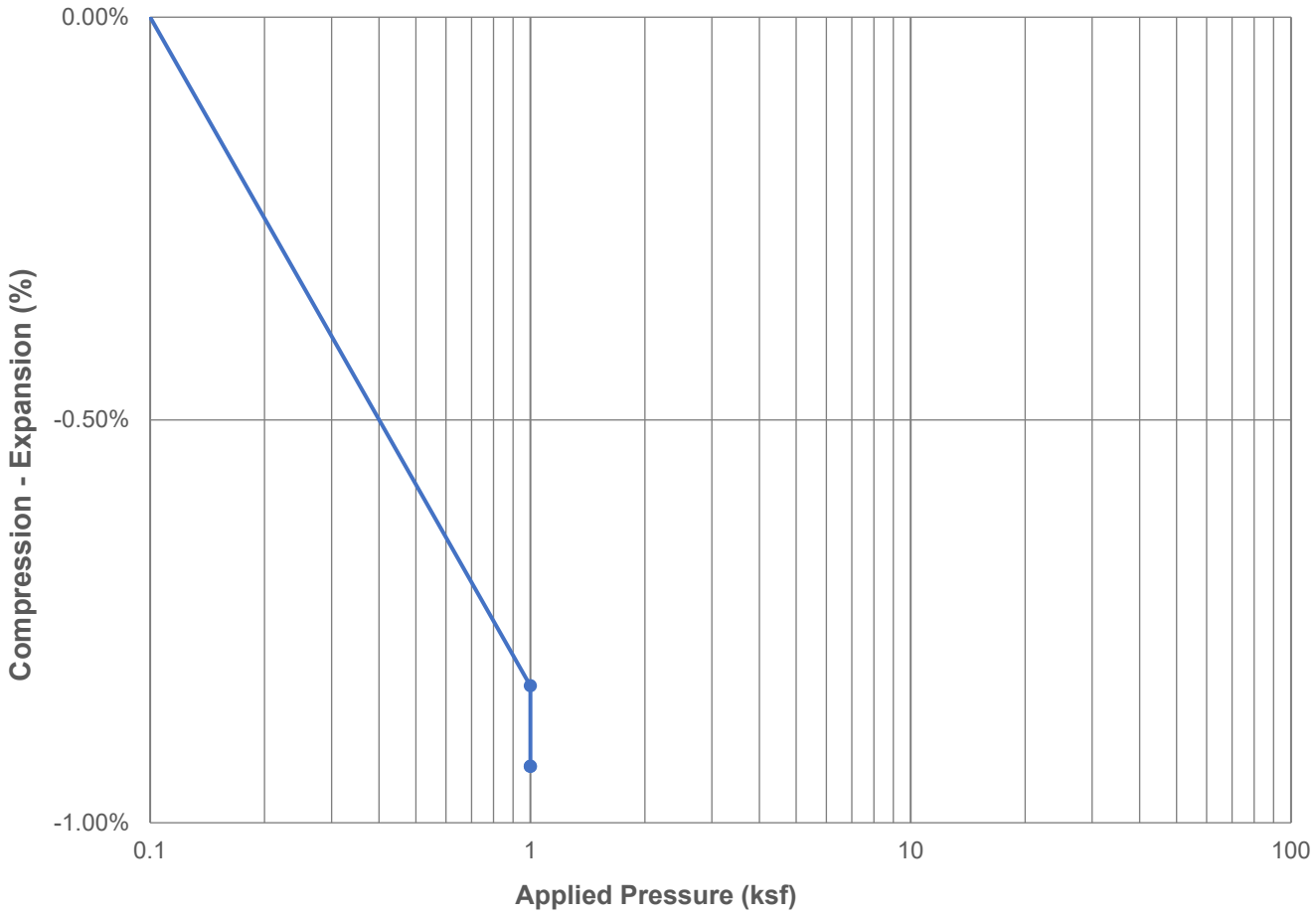
Sample Info

Native Moisture:	6.35%
Post-Test Moisture:	11.52%
Expansion Potential:	-0.12%
Deadload (psf):	1,000

Swell-Consolidation Test

Project:	16850 Steppler Rd	Borehole:	TH-6
Client:	Herebic Homes	Sample Depth:	9 Ft
Job No.:	24-0181	Classification:	SM
Location:	Colorado Springs, CO		

A Better Soil Solution



Values

Applied Load (lbs)	Displacement (in)
0	0.0000
1,000	-0.0083
Add Water	-0.0093

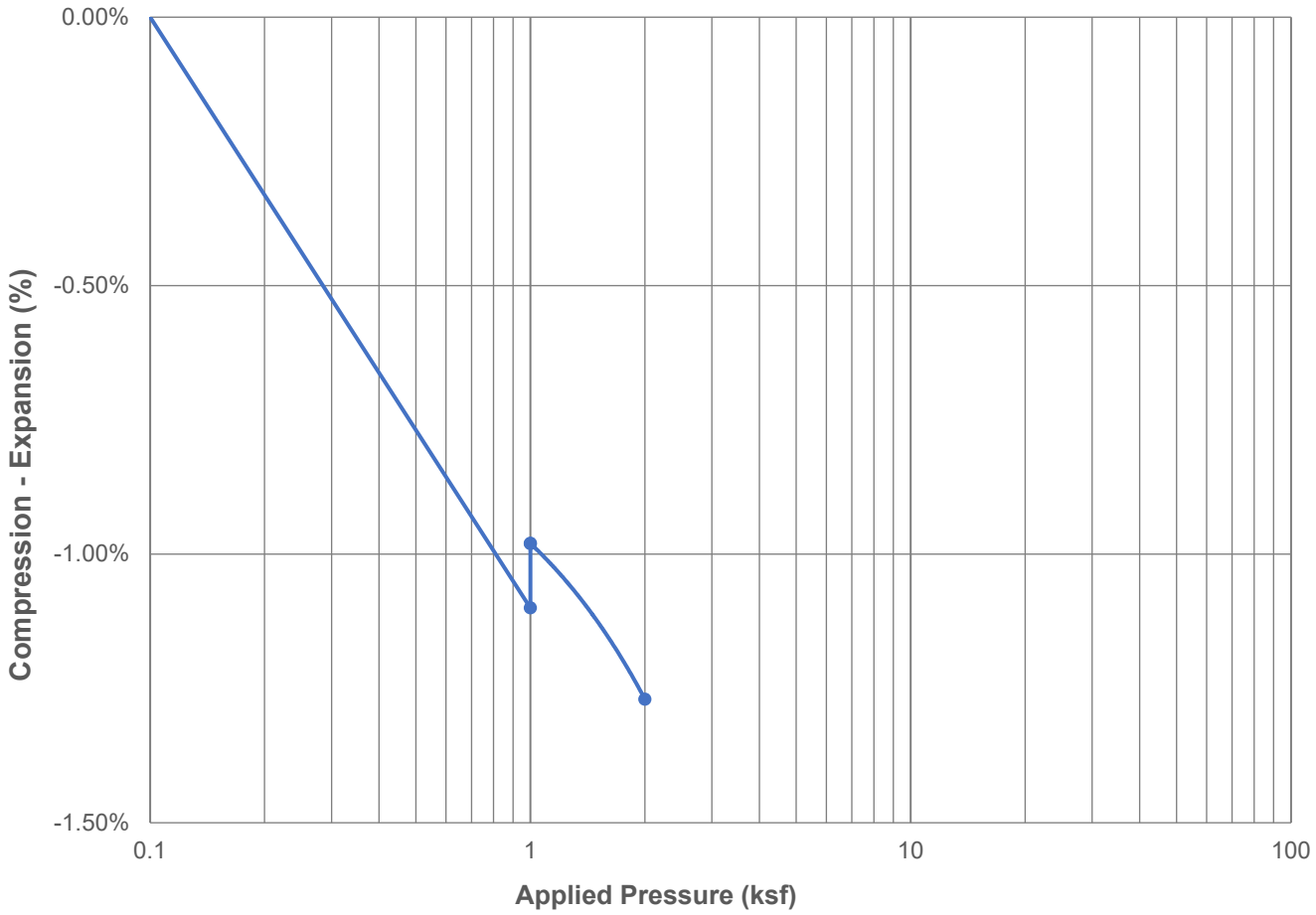
Sample Info

Native Moisture:	6.69%
Post-Test Moisture:	13.82%
Expansion Potential:	-0.10%
Deadload (psf):	1,000

Swell-Consolidation Test

Project:	16850 Steppler Rd	Borehole:	TH-7
Client:	Herebic Homes	Sample Depth:	4 Ft
Job No.:	24-0181	Classification:	SC
Location:	Colorado Springs, CO		

A Better Soil Solution



Values

Applied Load (lbs)	Displacement (in)
0	0.0000
1,000	-0.0110
Add Water	-0.0098
2,000	-0.0127

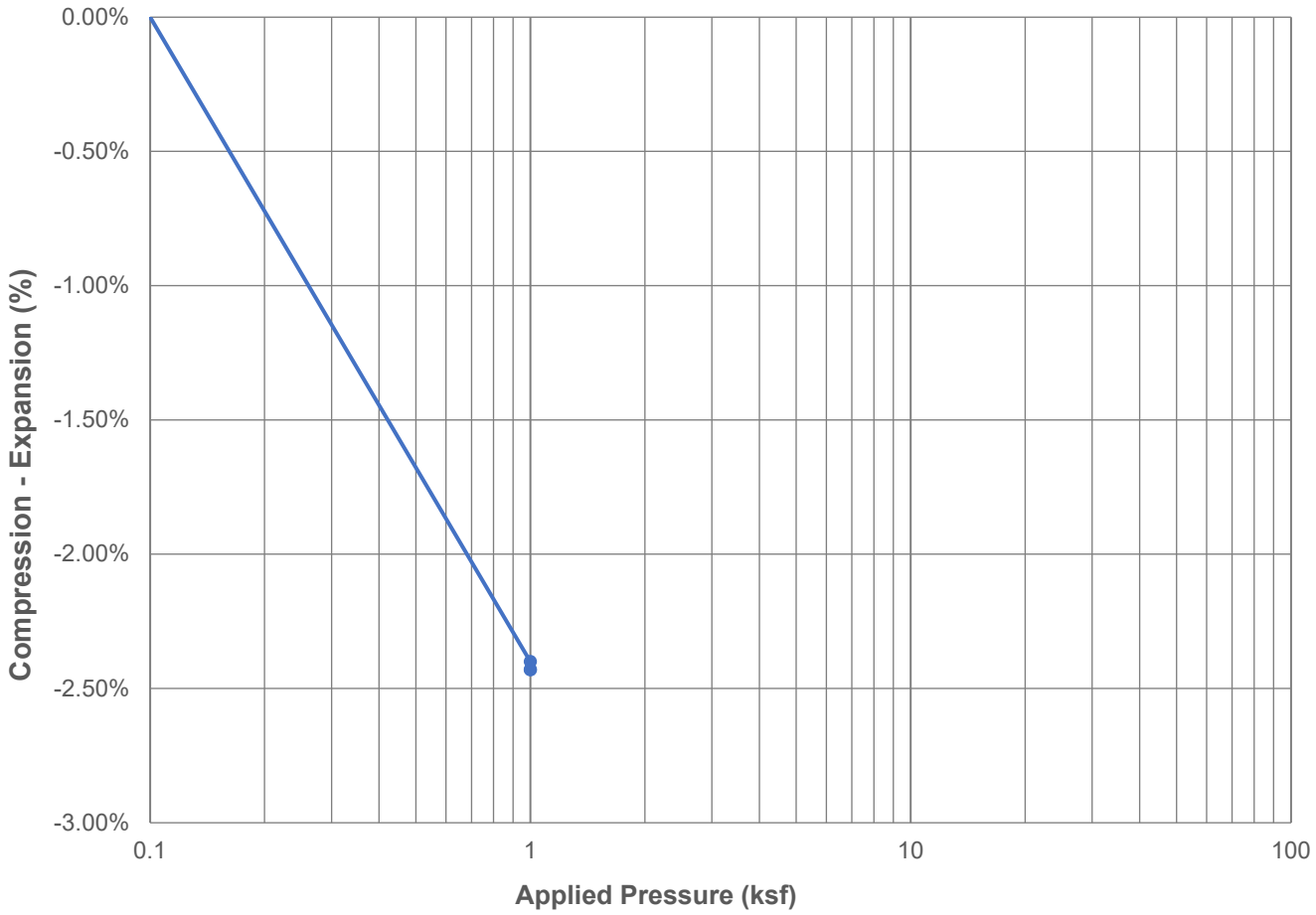
Sample Info

Native Moisture:	15.84%
Post-Test Moisture:	14.99%
Expansion Potential:	0.12%
Deadload (psf):	1,400

Swell-Consolidation Test

Project:	16850 Steppler Rd	Borehole:	TH-7
Client:	Herebic Homes	Sample Depth:	9 Ft
Job No.:	24-0181	Classification:	SC
Location:	Colorado Springs, CO		

A Better Soil Solution



Values

Applied Load (lbs)	Displacement (in)
0	0.0000
1,000	-0.0240
Add Water	-0.0243

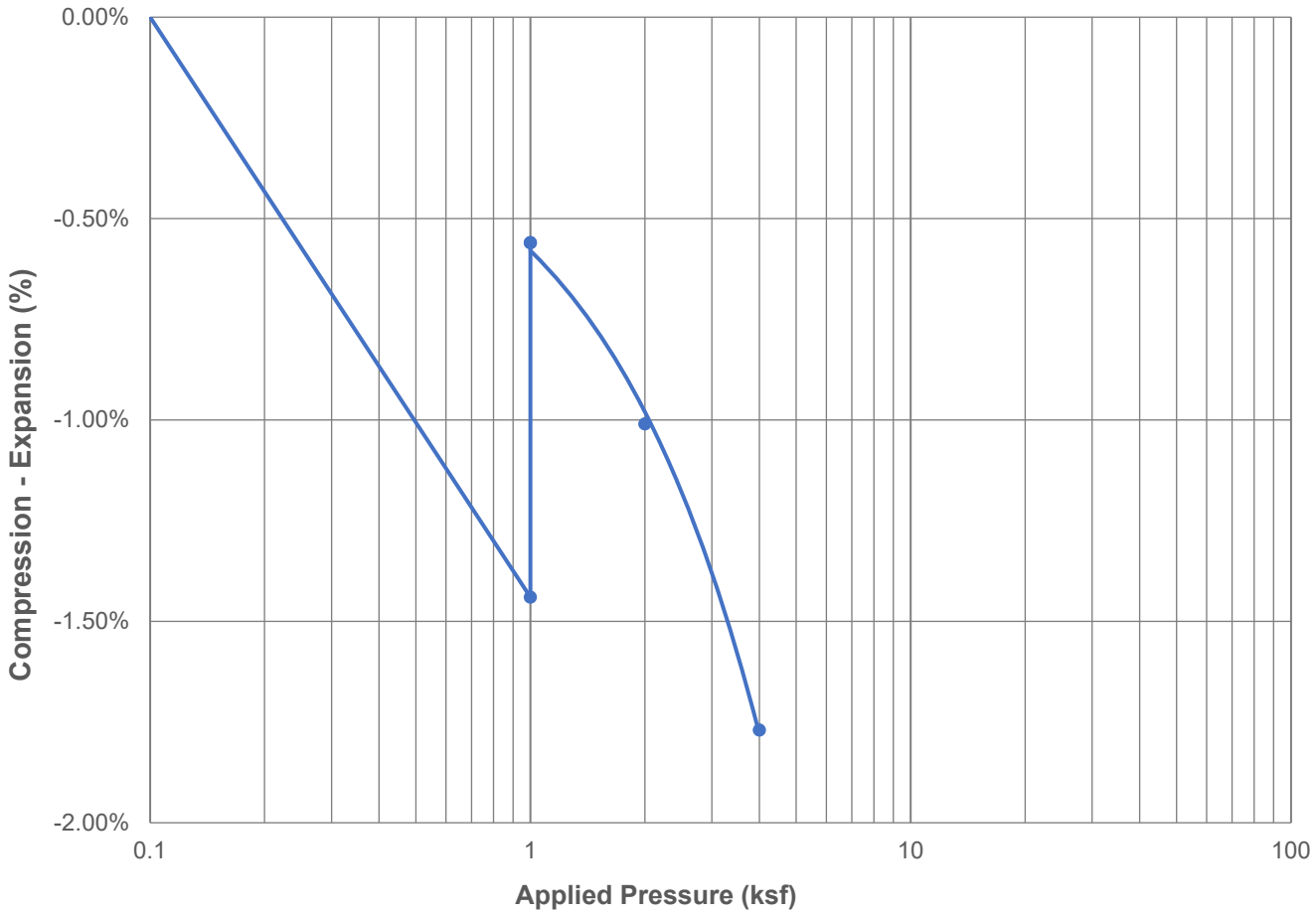
Sample Info

Native Moisture:	18.67%
Post-Test Moisture:	14.44%
Expansion Potential:	-0.03%
Deadload (psf):	1,000

Swell-Consolidation Test

Project:	16850 Steppler Rd	Borehole:	TH-7
Client:	Herebic Homes	Sample Depth:	19 Ft
Job No.:	24-0181	Classification:	CL
Location:	Colorado Springs, CO		

A Better Soil Solution



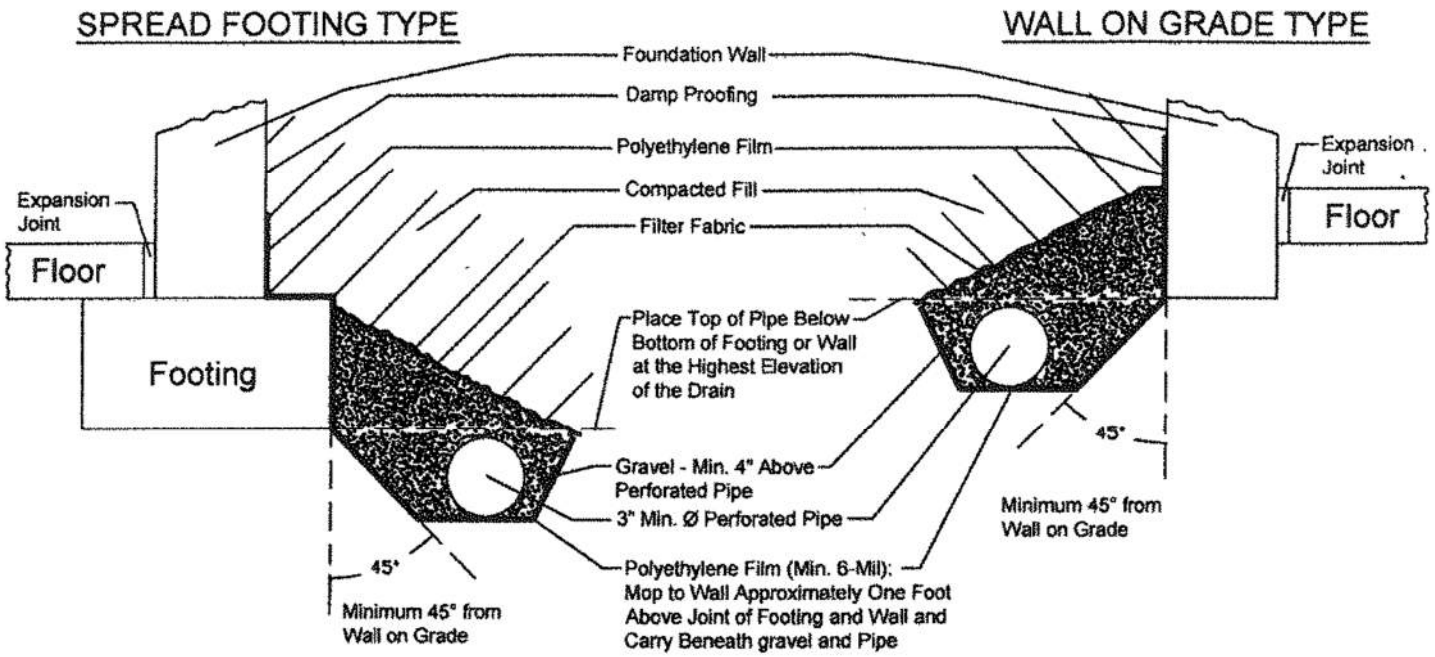
Values

Applied Load (lbs)	Displacement (in)
0	0.0000
1,000	-0.0144
Add Water	-0.0056
2,000	-0.0101
4,000	-0.0177

Sample Info

Native Moisture:	13.83%
Post-Test Moisture:	13.36%
Expansion Potential:	0.88%
Deadload (psf):	3,200

Exterior Drain Detail



1. Gravel to be Not More Than 1-1/2" and Not Less Than 1/2" Diameter.

2. Perforated Pipe Diameter Varies With Expected Seepage. 3"Ø and 4"Ø are Most Common. ABS and PVC are Most Common Materials for Pipe. We approve the use of an "EZ Flow Drainage System" by Infiltrator. All specifications in this drain detail are still applicable.

3. Pipe to be Laid out in a Minimum Slope of 1" in 10'.

4. Gravity Outfall is Desired if Possible. Portion of Pipe in Area Not Drained Shall be Non-Perforated. Daylight Must be Maintained Clear of Debris in Order to Function Properly.

5. If Gravity Outfall is Not Possible, Provide a Sump With Operational Pump. Pump May Not Connect to Any Sanitary or Storm Sewer.

6. Soil Backfill Should be Compacted to at Least 80% of the Modified Proctor Denisty in the Upper Three Feet of Fill.

7. Filter Fabric to be Mirafi 140s or Approved Equivalent. Roofing Felt and Sheet Plastic are Not Acceptable.

8. Drain Pipe Shall be Laid Below Protected Area, as Shown in The Detail Above.

9. Mop Polyethylene Film to Wall Approximately One Foot Above Joint of Footing and Wall (Do Not Pull Plastic Tight) and Carry Beneath Gravel and Pipe.

10. The Polyethylene Film Shall be Continued to the Edge of the Excavation.

Appendix D

Important Information About This Geotechnical Engineering Report

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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