Architectural
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Materials Testing
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SOILS AND GEOLOGY STUDY

Rolling Meadows
Bradley Road
El Paso County, Colorado

PREPARED FOR:

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

JOB NO. 187746

August 5, 2022

Respectfully Submitted,

RMG – Rocky Mountain Group

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Reviewed by,

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39818

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1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in Section 1, Section 12, the east and southeast portion of Section 2, and the northeast ¼ of Section 11 and Section 13, Township 15 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

1.2 Existing Land Use

The site is to be comprised of 18 existing parcels. The total area of the proposed site is to be approximately 1,564 acres, as denoted on the *Overall Conceptual Layout* provided by Matrix, dated October 25, 2021. The parcels included are:

5,440 indicated in the letter of intent and sketch plan

- El Paso County Parcel No. 5500000385. This parcel currently consists of a total of approximately 802.42 acres and is currently undeveloped.
- El Paso County Parcel No. 5500000383. This parcel currently consists of a total of approximately of 124.76 acres and is currently undeveloped.
- El Paso County Parcel No. 5500000324. This parcel currently consists of a total of approximately 593.51 acres and is currently undeveloped.
- Power line easement and open space parcels range in order from El Paso County Parcel No. 5500000314 to 5500000323 and 5500000325 to 5500000329. These parcels consist of a total of approximately 43.31 acres and contain the existing overhead power lines that traverse the property from southeast to northwest.

The parcel is to maintain the current zoning "PUD" (Planned Unit Development), but a transition from PUD to PUDSP has been requested. It is our understanding the name of the subdivision is to be Rolling Meadows.

please delete this - straight zoning may occur. There is no requirement for a site specific PUD.

~~The site is conceptual PUD zoned only~~

1.3 Project Description

The proposed site development is to consist of approximately 7,785 residential units, comprised of a mixture of single-family to multi-family structures. The lots reportedly are to range from 2,975 to 6,600 square feet. Entrance into the subdivision is to be provided from the east and west by the existing Bradley Road by extending the existing Meridian Road, and from the north by the existing Drennan Road. Additional proposed land usage includes four elementary schools, one middle school, fire station, substations, parks, detention ponds, power line and open space easements, floodplain/channel easements, and a water tank. It is our understanding the existing powerline easement is to remain an open space. The Test Boring Location Plan is presented in Figure 2.

The streets within the subdivision are to be planned as Residential Collector with 60’ R.O.W, and a Non-Residential Collector with an 80’ R.O.W and constructed to El Paso County standards. Drennan Road and Meridian Road are planned as Collector Roads in EPC 2040 MTCP. Bradley Road is planned as Minor Arterial in EPC 2040 MTCP. The streets are to be maintained by El Paso County.

uses may be added

meridian is a minor arterial south of Bradley per MTCP{. Revise.

The development is to utilize sewer and water services provided by Widefield Water and Sanitation District. Neither individual wells nor on-site wastewater treatment systems are proposed.

2.0 QUALIFICATIONS OF PREPARERS

This Soils and Geology Study was prepared by a professional geologist as defined by Colorado Revised Statures section 34-1-201(3) and by a qualified geotechnical engineer as defined by policy statement 15, "Engineering in Designated Natural Hazards Areas" of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors. (Ord. 96-74; Ord. 01-42)

The principle investigators for this study are Kelli Zigler P.G., and Tony Munger, P.E. Ms. Zigler is a Professional Geologist as defined by State Statute (C.R.S 34-1-201) with over 21 years of experience in the geological and geotechnical engineering field. Ms. Kelli Zigler holds a B.S. in Geology from the University of Tulsa. Ms. Zigler has supervised and performed numerous geological and geotechnical field investigations throughout Colorado.

Tony Munger is a licensed professional engineer with over 21 years of experience in the construction engineering (residential) field. Mr. Munger and holds a Bachelor of Science in Architectural Engineering from the University of Wyoming.

3.0 STUDY OVERVIEW

The purpose of this investigation is to characterize the general geotechnical and geologic site conditions, and present our opinions of the potential effect of these conditions on the proposed development of single-family residences within the referenced site. As such, our services exclude evaluation of the environmental and/or human, health-related work products or recommendations previously prepared, by others, for this project.

Revisions to the conclusions presented in this report may be issued based upon submission of the Development Plan. This study has been prepared in accordance with the requirements outlined in the El Paso County Land Development Code (LDC) specifically Chapter 8 last updated August 27, 2019 applicable sections include 8.4.8 and 8.4.9. and the Engineering Criteria Manual (ECM), specifically Appendix C last updated July 9, 2019.

This report presents the findings of the study performed by RMG relating to the geotechnical and geologic conditions of the above-referenced site. Revisions and modifications to the conclusions and recommendations presented in this report may be issued subsequently by RMG based upon additional observations made during grading and construction which may indicate conditions that require re-evaluation of some of the criteria presented in this report.

3.1 Scope and Objective

The scope of this study is to include a physical reconnaissance of the site and a review of pertinent, publically available documents including (but not limited to) previous geologic and geotechnical reports, overhead and remote sensing imagery, published geology and/or hazard maps, design documents, etc. Our services exclude the evaluation of the environmental and/or human, health-related work products or recommendations previously prepared, by others, for this project.

The objectives of our study are to:

- Identify geologic conditions that are present on this site,
- Analyze the potential negative impacts of these conditions on the proposed site development,
- Analyze the potential negative impacts to the surrounding properties and/or public services resulting from the proposed site development as it relates to existing geologic hazards,
- Provide our opinion of suitable techniques that may be utilized to mitigate the potential negative impacts identified herein.

This report presents the findings of the study performed by RMG relating to the geologic conditions of the above-referenced site. Revisions and modifications to this report may be issued subsequently by RMG, based upon:

- Additional observations made during grading and construction which may indicate conditions that require re-evaluation of some of the criteria presented in this report,
- Review of pertinent documents (development plans, plat maps, drainage reports/plans, etc.) not available at the time of this study,
- Comments received from the governing jurisdiction and/or their consultants subsequent to submission of this document.

3.2 Site Evaluation Techniques

The information included in this report has been compiled from:

- Field reconnaissance
- Geologic and topographic maps
- Review of selected publicly available, pertinent engineering reports
- Available aerial photographs
- Exploratory soil test borings by RMG
- Laboratory testing of representative site soil and rock samples by RMG
- Geologic research and analysis
- Site development plans prepared by others

Geophysical investigations were not considered necessary for characterization of the site geology. Monitoring programs, which typically include instrumentation and/or observations for changes in groundwater, surface water flows, slope stability, subsidence, and similar conditions, are not known to exist and were not considered applicable for the scope of this report.

3.3 Additional Documents

Additional documents reviewed during the performance of this study are included in Appendix A.

4.0 SITE CONDITIONS

4.1 Existing Site Conditions

The entire site is undeveloped. Overhead power lines that traverse the property from southeast to northwest are to reside within a power line easement, which is to be designated as open space. Construction of a water tank and detention pond was observed near the northern boundary off of Drennan Road at the time of site reconnaissance.

4.2 Topography

Based on our site reconnaissance and the 2022 USGS topographic maps of the Corral Bluffs, Elsmere, Fountain, and Fountain NE quadrangles, the site topography is generally flat with rolling hills. The elevation varies by approximately 147 feet across the site, sloping generally downwards from the northwest to the southeast.

4.3 Vegetation

The majority of the site consists of native prairie grasses and weeds, and generally remains in an undisturbed (native) state.

4.4 Aerial photographs and remote-sensing imagery

Personnel of RMG reviewed aerial photos available through Google Earth Pro dating back to 1999, CGS surficial geologic mapping, and historical photos by historicaerials.com dating back to 1947. Historically, the site has remained generally undisturbed since 1947. The construction of the overhead power lines occurred prior to 1969. Since 1969, the site has remained vacant.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

The subsurface conditions within the property were explored by drilling a total of 70 exploratory test borings to depths of approximately 20 to 35 feet below the existing ground surface. The test boring locations are presented on the Test Boring Location Plan, Figure 2.

The number of borings is in excess of the minimum one test boring per 10 acres of development up to 100 acres and one additional boring for every 25 acres of development above 100 acres as required by the ECM, Section C.3.3.

The test borings were drilled with a power-driven, continuous-flight auger drill rig. Samples were obtained during drilling of the test boring in general accordance with ASTM D-1586 and D-3550, utilizing a 2-inch O.D. Split Barrel Sampler and a 2½-inch O.D. California sampler, respectively.

Results of the penetration tests are shown on the drilling logs. The proposed lot layout is shown on the Proposed Lot Layout, Figure 3. An Explanation of Test Boring Logs is shown in Figure 4, and the Test Boring Logs are shown in Figures 5 through 39.

5.1 Laboratory Testing

Soil laboratory testing was performed as part of this investigation. The laboratory tests included moisture content, dry density, grain-size analyses, Atterberg Limits and Swell/Consolidation tests. A Summary of Laboratory Test Results is presented in Figure 40. Soils Classification Data is presented in Figures 41 through 55. Swell/Consolidation Test Results are presented in Figures 56 through 78.

6.0 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

The site is located within the western flank of the Colorado Piedmont section of the Great Plains physiographic province. The Colorado Piedmont, formed during Late Tertiary and Early Quaternary time (approximately 2,000,000 years ago), is a broad, erosional trench which separates the Southern Rocky Mountains from the High Plains. During the Late Mesozoic and Early Cenozoic Periods (approximately 70,000,000 years ago), intense tectonic activity occurred, causing the uplifting of the Front Range and associated downwarping of the Denver Basin to the east. Relatively flat uplands and broad valleys characterize the present-day topography of the Colorado Piedmont in this region.

6.1 Subsurface Soil Conditions

The subsurface materials encountered in the test borings performed for this study were classified within the laboratory using the Unified Soil Classification System (USCS). The majority of the laboratory testing focused on the Swell/Consolidation test results for the subexcavation recommendations and limited classifications (gradations and atterberg limits) were completed on the clay and claystone materials. The soils were identified and classified as clayey sand (SC) , silty sand (SM), silty to clayey sand (SM-SC), sandy clay (CL), claystone, and sandstone.

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented on the Test Boring Logs. The classifications shown on the logs are based upon the engineer’s classification of the samples at the depths indicated. Stratification lines shown on the logs represent the approximate boundaries between material types and the actual transitions may be gradual and vary with location.

6.2 Bedrock Conditions

In general, the bedrock (as mapped by Colorado Geologic Survey - CGS) beneath the site is considered to be part of the Pierre Shale formation. Bedrock was encountered in the majority of test borings performed for this investigation. Bedrock conditions are anticipated to be encountered in the excavations and utility trenches for the proposed development.

6.3 U.S. Soil Conservation Service

The U.S. Soil Conservation Service along with United States Department of Agriculture (USDA) has identified the soils on the property as:

- 56 – Nelson-Tassel fine sandy loam, 3 to 18 percent slopes. Properties of the sandy loam include, well-drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be medium, frequency of flooding and/or ponding is none, and landforms include hills.

- 108 – Wiley silt loam, 3 to 9 percent slopes. Properties of the silt loam include, well-drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be medium, frequency of flooding and/or ponding is none, and landforms include hills.
- 2 – Ascalon sandy loam, 1 to 3 percent slopes. Properties of the sandy loam include, well-drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be low, frequency of flooding and/or ponding is none, and landforms include flats.
- 28 – Ellicott loamy coarse sand, 0 to 5 percent slopes. Properties of the loamy coarse sand include, somewhat excessively drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be very low, frequency of flooding is frequent, frequency of ponding is none, and landforms include flood plains and stream terraces.
- 43 – Kim loam, 1 to 8 percent slopes. Properties of the loam include, well-drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be medium, frequency of flooding and/or ponding is none, and landforms include fans and hills.
- 52 – Manzanst clay loam, 0 to 3 percent slopes. Properties of the clay loam include, well-drained soils, depth of the water table is anticipated to be greater than 80 inches, frequency of flooding and/or ponding is none, and landforms include terraces and drainageways.
- 75 – Razor-Midway Complex. Properties of the complex include, well-drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be medium, frequency of flooding and/or ponding is none, and landforms include hills.
- 78 – Sampson loam, 0 to 3 percent slopes. Properties of the loam include, well-drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be low, frequency of flooding and/or ponding is none, and landforms include depressions, alluvial fans, and terraces.
- 86 – Stoneham sandy loam, 3 to 8 percent slopes. Properties of the sandy loam include, well-drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be medium, frequency of flooding and/or ponding is none, and landforms include hills.
- 89 – Tassel fine sandy loam, 3 to 18 percent slopes. Properties of the fine sandy loam include, well-drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be medium, frequency of flooding and/or ponding is none, and landforms include hills.

- 124 – Olnest sandy loam, 0 to 3 percent slopes. Properties of the sandy loam include, well-drained soils, depth of the water table is anticipated to be greater than 80 inches, Runoff is anticipated to be low, frequency of flooding and/or ponding is none, and landforms include sand sheets.

The USDA Soil Survey Map is presented in Figure 82 and the FEMA Map is presented in Figure 83.

6.4 General Geologic Conditions

Based on our field observations, the USDA map, the Geologic Map of the Corral Bluffs Quadrangle, the Geologic Map of the Pueblo 1-degree by 2-degrees Quadrangle, the Geologic Map of the Elsmere Quadrangle, and the Generalized Surficial Geologic Map of the Pueblo 1-degree by 2-degree Quadrangle, an interpreted geologic map of significant surficial deposits and features was mapped for the site. The identified geologic conditions affecting the development are presented in the General Geologic Map, Figure 81.

The site generally consists of alluvial sand, silt and clay deposits underlain by claystone bedrock of the Pierre Shale formation. 14 geologic units were mapped at the site as:

- *es* – Eolian sand
- *asa* – Alluvial sand, silt, clay, and gravel (post-Piney Creek alluvium, Piney Creek Alluvium, and pre-Piney Creek alluvium of Hunt, 1954, and Scott, 1960; Broadway Alluvium)
- *xch* – Clayey, calcareous disintegration residuum
- *Qam – Middle alluvium (Late Pleistocene)* – Light-brownish-gray, pale-brown, light-yellowish-brown, and grayish-brown, poorly sorted sand and subordinate amounts of gravel. Estimated thickness is 20-50 feet.
- *Qav – Valley-side alluvium, undivided (Holocene and late Pleistocene)* – Brown to light-yellowish-brown, extremely poorly sorted sand, silty and clayey sand, and minor amounts of mostly pebble-size gravel. Unit exists primarily on valley-side slopes and alluvial fans and consists of sheetwash and re-worked wind-deposited sediment. Estimated thickness is 3-25 feet.
- *Kpc – Cone-in-cone of Lavington (1933)* - Dark-gray clayey or silty shale containing reddish-brown siderite ironstone concretions, gray iron-stained limestone concretions, thin bentonite beds, and concretions with cone-in-cone structure.
- *Kpts – Lower part of upper transition member* – yellowish-gray, medium- to coarse-grained cross-bedded sandstone with thin shale interbeds.
- *Qay2 – Young alluvium two (late and middle? Holocene)* – Includes several thin beds and lenses of dark-grayish-brown to very dark-grayish-brown sediment. The unit blankets large areas on broad valley floors. Upper surface of unit is 15-20 feet higher than stream channels

in the southern part of the quadrangle. A very weak, 6 to 18 inch thick soil is developed in this unit. Unit is subject to infrequent large floods and is estimated to be 10-20 feet thick.

- *Qs – Slocum Alluvium (Sangamon Interglaciation or Illinoian Glaciation)* – Weathered gravel on cut surface about 100 feet above modern streams.

- *Kps – Pierre Shale, Sandstone at or just above base of upper transition member* – Grayish-yellow except light-yellowish-gray to dark-yellowish-orange in about lower 30 feet, medium- coarse-grained, some thin shale interbeds and laminae, mostly crossbedded. Unit is about 160 to 190 feet thick.

- *Kp – Pierre Shale, Main part of formation* – Shale, minor siltstone and sandstone beds, and thin concretionary limestone beds; marine fossils in some beds; mostly dark to light gray and olive gray. Poorly exposed in general. Unit is about 1,200 feet exposed in Elsmere quadrangle. Total formation thickness is about 5,000 feet.

- *Qpc – Piney Creek Alluvium* – Alluvial and pond or bog deposits. Mostly clayey sandy silt and silty sand; very clayey in pond and bog deposits, gravelly along main stream and in areas of high relief; yellowish-brown and brownish-gray to dark-yellowish-brown, commonly has alternating darker and lighter colored flat even beds a few inches to a foot thick. Thickness is generally 5 to 15 feet, maximum of 50 feet possible.

- *Qal – Alluvium* - Sand, gravel, and silt mainly in present stream channels but includes deposits that form terraces as much as 4 feet high; mostly grayish yellow. Thickness generally less than 25 feet.

- *Kpt – Pierre Shale, Main part of upper transition member* - Gray to yellowish-gray shale, siltstone, and thin beds of very fone- to fine-grained sandstone; beds of concretionary limestone or limestone concretions ½- to 1-foot thick dispersed throughout; small phosphate nodules locally. The unit is poorly exposed and is about 400 feet thick.

6.5 Structural Features

Structural features such as schistocity, folds, zones of contortion or crushing, joints, shear zones or faults were not observed on the site, in the surrounding area, or in the soil samples collected for laboratory testing.

6.6 Surficial (Unconsolidated) Deposits

Lake and pond sediments, swamp accumulations, sand dunes, marine terrace deposits, talus accumulations, creep, or slope wash were not observed on the site. Slump and slide debris were also not observed on the site.

6.7 Engineering Geology

Charles Robinson and Associates (1977) have mapped 16 environmental engineering units at the site as:

- 1A – Stable alluvium, colluvium and bedrock on flat to gentle slopes (0-5%).
- 2A – Stable alluvium, colluvium and bedrock on gentle to moderate slopes (5 to 12%).
- 2D – Eolian deposits generally on flat to gentle slopes of upland areas.
- 2E – Low terraces and valleys of minor tributary streams.
- 3B – Expansive and potentially expansive soil and bedrock on flat to moderate slopes (0-12%).
- 5D – Debris fans
- 7A – Physiographic floodplain where erosion and deposition presently occur and is generally subject to recurrent flooding. Includes 100-year floodplain along major streams where floodplain studies have been conducted.
- al – Alluvium
- a Qp – Piney Creek Alluvium
- Soil Conservation Service (SCS) Floodplain
- c Kp – Colluvium, Pierre Shale (locally subdivided)
- c Kps – Colluvium, Pierre Shale (locally subdivided)
- pfp – Physiographic Floodplain
- df – Debris Fan
- Qes – Eolian Sand
- p Qs – Slocum Alluvium

The potential geologic hazards and surficial deposits as mapped by Robinson and Associates is presented in the Engineering Map of Potential Geologic Hazards and Surficial Deposits, Figure 79. The environmental and engineering conditions as mapped by Robinson and Associates is presented in the Environmental and Engineering Geologic Map for Land Use, Figure 80.

6.8 Features of Special Significance

Features of special significance such as accelerated erosion, (advancing gully head, badlands, or cliff reentrants) were not observed on the property. Features indicating settlement or subsidence such as fissures, scarplets, and offset reference features were not observed on the property or surrounding areas.

Features indicating creep, slump, or slide masses in bedrock and surficial deposits were not observed on the property.

6.9 Drainage of Water and Groundwater

The overall topography varies by approximately 147 feet across the site, sloping generally downwards from the northwest to the southeast. It is anticipated the direction of groundwater is towards Jimmy Camp Creek located to the west of the site.

Groundwater was encountered in two test borings during the field exploration, test boring TB-11 and TB-15 at depths of 17 feet and 14 feet, respectively. Based on the water contents for the samples collected at the time of drilling, moistures were not elevated and do not indicate an elevated groundwater condition.

Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Development of the property and adjacent properties may also affect groundwater levels. Based on our knowledge of the area and engineering design and construction techniques commonly employed in the El Paso County area at this time, it is our opinion that there is insufficient reason to preclude full-depth basements on any of the lots in this subdivision at this time.

7.0 ECONOMIC MINERAL RESOURCES

Under the provision of House Bill 1529, it was made a policy by the State of Colorado to preserve for extraction commercial mineral resources located in a populous county. Review of the *El Paso Aggregate Resource Evaluation Map, Master Plan for Mineral Extraction*, *Map 1* indicates the site is identified as floodplain deposits consisting of sand and gravel with minor amounts of silt and clay deposited by water along present stream courses, valley fill consisting of sand and gravel with silt and clay deposited by water in one or a series of stream valleys, eolian deposits consisting of wind blown sand and upland deposits consisting of sand, gravel with silt and clay; remnants of older streams desisted on topographic highs or bench like features. The extraction of the clay and claystone resources are not considered to be economical compared to materials available elsewhere within the county.

According to the *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands*, the site is mapped within the southern part of the Denver Basin Coal Region with a tract identifier of 41-59. However, the area of the site does not contain coal resources. The tract is underlain primarily by the Pierre Shale of Cretaceous age. No wells are drilled within the tract. Grand Union Oil Company drilled a well in the vicinity of the tract to a depth of 1,250 feet in 1901. No shows of hydrocarbons were recorded. The well was plugged and abandoned. The sedimentary rocks in this area appear to contain all of the essential elements; however, existing geological control is insufficient to determine the presence of a trap or reservoir. The tract is not prospective for metallic mineral resources. There are no mines in the Pierre Shale within ten miles of the tract, but the tract has some potential to contain useful clay and shale resources.

8.0 IDENTIFICATION AND MITIGATION OF POTENTIAL GEOLOGIC CONDITIONS

The El Paso County Engineering Criteria Manual recognizes and delineates the difference between hazards and constraints. A geologic hazard is one of several types of adverse geologic conditions capable of causing significant damage or loss of property and life. Geologic hazards are defined in Section C.2.2 Sub-section E.1 of the ECM. A geologic constraint is one of several types of adverse geologic conditions capable of limiting or restricting construction on a particular site. Geologic constraints are defined in Section C.2.2 Sub-section E.2 of the ECM (1.15 Definitions of Specific Terms and Phrases). The following geologic constraints were considered in the preparation of this report, and are not are not anticipated to pose a significant risk to the proposed development:

- Avalanches
- Debris Flow-Fans/Mudslides
- Ground Subsidence
- Landslides
- Rockfall
- Groundwater Springs or Seeps
- Ponding water
- Steeply Dipping Bedrock
- Unstable or Potentially Unstable Slopes
- Scour, Erosion, Accelerated Erosion Along Creek Banks and Drainageways
- History of Landfill or Uncontrolled/Undocumented Fill Placement
- Valley Fill
- Downhill/Down-Slope Creep
- Soil Slumps and Undercutting
- Corrosive Minerals

The following sections present geologic constraints that have been identified on the property:

8.1 Expansive Soils and Bedrock

Shallow foundations are anticipated for the majority of the development, and it is our understanding a mass subexcavation is proposed for mitigation of unsuitable soils. Subexcavation and replacement with moisture-conditioned structural fill is a commonly utilized method of mitigating expansive soils. Based on the test borings performed by RMG for this investigation, the on-site soils and bedrock generally possess low to very high swell potential.

Mitigation

Our subexcavation recommendations are presented in Section **13.0 Subexcavation and Replacement** of this report.

Note, the recommended subexcavation and replacement process does not guarantee that the swell potential will be reduced to acceptable levels. It is possible that the expansive material will retain swell potential in excess of the allowable value presented herein, even after processing and moisture-conditioning. If (at the time of the lot-specific subsurface soil investigation and/or the open excavation observation) the soil is found to possess swell potential in excess of acceptable levels for the foundation system and design parameters proposed for construction at that time, overexcavation and replacement of some or all of the previously placed fill material may be required.

Provided that appropriate mitigations and/or foundation design adjustments are implemented, the presence of expansive soils or bedrock is not considered to pose a risk to the proposed structures.

8.2 Compressible Soils

Shallow foundations are anticipated for the majority of the development, and it is our understanding a mass subexcavation is proposed for mitigation of unsuitable soils. Subexcavation and replacement with moisture-conditioned structural fill is a commonly utilized method of mitigating expansive soils. Based on the test borings performed by RMG for this investigation, the on-site soils and bedrock generally possess low to moderate compressibility potential.

Mitigation

Our subexcavation recommendations are presented in Section **13.0 Subexcavation and Replacement** of this report.

If loose soils are encountered during the Open Excavation Observation, they may require additional compaction to achieve the allowable bearing pressure indicated in this report. Fluctuations in material density may occur. In some cases, removal and recompaction of up to 2 feet of soil may be required. The removal and recompaction shall extend a minimum of the same distance beyond the building perimeter, and at least that same distance beyond the perimeter of counterfort and "T" wall footings. The use of track-mounted excavation equipment, or other low ground pressure equipment, is recommended on loose soils to reduce the likelihood of loss of stability during excavation.

8.3 Shallow Groundwater Tables

Groundwater was encountered in TB-11 and TB-15 at depths of 17 feet and 14 feet, respectively. It is anticipated that groundwater will not affect shallow foundations for the structures or shallow buried utilities proposed on the site. Groundwater may affect areas depending upon grading cuts and within deeper excavations made for installation of utilities. It should be noted that groundwater levels, other than those observed at the time of the subsurface soil investigation, could change due to season variations, changes in land runoff characteristics and future development of nearby areas.

It should be noted that in granular soils and bedrock, some subsurface water conditions might be encountered due to the variability of the soil profile. Isolated sand and gravel layers within the soil, even those of limited thickness and width, can convey subsurface water. Subsurface water may also flow atop the interface between the upper soils and the underlying bedrock. While not indicative of a "groundwater" condition, these occurrences of subsurface water migration can (especially in times of heavy rainfall or snowmelt) result in water migration into the excavation or (once construction is complete) the building envelope. Builders and planners should be cognizant of the potential for the occurrence of subsurface water conditions during on-site construction, and be prepared to evaluate and mitigate each individual occurrence as necessary.

Mitigation

Seasonal variations in groundwater conditions are expected. It is assumed groundwater beneath the subject site predominates in fractured weathered consolidated sedimentary bedrock located at depth. If shallow groundwater conditions are encountered during the site-specific Subsurface Soil Investigations and/or Open Excavation Observations, mitigations may include a combination of surface and subsurface drainage systems, vertical drainboard, etc.

In general, if groundwater was encountered within 4 to 6 feet of the proposed foundation slab elevation, an underslab drain should be anticipated in conjunction with the perimeter drain. Perimeter drains are anticipated for each individual lot to prevent the infiltration of water and to help control wetting of potentially expansive and compressible soils in the immediate vicinity of foundation elements. It must be understood that the drain is designed to intercept some types of subsurface moisture and not others. Therefore, the drain could operate properly and not mitigate all moisture problems relating to foundation performance or moisture intrusion into the basement area.

8.4 Floodplain/Floodway

Based on our review of the available Federal Emergency Management (FEMA) Community Panel No. 08041C0790G, 08041C0769G, and the online ArcGIS El Paso County Risk Map, the site lies within a 100-year floodplain (Zone AE) and regulatory floodway. The floodplain traverses the site down-gradient from the northeast to the southwest.

Mitigation
As indicated on the *Conceptual Layout 03* map prepared by Matrix Design Group, the proposed build areas of the development are to be located outside of the designated channel/floodplain as shown on the Proposed Lot Layout, Figure 3.

8.5 Faults and Seismicity

Based on review of the Earthquake and Late Cenozoic Fault and Fold Map Server provided by CGS located at http://dnrwebmapgdev.state.co.us/CGSOnline/ and the recorded information dating back to November of 1900, Colorado Springs has not experienced a recorded earthquake with a magnitude greater than 1.6 during that time period. The nearest recorded earthquakes over 1.6 occurred in December of 1995 in Manitou Springs, which experienced magnitudes ranging between 2.8 to 3.5. Additional earthquakes over 1.6 occurred between 1926 and 2001 in Woodland Park, which experienced magnitudes ranging from 2.7 to 3.3. Both of these locations are in the vicinity of the Ute Pass Fault, which is greater than 10 miles from the subject site.

Earthquakes felt at this site will most likely result from minor shifting of the granite mass within the Pikes Peak Batholith, which includes pull from minor movements along faults found in the Denver basin. It is our opinion that ground motions resulting from minor earthquakes may affect structures (and the surrounding area) at this site if minor shifting were to occur.

Mitigation
The Pikes Peak Regional Building Code, 2017 Edition, indicates maximum considered earthquake spectral response accelerations of 0.181g for a short period (S_s) and 0.055g for a 1-second period (S_1). Based on the results of our experience with similar subsurface conditions, we recommend the site be classified as Site Class B, with average shear wave velocities ranging from 2,500 to 5,000 feet per second for the materials in the upper 100 feet.

8.6 Radon

*"**Radon Act 51** passed by Congress set the natural outdoor level of radon gas (0.4 pCi/L) as the target radon level for indoor radon levels.*

Southern El Paso County and the 80929 zip code located in Rolling Meadows has an EPA assigned Radon Zone of 1. A radon zone of 1 predicts an average indoor radon screening level greater than 4 pCi/L, which is above the recommended levels assigned by the EPA. Rolling Meadows is located in a high risk area of the country. *The EPA recommends you take corrective measures to reduce your exposure to radon gas.*

Most of Colorado is generally considered to have the potential of high levels of radon gas, based on the information provided at: https://www.elpasocountyhealth.org/sites/default/files/CDPHERadonMap.pdf. There is not believed to be unusual hazardous levels of radon from naturally occurring sources at this site.

Mitigation

Radon hazards are best mitigated at the building design and construction phases. Providing increased ventilation of basements, crawlspaces, creating slightly positive pressures within structures, and sealing of joints and cracks in the foundations and below-grade walls can help mitigate radon hazards. Radon hazards are best mitigated at the building design and construction phases. Providing increased ventilation of basements, crawlspaces, creating slightly positive pressures within structures, and sealing of joints and cracks in the foundations and below-grade walls can help mitigate radon hazards. Passive radon mitigation systems are also available.

Passive and active mitigation procedures are commonly employed in this region to effectively reduce the buildup of radon gas. Measures that can be taken after the residence is enclosed during construction include installing a blower connected to the foundation drain and sealing the joints and cracks in concrete floors and foundation walls. If the occurrence of radon is a concern, it is recommended that the residence be tested after they are enclosed and commonly utilized techniques are in place to minimize the risk.

8.7 Proposed Grading, Erosion Control, Cuts and Masses of Fill and Erosion Control

Based on the test borings for this investigation, the excavations are anticipated to encounter silty to clayey sand, claystone and sandstone. The on-site soils can generally be used as site-grading fill.

Prior to placement of overlot fill or removal and re-compaction of the existing materials, topsoil, low-density native soil, fill and organic matter should be removed from the fill area. The subgrade should be scarified, moisture conditioned to within 2% of the optimum moisture content, and recompacted to the same degree as the overlying fill to be placed. The placement and compaction of fill should be periodically observed and tested by a representative of RMG during construction.

If unsuitable fill soils are encountered at the time of construction for the single-family residences, they should be removed (overexcavated) and replaced with compacted structural fill. The zone of overexcavation shall extend to the bottom of the unsuitable fill zone and shall extend at least that same distance beyond the building perimeter (or lateral extent of any fill, if encountered first). Provided that this recommendation is implemented, the presence of this fill is not considered to pose a risk to proposed structures.

We anticipate that the deepest excavation cuts for crawlspace and garage level construction will be approximately 3 to 4 feet below the existing ground surface, and for basement level construction will be approximately 6 to 8 feet below the existing ground surface, not including subexcavation where performed.

We believe the sandy clay and claystone will classify as Type A material and the clayey sand, silty sand, silty to clayey sand, and sandstone will classify as Type C materials as defined by OSHA in 29 CFR Part 1926. OSHA requires that temporary excavations made in Type A materials be laid back at ratios no steeper than 3/4:1 (horizontal to vertical) and temporary excavations made in Type C materials be laid back at ratios no steeper than 1 1/2:1 (horizontal to vertical), unless the excavation is shored and braced. Excavations deeper than 20 feet, or when water is present, should always be braced or the slope designed by a professional engineer. Long term cut slopes in the upper soil should be limited to no steeper than 3:1 (horizontal to vertical). Flatter slopes will likely be necessary should groundwater conditions occur. It is recommended that long term fill slopes be no steeper than 3:1 (horizontal to vertical).

Erosion Control

Erosion generally refers to lowering the ground surface over a wide area. The soils on-site are mildly to moderately susceptible to wind and water erosion. Temporary problems may arise due to minor wind erosion and dust during and immediately after construction. Watering of the cut areas or the use of chemical palliatives may be needed to control dust. However, once construction has been completed and vegetation reestablished, the potential for wind erosion and dust will be considerably reduced.

Loose soils are the most susceptible to water erosion. The residually weathered sands on site were encountered at medium densities and overlaid medium hard to very hard sandstone bedrock which is increasingly less susceptible to water erosion.

Cut and fill areas may be subjected to sheetwash (surface) erosion. Unchecked erosion could eventually lead to concentrated flows of water. Generally, the most effective means to control erosion is to re-vegetate the cut and fill slopes with native vegetation.

Guideline Site Grading Specifications are included in the Appendix B.

9.0 BEARING OF GEOLOGIC CONDITIONS UPON PROPOSED DEVELOPMENT

Geologic hazards (as described in Section 8 of this report) were not found to be present at this site. Geologic constraints (also as described in section 8 of this report) such as: expansive soils and bedrock, compressible soils, potentially shallow groundwater, faults/seismicity, floodplain/floodways, and radon were found on the site. Where avoidance is not readily achievable, it is our opinion that the existing geologic and engineering conditions can be satisfactorily mitigated through proper engineering, design, and construction practices.

10.0 BURIED UTILITIES

Based upon the conditions encountered in the test borings, we anticipate that the soils encountered in individual utility trench excavations will consist mostly of native or moisture conditioned and recompacted clayey sand, silty to clayey sand, sandstone, silty sand, sandy clay and claystone. It is anticipated the sandy clay will be encountered at medium stiff to very stiff densities, the claystone at medium hard to very hard relative densities, the sandstone at hard to very hard relative densities, and the clayey sand soils at loose to very dense densities. Bedrock conditions are anticipated within the utility trenches.

We believe the sandy clay and claystone will classify as Type A material and the clayey sand, silty sand, silty to clayey sand, and sandstone will classify as Type C materials as defined by OSHA in 29 CFR Part 1926. OSHA requires that temporary excavations made in Type A materials be laid back at ratios no steeper than 3/4:1 (horizontal to vertical) and temporary excavations made in Type C materials be laid back at ratios no steeper than 1 1/2:1 (horizontal to vertical), unless the excavation is shored and braced. Excavations deeper than 20 feet, or when water is present, should always be braced or the slope designed by a professional engineer.

11.0 PRELIMINARY PAVEMENTS

The proposed roadways within this development will require a new pavement design prepared in accordance with the El Paso County regulations. The interior roadways, as indicated by the *Conceptual Layout* map prepared by Matrix Design Group are to be classified as Residential Collector with 60’ R.O.W, and Non-Residential Collector with an 80’ R.O.W.

The actual pavement section design for individual streets will be completed following overlot grading and rough cutting of the street subgrade.

The developer of the proposed site, Landhuis Company, has generally preferred to construct the roadways with a composite roadway section consisting of Hot Mix Asphalt over Cement-Treated Subgrade (CTS). For purposes of this report, we anticipate the subgrade soils will primarily have American Association of State Highway and Transportation Officials (AASHTO) Soil Classifications of A-2-4, A-2-6, A-4, A-6, A-7-6, and A-2-7, with indices ranging between 0 and 51, with estimated design subgrade "CBR-values" on the order of approximately 5 to 40.

The ECM 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 are expected to encounter low to very high expansive potential. Therefore, special mitigation measures may be necessary for subgrade preparation.

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

12.0 ANTICIPATED FOUNDATION SYSTEMS

Based on the information presented previously, conventional shallow spread-footing foundation systems are anticipated to be suitable for the proposed residential structures. It is our understanding a combination of crawlspace and basement excavations is proposed for the lots. Typical foundation cuts are anticipated to be approximately 3 to 4 feet below the final ground surface for crawlspace and garage foundations and 6 to 8 feet below the final ground surface for basement foundations, not including subexcavation where performed.

Expansive soils and/or bedrock are anticipated to be encountered in a majority of the excavations at foundation and floor slab bearing levels. Removal and replacement with structural fill is anticipated. This can be accomplished through "mass" subexcavation and replacement with moisture-conditioned expansive soils/bedrock during land development operations, lot-specific overexcavation and replacement with structural fill during construction, or a combination of the two. However, it should be noted that the use of subexcavated and moisture-conditioned expansive soils as fill below foundations may result in a condition that is not suitable for all types of shallow foundations.

If loose sands are encountered, they may require additional compaction to achieve the allowable bearing pressure as indicated in a site specific subsurface soil investigation. In some cases, removal and recompaction may be required for loose soils.

It must be understood that the subexcavation and replacement process does not guarantee that the swell potential will be reduced to acceptable levels. It is possible that the expansive material will retain swell potential in excess of the allowable value presented herein, even after processing and moisture-conditioning. In such a case, the material will need to be removed, reconditioned, and replaced until the swell potential is reduced to the stated value.

If (at the time of the lot-specific subsurface soil investigation and/or the open excavation observation) the soil is found to possess swell potential in excess of acceptable levels for the foundation system and design parameters proposed for construction at that time, overexcavation and replacement of some or all of the previously placed fill material may be required.

It is also possible that material that was properly conditioned, placed, and compacted during the subexcavation process will require removal (overexcavation) and replacement at the time of construction. The swell potential of the moisture-conditioned structural fill is dependent on many factors, including (but not limited to) density/degree of compaction, moisture content (particularly changes that occur in the moisture content from the time of placement to the time of actual foundation construction), etc. Additionally, various construction processes which can adversely affect the performance of moisture-conditioned structural fill are completed at times before and after our observations, as well as between the time of land development and when the lot-specific foundation is constructed.

While the subexcavation and replacement process is generally considered suitable for use with shallow foundation types, it may result in design parameters that are not consistent with the future builder(s)' pre-existing foundation designs. In such a case, the builder would either need to obtain a foundation designed for parameters consistent with the subsurface soil conditions present at that time, or perform additional mitigation (in most cases, this consists of overexcavation and replacement with material suitable to provide the design parameters utilized in that pre-existing foundation design).

The final foundation design parameters are to be determined based on lot-specific subsurface soil investigations performed at the time of construction. However, for a structure supported atop moisture-conditioned structural fill, the maximum allowable bearing pressures are anticipated to be in the range of 2,000 to 3,000 psf with minimum dead loads in the range of 800 to 1,500 psf. For a structure supported atop granular, non-expansive structural fill, the maximum allowable bearing pressures are anticipated to range from 2,000 to 2,400 psf with no minimum dead load requirement.

The foundation designs should be prepared by a qualified Colorado Registered Professional Engineer using the recommendations presented in this report. This foundation system should be designed to span a minimum of 10 feet under the design loads. The bottoms of exterior foundations should be at least 30 inches below finished grade for frost protection.

12.1 Foundation Drains

A subsurface perimeter drain is recommended around portions of the structures which will have habitable or storage space located below the finished ground surface. This includes crawlspace areas but not the walkout trench, if applicable.

Shallow groundwater conditions were not encountered in the test boring performed for this study. Depending on the conditions encountered during the site-specific subsurface soil investigations and the conditions observed at the time of the open excavation observations, additional subsurface drainage systems may be recommended.

It must be understood that the drain systems are designed to intercept some types of subsurface moisture and not others. Therefore, the drains could operate properly and not mitigate all moisture problems relating to foundation performance or moisture intrusion into the basement area.

13.0 SUBEXCAVATION AND REPLACEMENT

The proposed lots within Rolling Meadows contain expansive soils and bedrock at depths that are anticipated to effect the performance of foundations, floor slabs, and roadways. It is our understanding that subexcavation and replacement of moisture conditioned and recompacted on-site material is the preferred alternative to reduce heave risk and enhance the performance of the foundations, roadways and flatwork. This type of subexcavation and replacement is commonly utilized throughout this region and is generally considered an acceptable alternative to the typical lot-by-lot overexcavation.

13.1 Subexcavation

Where subexcavation is to be performed, vegetation, organic and deleterious material shall be cleared and disposed of in accordance with applicable requirements prior to performing excavation and/or filling operations. Subexcavation depths are anticipated to range between 6 and 10 feet below the bottom of foundations, floor slabs, and roadways, and at least those same distances (laterally) beyond the proposed "buildable" area on each lot. Before the placement of moisture-conditioned fill, the underlying subgrade shall be scarified, moisture conditioned to within 2% of the optimum moisture content and compacted to the degree specified for the overlying fill material.

13.2 Moisture-Conditioned Structural Fill

Subexcavation and replacement with moisture-conditioned (on-site) structural fill is commonly utilized throughout the region. This approach may be combined with the use of an intermittent (voided) spread-footing foundation system or with a post-tensioned slab-on-grade foundation system.

Areas to receive moisture-conditioned expansive soils used as structural fill should have topsoil, organic material, or debris removed. After subexcavation to the recommended depth below the bottom of all foundation components, the upper 6 inches of exposed soil should be scarified and moisture-conditioned to facilitate compaction (usually within 2 percent of the optimum moisture content) and compacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D-698) or to a minimum of 92 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D-1557) prior to placing structural fill.

Moisture-conditioned structural fill placed on slopes should be benched into the slope. Maximum bench heights should not exceed 4 feet, and bench widths should be wide enough to accommodate compaction equipment.

Replacement structural fill shall consist of a moisture-conditioned, on-site cohesive fill material. The fill material shall be moisture conditioned and replaced as follows:

- Fill shall be free of deleterious material and shall not contain rocks or cobbles greater than 6 inches in diameter.

- Claystone fill shall be thoroughly "pulverized" and shall not contain claystone chunks greater than 1 1/2 inches in diameter if being processed and/or placed by a loader, or not greater than 3 inches in diameter if being processed/placed as part of "mass" fill (scrapers and disking) operations.

- When claystone is to be incorporated using a loader, the fill materials shall be processed in a stockpile **(processing these materials in the excavations will not be permitted)**. These stockpiled fill materials shall be moisture-conditioned to a minimum of 1 percent to 4 percent above optimum moisture content (as determined by the Standard Proctor test, ASTM D-698), with an average of not less than 1 1/2 percent above optimum moisture content. These materials, once moisture conditioned and thoroughly mixed, should rest in the stockpile a minimum of 24 hours to ensure proper distribution of the moisture through the material. After resting, the materials should be re-wet and re-mixed to replace the surficial moisture lost to evaporation during the resting period.

- Fill materials not containing claystone and/or fill materials being processed/placed as part of "mass" fill (scrapers and disking) operations do not require processing in a stockpile, but shall be moisture-conditioned to a minimum of 1 percent to 4 percent above optimum moisture content (as determined by the Standard Proctor test, ASTM D-698), with an average of not less than 1 1/2 percent above optimum moisture content.

- The moisture-conditioned materials should be placed in maximum 6" compacted lifts. These materials should be compacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D-698). Material not meeting the above requirements shall be reprocessed.

Material not meeting the above requirements shall be reprocessed.

Materials used for moisture-conditioned structural fill should be approved by RMG prior to use. Moisture-conditioned structural fill should not be placed on frozen subgrade or allowed to freeze during moisture-conditioning and placement.

To verify the condition of the compacted soils, density tests should be performed during placement. The first density tests should be conducted when 24 inches of fill have been placed.

The existing soils will require the addition of water to achieve the required moisture content. The fill soils should be thoroughly mixed or disked to provide uniform moisture content through the fill. It should be noted that clay and claystone materials compacted at the above moisture contents are likely to result in wet, slick conditions. We recommend that the excavation contractor retained to perform this work have significant experience processing subexcavated and moisture-conditioned soils.

Frequent moisture content and density tests shall be performed in the field to verify conformance with the above specifications. Furthermore, representative samples of the moisture-conditioned fill shall be obtained by personnel of RMG on a daily basis for follow-up swell testing to demonstrate that the swell potential has been reduced to not more than 1 percent swell when saturated under a 1,000 psf surcharge pressure. Areas where the follow-up swell tests indicate swells higher than that value shall have the fill material removed, reprocessed, recompacted, and retested.

RMG should be contacted a minimum of 3 days prior to initiation of subexcavation and moisture conditioning processes in order to schedule appropriate field services. Fill shall not be placed on frozen subgrade or allowed to freeze during processing. The time of the year when night temperatures are above freezing are the most optimal period for a subexcavation operation.

Following completion of the subexcavation and moisture conditioning process, it is imperative that the "as-compacted" moisture content be maintained prior to construction and establishment of landscape irrigation. This may require reprocessing of materials and addition of supplemental water to prevent remobilization of swell potential within the fill.

13.3 Granular Structural Fill

Areas to receive granular (non-expansive) structural fill should have topsoil, organic material, or debris removed. The upper 6 inches of the exposed surface soils should be scarified and moisture conditioned to facilitate compaction (usually within 2 percent of the optimum moisture content) and compacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D-698) or to a minimum of 92 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D-1557) prior to placing structural fill.

Structural fill placed on slopes should be benched into the slope. Maximum bench heights should not exceed 4 feet, and bench widths should be wide enough to accommodate compaction equipment.

Structural fill shall consist of granular, non-expansive material. It should be placed in loose lifts not exceeding 8 to 12 inches, moisture conditioned to facilitate compaction (usually within 2 percent of the optimum moisture content) and compacted to a minimum of 92 percent of the maximum dry density as determined by the Modified Proctor test, ASTM D-1557. The materials should be compacted by mechanical means.

Materials used for structural fill should be approved by RMG prior to use. Structural fill should not be placed on frozen subgrade or allowed to freeze during moisture conditioning and placement.

14.0 DETENTION STORAGE CRITERIA

This section has been prepared in accordance with the requirements outlined in the El Paso County Land Development Code (LDC), the Engineering Criteria Manual (ECM) Section 2.2.6 and Appendix C.3.2.B, and the El Paso County (EPC) Drainage Criteria Manual, Volume 1 Section 11.3.3.

14.1 Soil and Rock Design Parameters

It is unknown at this time if detention ponds, retention ponds or a combination of both are proposed for the Rolling Meadows development. A site grading plan with retention/retention pond specifications has not been provided to RMG by Landhuis Company.

RMG has performed laboratory tests of soil from across the proposed development. Based upon field and laboratory testing, the following soil and rock parameters are typical for the soils likely to be encountered, and are recommended for use in detention/retention pond embankment design.

Soil Description	Unit Weight (lb/ft^3)	Friction Angle (degree)	Active Earth Pressure, Ka	Passive Earth Pressure, Kp	At Rest Earth Pressure, Ko
Clay to Sandy Clay	115	17	0.548	1.826	0.708
Claystone	125	17	0.548	1.826	0.708
Silty to Clayey Sand	120	28	0.361	2.770	0.531
Sandstone	130	30	0.333	3.000	0.500

14.2 Detention Pond Considerations

It is uncertain if above-ground embankment construction is anticipated. All pond side slopes are to be constructed with a maximum 3:1 (horizontal:vertical) slope. Side slopes should be constructed in accordance with applicable sections of the El Paso County Engineering Criteria Manual, the El Paso County Drainage Criteria Manual, and the El Paso County Land Development Code.

15.0 ADDITIONAL STUDIES

The findings, conclusions and recommendations presented in this report were provided to evaluate the suitability of the site for future development. Unless indicated otherwise, the test borings, laboratory test results, conclusions and recommendations presented in this report are not intended for use for design and construction. **We recommend that a *lot-specific* subsurface soil investigation be performed for the proposed structures.** The extent of any fill soils encountered during the lot-specific investigation(s) should be evaluated for suitability to support the proposed structures prior to construction.

Additionally, the groundwater conditions encountered in the lot-specific investigation should be evaluated to determine the feasibility of basement construction on that lot.

The lot-specific subsurface soil investigations should consider the proposed structure type, anticipated foundation loading conditions, location within the property, and local construction methods. Recommendations resulting from the investigations should be used for design and confirmed by on-site observation and testing during development and construction.

16.0 CONCLUSIONS

Based upon our evaluation of the geologic conditions, it is our opinion that the proposed development is feasible. The geologic conditions identified (expansive soils and bedrock, compressible soils, potentially shallow groundwater, faults/seismicity, floodplain/floodways, and radon) are not considered unusual for the Front Range region of Colorado. Mitigation of geologic conditions is most effectively accomplished by avoidance. However, where avoidance is not a practical or acceptable alternative, geologic conditions should be mitigated by implementing appropriate planning, engineering, and local construction practices.

In addition to the previously identified mitigation alternatives, surface and subsurface drainage systems should be implemented. Exterior, perimeter foundation drains should be installed around below-grade habitable or storage spaces. Surface water should be efficiently removed from the building area to prevent ponding and infiltration into the subsurface soil.

The foundation systems for the proposed single-family structures should be designed and constructed based upon recommendations developed in a site-specific subsurface soil investigation.

Foundation selection and design should consider the potential for subsurface expansive soil-related movements. Mitigation techniques commonly used in the El Paso County area include overexcavation and replacement with structural fill, subexcavation and replacement with on-site moisture-conditioned soils, and/or the installation of deep foundation systems all of which are considered common construction practices for this area.

The foundation and floor slabs of each structure should be designed using the recommendations provided in the lot-specific subsurface soil investigation performed for each lot. In addition, appropriate surface drainage should be established during construction and maintained by the homeowner.

Irrigation devices should not be placed within 5 feet of the foundation. Irrigation should be limited to the amount sufficient to maintain vegetation. Application of more water will increase the likelihood of slab and foundation movements.

Additionally, the ground surface should be sloped from the building with a minimum gradient of 10 percent for the first 10 feet. This is equivalent to 12 inches of fall across this 10-foot zone. 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 5 feet from the foundation and sloped parallel with the wall with a minimum slope of 2 percent to intercept the surface water and transport it around and away from the structure. Roof drains should extend across backfill zones and landscaped areas to a region that is graded to direct flow away from the structure. Owners should maintain the surface grading and drainage recommended in this report to help prevent water from being directed toward and/or ponding near the foundations.

Landscaping should be selected to reduce irrigation requirements. Plants used close to foundation walls should be limited to those with low moisture requirements and irrigated grass should not be located within 5 feet of the foundation. To help control weed growth, geotextiles should be used below landscaped areas adjacent to foundations. Impervious plastic membranes are not recommended.

The recommendations listed in this report are intended to address normal surface drainage conditions, assuming the presence of groundcover (established vegetation, paved surfaces, and/or structures) throughout the regions upslope from this structure. However, groundcover may not be present due to a variety of factors (ongoing construction/development, wildfires, etc.). During periods when groundcover is not present in the "upslope" regions, higher than normal surface drainage conditions may occur, resulting in perched water tables, excess runoff, flash floods, etc. In these cases, the surface drainage recommendations presented herein (even if properly maintained) may not mitigate all groundwater problems or moisture intrusion into the structure. We recommend that the site plan be prepared with consideration of increased runoff during periods when groundcover is not present on the upslope areas.

We believe the sandy clay and claystone will classify as Type A material and the clayey sand, silty sand, silty to clayey sand, and sandstone will classify as Type C materials as defined by OSHA in 29 CFR Part 1926. OSHA requires that temporary excavations made in Type A materials be laid back at ratios no steeper than 3/4:1 (horizontal to vertical) and temporary excavations made in Type C materials be laid back at ratios no steeper than 1 1/2:1 (horizontal to vertical), unless the excavation is shored and braced. Flatter slopes will likely be necessary should groundwater conditions occur.

Long term cut slopes in the upper soil should be limited to no steeper than 3:1 (horizontal to vertical). Flatter slopes will likely be necessary should groundwater conditions occur. It is recommended that long term fill slopes be no steeper than 3:1 (horizontal to vertical).

Revisions and modifications to the conclusions and recommendations presented in this report may be issued subsequently by RMG based upon additional observations made during grading and construction which may indicate conditions that require re-evaluation of some of the criteria presented in this report.

It is important for the Owner(s) of these properties read and understand this report, as well as the previous reports referenced above, and too carefully familiarize themselves with the geologic constraints associated with construction in this area. This report only addresses the geologic constraints contained within the boundaries of the site referenced above.

17.0 CLOSING

This report is for the exclusive purpose of providing geologic hazards information and preliminary geotechnical engineering recommendations. The scope of services did not include, either specifically or by implication, evaluation of wild fire hazards, 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 owner is concerned about the potential for such contamination or conditions, other studies should be undertaken.

This report has been prepared for **Landhuis Company** in accordance with generally accepted geotechnical engineering and engineering geology practices. The conclusions and recommendations in this report are based in part upon data obtained from review of available topographic and geologic maps, review of available reports of previous studies conducted in the site vicinity, a site reconnaissance, and research of available published information, soil test borings, soil laboratory testing, and engineering analyses. The nature and extent of variations may not become evident until construction activities begin. If variations then become evident, RMG should be retained to re-evaluate the recommendations of this report, if necessary.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers and engineering geologists 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.

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

FIGURES

NOT TO SCALE

Architecture
Structural
Geotechnical

RMG

Materials Testing
Forensics
Civil / Planning

Engineers / Architects

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SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

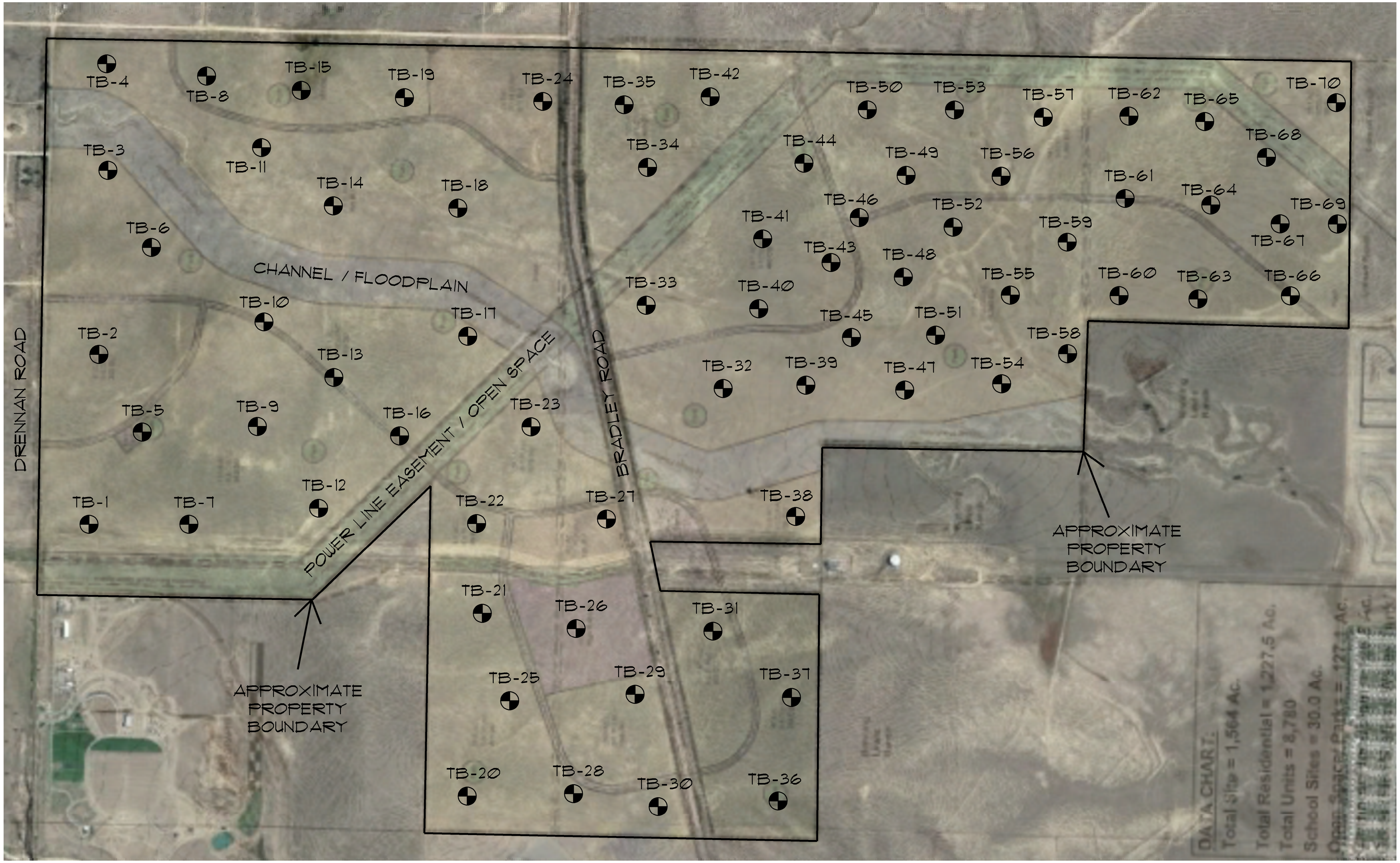
SITE VICINITY MAP

ROLLING MEADOWS
BRADLEY ROAD
EL PASO COUNTY, COLORADO
LANDHUIS COMPANY

JOB No. 187746

FIG No. 1

DATE 8-5-2022



NOT TO SCALE

● DENOTES APPROXIMATE LOCATION OF TEST BORINGS

JOB No. 187746

Architecture
Structural
Geotechnical

Materials Testing
Forensics
Civil / Planning

Engineers / Architects

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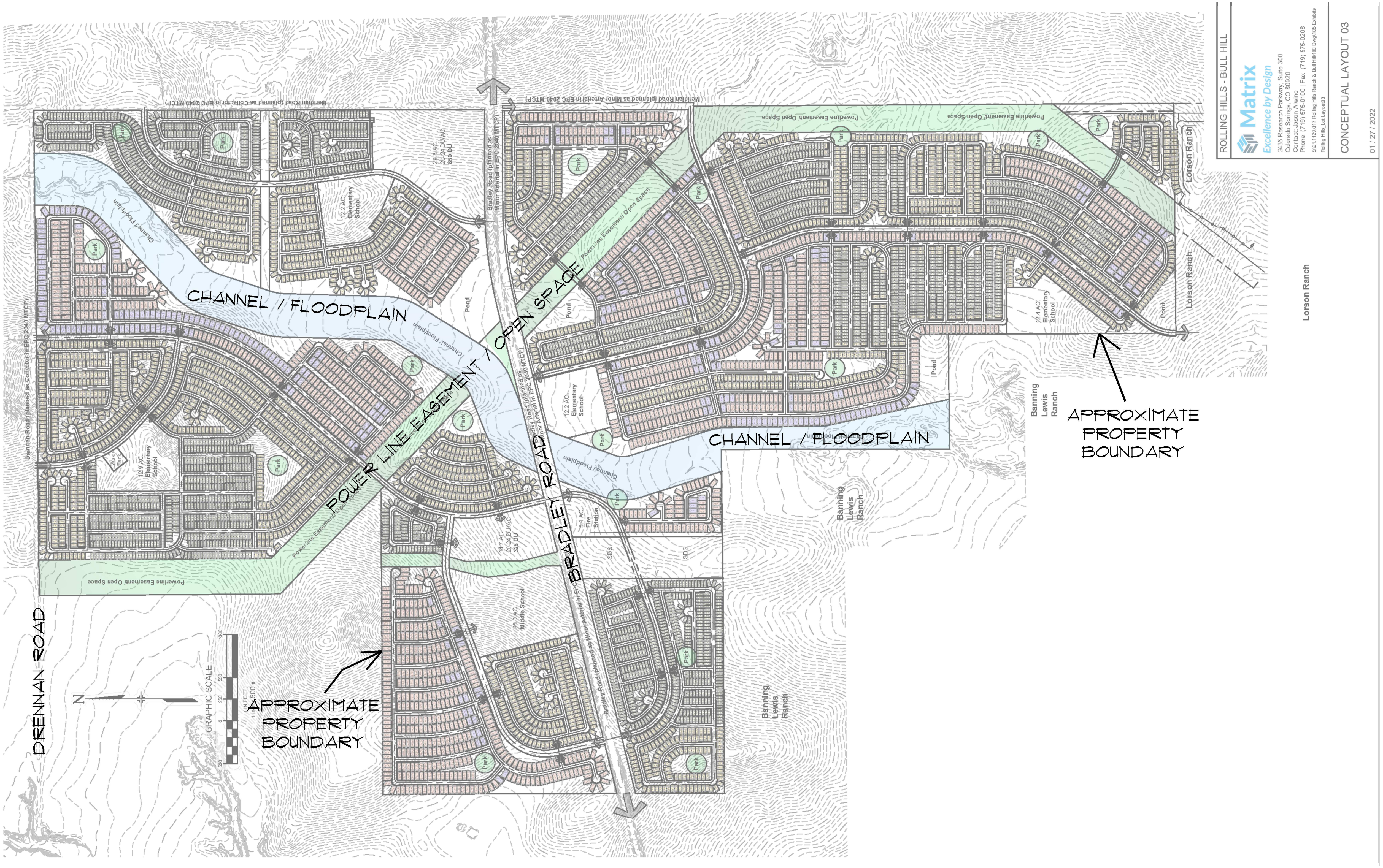
ROLLING MEADOWS
BRADLEY ROAD
EL PASO COUNTY, COLORADO
LANDUIS COMPANY

ENGINEER:	TPM
DRAWN BY:	KCR
CHECKED BY:	TPM
ISSUED:	8-5-2022

TEST BORING LOCATION PLAN

SHEET No.
FIG-2



ROLLING HILLS - BULL HILL

Matrix
Excellence by Design
2435 Research Parkway, Suite 300
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Contact: Jason Alwine
Phone (719) 575-0100 | Fax (719) 575-0208
S:\21.1129.017 Rolling Hills Ranch & Bull Hill\100 Dwg\105 Exhibits
Rolling Hills_Lot Layout03

CONCEPTUAL LAYOUT 03

01 / 27 / 2022

NOT TO SCALE

JOB No. 187746

Architecture
Structural
Geotechnical

Materials Testing
Forensics
Civil / Planning

Engineers / Architects
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ROLLING MEADOWS
BRADLEY ROAD
EL PASO COUNTY, COLORADO
LANDUIS COMPANY

ENGINEER: TPM
DRAWN BY: KCR
CHECKED BY: TPM
ISSUED: 8-5-2022

PROPOSED LOT LAYOUT

SHEET No.
FIG-3

SOILS DESCRIPTION

▧ CLAYEY SAND

▤ CLAYSTONE

░ SANDSTONE

▨ SANDY CLAY

▥ SILTY SAND

▨ SILTY TO CLAYEY SAND

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

SYMBOLS AND NOTES

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

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

▽ FREE WATER TABLE

⊠ DEPTH AT WHICH BORING CAVED

⧗ BULK DISTURBED BULK SAMPLE

AUG AUGER "CUTTINGS"

4.5 WATER CONTENT (%)

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EXPLANATION OF
TEST BORING LOGS

JOB No. 187746

FIGURE No. 4

DATE Aug/05/2022

TEST BORING: **1**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

	DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
SAND, CLAYEY, light brown to brown, medium dense, moist			
	5	20	5.3
	10	20	6.8
CLAY, SANDY, brown, stiff to very stiff, moist			
	15	20	8.4
	20	16	11.5
	25	23	12.4
SAND, CLAYEY, tan, medium dense, moist	30	20	11.1

TEST BORING: **2**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

	DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, tan to brown, very stiff, moist			
	5	30	6.5
SANDSTONE, CLAYEY, tan to brown and olive, very hard, moist		50/5"	13.6
	10		
CLAYSTONE, SANDY, reddish brown to gray, hard to very hard, moist		50/8"	13.1
	15		
		50/3"	9.8
	20		

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TEST BORING LOG

JOB No. 187746

FIGURE No. 5

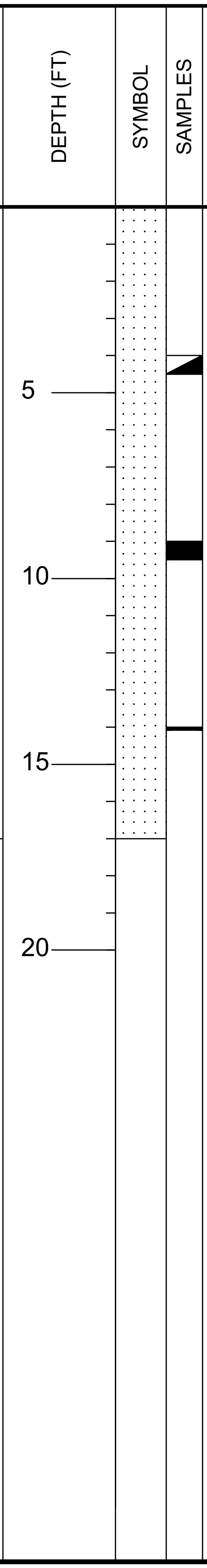
DATE Aug/05/2022

TEST BORING: **3**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

SANDSTONE, CLAYEY, with interbedded claystone, tan to gray, hard to very hard, moist

AUGER REFUSAL AT 17 FEET DUE TO VERY HARD BEDROCK



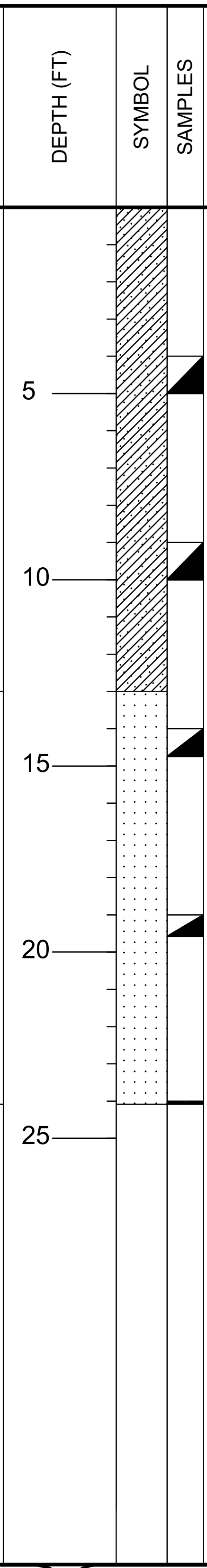
BLOWS PER FT.	WATER CONTENT %
50/6"	3.4
50/6"	10.9
10/0"	6.8

TEST BORING: **4**

DATE DRILLED:
2/11/22
NO GROUNDWATER ON
2/11/22

CLAY, SANDY, brown, stiff, moist

SANDSTONE, CLAYEY, with interbedded claystone seams, brown to olive, medium hard to very hard, moist



BLOWS PER FT.	WATER CONTENT %
15	7.7
15	9.3
50/9"	12.7
50/7"	15.4
10/0"	10.2

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TEST BORING LOG

JOB No. 187746

FIGURE No. 6

DATE Aug/05/2022

TEST BORING: **5**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, CLAYEY, light brown, loose to medium dense, moist		▨			
	5	▨	■	17	7.4
	10	▨	◢	15	7.9
	15	▨	◢	16	8.6
	20	▨	◢	17	6.1

TEST BORING: **6**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, CLAYEY, brown, loose to medium dense, moist		▨			
	5	▨	■	13	5.7
	10	▨	◢	15	6.1
	15	▨	◢	13	8.4
	20	▨	◢	13	9.5

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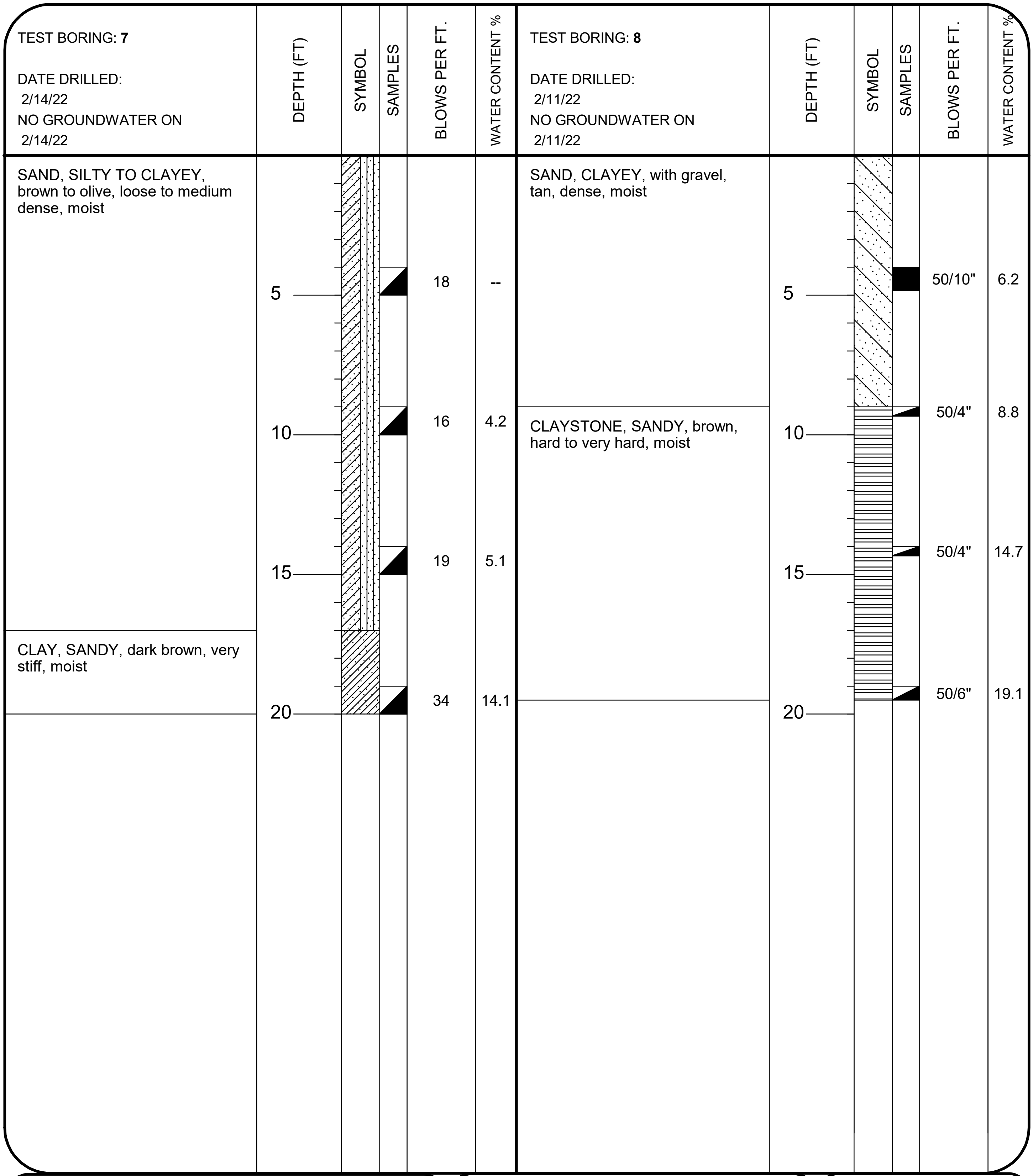
TEST BORING LOG

JOB No. 187746

FIGURE No. 7

DATE Aug/05/2022



TEST BORING: **7**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

DEPTH (FT)		BLOWS PER FT.	WATER CONTENT %
	SAND, SILTY TO CLAYEY, brown to olive, loose to medium dense, moist		
5		18	--
10		16	4.2
15		19	5.1
	CLAY, SANDY, dark brown, very stiff, moist		
20		34	14.1

TEST BORING: **8**

DATE DRILLED:
2/11/22
NO GROUNDWATER ON
2/11/22

DEPTH (FT)		BLOWS PER FT.	WATER CONTENT %
	SAND, CLAYEY, with gravel, tan, dense, moist		
5		50/10"	6.2
		50/4"	8.8
10	CLAYSTONE, SANDY, brown, hard to very hard, moist		
15		50/4"	14.7
20		50/6"	19.1

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TEST BORING LOG

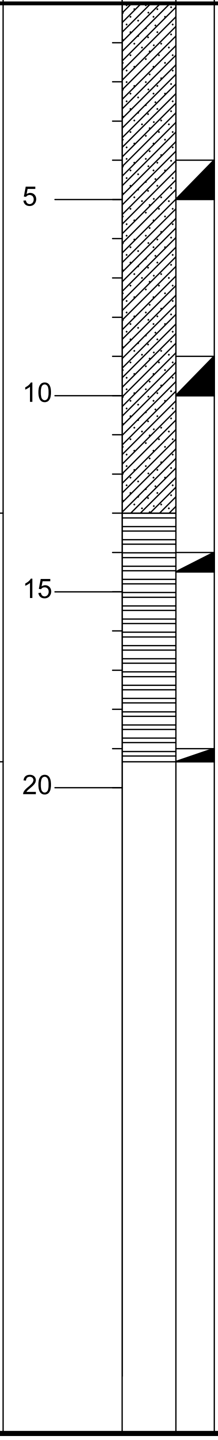
JOB No. 187746

FIGURE No. 8

DATE Aug/05/2022

TEST BORING: **9**

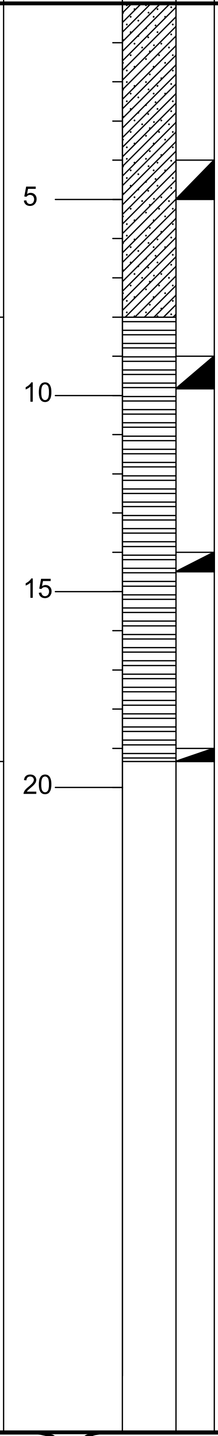
DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22



	DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, tan to brown, stiff, moist			
	5	16	6.2
	10	15	10.7
CLAYSTONE, SANDY, tan to brown and olive, hard to very hard, moist		50/6"	13.3
	15		
		50/4"	11.8
	20		

TEST BORING: **10**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22



	DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, tan to olive, very stiff, moist			
	5	25	7.7
CLAYSTONE, SANDY, tan to olive, medium hard to very hard, moist			
	10	50/10"	12.1
		50/6"	15.9
	15		
		50/4"	13.7
	20		

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TEST BORING LOG

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FIGURE No. 9

DATE Aug/05/2022

TEST BORING: **11** DATE DRILLED: 2/11/22 GROUNDWATER @ 17.0 ' 2/11/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown to dark brown, soft to stiff, moist to wet		▨			
	5	▨	◢	14	5.9
	10	▨	◢	8	11.0
	15	▨	◢	6	16.7
	▽	▨			
	20	▨	◢	4	29.0

TEST BORING: **12** DATE DRILLED: 2/9/22 NO GROUNDWATER ON 2/9/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAYSTONE, SANDY, brown, with rust staining, medium hard to very hard, moist		☰			
	5	☰	◢	50	12.2
	10	☰	◢	50/8"	12.7
	15	☰	◢	50/6"	12.7
	20	☰	◢	50/5"	11.6

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TEST BORING LOG

JOB No. 187746

FIGURE No. 10

DATE Aug/05/2022

TEST BORING: **13**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

	DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
SAND, CLAYEY, tan, moist			
CLAY, SANDY, light brown to brown, stiff to very stiff, moist	5	15	8.4
	10	16	9.5
	15	21	9.7
	20	21	10.2
	25	26	9.5
CLAYSTONE, SANDY, brown to olive, very hard, moist		50/4"	10.7
	30		

TEST BORING: **14**

DATE DRILLED:
2/11/22
NO GROUNDWATER ON
2/11/22

	DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, stiff, moist	5	17	5.3
SAND, CLAYEY, with gravel, brown, loose, moist	10	9	0.9
CLAY, SANDY, brown, moist			
SAND, CLAYEY, with gravel, tan, loose to medium dense, moist	15	13	2.9
	20	10	3.6

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TEST BORING LOG

JOB No. 187746

FIGURE No. 11

DATE Aug/05/2022

TEST BORING: **15** DATE DRILLED: 2/11/22 GROUNDWATER @ 14.0 ' 2/11/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, CLAYEY, with gravel, brown to dark brown, loose to medium dense, moist to wet					
	5			32	7.8
	10			18	10.2
	▽				
	15			9	24.8
	20			25	12.4

TEST BORING: **16** DATE DRILLED: 2/14/22 NO GROUNDWATER ON 2/14/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, light brown to brown, stiff to very stiff, moist					
	5			13	5.8
	10			20	8.7
CLAYSTONE, SANDY, brown to olive, firm to very hard, moist				34	10.8
	15				
				50/4"	11.8
	20				

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TEST BORING LOG

JOB No. 187746

FIGURE No. 12

DATE Aug/05/2022

TEST BORING: **17**

DATE DRILLED:
2/11/22
NO GROUNDWATER ON
2/11/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, light brown, moist		▨			
CLAYSTONE, SANDY, olive to gray, medium hard to very hard, moist		▤	▬	10/0"	11.3
	5	▤			
		▤	◣	50/9"	16.0
	10	▤			
		▤	◣	50/8"	17.1
	15	▤			
		▤	◣	50/7"	17.8
	20				

TEST BORING: **18**

DATE DRILLED:
2/11/22
NO GROUNDWATER ON
2/11/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, tan to dark brown and olive, stiff, moist		▨			
		▨	◣	14	8.7
	5	▨			
		▨	◣	14	14.6
	10	▨			
		▨	◣	17	7.4
	15	▨			
		▨	◣	12	14.0
	20				

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TEST BORING LOG

JOB No. 187746

FIGURE No. 13

DATE Aug/05/2022

TEST BORING: **19**

DATE DRILLED:
2/11/22
NO GROUNDWATER ON
2/11/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, stiff to very stiff, moist		▨			
	5	▨	◢	17	4.7
	10	▨	◢	15	7.9
	15	▨	◢	21	10.8
	20	▨	◢	17	8.5
	25	▨	◢	20	7.0
SAND, CLAYEY, tan to olive, moist		▨			
CLAY, SANDY, brown, very stiff, moist	30	▨	◢	25	12.3

TEST BORING: **20**

DATE DRILLED:
2/9/22
NO GROUNDWATER ON
2/9/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, light brown to tan, medium stiff to very stiff, moist		▨			
	5	▨	■	7	8.4
	10	▨	■	17	7.3
SAND, CLAYEY, brown, medium dense, moist		▨			
	15	▨	■	16	5.2
CLAY, SANDY, brown, very stiff, moist		▨			
	20	▨	◢	20	16.3

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TEST BORING LOG

JOB No. 187746

FIGURE No. 14

DATE Aug/05/2022

TEST BORING: **21** DATE DRILLED: 2/9/22 NO GROUNDWATER ON 2/9/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, CLAYEY, tan, moist		▧			
CLAY, SANDY, tan to olive, stiff to very stiff, moist	5	▨	■	22	11.1
	10	▨	■	18	9.3
	15	▨	■	16	6.3
	20	▨	■	15	8.9

TEST BORING: **22** DATE DRILLED: 2/9/22 NO GROUNDWATER ON 2/9/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, tan, with rust staining, stiff to very stiff, moist	5	▨	◢	18	4.8
	10	▨	◢	20	9.7
	15	▨	◢	28	14.5
CLAYSTONE, SANDY, light brown, weathered, moist	20	▤	◢	16	10.0

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TEST BORING LOG

JOB No. 187746

FIGURE No. 15

DATE Aug/05/2022

TEST BORING: **23** DATE DRILLED: 2/9/22 NO GROUNDWATER ON 2/9/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, tan, stiff to very stiff, moist		▨			
	5	▨	◢	12	7.8
	10	▨	◢	24	7.7
	15	▨	◢	34	8.1
	20	▨	◢	28	9.6

TEST BORING: **24** DATE DRILLED: 2/11/22 NO GROUNDWATER ON 2/11/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, stiff to very stiff, moist		▨			
	5	▨	◢	18	7.2
	10	▨	◢	25	8.5
	15	▨	◢	27	8.6
CLAYSTONE, SANDY, olive to gray, medium hard, moist		☰			
	20	☰	■	40	12.6

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TEST BORING LOG

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FIGURE No. 16

DATE Aug/05/2022

TEST BORING: **25**

DATE DRILLED:
2/9/22
NO GROUNDWATER ON
2/9/22

CLAY, SANDY, tan, stiff to very stiff, moist

CLAYSTONE, SANDY, tan, medium hard, moist

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5	▨	■	9	7.8
10	▨	■	10	9.6
15	▨	◢	20	7.7
20	▨	■	24	7.9
25	▨	■	20	7.0
30	☰	■	31	8.2

TEST BORING: **26**

DATE DRILLED:
2/9/22
NO GROUNDWATER ON
2/9/22

CLAY, SANDY, light brown, with rust staining, very stiff to hard, moist

CLAYSTONE, SANDY, brown, hard, moist

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5	▨	■	18	8.3
10	▨	◢	30	9.3
15	▨	■	38	9.0
20	☰	■	50/10"	9.1

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TEST BORING LOG

JOB No. 187746

FIGURE No. 17

DATE Aug/05/2022

TEST BORING: **27**

DATE DRILLED:
2/9/22
NO GROUNDWATER ON
2/9/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, very stiff, moist		▨			
	5	▨	◢	21	7.3
	10	▨	◢	31	14.0
	15	▨	◢	33	12.4
	20	▨	◢	27	8.9

TEST BORING: **28**

DATE DRILLED:
2/9/22
NO GROUNDWATER ON
2/9/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, tan, very stiff, moist		▨			
	5	▨	■	18	8.5
	10	▨	■	22	9.4
	15	▨	◢	32	9.8
CLAYSTONE, SANDY, tan to olive, hard, moist	20	☰	■	50	13.0

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TEST BORING LOG

JOB No. 187746

FIGURE No. 18

DATE Aug/05/2022

TEST BORING: **29**

DATE DRILLED:
2/9/22
NO GROUNDWATER ON
2/9/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAYSTONE, SANDY, brown, with rust staining, medium hard to hard, moist		▤			
	5	▤	◢	50	14.3
	10	▤	◢	50/11"	12.9
	15	▤	◢	50/10"	13.2
	20	▤	■	50/11"	11.3

TEST BORING: **30**

DATE DRILLED:
2/9/22
NO GROUNDWATER ON
2/9/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, light brown, stiff to very stiff, moist		▨			
	5	▨	■	13	7.6
	10	▨	■	20	8.0
	15	▨	■	21	6.9
CLAYSTONE, SANDY, brown to olive, firm, moist		▤			
	20	▤	◢	37	14.5

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TEST BORING LOG

JOB No. 187746

FIGURE No. 19

DATE Aug/05/2022

TEST BORING: **31** DATE DRILLED: 3/14/22 NO GROUNDWATER ON 3/14/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAYSTONE, SANDY, brown and olive to gray, firm to hard, moist		▤			
	5	▤	◢	40	10.2
	10	▤	◢	40	11.6
	15	▤	◢	50/8"	12.5
	20	▤	■	50/9"	14.4

TEST BORING: **32** DATE DRILLED: 2/14/22 NO GROUNDWATER ON 2/14/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, very stiff, moist		▨			
	5	▨	◢	19	13.4
SAND, SILTY, with gravel, tan to brown, loose, moist		░			
	10	░	■	9	4.7
	15	░	■	9	7.0
	20	░	■	6	6.8

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TEST BORING LOG

JOB No. 187746

FIGURE No. 20

DATE Aug/05/2022

TEST BORING: **33**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, with gravel, tan to brown, medium dense, moist	5	▨	■	11	5.6
	10	▨	■	10	3.4
	15	▨	■	11	1.5
	20	▨	■	14	1.8

TEST BORING: **34**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, brown, medium dense, moist	5	▨	■	12	5.5
CLAY, SANDY, brown, stiff to very stiff, moist	10	▨	■	9	14.6
	15	▨	◢	10	16.0
	20	▨	■	21	13.5

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TEST BORING LOG

JOB No. 187746

FIGURE No. 21

DATE Aug/05/2022

TEST BORING: **35**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, medium stiff, moist	5	▨	■	8	9.7
CLAYSTONE, SANDY, brown, medium hard to hard, moist	10	☰	■	40	12.5
	15	☰	◢	50/6"	11.2
SANDSTONE, SILTY, brown, hard, moist	20	⁘	◢	50/6"	10.8
CLAYSTONE, SANDY, brown, hard, moist	25	☰			
	30	☰	■	50/10"	19.2

TEST BORING: **36**

DATE DRILLED:
3/14/22
NO GROUNDWATER ON
3/14/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, light brown, stiff to very stiff, moist	5	▨	◢	15	6.0
	10	▨	■	21	6.3
	15	▨	◢	20	6.8
CLAYSTONE, SANDY, olive to gray, hard, moist	20	☰	■	50/8"	10.1

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TEST BORING LOG

JOB No. 187746

FIGURE No. 22

DATE Aug/05/2022

TEST BORING: **37** DATE DRILLED: 3/14/22 NO GROUNDWATER ON 3/14/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, light brown to brown and olive, stiff to very stiff, moist		▨			
	5		◢	15	7.3
	10		◢	18	6.0
	15		◢	25	10.2
	20		■	20	10.9
	25		■	25	13.1
SAND, CLAYEY, brown, dense, moist	30		■	35	13.7

TEST BORING: **38** DATE DRILLED: 2/14/22 NO GROUNDWATER ON 2/14/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, moist					
CLAY, SANDY, brown, stiff to hard, moist	5	▨	■	38	11.0
	10		◢	35	20.4
	15		◢	19	17.6
SAND, CLAYEY, brown, medium dense, moist	20		■	13	16.6
CLAYSTONE, SANDY, brown, medium hard, moist	25	▤			
	30		◢	50/11"	17.5

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JOB No. 187746

FIGURE No. 23

DATE Aug/05/2022

TEST BORING: **39** DATE DRILLED: 2/14/22 NO GROUNDWATER ON 2/14/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, with gravel, light brown to tan, loose to medium dense, moist	5		■	12	10.6
	10		■	10	3.3
	15		■	9	5.2
	20		■	19	2.6

TEST BORING: **40** DATE DRILLED: 2/14/22 NO GROUNDWATER ON 2/14/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, with gravel, tan to brown, medium dense, moist	5		■	12	6.3
CLAY, SANDY, brown, very stiff, moist	10		■	16	20.0
SAND, SILTY, with gravel, brown, loose to medium dense, moist	15		■	6	4.1
	20		■	19	2.6

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TEST BORING LOG

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FIGURE No. 24

DATE Aug/05/2022

TEST BORING: **41** DATE DRILLED: 2/14/22 NO GROUNDWATER ON 2/14/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, stiff to very stiff, moist		▨			
	5	▨	■	9	7.4
	10	▨	■	23	12.2
CLAYSTONE, SANDY, brown, medium hard to very hard, moist		▤			
	15	▤	◣	50/7"	12.8
AUGER REFUSAL AT 18 FEET DUE TO VERY HARD BEDROCK					
	20				

TEST BORING: **42** DATE DRILLED: 2/14/22 NO GROUNDWATER ON 2/14/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, very stiff, moist		▨			
	5	▨	◣	19	18.2
CLAYSTONE, SANDY, gray, medium hard to hard, moist		▤			
	10	▤	■	50/8"	13.0
	15	▤	◣	50/8"	14.5
	20	▤	■	50/8"	14.3

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FIGURE No. 25

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TEST BORING: **43**

DATE DRILLED:
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	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, light brown, moist					
CLAY, SANDY, light brown to dark brown, stiff to very stiff, moist	5		◢	39	12.9
	10		◢	16	10.2
	15		◢	17	15.5
CLAYSTONE, SANDY, brown, firm, moist	20		◢	48	18.6

TEST BORING: **44**

DATE DRILLED:
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NO GROUNDWATER ON
3/12/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, very stiff, moist	5		◢	33	12.6
	10		◢	41	13.2
CLAYSTONE, SANDY, brown, medium hard, moist	15		◢	50/9"	11.9
	20		◢	50/9"	12.6

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TEST BORING LOG

JOB No. 187746

FIGURE No. 26

DATE Aug/05/2022

TEST BORING: **45**

DATE DRILLED:
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NO GROUNDWATER ON
3/12/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist		░			
	5	░	◣	9	3.8
	10	░	◣	25	7.7
CLAYSTONE, SANDY, brown, medium hard to hard, moist		▤			
	15	▤	◣	50/9"	13.6
	20	▤	◣	50/6"	13.9

TEST BORING: **46**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, very stiff, moist		▨			
	5	▨	◣	21	8.9
CLAYSTONE, SANDY, brown, firm, moist		▤			
	10	▤	◣	41	9.2
	15	▤	◣	45	9.6
	20	▤	◣	46	9.3

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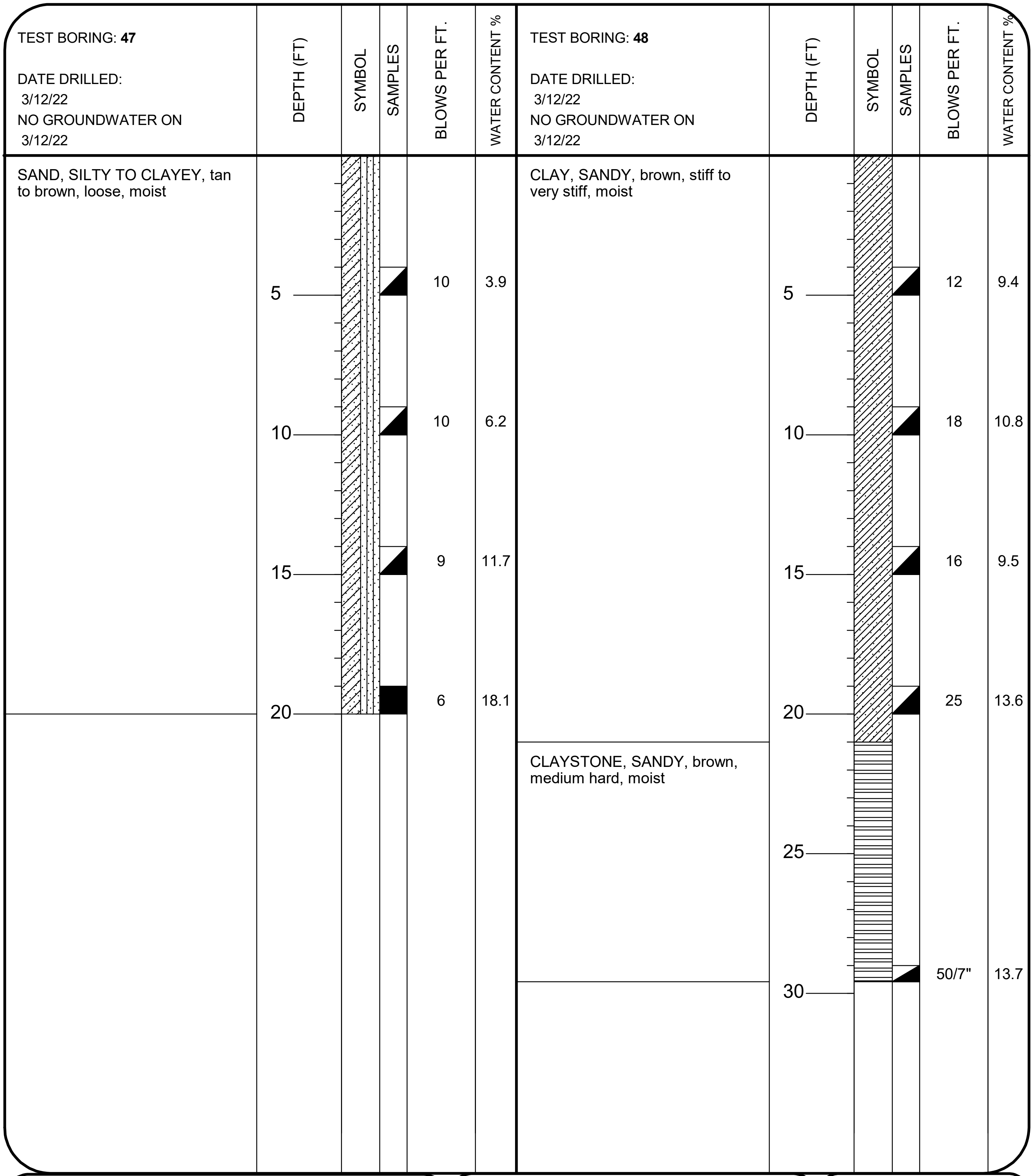
TEST BORING LOG

JOB No. 187746

FIGURE No. 27

DATE Aug/05/2022



TEST BORING: **47**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

SAND, SILTY TO CLAYEY, tan to brown, loose, moist

BLOWS PER FT.	WATER CONTENT %
10	3.9
10	6.2
9	11.7
6	18.1

TEST BORING: **48**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

CLAY, SANDY, brown, stiff to very stiff, moist

CLAYSTONE, SANDY, brown, medium hard, moist

BLOWS PER FT.	WATER CONTENT %
12	9.4
18	10.8
16	9.5
25	13.6
50/7"	13.7

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FIGURE No. 28

DATE Aug/05/2022

TEST BORING: **49** DATE DRILLED: 3/12/22 NO GROUNDWATER ON 3/12/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAYSTONE, SANDY, brown, firm to medium hard, moist	5			33	14.8
	10			50/10"	13.3
	15			50/7"	14.5
	20				16.0

TEST BORING: **50** DATE DRILLED: 3/12/22 NO GROUNDWATER ON 3/12/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, stiff to very stiff, moist	5			13	7.1
	10			21	10.3
CLAYSTONE, SANDY, brown, firm to medium hard, moist	15			45	11.0
	20			50/8"	12.6

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FIGURE No. 29

DATE Aug/05/2022

TEST BORING: **51**

DATE DRILLED:
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NO GROUNDWATER ON
3/12/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown to dark brown and olive, stiff, moist					
	5		◢	13	3.8
	10		◢	16	15.9
	15		◢	12	6.0
	20		■	7	18.9

TEST BORING: **52**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, with gravel , light brown to dark brown and olive to gray, stiff, moist					
	5		◢	18	6.2
SAND, CLAYEY, with gravel, brown, loose, moist					
	10		◢	14	2.9
CLAY, SANDY, brown, very stiff, moist					
	15		◢	20	10.0
	20		■	20	18.9

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TEST BORING LOG

JOB No. 187746

FIGURE No. 30

DATE Aug/05/2022

TEST BORING: **53**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown to dark brown, stiff to very stiff, moist		▨			
	5	▨	◩	15	6.2
	10	▨	◩	32	17.4
	15	▨	◩	14	8.2
SAND, CLAYEY, brown, loose to medium dense, moist	20	▧	■	11	5.6
	25	▧	■	7	13.0
CLAY, SANDY, brown to olive, stiff, moist	30	▨	■	15	18.4

TEST BORING: **54**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, stiff, moist		▨			
	5	▨	◩	13	12.9
	10	▨	◩	14	11.1
	15	▨	◩	17	16.2
SAND, CLAYEY, light brown, loose, moist	20	▧	■	8	4.4

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TEST BORING LOG

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FIGURE No. 31

DATE Aug/05/2022

TEST BORING: **55**

DATE DRILLED:
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NO GROUNDWATER ON
3/12/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, CLAYEY, brown to dark brown, loose, moist	5	▨	◪	10	5.4
	10	▨	◪	13	7.5
	15	▨	◪	10	5.5
CLAY, SANDY, dark brown, stiff, moist	20	▨	■	14	15.4

TEST BORING: **56**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, CLAYEY, brown, loose, moist	5	▨	◪	8	5.3
	10	▨	◪	8	8.6
	15	▨	◪	8	9.1
	20	▨	■	5	12.6

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TEST BORING LOG

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FIGURE No. 32

DATE Aug/05/2022

TEST BORING: **57**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

CLAYSTONE, SANDY, olive to gray, medium hard to hard, moist

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5	▤	◣	50/6"	13.5
10	▤	◣	50/6"	13.7
15	▤	◣	50/7"	14.5
20	▤	■	50	13.4

TEST BORING: **58**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

SAND, SILTY TO CLAYEY, light brown to brown, medium dense, moist

CLAY, SANDY, olive, medium stiff to stiff, moist

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5	▨	◣	19	6.0
10	▨	◣	22	5.9
15	▨	◣	27	6.5
20	▨	■	10	9.4
25	▨	■	7	11.8
30	▨	■	9	19.7

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FIGURE No. 33

DATE Aug/05/2022

TEST BORING: **59** DATE DRILLED: 3/12/22 NO GROUNDWATER ON 3/12/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, moist		▨			
CLAYSTONE, SANDY, brown and olive to gray, firm to hard, moist	5	▤	◣	35	11.4
	10	▤	◣	50/7"	11.9
	15	▤	◣	50/6"	13.2
	20	▤	■	50/8"	12.5

TEST BORING: **60** DATE DRILLED: 3/12/22 NO GROUNDWATER ON 3/12/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown to olive, stiff, moist		▨			
	5	▨	◣	11	9.1
	10	▨	◣	13	13.8
	15	▨	◣	14	15.9
	20	▨	■	13	15.7

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TEST BORING LOG

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FIGURE No. 34

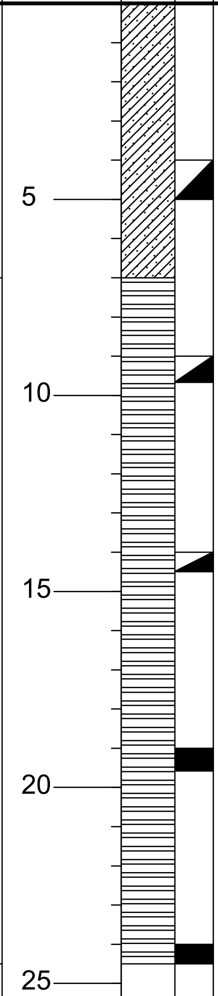
DATE Aug/05/2022

TEST BORING: **61**

DATE DRILLED:
3/8/22
NO GROUNDWATER ON
3/8/22

CLAY, SANDY, brown, very stiff, moist

CLAYSTONE, SANDY, brown to dark brown and olive, medium hard to very hard, moist



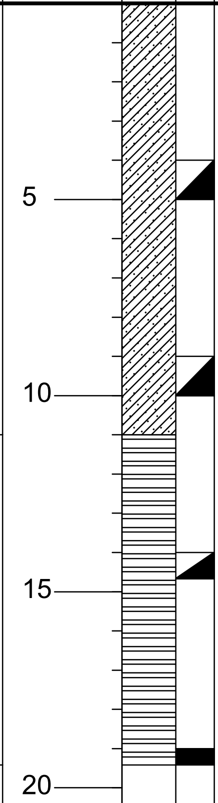
BLOWS PER FT.	WATER CONTENT %
29	8.4
50/8"	12.2
50/6"	12.6
50/7"	11.5
50/6"	20.6

TEST BORING: **62**

DATE DRILLED:
3/8/22
NO GROUNDWATER ON
3/8/22

CLAY, SANDY, brown to olive, very stiff, moist

CLAYSTONE, SANDY, brown to olive, medium hard to very hard, moist



BLOWS PER FT.	WATER CONTENT %
26	9.4
32	10.9
50/8"	11.9
50/5"	11.7

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FIGURE No. 35

DATE Aug/05/2022

TEST BORING: **63**

DATE DRILLED:
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NO GROUNDWATER ON
3/12/22

CLAY, SANDY, brown to olive, stiff to hard, moist

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5	▨	◢	24	10.9
10	▨	◢	50/9"	13.4
15	▨	◢	50/8"	14.5
20	▨	■	12	16.5

TEST BORING: **64**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

CLAY, SANDY, olive, very stiff, moist

CLAYSTONE, SANDY, brown to olive, hard to very hard, moist

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5	▨	◢	40	12.2
10	▨	◢	42	14.5
15	▤	◢	50/6"	10.7
20	▤	■	50/7"	11.6

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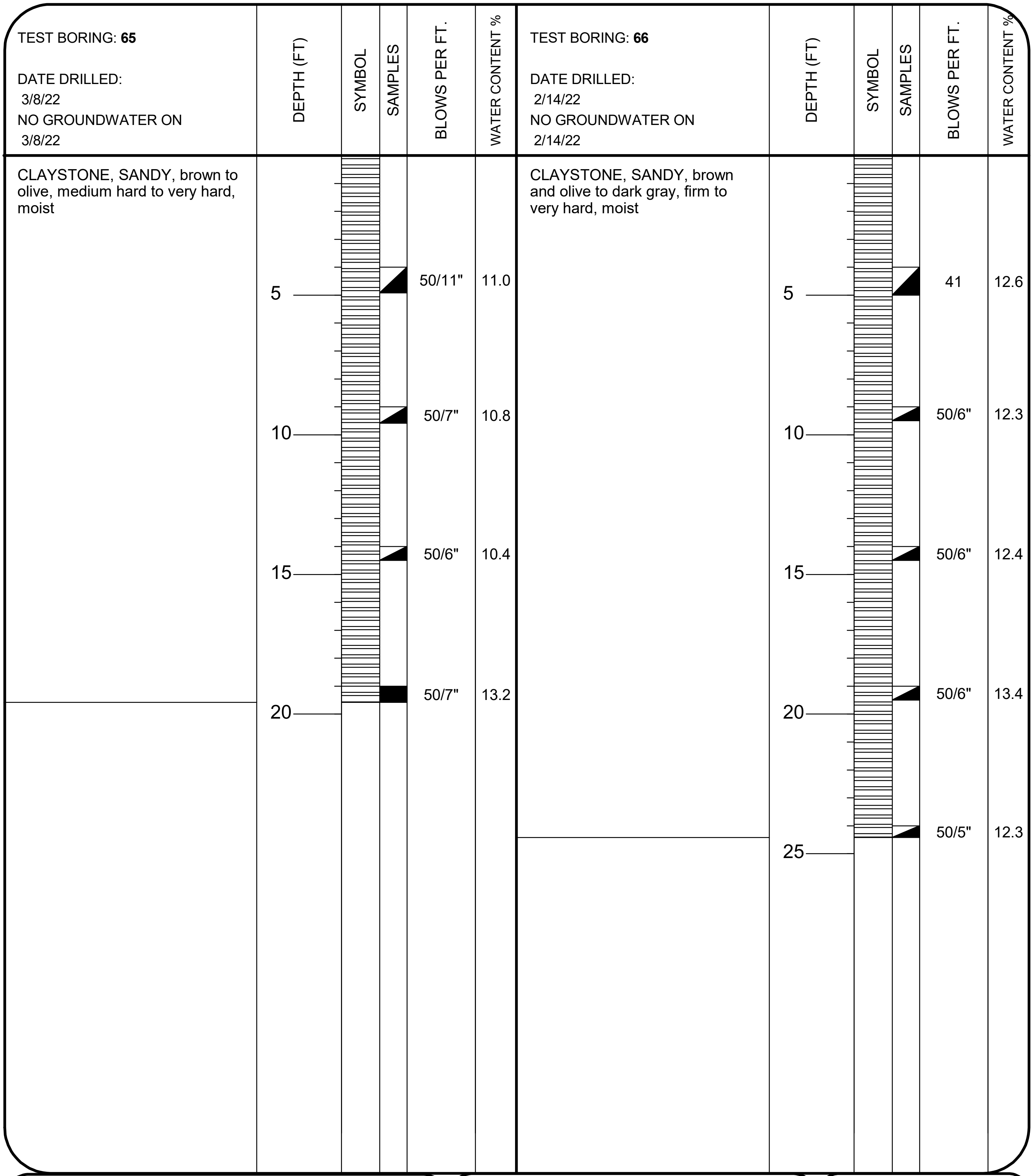
FIGURE No. 36

DATE Aug/05/2022



TEST BORING: **65**

DATE DRILLED:
3/8/22
NO GROUNDWATER ON
3/8/22

CLAYSTONE, SANDY, brown to olive, medium hard to very hard, moist

DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
5	50/11"	11.0
10	50/7"	10.8
15	50/6"	10.4
20	50/7"	13.2

TEST BORING: **66**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

CLAYSTONE, SANDY, brown and olive to dark gray, firm to very hard, moist

DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
5	41	12.6
10	50/6"	12.3
15	50/6"	12.4
20	50/6"	13.4
25	50/5"	12.3

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TEST BORING LOG

JOB No. 187746

FIGURE No. 37

DATE Aug/05/2022

TEST BORING: **67**

DATE DRILLED:
3/8/22
NO GROUNDWATER ON
3/8/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, stiff, moist	5			12	13.4
CLAYSTONE, SANDY, brown to dark brown and olive, firm to hard, moist	10			45	13.8
	15			50/9"	10.7
	20			50/10"	10.5

TEST BORING: **68**

DATE DRILLED:
3/8/22
NO GROUNDWATER ON
3/8/22

	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, very stiff, moist	5			22	8.4
	10			35	10.0
CLAYSTONE, SANDY, dark brown, medium hard, moist	15			50	14.9
	20			49	14.4

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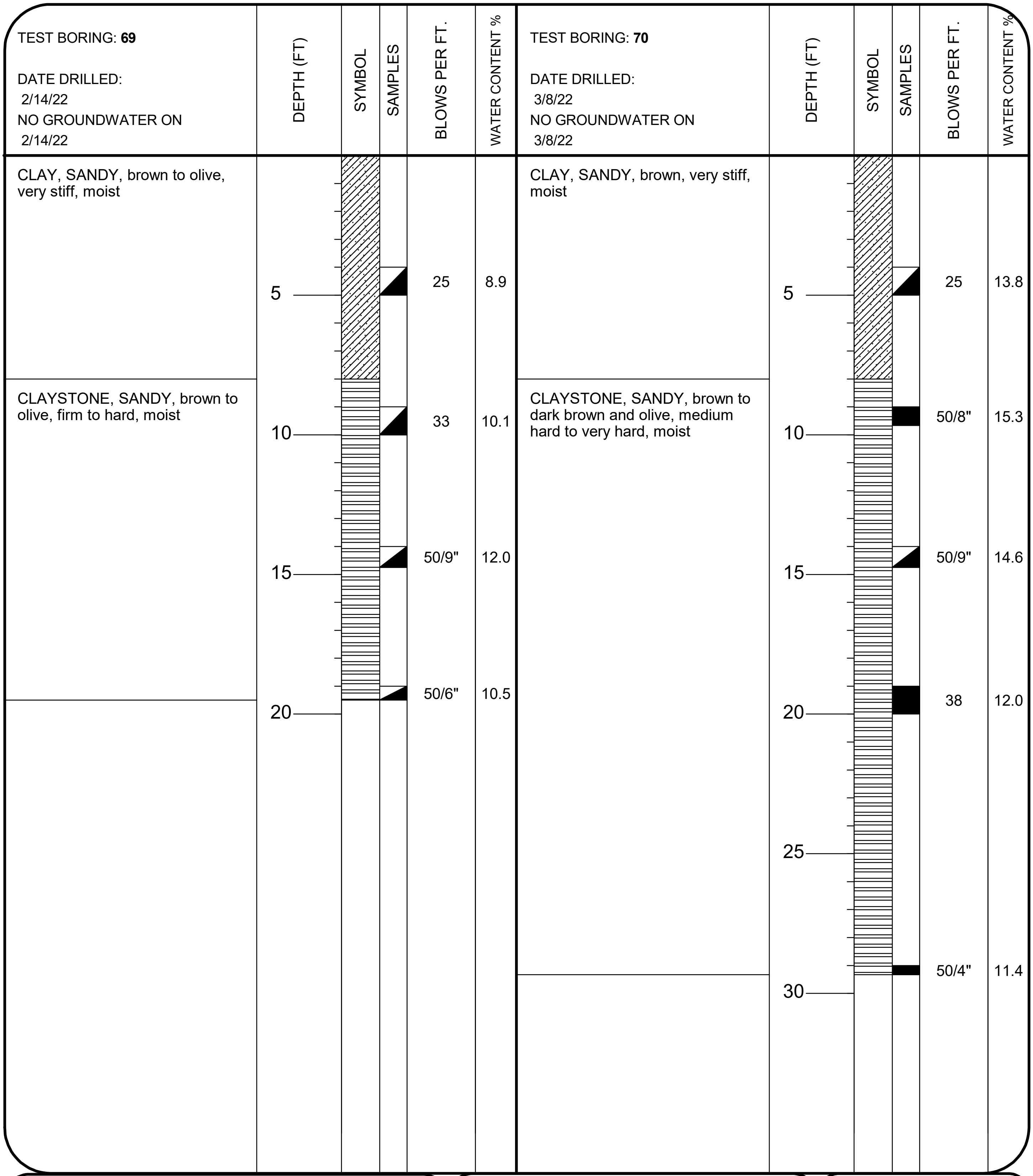
TEST BORING LOG

JOB No. 187746

FIGURE No. 38

DATE Aug/05/2022



TEST BORING: **69**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

CLAY, SANDY, brown to olive, very stiff, moist

CLAYSTONE, SANDY, brown to olive, firm to hard, moist

BLOWS PER FT.	WATER CONTENT %
25	8.9
33	10.1
50/9"	12.0
50/6"	10.5

TEST BORING: **70**

DATE DRILLED:
3/8/22
NO GROUNDWATER ON
3/8/22

CLAY, SANDY, brown, very stiff, moist

CLAYSTONE, SANDY, brown to dark brown and olive, medium hard to very hard, moist

BLOWS PER FT.	WATER CONTENT %
25	13.8
50/8"	15.3
50/9"	14.6
38	12.0
50/4"	11.4

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TEST BORING LOG

JOB No. 187746

FIGURE No. 39

DATE Aug/05/2022

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
1	4.0	5.3	103.2	23	8	0.0	25.8		- 1.3	SC
1	9.0	6.8								
1	14.0	8.4								
1	19.0	11.5								
1	24.0	12.4	110.1	25	10				- 0.9	
1	29.0	11.1				0.3	21.7			
2	4.0	6.5								
2	9.0	13.6	107.4			1.9	32.3		- 0.7	
2	14.0	13.1								
2	19.0	9.8								
3	4.0	3.4				0.0	7.9			
3	9.0	10.9								
3	14.0	6.8								
3	19.0	5.5								
4	4.0	7.7								
4	9.0	9.3								
4	14.0	12.7		30	13	0.4	28.9			SC
4	19.0	15.4								
4	24.0	10.2								
5	4.0	7.4								
5	9.0	7.9	102.1				32.7		- 2.4	
5	14.0	8.6								
5	19.0	6.1								
6	4.0	5.7								
6	9.0	6.1								
6	14.0	8.4	102.5	24	10		38.8		- 2.3	SC
6	19.0	9.5								
7	9.0	4.2		NP	NP	0.0	22.6			SM
7	14.0	5.1								
7	19.0	14.1								
8	4.0	6.2				0.5	14.3			
8	9.0	8.8								
8	14.0	14.7								
8	19.0	19.1								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 187746
FIGURE No. 40
PAGE 1 OF 9
DATE Aug/05/2022

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
9	4.0	6.2		30	19	0.0	54.6			CL
9	9.0	10.7								
9	14.0	13.3								
9	19.0	11.8								
10	4.0	7.7								
10	9.0	12.1	118.5	42	25	0.0	67.9		0.9	CL
10	14.0	15.9								
10	19.0	13.7								
11	4.0	5.9								
11	9.0	11.0	103.7	29	18	0.0	54.6		- 0.7	CL
11	14.0	16.7								
11	19.0	29.0								
12	4.0	12.2	115.8				74.4		6.8	
12	9.0	12.7								
12	14.0	12.7								
12	19.0	11.6								
13	4.0	8.4								
13	9.0	9.5	107.5				57.3		1.6	
13	14.0	9.7								
13	19.0	10.2								
13	24.0	9.5	99.5	38	24		77.8		0.0	CL
13	29.0	10.7								
14	4.0	5.3								
14	9.0	0.9				0.2	3.0			SP
14	14.0	2.9								
14	19.0	3.6								
15	4.0	7.8	111.2	32	21		41.6		1.9	SC
15	9.0	10.2								
15	14.0	24.8								
15	19.0	12.4								
16	4.0	5.8		27	8	0.0	54.8			CL
16	9.0	8.7								
16	14.0	10.8								
16	19.0	11.8								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 187746
FIGURE No. 40
PAGE 2 OF 9
DATE Aug/05/2022

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
17	4.0	11.3								
17	9.0	16.0	115.3	73	54				4.1	
17	14.0	17.1								
17	19.0	17.8								
18	4.0	8.7	91.3	36	22				- 1.8	
18	9.0	14.6								
18	14.0	7.4								
18	19.0	14.0								
19	4.0	4.7								
19	9.0	7.9								
19	14.0	10.8								
19	19.0	8.5					61.1			
19	24.0	7.0	99.4						- 3.7	
19	29.0	12.3	109.9	32	17		64.5		- 0.7	CL
20	4.0	8.4		35	25		76.7			CL
20	9.0	7.3								
20	14.0	5.2								
20	19.0	16.3								
21	4.0	11.1								
21	9.0	9.3		33	19	0.0	65.6			CL
21	14.0	6.3								
21	19.0	8.9								
22	4.0	4.8					60.2			
22	9.0	9.7								
22	14.0	14.5								
22	19.0	10.0								
23	4.0	7.8								
23	9.0	7.7	103.1	36	25		70.1		0.8	CL
23	14.0	8.1								
23	19.0	9.6								
24	4.0	7.2								
24	9.0	8.5								
24	14.0	8.6	113.3	34	19				2.3	
24	19.0	12.6								

SUMMARY OF LABORATORY TEST RESULTS

JOB No. 187746
FIGURE No. 40
PAGE 3 OF 9
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Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
25	4.0	7.8								
25	9.0	9.6								
25	14.0	7.7	106.0	32	17				0.7	
25	19.0	7.9								
25	24.0	7.0		32	17		61.7			CL
25	29.0	8.2		35	22		61.0			CL
26	4.0	8.3								
26	9.0	9.3	114.8	33	22		71.9		0.8	CL
26	14.0	9.0								
26	19.0	9.1								
27	4.0	7.3	85.0				58.2		4.3	
27	9.0	14.0								
27	14.0	12.4								
27	19.0	8.9								
28	4.0	8.5								
28	9.0	9.4				0.0	82.4			
28	14.0	9.8								
28	19.0	13.0								
29	4.0	14.3	117.0				98.1		4.9	
29	9.0	12.9								
29	14.0	13.2								
29	19.0	11.3								
30	4.0	7.6								
30	9.0	8.0		31	14		70.0			CL
30	14.0	6.9								
30	19.0	14.5								
31	4.0	10.2								
31	9.0	11.6	127.4	49	32		87.5		4.8	CL
31	14.0	12.5								
31	19.0	14.4								
32	4.0	13.4	96.4	49	30	0.0	86.6		- 0.4	CL
32	9.0	4.7								
32	14.0	7.0								
32	19.0	6.8								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 187746
FIGURE No. 40
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Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
33	4.0	5.6								
33	9.0	3.4				2.1	26.4			
33	14.0	1.5								
33	19.0	1.8								
34	4.0	5.5								
34	9.0	14.6		33	19		89.3			CL
34	14.0	16.0								
34	19.0	13.5								
35	4.0	9.7		38	23		73.0			CL
35	9.0	12.5								
35	14.0	11.2								
35	19.0	10.8								
35	29.0	19.2		59	39	0.0	92.2			CH
36	4.0	6.0	101.6	27	9		53.4		- 1.5	CL
36	9.0	6.3								
36	14.0	6.8								
36	19.0	10.1								
37	4.0	7.3								
37	9.0	6.0								
37	14.0	10.2	106.2				84.2		1.2	
37	19.0	10.9								
37	24.0	13.1								
37	29.0	13.7		45	30		79.3			CL
38	4.0	11.0								
38	9.0	20.4	102.5				98.0		2.2	
38	14.0	17.6								
38	19.0	16.6								
38	29.0	17.5	108.9				97.4		- 0.8	
39	4.0	10.6								
39	9.0	3.3		59	36	0.5	24.9			SC
39	14.0	5.2								
39	19.0	2.6								
40	4.0	6.3								
40	9.0	20.0		40	24	0.0	85.3			CL

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 187746
FIGURE No. 40
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Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
40	14.0	4.1								
40	19.0	2.6								
41	4.0	7.4		29	10	0.0	64.2			CL
41	9.0	12.2								
41	14.0	12.8								
42	4.0	18.2	111.8	48	32	0.0	71.7		4.7	CL
42	9.0	13.0								
42	14.0	14.5								
42	19.0	14.3								
43	4.0	12.9	112.0	48	32		82.0		5.6	CL
43	9.0	10.2								
43	14.0	15.5								
43	19.0	18.6								
44	4.0	12.6								
44	9.0	13.2	118.6				90.7		6.2	
44	14.0	11.9								
44	19.0	12.6								
45	4.0	3.8				0.5	31.4			
45	9.0	7.7								
45	14.0	13.6								
45	19.0	13.9								
46	4.0	8.9								
46	9.0	9.2								
46	14.0	9.6	118.9			0.0	80.6		4.3	
46	19.0	9.3								
47	4.0	3.9				0.1	25.4			
47	9.0	6.2								
47	14.0	11.7								
47	19.0	18.1								
48	4.0	9.4								
48	9.0	10.8		36	22		73.4			CL
48	14.0	9.5								
48	19.0	13.6								
48	29.0	13.7	121.2	47	31		92.8		4.9	CL

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 187746
FIGURE No. 40
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DATE Aug/05/2022

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
49	4.0	14.8		54	35		82.7			CH
49	9.0	13.3								
49	14.0	14.5								
49	19.0	16.0								
50	4.0	7.1								
50	9.0	10.3	111.1	36	24				1.6	
50	14.0	11.0								
50	19.0	12.6								
51	4.0	3.8								
51	9.0	15.9	119.2	46	31		50.3		0.8	CL
51	14.0	6.0								
51	19.0	18.9								
52	4.0	6.2				0.0	39.7			
52	9.0	2.9								
52	14.0	10.0								
52	19.0	18.9								
53	4.0	6.2								
53	9.0	17.4	106.6	58	39	0.0	97.7		3.3	CH
53	14.0	8.2								
53	19.0	5.6								
53	24.0	13.0				2.0	48.1			
53	29.0	18.4								
54	4.0	12.9	89.0				84.9		- 0.4	
54	9.0	11.1								
54	14.0	16.2								
54	19.0	4.4								
55	4.0	5.4								
55	9.0	7.5				0.0	38.1			
55	14.0	5.5								
55	19.0	15.4								
56	4.0	5.3								
56	9.0	8.6				0.0	42.0			
56	14.0	9.1								
56	19.0	12.6								

SUMMARY OF LABORATORY TEST RESULTS

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
57	4.0	13.5								
57	9.0	13.7								
57	14.0	14.5	116.4	49	34				2.1	
57	19.0	13.4								
58	4.0	6.0								
58	9.0	5.9								
58	14.0	6.5	99.6	19	7	0.0	40.1		- 5.5	SC-SM
58	19.0	9.4								
58	24.0	11.8								
58	29.0	19.7								
59	4.0	11.4								
59	9.0	11.9	116.6	46	32		89.5		6.1	CL
59	14.0	13.2								
59	19.0	12.5								
60	4.0	9.1				0.0	69.2			
60	9.0	13.8								
60	14.0	15.9								
60	19.0	15.7								
61	4.0	8.4								
61	9.0	12.2	124.4	42	28	0.0	97.5		3.6	CL
61	14.0	12.6								
61	19.0	11.5								
61	24.0	20.6								
62	4.0	9.4								
62	9.0	10.9	117.2	38	26	1.9	84.6		2.5	CL
62	14.0	11.9								
62	19.0	11.7								
63	4.0	10.9	111.1	37	22				3.3	
63	9.0	13.4								
63	14.0	14.5								
63	19.0	16.5								
64	4.0	12.2								
64	9.0	14.5		47	34		76.0			CL
64	14.0	10.7								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 187746
FIGURE No. 40
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Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
64	19.0	11.6								
65	4.0	11.0								
65	9.0	10.8								
65	14.0	10.4	118.5			0.0	91.9		5.4	
65	19.0	13.2								
66	4.0	12.6								
66	9.0	12.3	122.2	48	32		90.4		2.3	CL
66	14.0	12.4								
66	19.0	13.4								
66	24.0	12.3								
67	4.0	13.4								
67	9.0	13.8		44	31	0.0	95.6			CL
67	14.0	10.7								
67	19.0	10.5								
68	4.0	8.4		33	20	0.0	85.3			CL
68	9.0	10.0								
68	14.0	14.9								
68	19.0	14.4								
69	4.0	8.9								
69	9.0	10.1	102.4				80.9		1.2	
69	14.0	12.0								
69	19.0	10.5								
70	4.0	13.8								
70	9.0	15.3		62	47	0.0	99.0			CH
70	14.0	14.6								
70	19.0	12.0								
70	29.0	11.4								

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FIGURE No. 40
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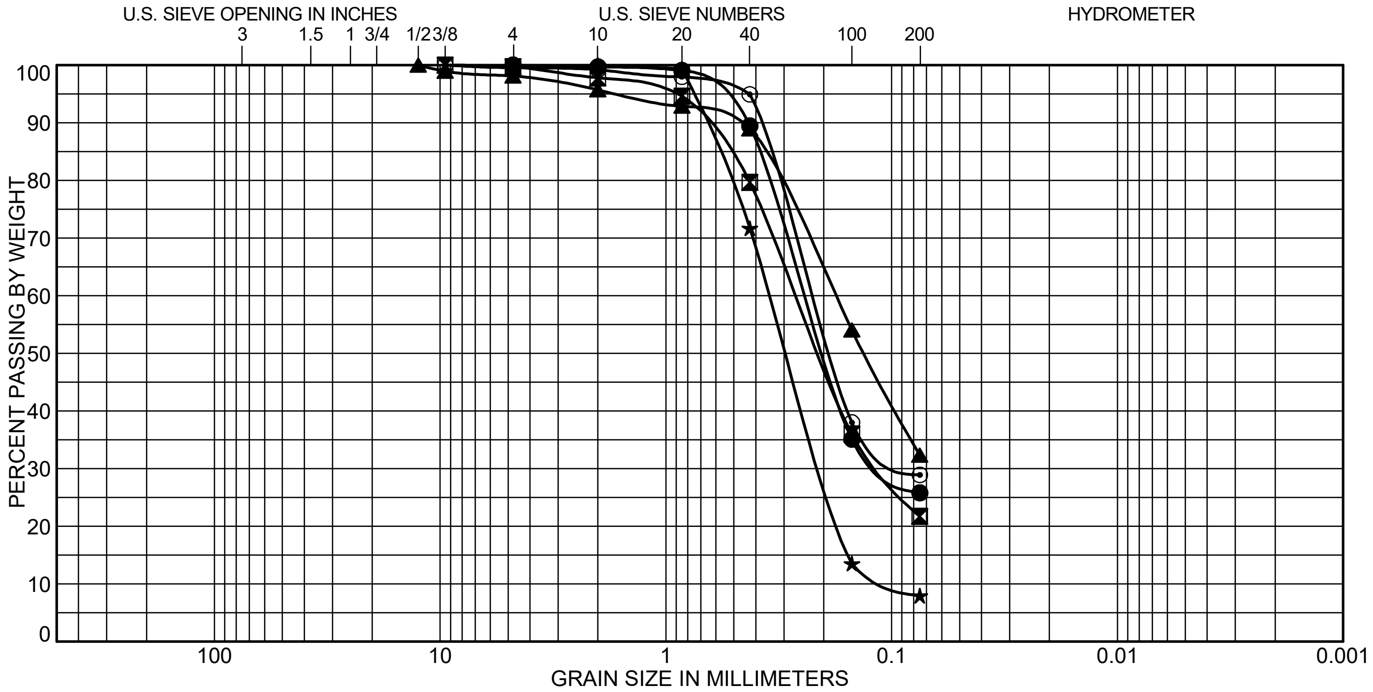

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring		Depth (ft)	Classification	LL	PL	PI
●	**1**	**4.0**	**CLAYEY SAND(SC)**	**23**	**15**	**8**
⧗	**1**	**29.0**				
▲	**2**	**9.0**				
★	**3**	**4.0**				
⊙	**4**	**14.0**	**CLAYEY SAND(SC)**	**30**	**17**	**13**

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**1**	**4.0**	**0.0**	**74.2**	**25.8**	
⧗	**1**	**29.0**	**0.3**	**78.0**	**21.7**	
▲	**2**	**9.0**	**1.9**	**65.8**	**32.3**	
★	**3**	**4.0**	**0.0**	**92.1**	**7.9**	
⊙	**4**	**14.0**	**0.4**	**70.7**	**28.9**	

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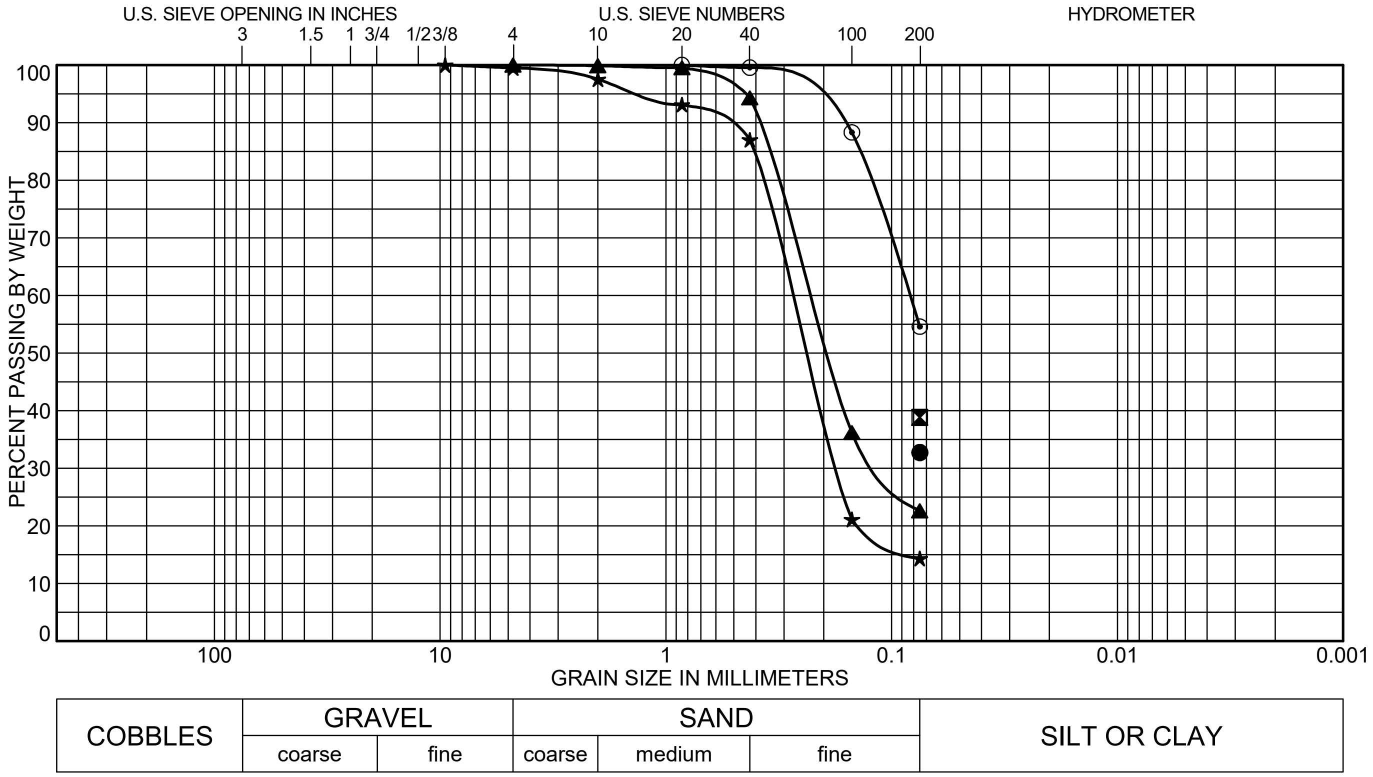
SOIL CLASSIFICATION DATA

JOB No. 187746

FIGURE No. 41

DATE Aug/05/2022



Test Boring	Depth (ft)	Classification	LL	PL	PI
● **5**	**9.0**				
⧗ **6**	**14.0**	**CLAYEY SAND(SC)**	**24**	**14**	**10**
▲ **7**	**9.0**	**SILTY SAND(SM)**	**NP**	**NP**	**NP**
★ **8**	**4.0**				
⦿ **9**	**4.0**	**SANDY LEAN CLAY(CL)**	**30**	**11**	**19**

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● **5**	**9.0**			**32.7**	
⧗ **6**	**14.0**			**38.8**	
▲ **7**	**9.0**	**0.0**	**77.4**	**22.6**	
★ **8**	**4.0**	**0.5**	**85.2**	**14.3**	
⦿ **9**	**4.0**	**0.0**	**45.4**	**54.6**	

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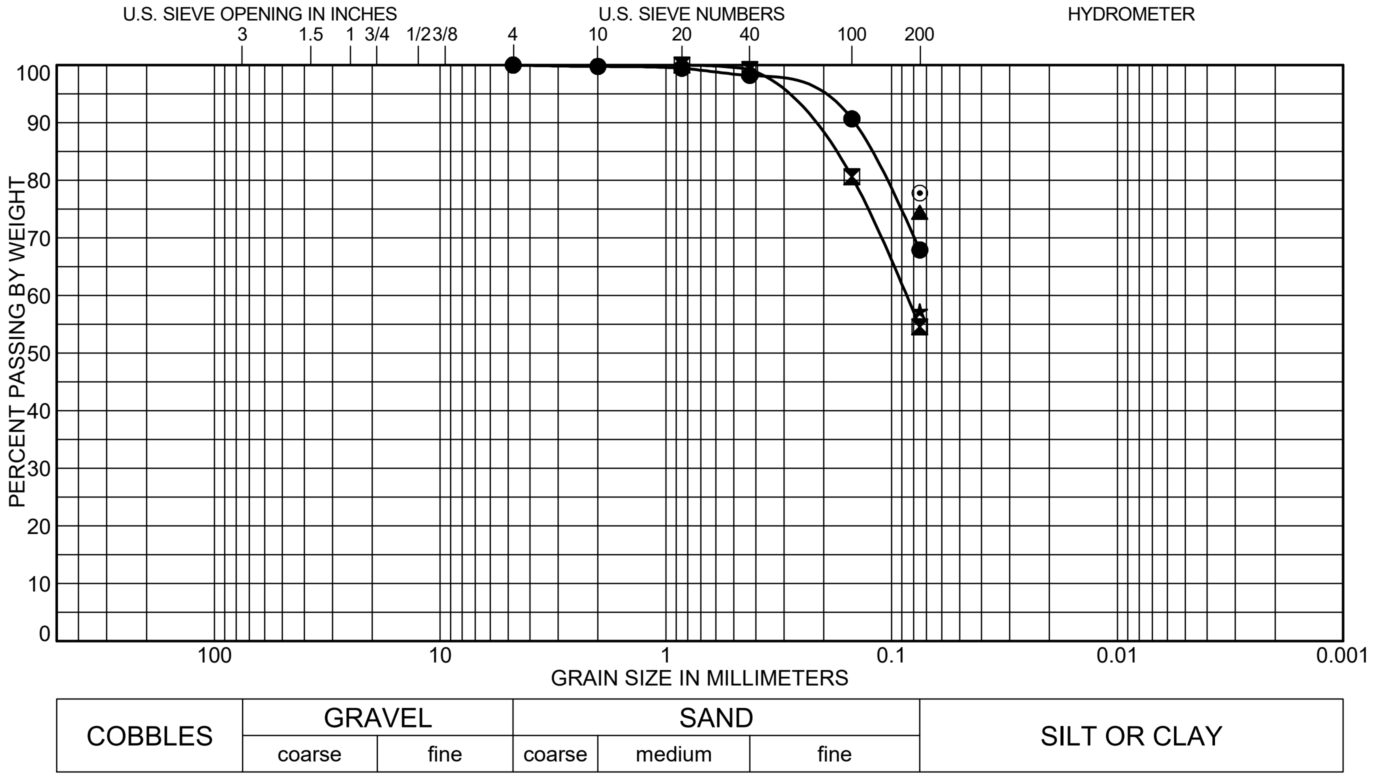
SOIL CLASSIFICATION DATA

JOB No. 187746

FIGURE No. 42

DATE Aug/05/2022



	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**10**	**9.0**	**SANDY LEAN CLAY(CL)**	**42**	**17**	**25**
☒	**11**	**9.0**	**SANDY LEAN CLAY(CL)**	**29**	**11**	**18**
▲	**12**	**4.0**				
★	**13**	**9.0**				
⊙	**13**	**24.0**	**LEAN CLAY with SAND(CL)**	**38**	**14**	**24**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**10**	**9.0**	**0.0**	**32.1**	**67.9**	
☒	**11**	**9.0**	**0.0**	**45.4**	**54.6**	
▲	**12**	**4.0**			**74.4**	
★	**13**	**9.0**			**57.3**	
⊙	**13**	**24.0**			**77.8**	

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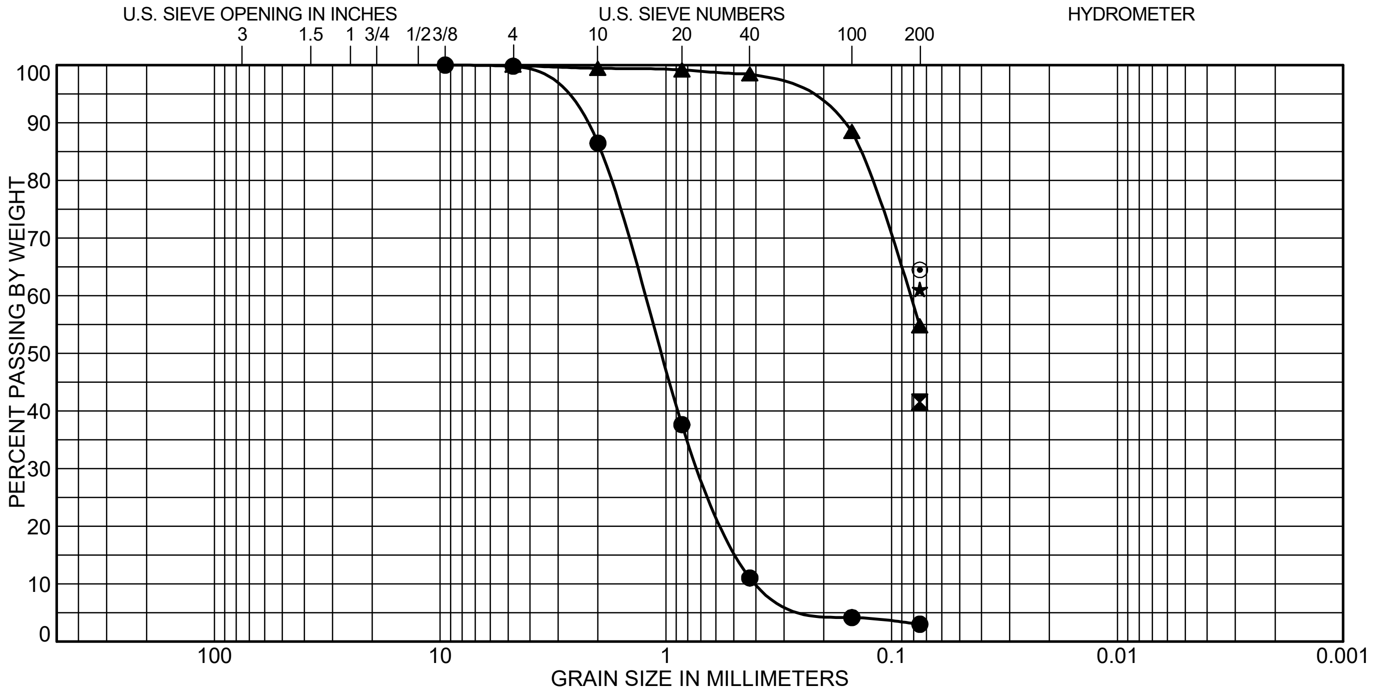
JOB No. 187746

FIGURE No. 43

DATE Aug/05/2022



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring		Depth (ft)	Classification	LL	PL	PI
●	**14**	**9.0**	**POORLY GRADED SAND(SP)**			
⧗	**15**	**4.0**	**CLAYEY SAND(SC)**	**32**	**11**	**21**
▲	**16**	**4.0**	**SANDY LEAN CLAY(CL)**	**27**	**19**	**8**
★	**19**	**19.0**				
⦿	**19**	**29.0**	**SANDY LEAN CLAY(CL)**	**32**	**15**	**17**

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**14**	**9.0**	**0.2**	**96.8**	**3.0**	
⧗	**15**	**4.0**			**41.6**	
▲	**16**	**4.0**	**0.0**	**45.2**	**54.8**	
★	**19**	**19.0**			**61.1**	
⦿	**19**	**29.0**			**64.5**	

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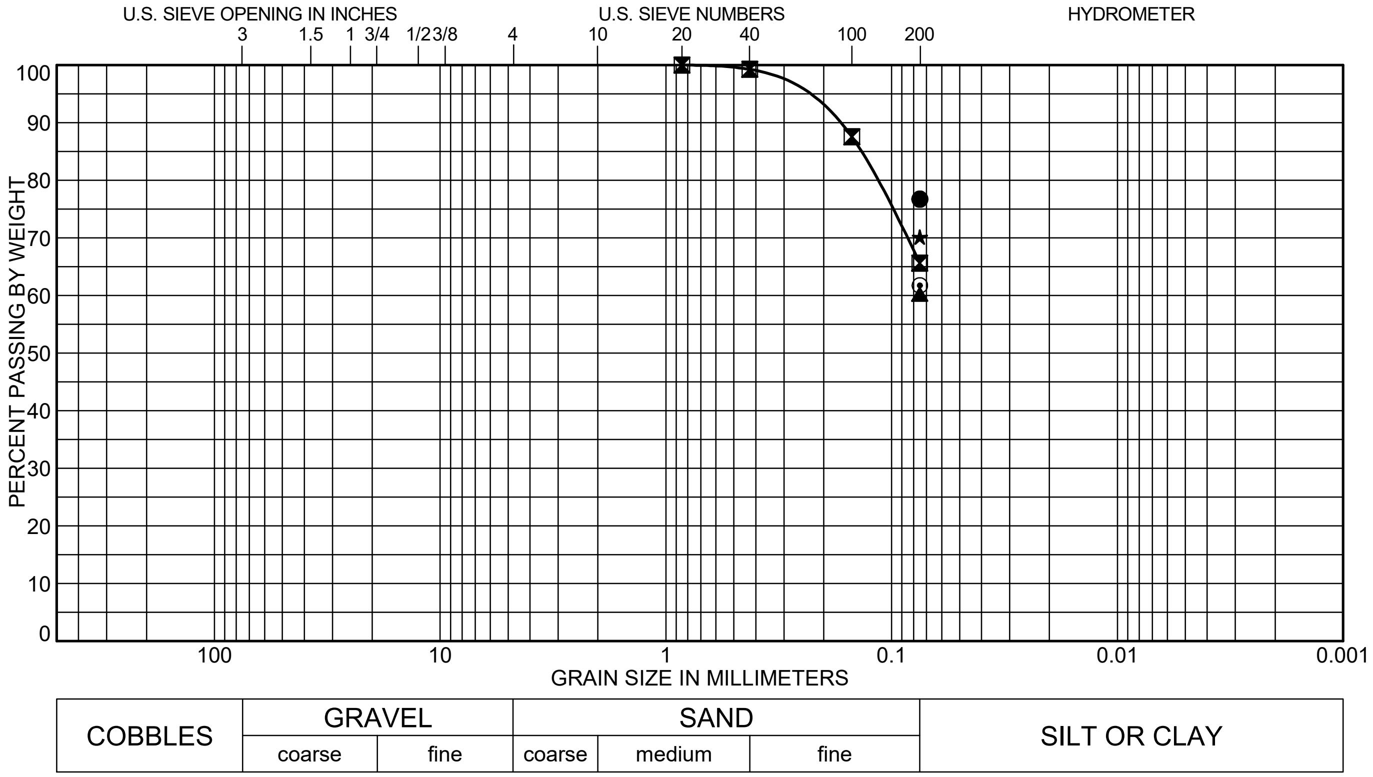
FIGURE No. 44

DATE Aug/05/2022



	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**20**	**4.0**	**LEAN CLAY with SAND(CL)**	**35**	**10**	**25**
⧗	**21**	**9.0**	**SANDY LEAN CLAY(CL)**	**33**	**14**	**19**
▲	**22**	**4.0**				
★	**23**	**9.0**	**LEAN CLAY with SAND(CL)**	**36**	**11**	**25**
⊙	**25**	**24.0**	**SANDY LEAN CLAY(CL)**	**32**	**15**	**17**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**20**	**4.0**			**76.7**	
⧗	**21**	**9.0**	**0.0**	**34.4**	**65.6**	
▲	**22**	**4.0**			**60.2**	
★	**23**	**9.0**			**70.1**	
⊙	**25**	**24.0**			**61.7**	

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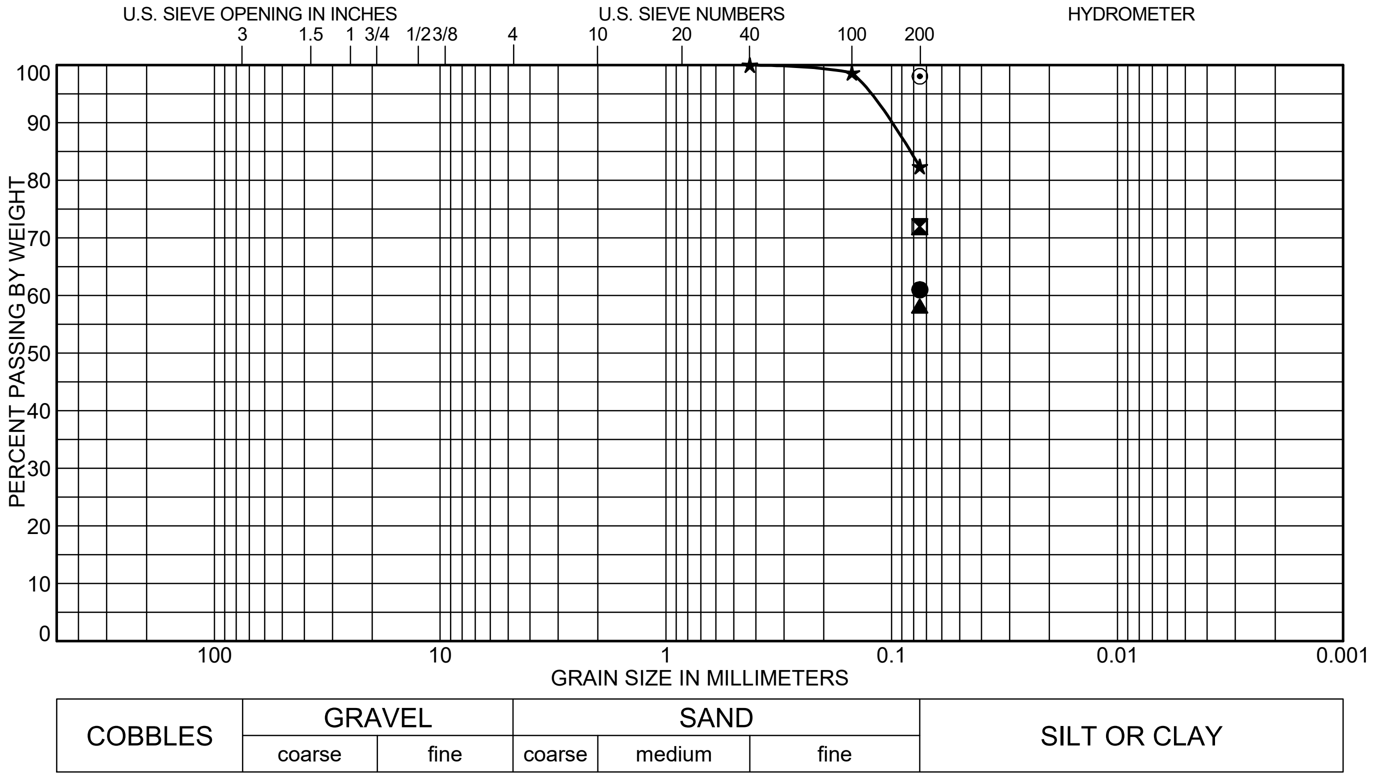
FIGURE No. 45

DATE Aug/05/2022



	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**25**	**29.0**	**SANDY LEAN CLAY(CL)**	**35**	**13**	**22**
⧗	**26**	**9.0**	**LEAN CLAY with SAND(CL)**	**33**	**11**	**22**
▲	**27**	**4.0**				
★	**28**	**9.0**				
⊙	**29**	**4.0**				

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**25**	**29.0**			**61.0**	
⧗	**26**	**9.0**			**71.9**	
▲	**27**	**4.0**			**58.2**	
★	**28**	**9.0**	**0.0**	**17.6**	**82.4**	
⊙	**29**	**4.0**			**98.1**	

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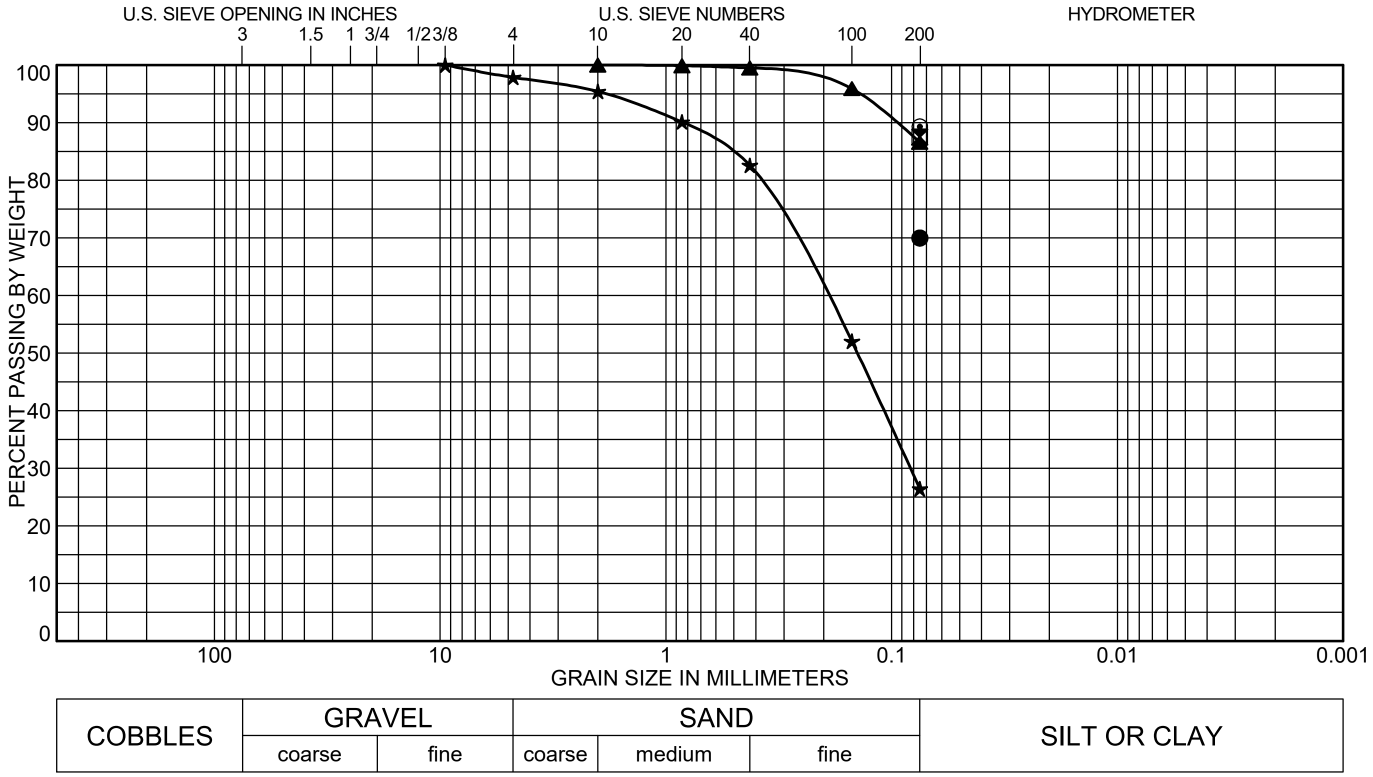
FIGURE No. 46

DATE Aug/05/2022



	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**30**	**9.0**	**SANDY LEAN CLAY(CL)**	**31**	**17**	**14**
☒	**31**	**9.0**	**LEAN CLAY(CL)**	**49**	**17**	**32**
▲	**32**	**4.0**	**LEAN CLAY(CL)**	**49**	**19**	**30**
★	**33**	**9.0**				
⊙	**34**	**9.0**	**LEAN CLAY(CL)**	**33**	**14**	**19**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**30**	**9.0**			**70.0**	
☒	**31**	**9.0**			**87.5**	
▲	**32**	**4.0**	**0.0**	**13.4**	**86.6**	
★	**33**	**9.0**	**2.1**	**71.4**	**26.4**	
⊙	**34**	**9.0**			**89.3**	

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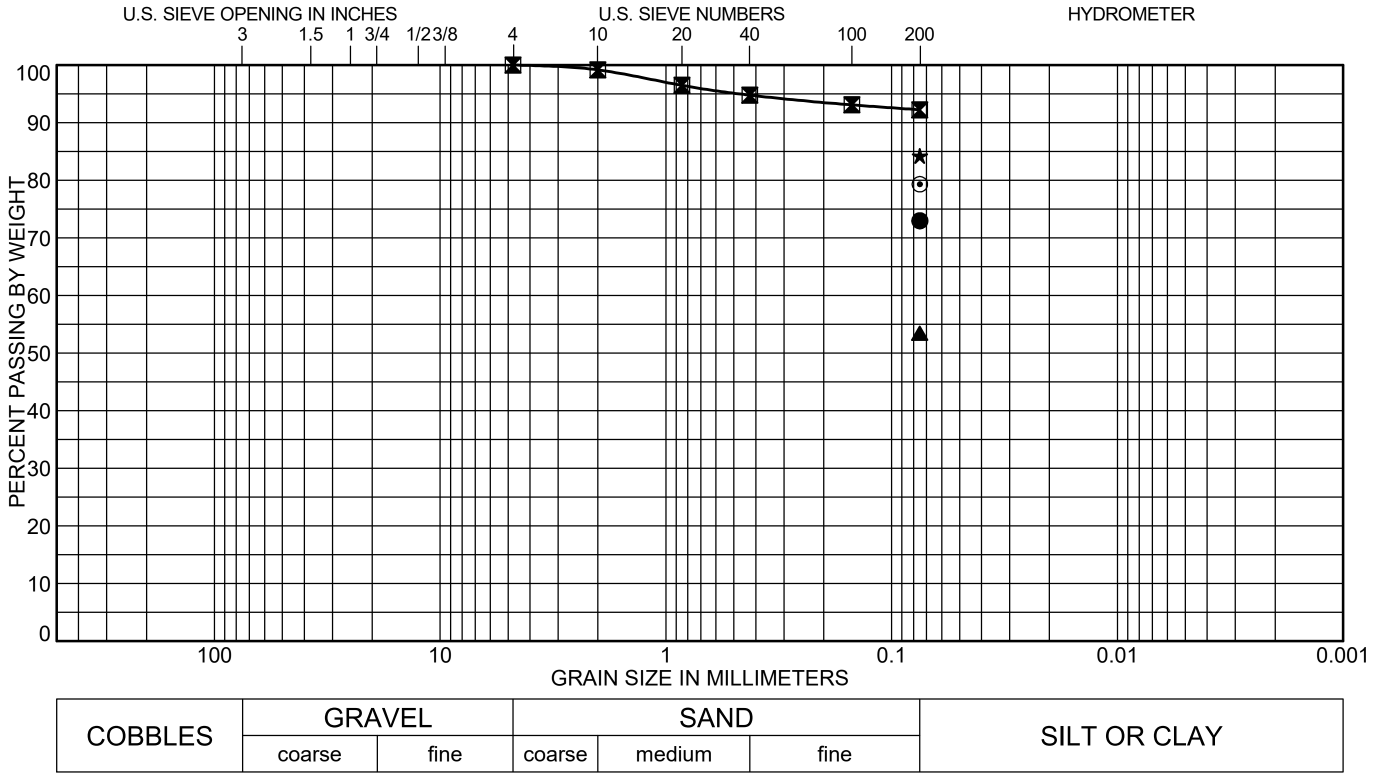
FIGURE No. 47

DATE Aug/05/2022



	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**35**	**4.0**	**LEAN CLAY with SAND(CL)**	**38**	**15**	**23**
⧗	**35**	**29.0**	**FAT CLAY(CH)**	**59**	**20**	**39**
▲	**36**	**4.0**	**SANDY LEAN CLAY(CL)**	**27**	**18**	**9**
★	**37**	**14.0**				
⊙	**37**	**29.0**	**LEAN CLAY with SAND(CL)**	**45**	**15**	**30**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**35**	**4.0**			**73.0**	
⧗	**35**	**29.0**	**0.0**	**7.8**	**92.2**	
▲	**36**	**4.0**			**53.4**	
★	**37**	**14.0**			**84.2**	
⊙	**37**	**29.0**			**79.3**	

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FIGURE No. 48

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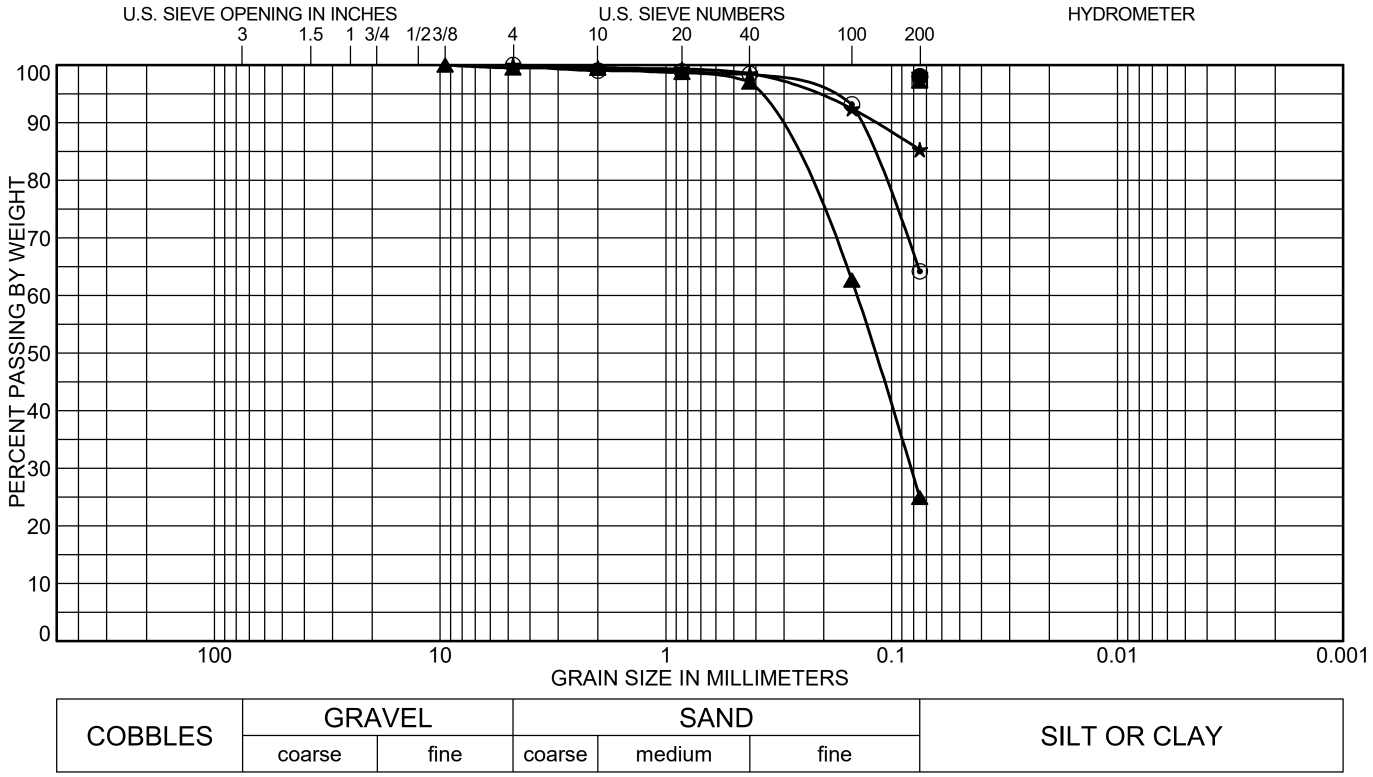

Test Boring	Depth (ft)	Classification	LL	PL	PI
● **38**	**9.0**				
⧗ **38**	**29.0**				
▲ **39**	**9.0**	**CLAYEY SAND(SC)**	**59**	**23**	**36**
★ **40**	**9.0**	**LEAN CLAY(CL)**	**40**	**16**	**24**
⊙ **41**	**4.0**	**SANDY LEAN CLAY(CL)**	**29**	**19**	**10**

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● **38**	**9.0**			**98.0**	
⧗ **38**	**29.0**			**97.4**	
▲ **39**	**9.0**	**0.5**	**74.6**	**24.9**	
★ **40**	**9.0**	**0.0**	**14.7**	**85.3**	
⊙ **41**	**4.0**	**0.0**	**35.8**	**64.2**	

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FIGURE No. 49

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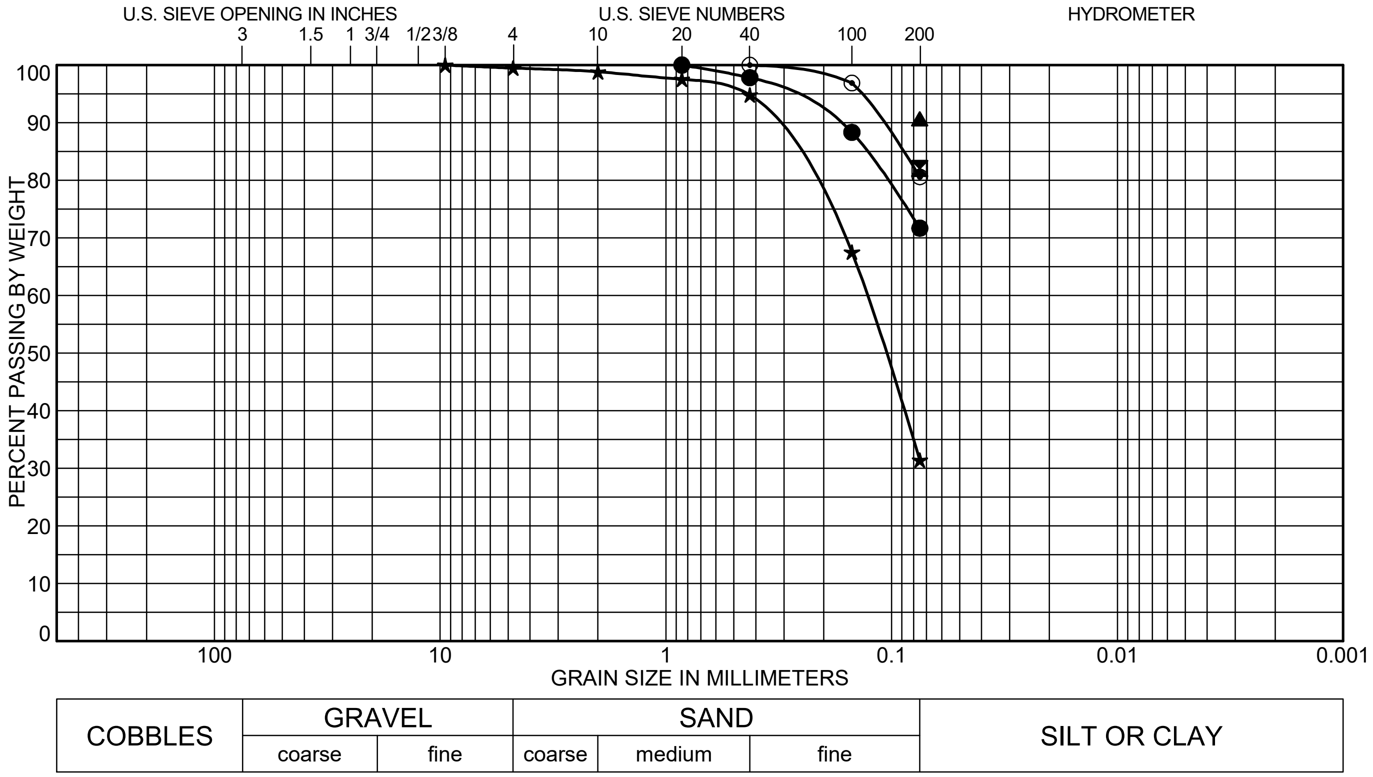

Test Boring		Depth (ft)	Classification	LL	PL	PI
●	**42**	**4.0**	**LEAN CLAY with SAND(CL)**	**48**	**16**	**32**
☒	**43**	**4.0**	**LEAN CLAY with SAND(CL)**	**48**	**16**	**32**
▲	**44**	**9.0**				
★	**45**	**4.0**				
⊙	**46**	**14.0**				

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**42**	**4.0**	**0.0**	**28.3**	**71.7**	
☒	**43**	**4.0**			**82.0**	
▲	**44**	**9.0**			**90.7**	
★	**45**	**4.0**	**0.5**	**68.1**	**31.4**	
⊙	**46**	**14.0**	**0.0**	**19.4**	**80.6**	

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FIGURE No. 50

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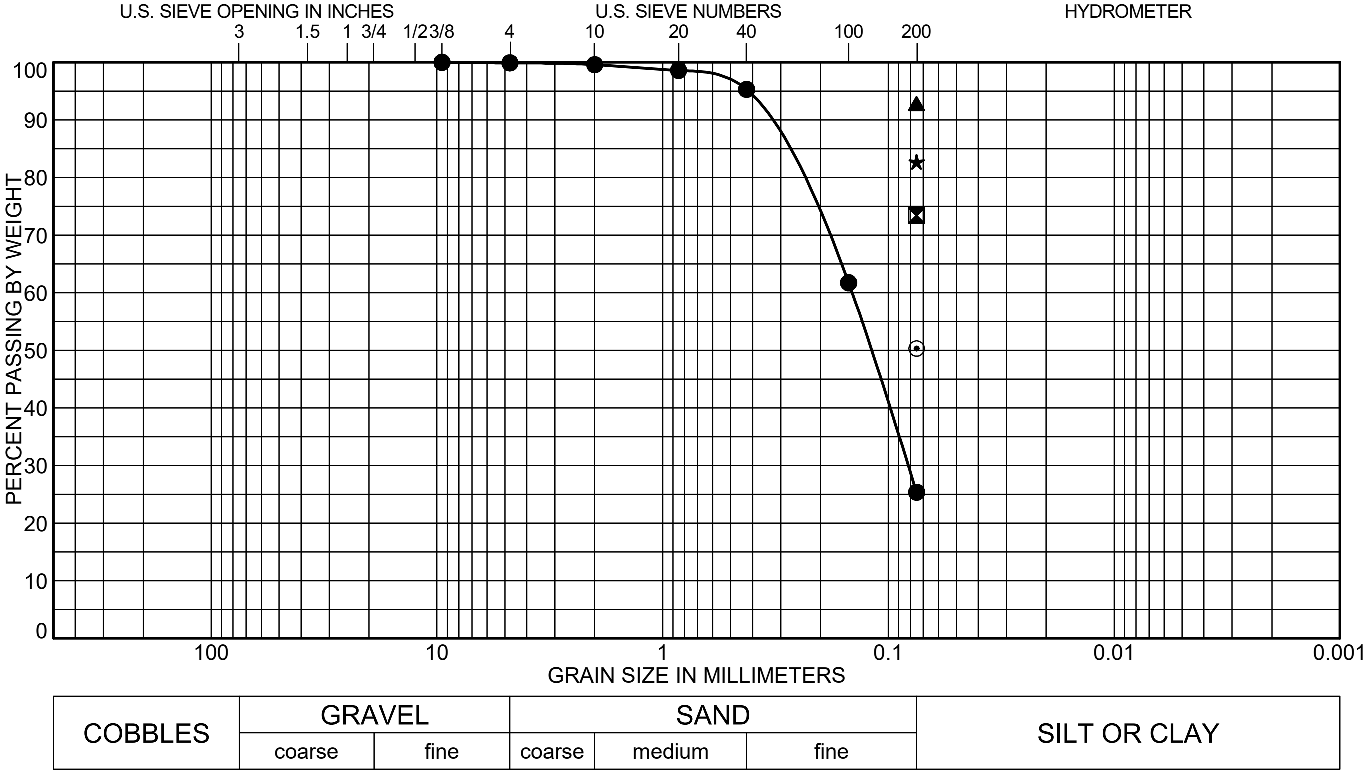

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**47**	**4.0**				
⧗	**48**	**9.0**	**LEAN CLAY with SAND(CL)**	**36**	**14**	**22**
▲	**48**	**29.0**	**LEAN CLAY(CL)**	**47**	**16**	**31**
★	**49**	**4.0**	**FAT CLAY with SAND(CH)**	**54**	**19**	**35**
⊙	**51**	**9.0**	**SANDY LEAN CLAY(CL)**	**46**	**15**	**31**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**47**	**4.0**	**0.1**	**74.5**	**25.4**	
⧗	**48**	**9.0**			**73.4**	
▲	**48**	**29.0**			**92.8**	
★	**49**	**4.0**			**82.7**	
⊙	**51**	**9.0**			**50.3**	

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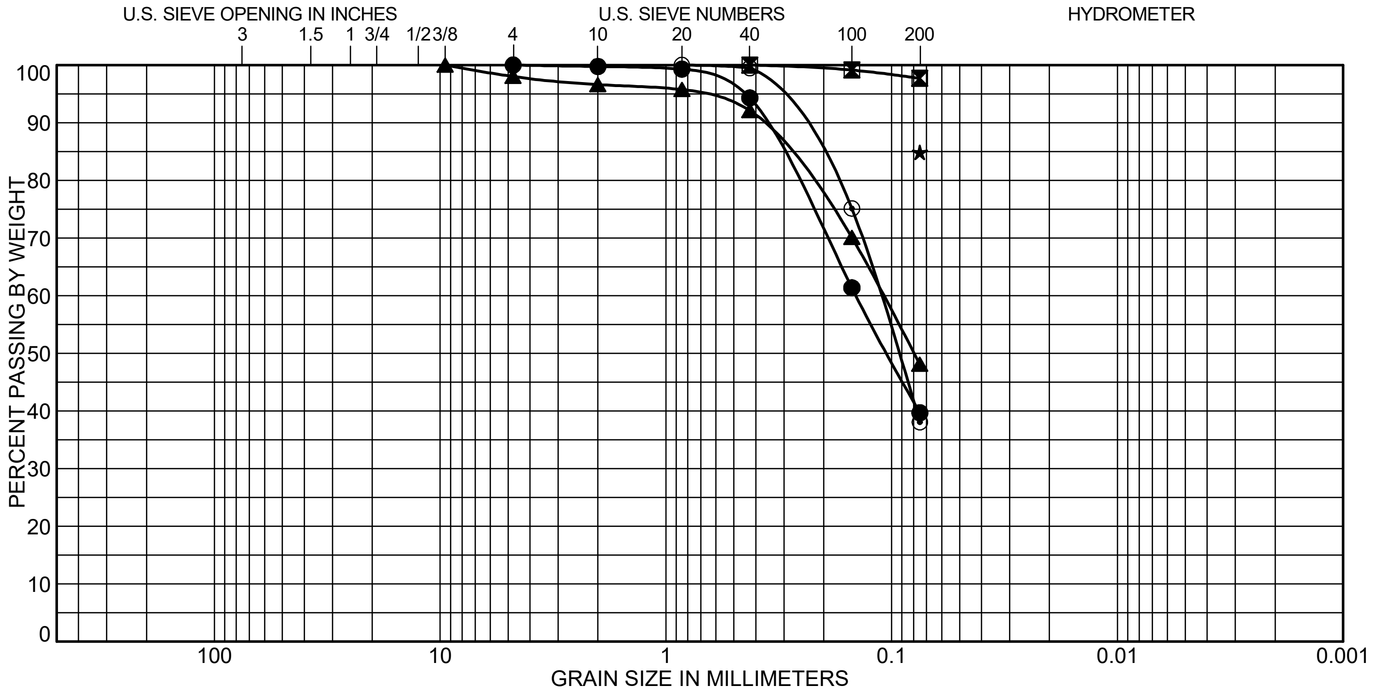
FIGURE No. 51

DATE Aug/05/2022



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring	Depth (ft)	Classification	LL	PL	PI
● **52**	**4.0**				
⧗ **53**	**9.0**	**FAT CLAY(CH)**	**58**	**19**	**39**
▲ **53**	**24.0**				
★ **54**	**4.0**				
⊙ **55**	**9.0**				

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● **52**	**4.0**	**0.0**	**60.3**	**39.7**	
⧗ **53**	**9.0**	**0.0**	**2.3**	**97.7**	
▲ **53**	**24.0**	**2.0**	**49.9**	**48.1**	
★ **54**	**4.0**			**84.9**	
⊙ **55**	**9.0**	**0.0**	**61.9**	**38.1**	

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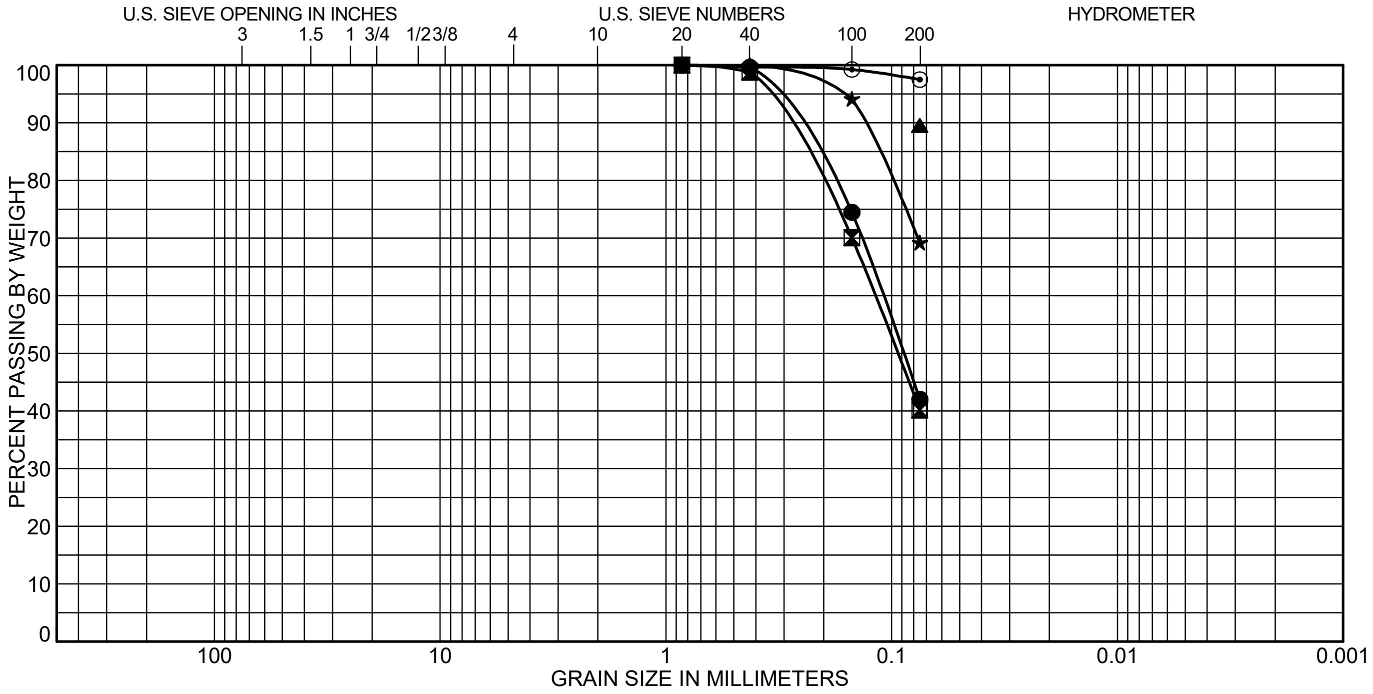
FIGURE No. 52

DATE Aug/05/2022



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**56**	**9.0**				
⧗	**58**	**14.0**	**SILTY, CLAYEY SAND(SC-SM)**	**19**	**12**	**7**
▲	**59**	**9.0**	**LEAN CLAY(CL)**	**46**	**14**	**32**
★	**60**	**4.0**			**14**	
⊙	**61**	**9.0**	**LEAN CLAY(CL)**	**42**	**14**	**28**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**56**	**9.0**	**0.0**	**58.0**	**42.0**	
⧗	**58**	**14.0**	**0.0**	**59.9**	**40.1**	
▲	**59**	**9.0**			**89.5**	
★	**60**	**4.0**	**0.0**	**30.8**	**69.2**	
⊙	**61**	**9.0**	**0.0**	**2.5**	**97.5**	

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FIGURE No. 53

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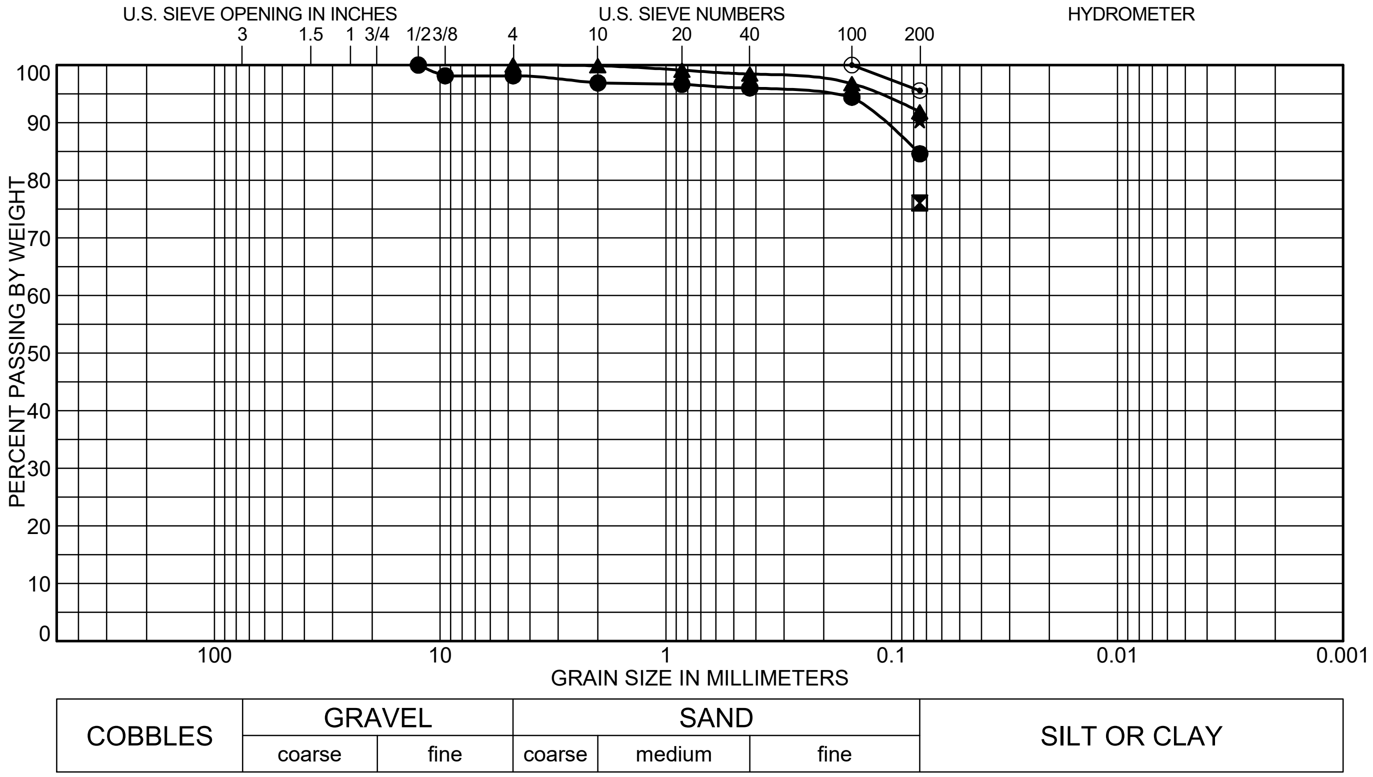

Test Boring		Depth (ft)	Classification	LL	PL	PI
●	**62**	**9.0**	**LEAN CLAY with SAND(CL)**	**38**	**12**	**26**
☒	**64**	**9.0**	**LEAN CLAY with SAND(CL)**	**47**	**13**	**34**
▲	**65**	**14.0**				
★	**66**	**9.0**	**LEAN CLAY(CL)**	**48**	**16**	**32**
⊙	**67**	**9.0**	**LEAN CLAY(CL)**	**44**	**13**	**31**

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**62**	**9.0**	**1.9**	**13.5**	**84.6**	
☒	**64**	**9.0**			**76.0**	
▲	**65**	**14.0**	**0.0**	**8.1**	**91.9**	
★	**66**	**9.0**			**90.4**	
⊙	**67**	**9.0**	**0.0**	**4.4**	**95.6**	

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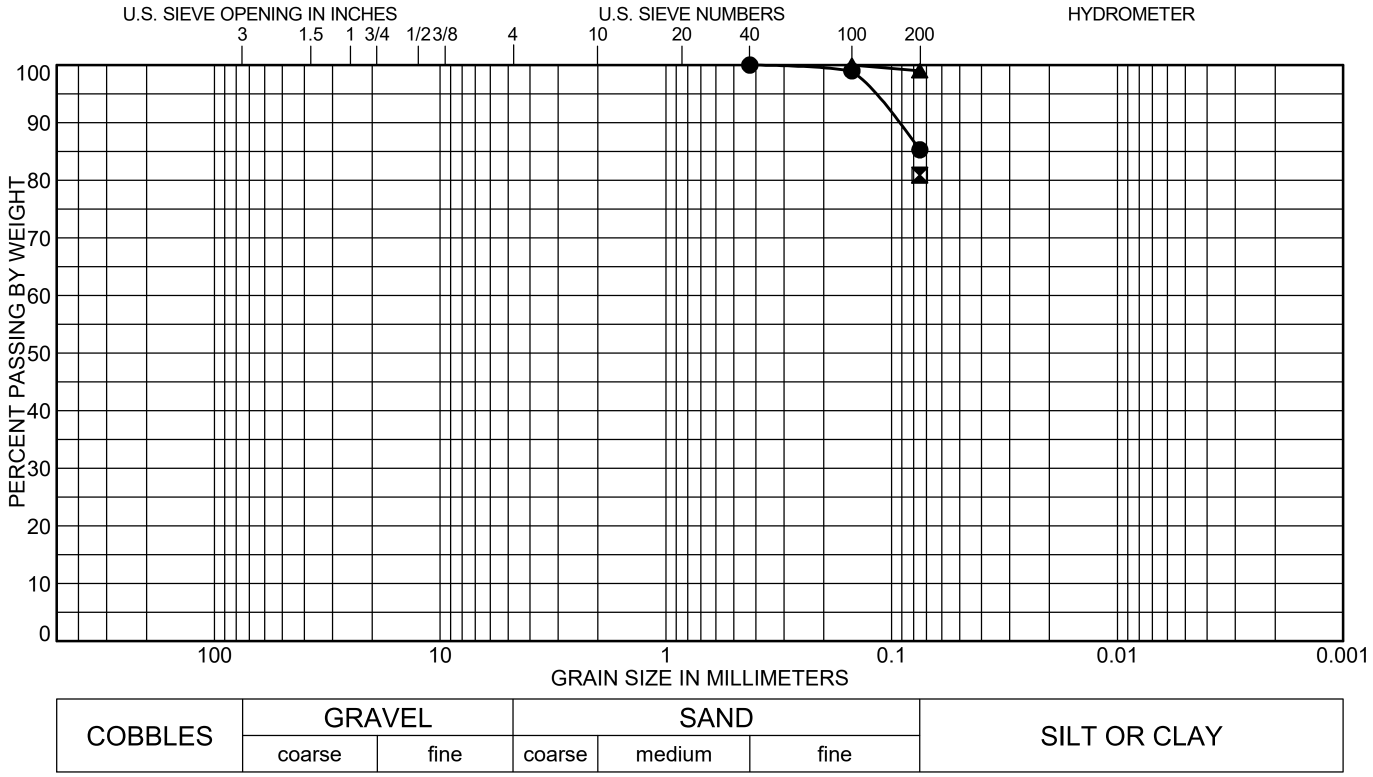
SOIL CLASSIFICATION DATA

JOB No. 187746

FIGURE No. 54

DATE Aug/05/2022



Test Boring		Depth (ft)	Classification	LL	PL	PI
●	**68**	**4.0**	**LEAN CLAY(CL)**	**33**	**13**	**20**
☒	**69**	**9.0**				
▲	**70**	**9.0**	**FAT CLAY(CH)**	**62**	**15**	**47**

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**68**	**4.0**	**0.0**	**14.7**	**85.3**	
☒	**69**	**9.0**			**80.9**	
▲	**70**	**9.0**	**0.0**	**1.0**	**99.0**	

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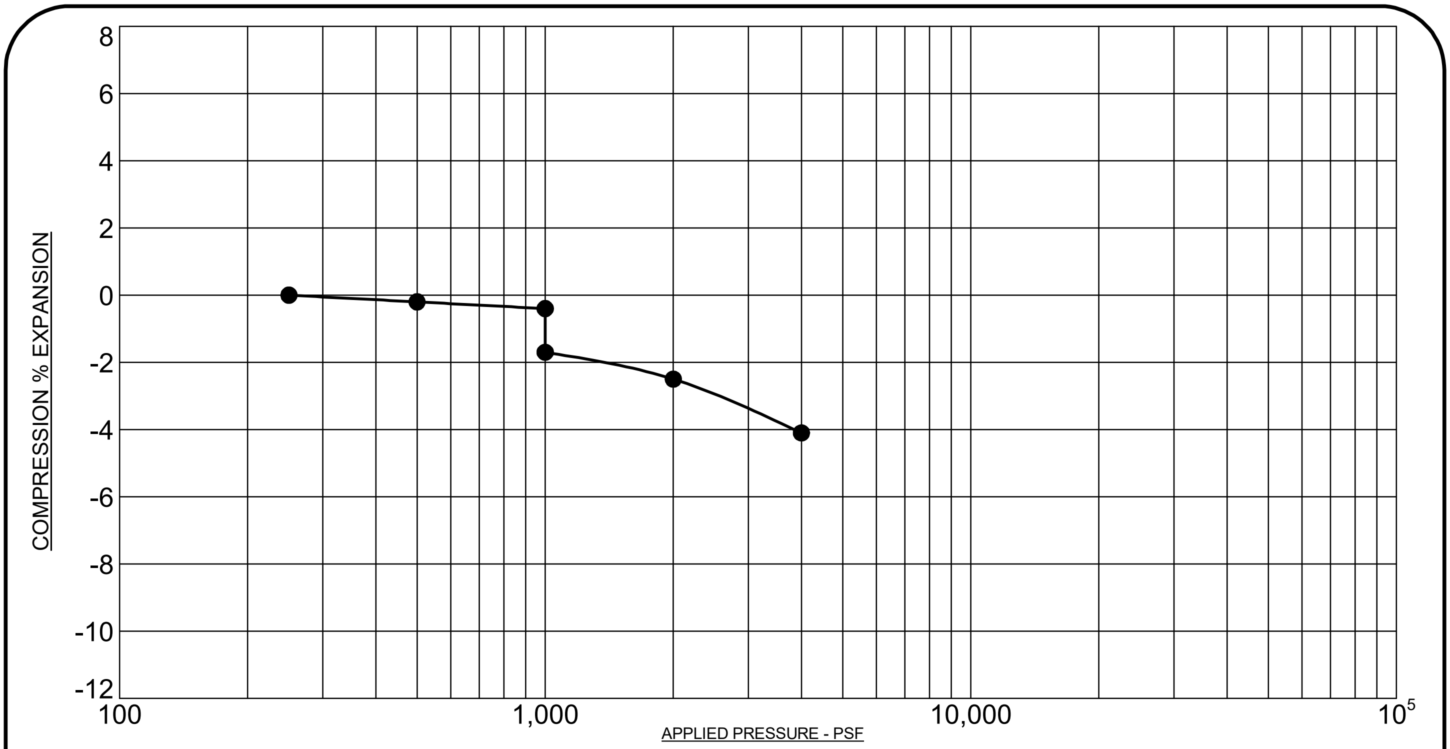
SOIL CLASSIFICATION DATA

JOB No. 187746

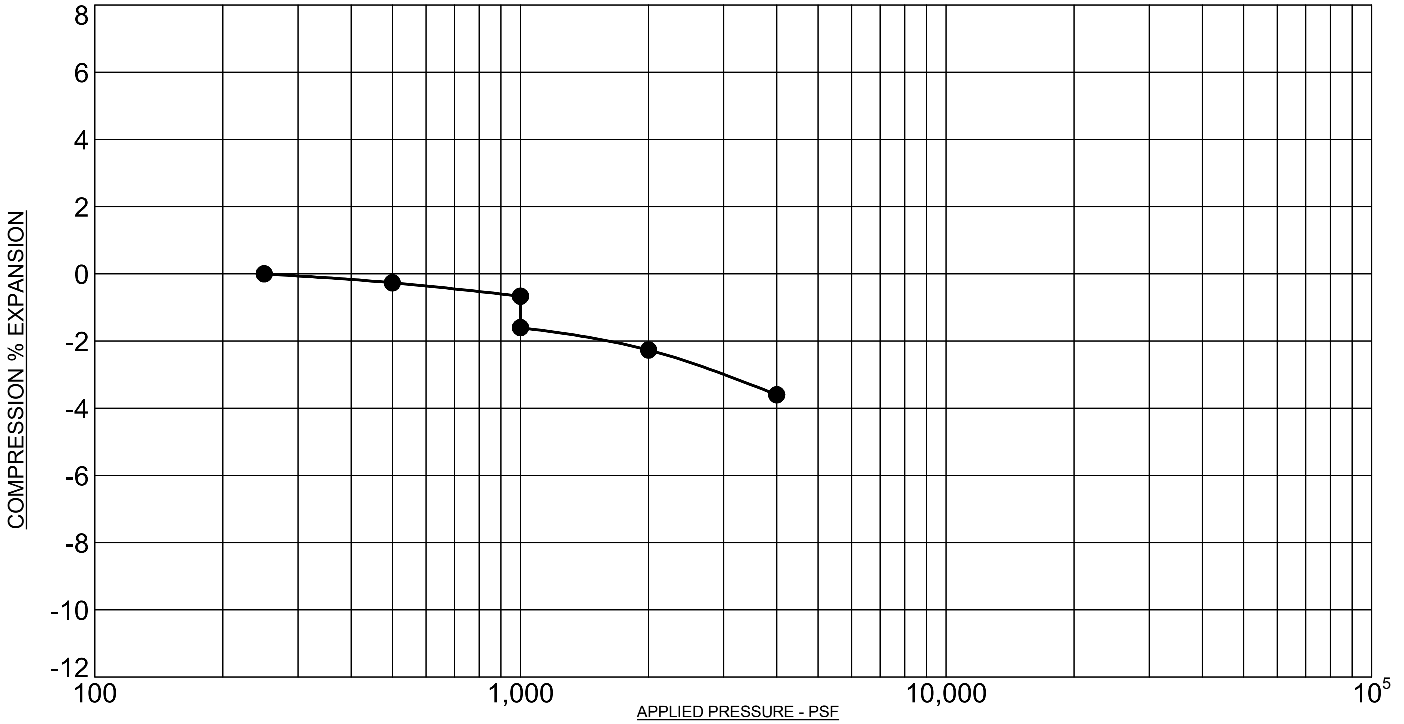
FIGURE No. 55

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **SAND, CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **1 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **103.2 PCF**
NATURAL MOISTURE CONTENT: **5.3%**
PERCENT SWELL/COMPRESSION: **- 1.3**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **1 @ 24 FT**
NATURAL DRY UNIT WEIGHT: **110.1 PCF**
NATURAL MOISTURE CONTENT: **12.4%**
PERCENT SWELL/COMPRESSION: **- 0.9**

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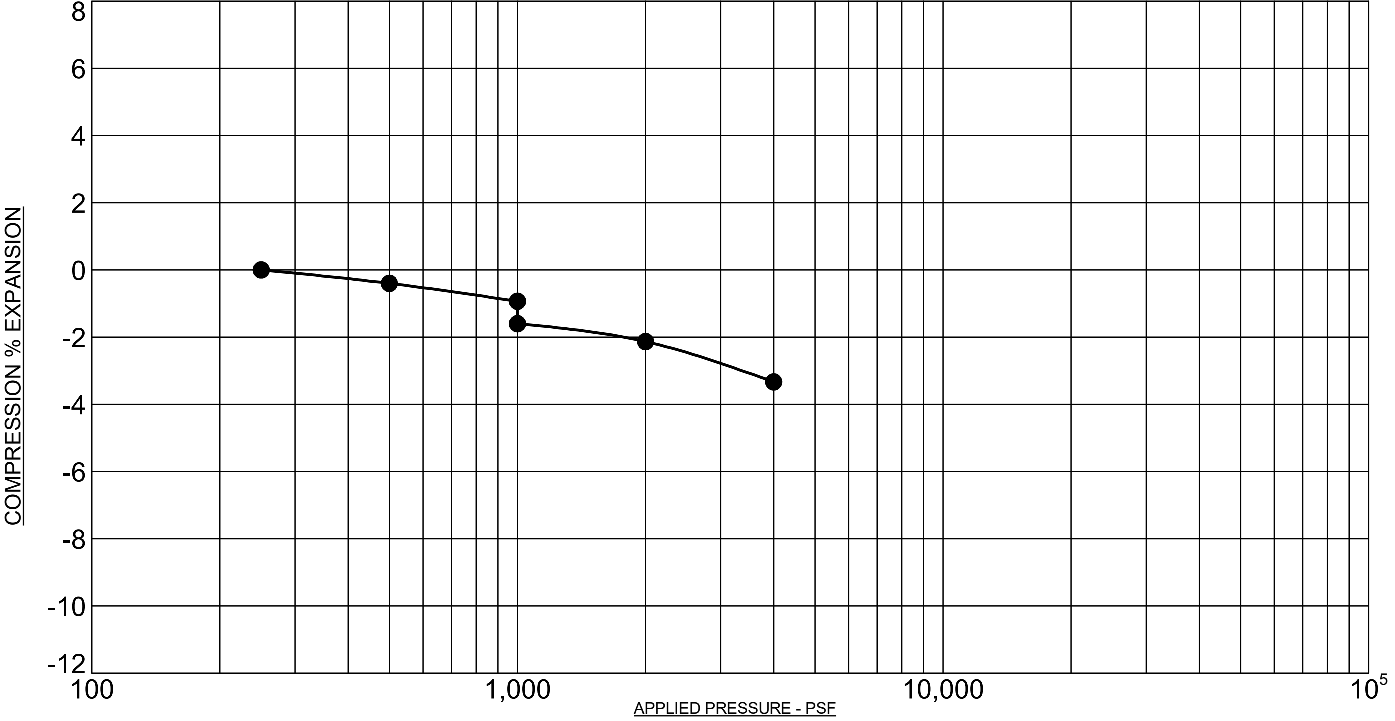
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

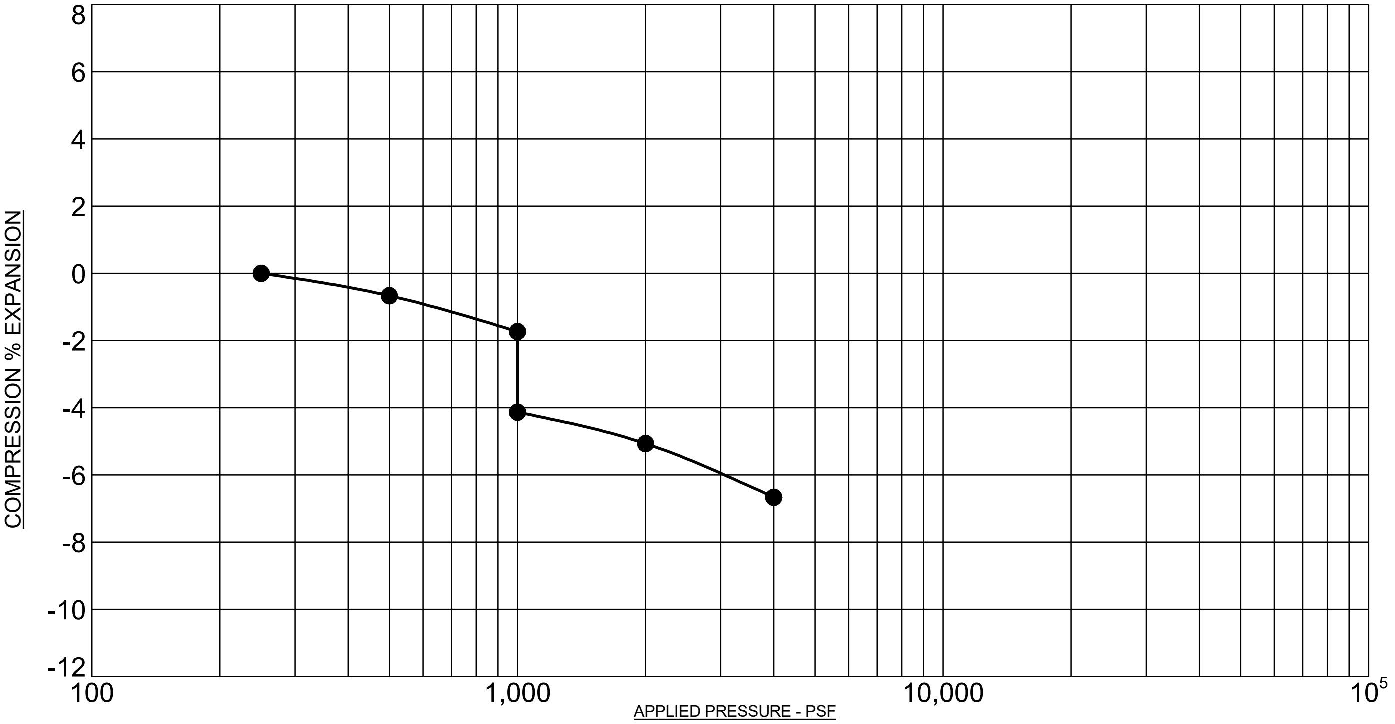
FIGURE No. 56

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **SANDSTONE, CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **2 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **107.4 PCF**
NATURAL MOISTURE CONTENT: **13.6%**
PERCENT SWELL/COMPRESSION: **- 0.7**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **SAND, CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **5 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **102.1 PCF**
NATURAL MOISTURE CONTENT: **7.9%**
PERCENT SWELL/COMPRESSION: **- 2.4**

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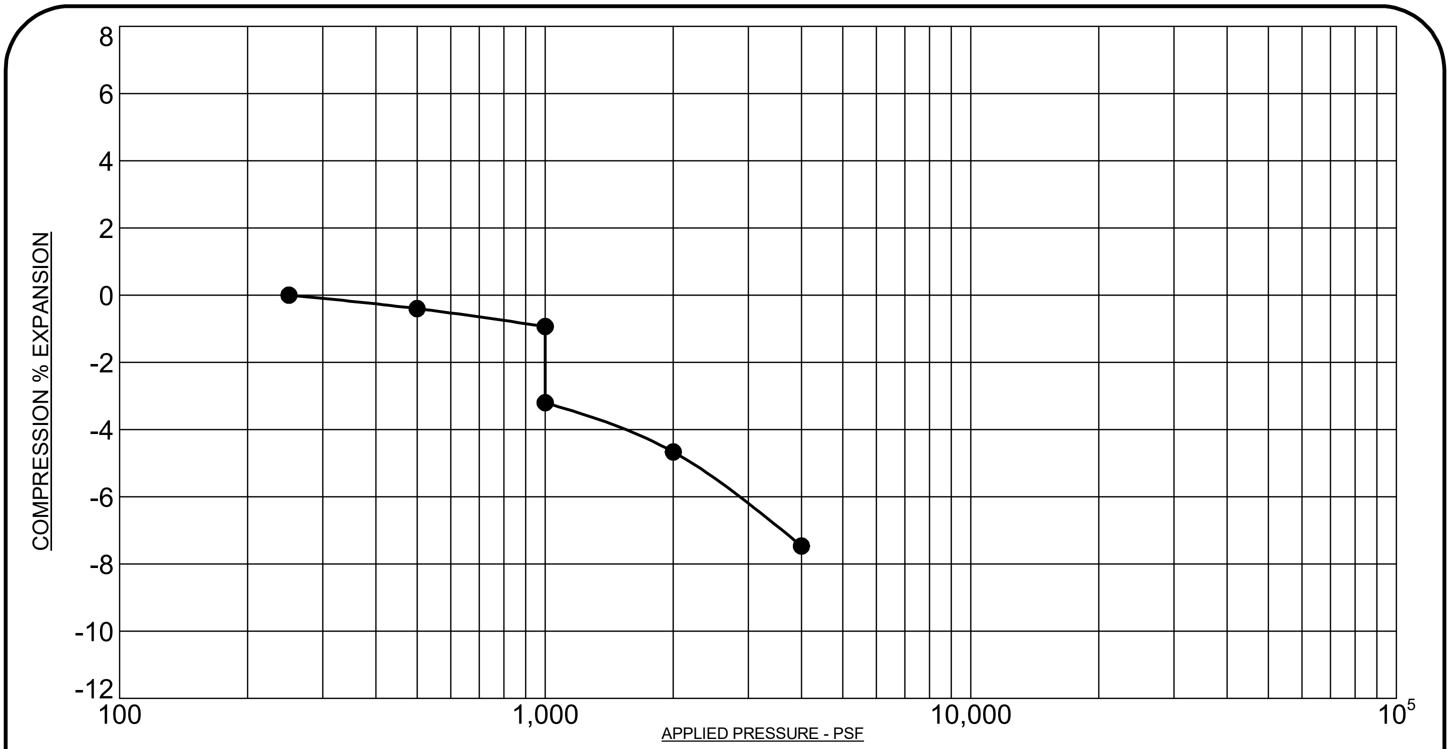
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

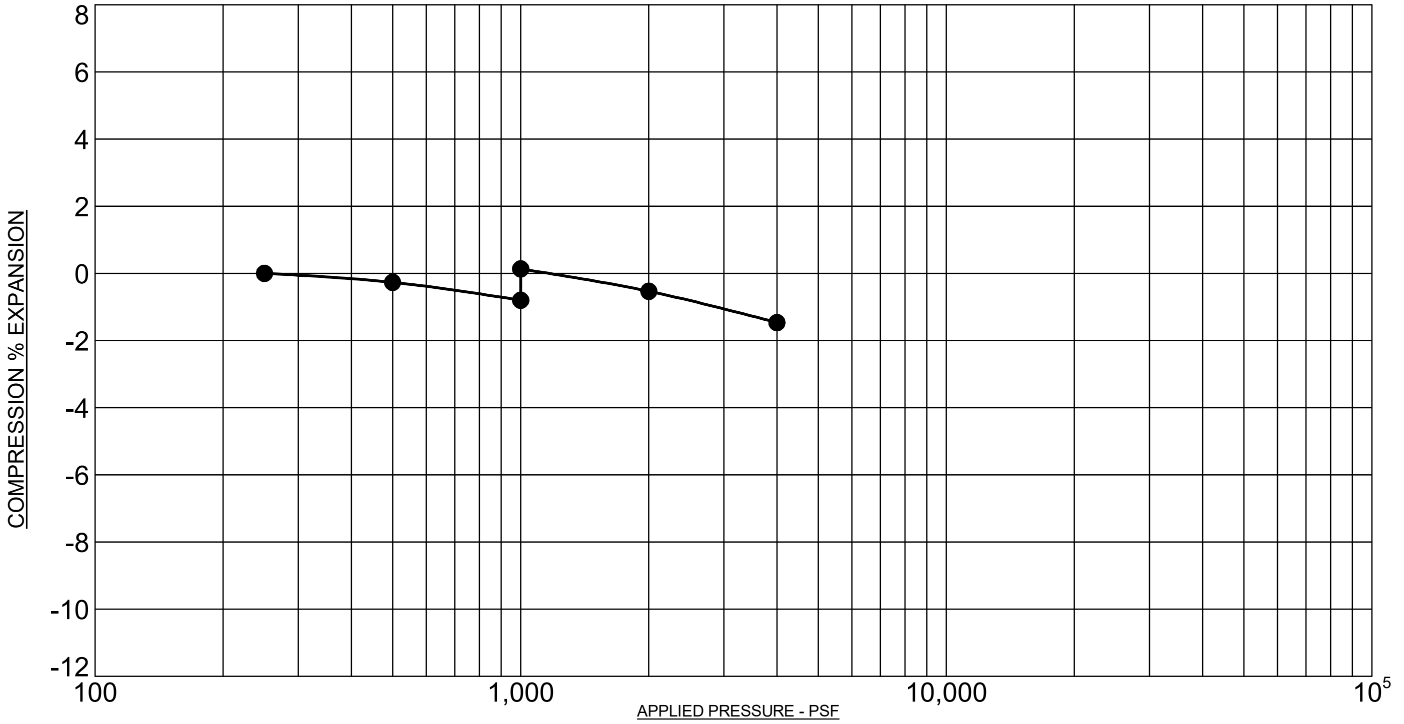
FIGURE No. 57

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **SAND, CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **6 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **102.5 PCF**
NATURAL MOISTURE CONTENT: **8.4%**
PERCENT SWELL/COMPRESSION: **- 2.3**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **10 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **118.5 PCF**
NATURAL MOISTURE CONTENT: **12.1%**
PERCENT SWELL/COMPRESSION: **0.9**

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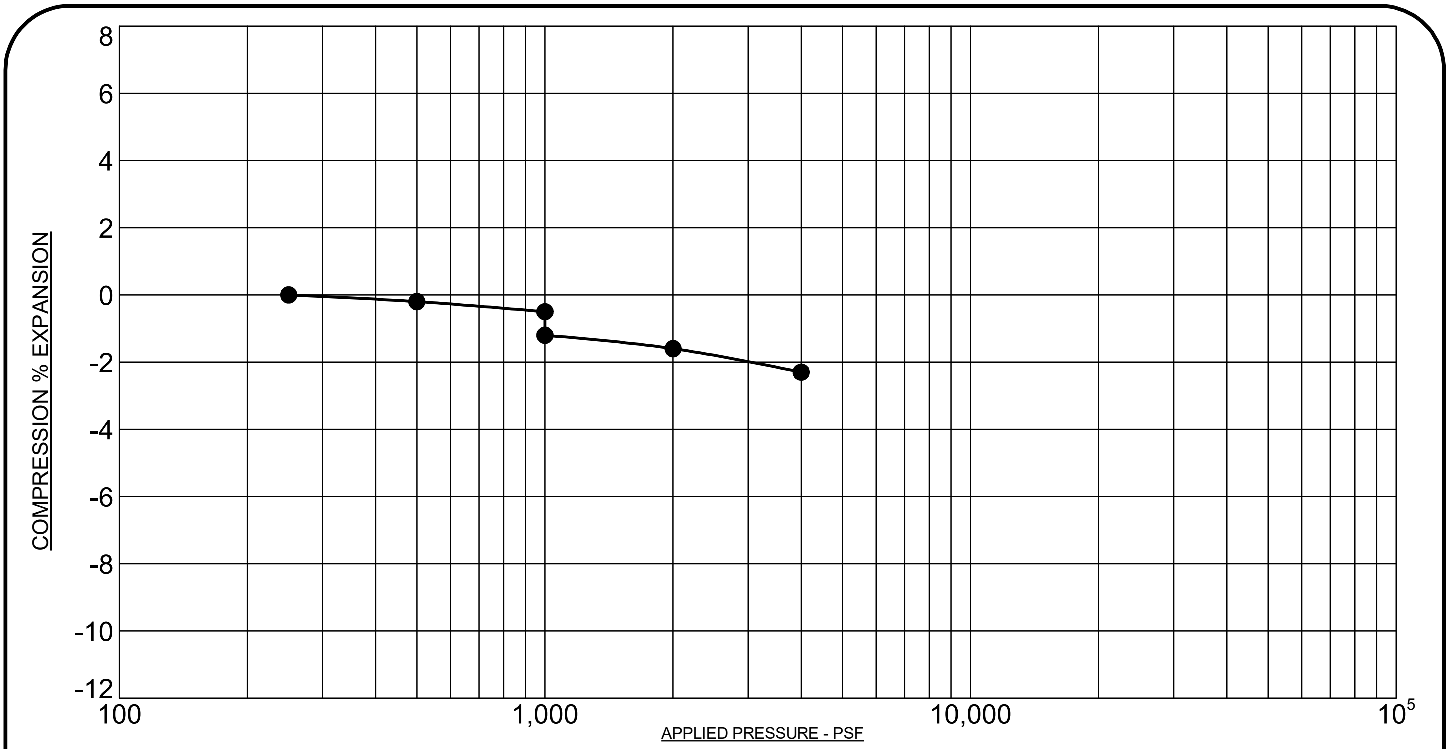
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

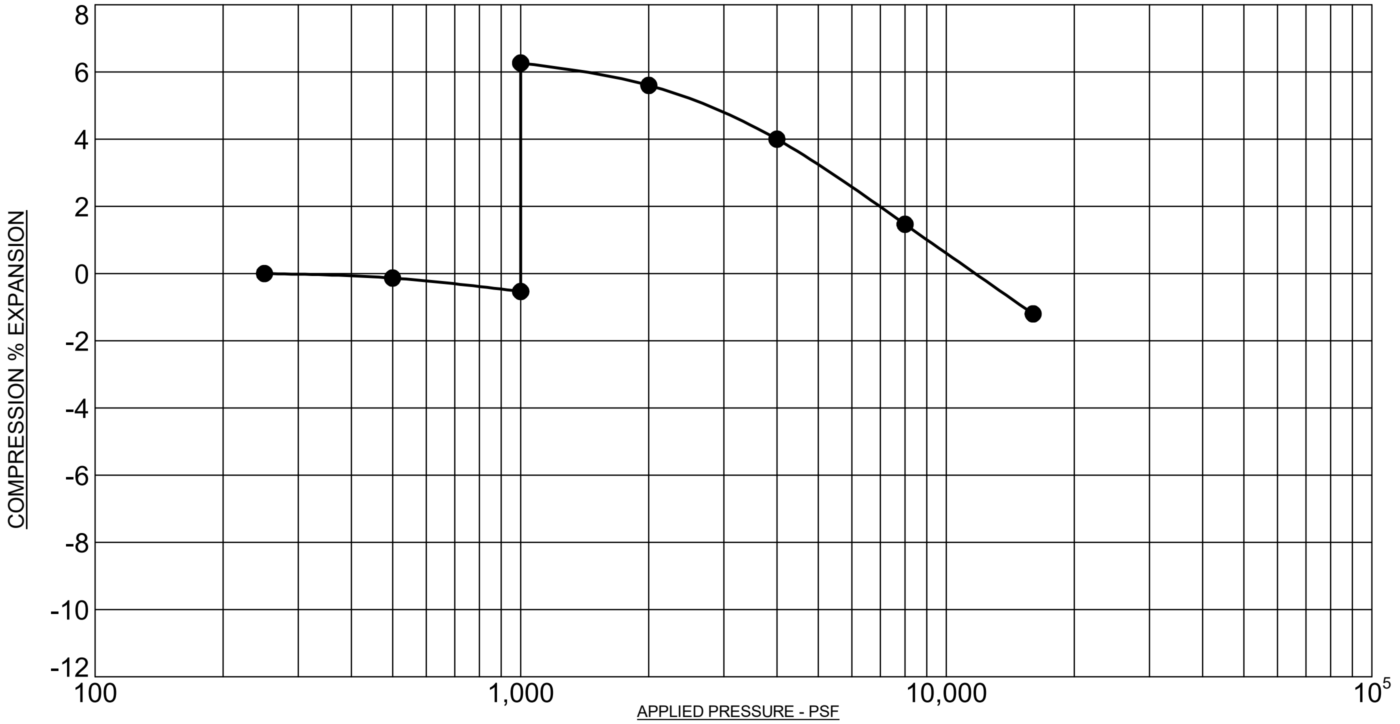
FIGURE No. 58

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **11 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **103.7 PCF**
NATURAL MOISTURE CONTENT: **11.5%**
PERCENT SWELL/COMPRESSION: **- 0.7**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **12 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **115.8 PCF**
NATURAL MOISTURE CONTENT: **12.4%**
PERCENT SWELL/COMPRESSION: **6.8**

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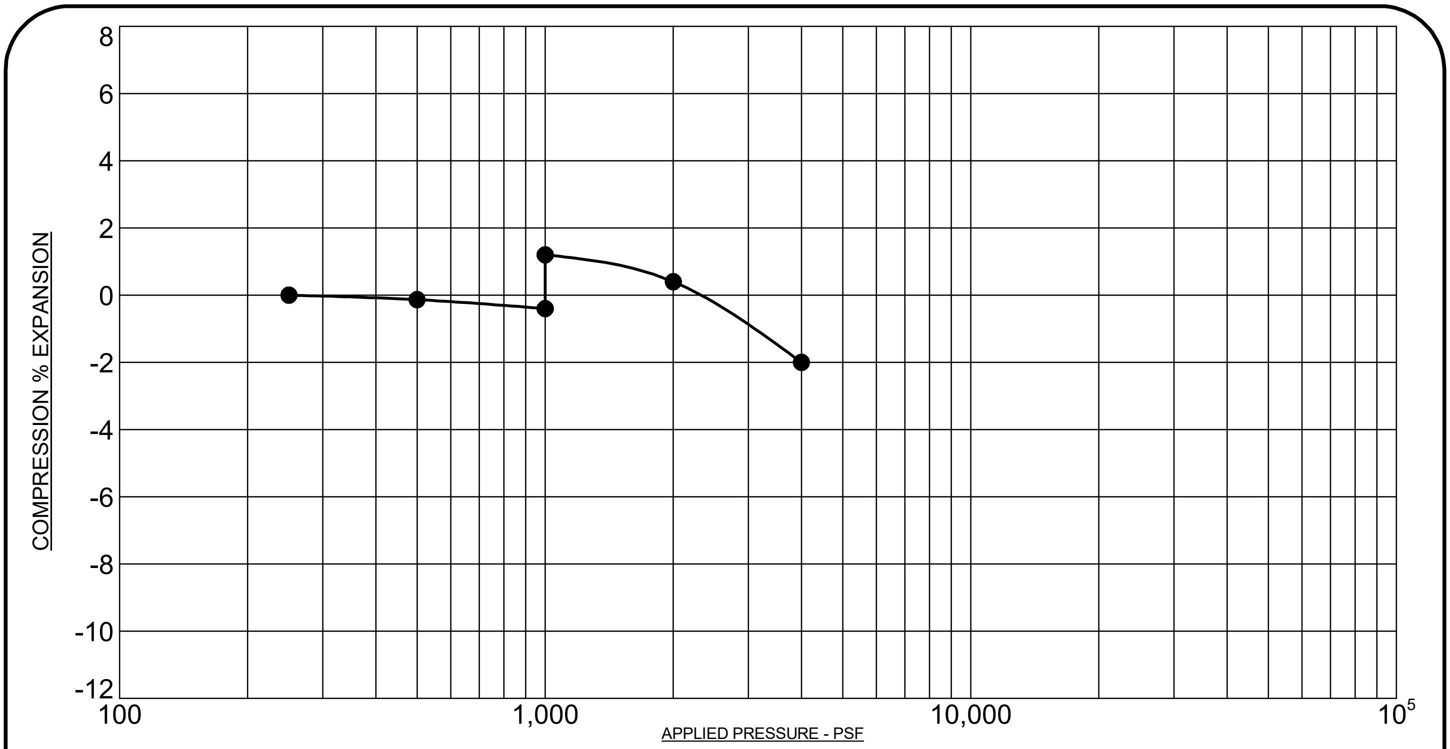
JOB No. 187746

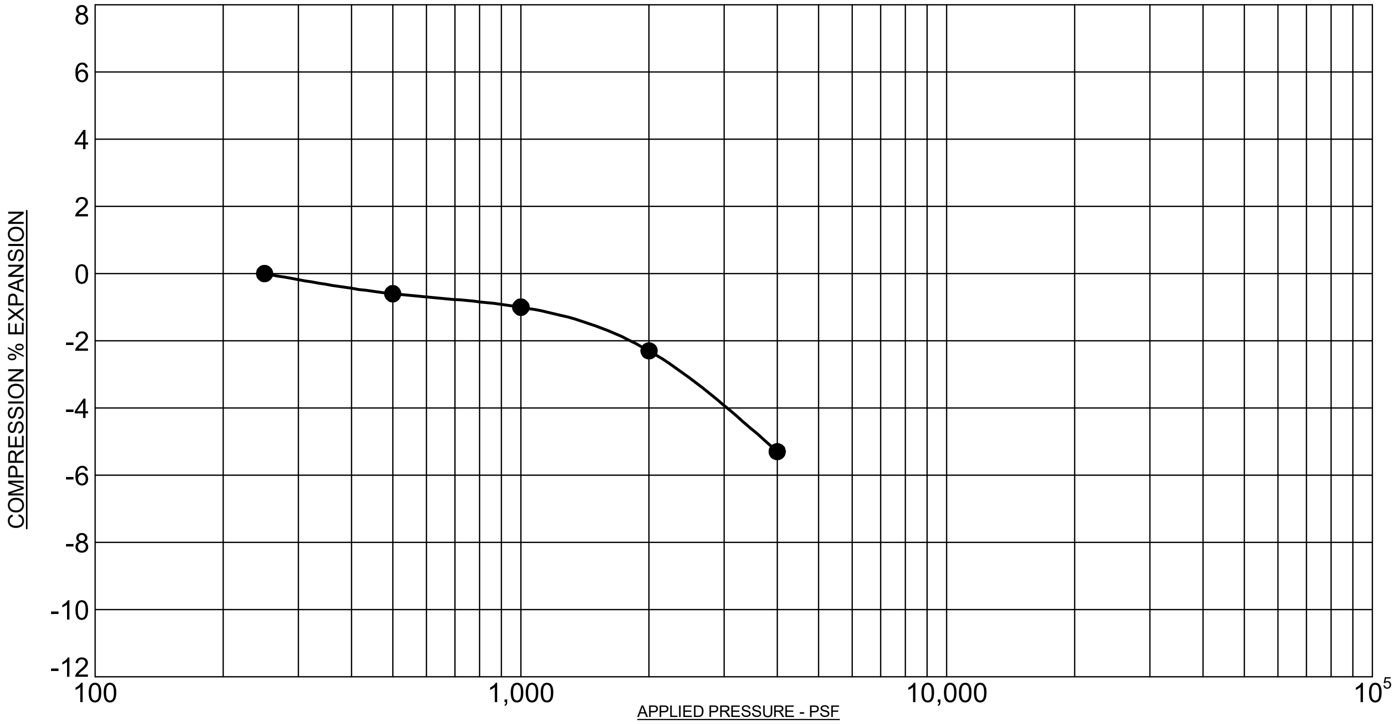
FIGURE No. 59

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **13 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **107.5 PCF**
NATURAL MOISTURE CONTENT: **9.5%**
PERCENT SWELL/COMPRESSION: **1.6**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **13 @ 24 FT**
NATURAL DRY UNIT WEIGHT: **99.5 PCF**
NATURAL MOISTURE CONTENT: **9.5%**
PERCENT SWELL/COMPRESSION: **0.0**

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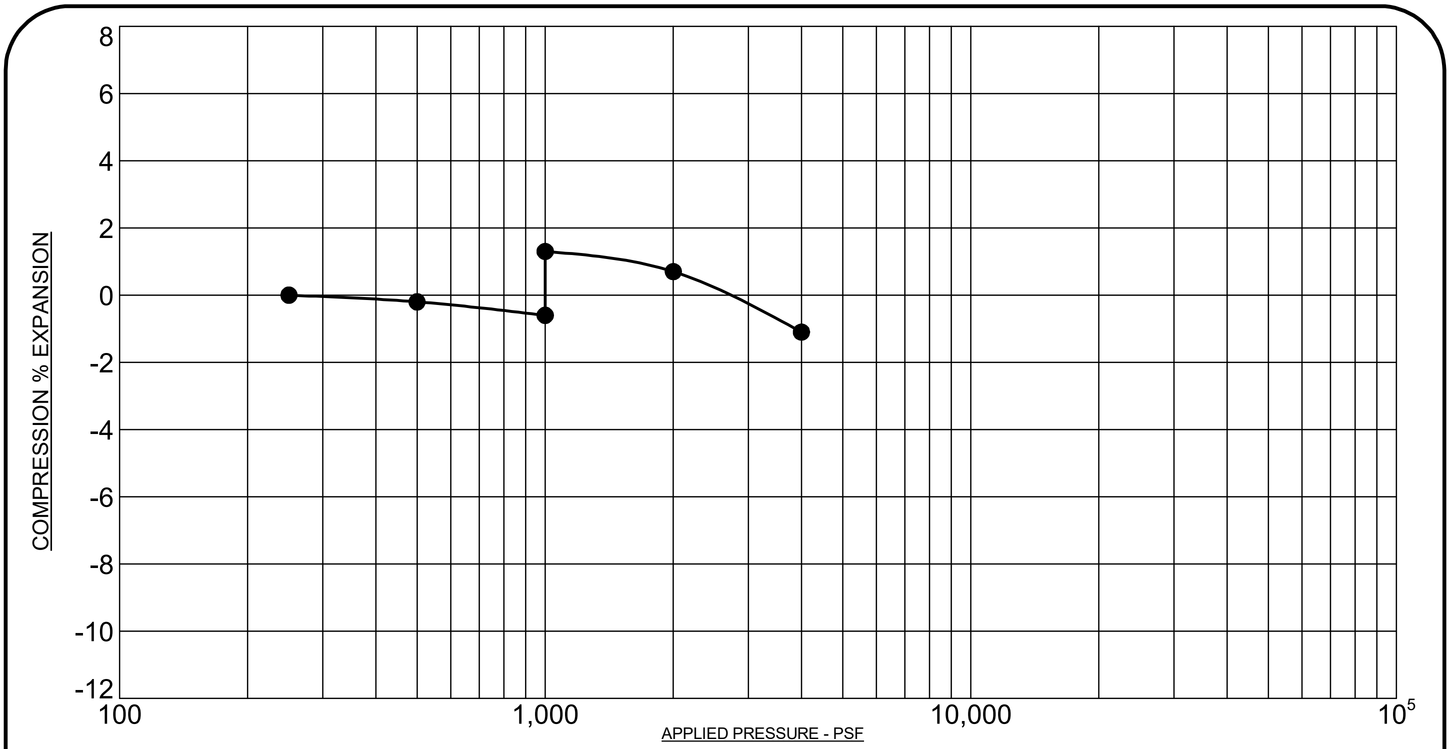
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

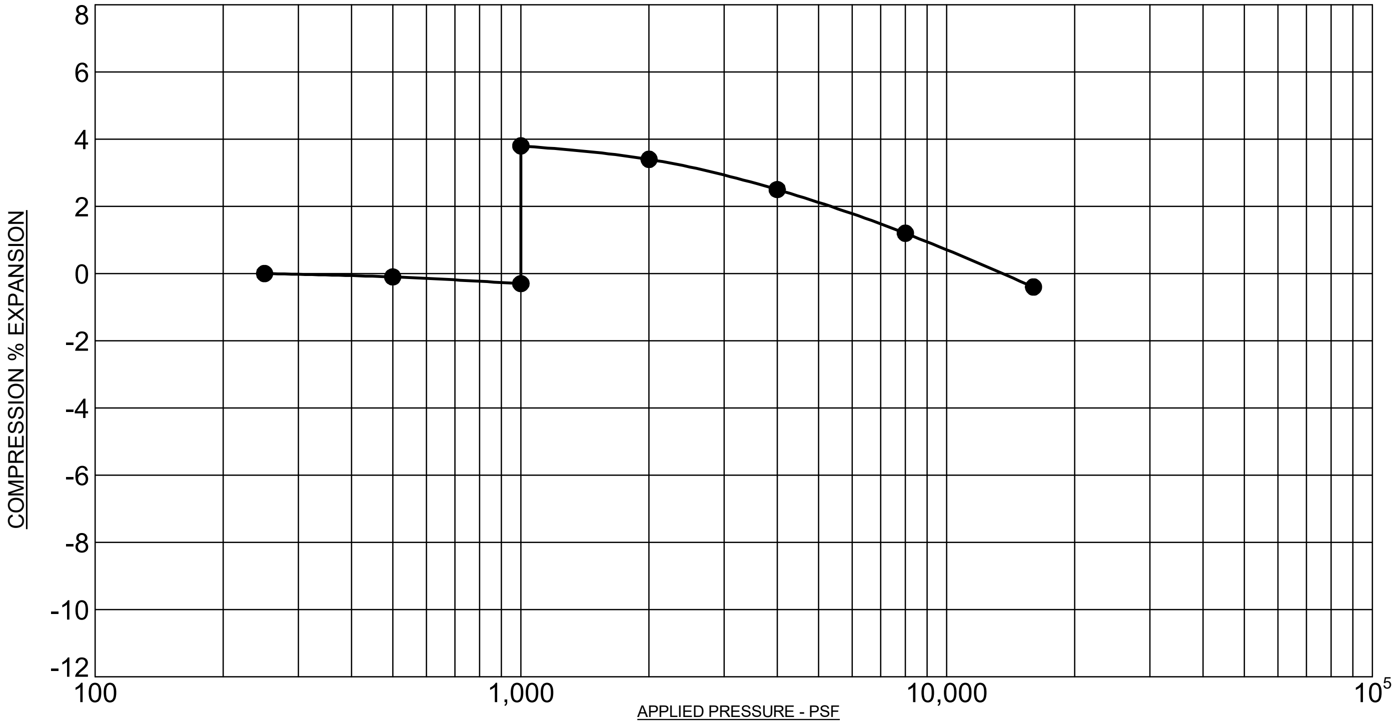
FIGURE No. 60

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **SAND, CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **15 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **111.2 PCF**
NATURAL MOISTURE CONTENT: **7.8%**
PERCENT SWELL/COMPRESSION: **1.9**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **17 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **115.3 PCF**
NATURAL MOISTURE CONTENT: **16.0%**
PERCENT SWELL/COMPRESSION: **4.1**

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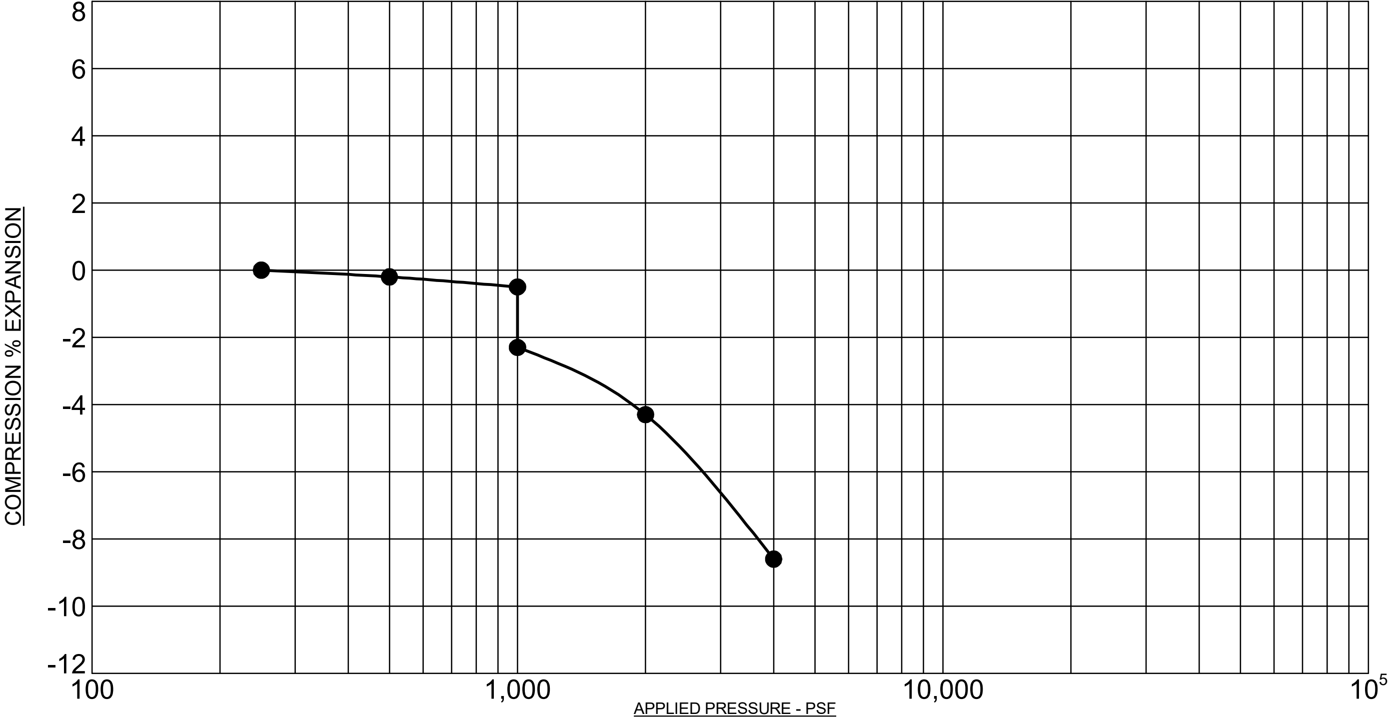
SWELL/CONSOLIDATION
TEST RESULTS

JOB No. 187746

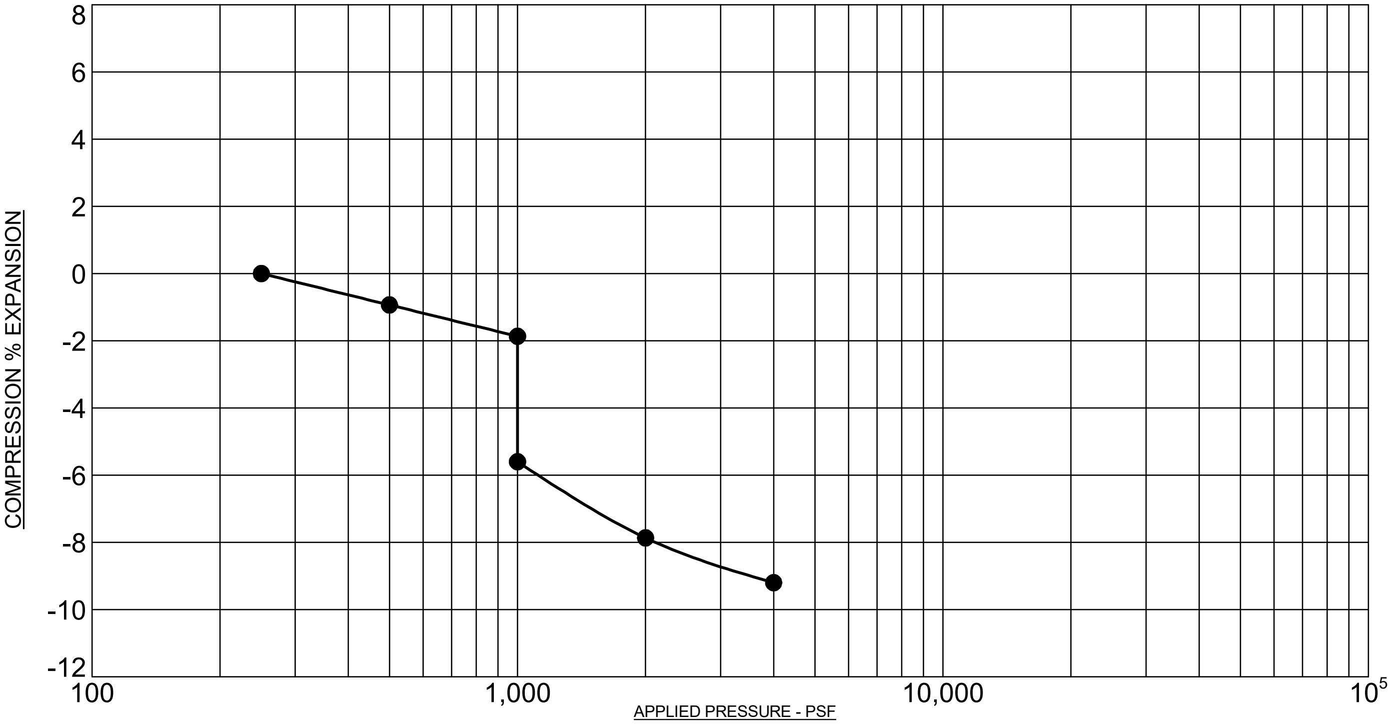
FIGURE No. 61

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **18 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **91.3 PCF**
NATURAL MOISTURE CONTENT: **8.7%**
PERCENT SWELL/COMPRESSION: **- 1.8**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **19 @ 24 FT**
NATURAL DRY UNIT WEIGHT: **99.4 PCF**
NATURAL MOISTURE CONTENT: **7.0%**
PERCENT SWELL/COMPRESSION: **- 3.7**

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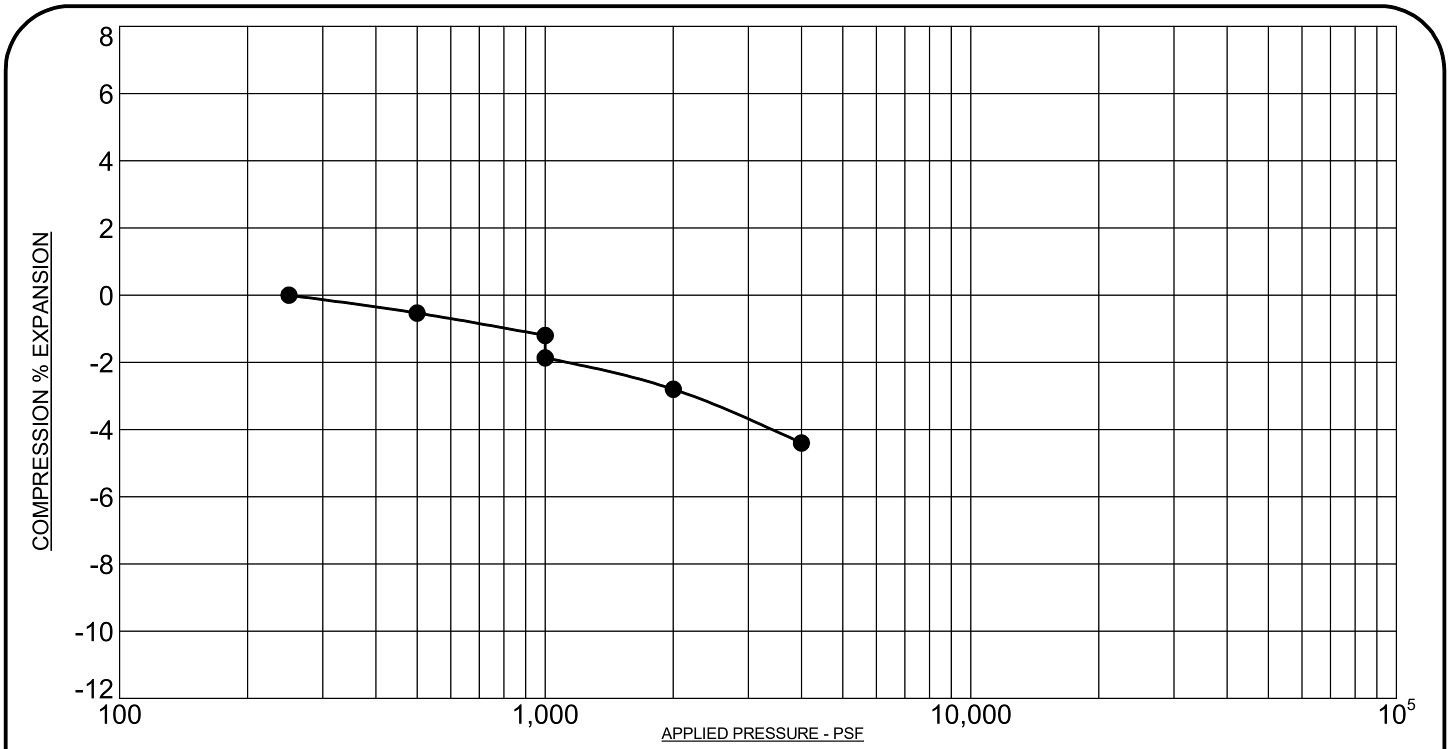
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

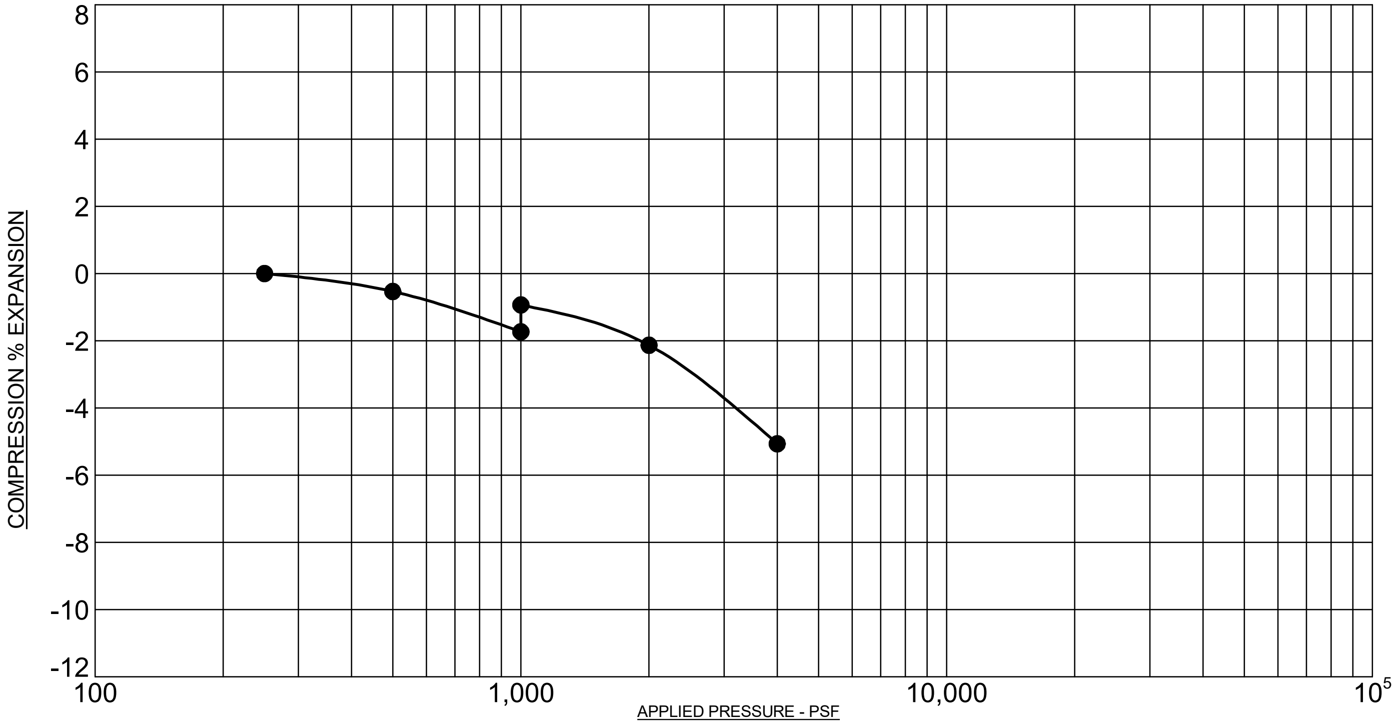
FIGURE No. 62

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **19 @ 29 FT**
NATURAL DRY UNIT WEIGHT: **109.9 PCF**
NATURAL MOISTURE CONTENT: **12.3%**
PERCENT SWELL/COMPRESSION: **- 0.7**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **23 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **103.1 PCF**
NATURAL MOISTURE CONTENT: **7.7%**
PERCENT SWELL/COMPRESSION: **0.8**

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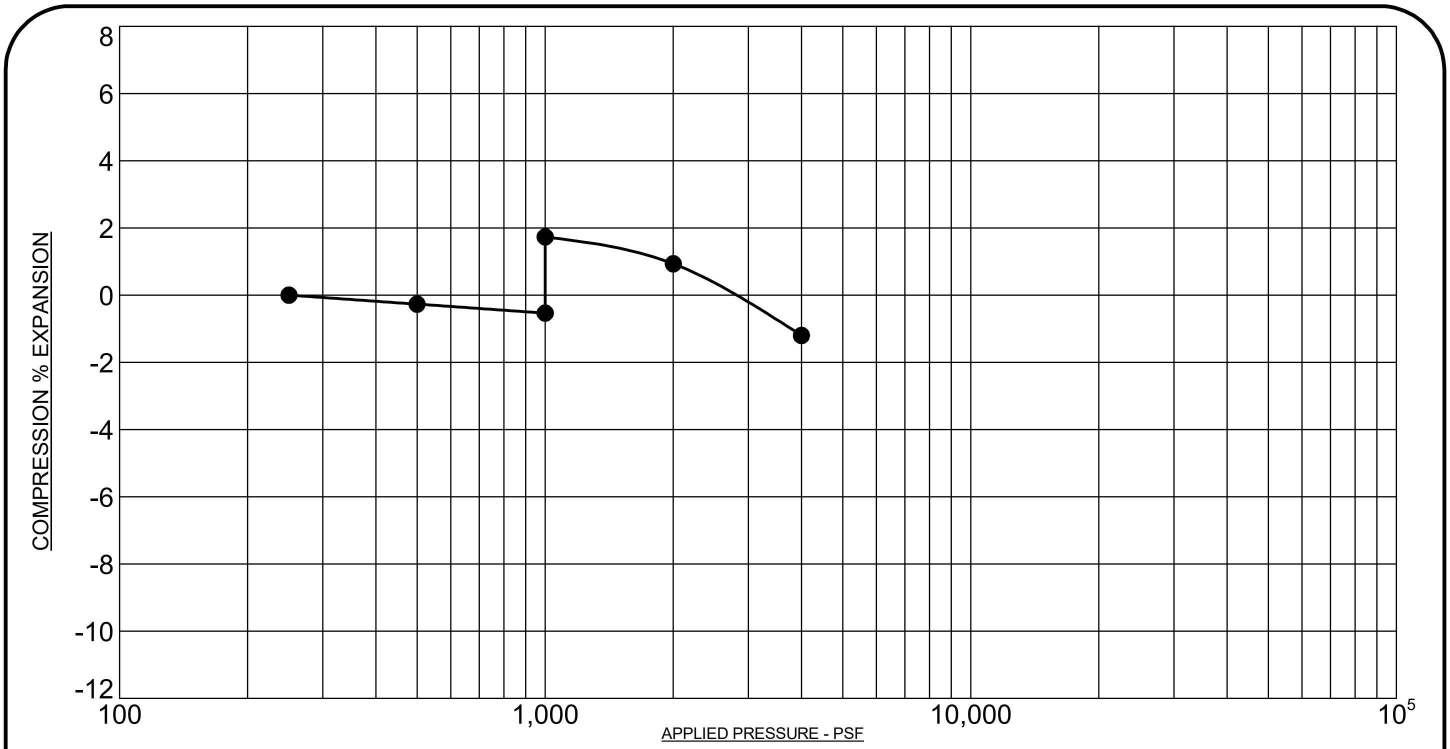
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

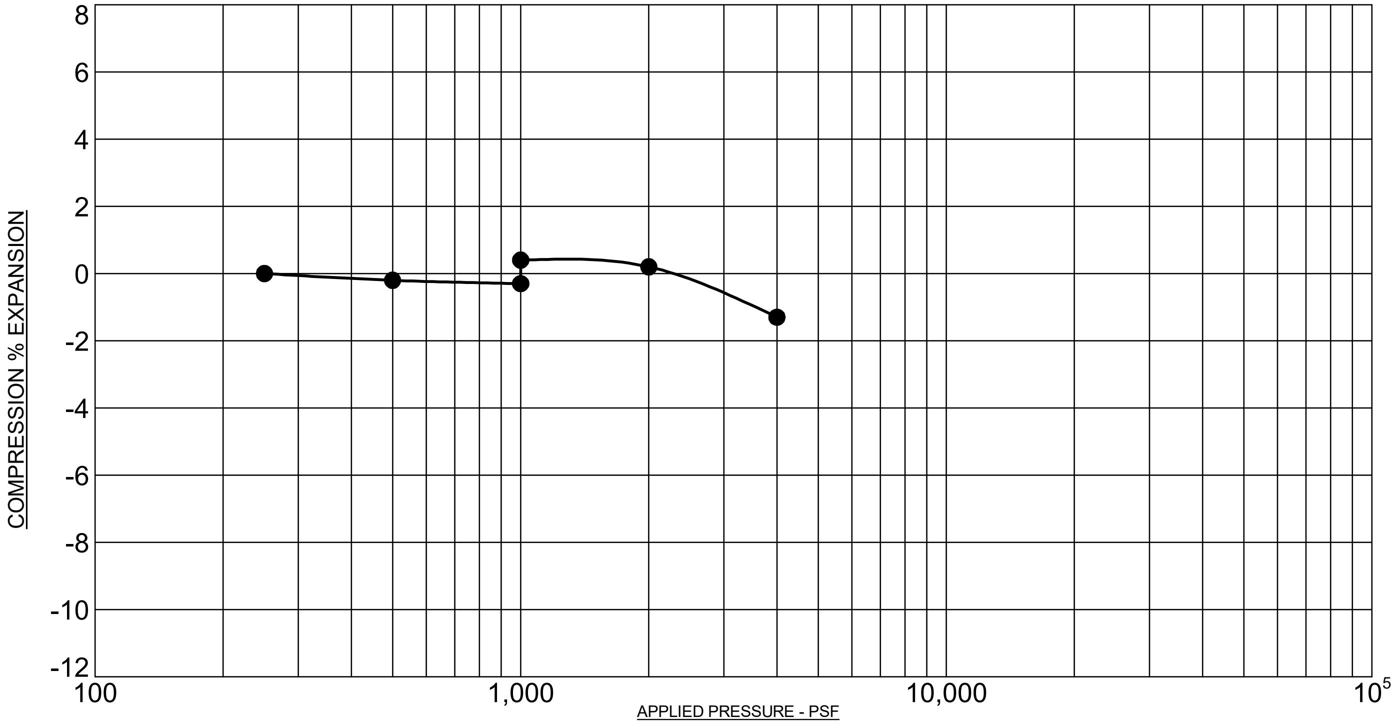
FIGURE No. 63

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **24 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **113.3 PCF**
NATURAL MOISTURE CONTENT: **8.6%**
PERCENT SWELL/COMPRESSION: **2.3**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY,**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **25 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **106.0 PCF**
NATURAL MOISTURE CONTENT: **7.7%**
PERCENT SWELL/COMPRESSION: **0.7**

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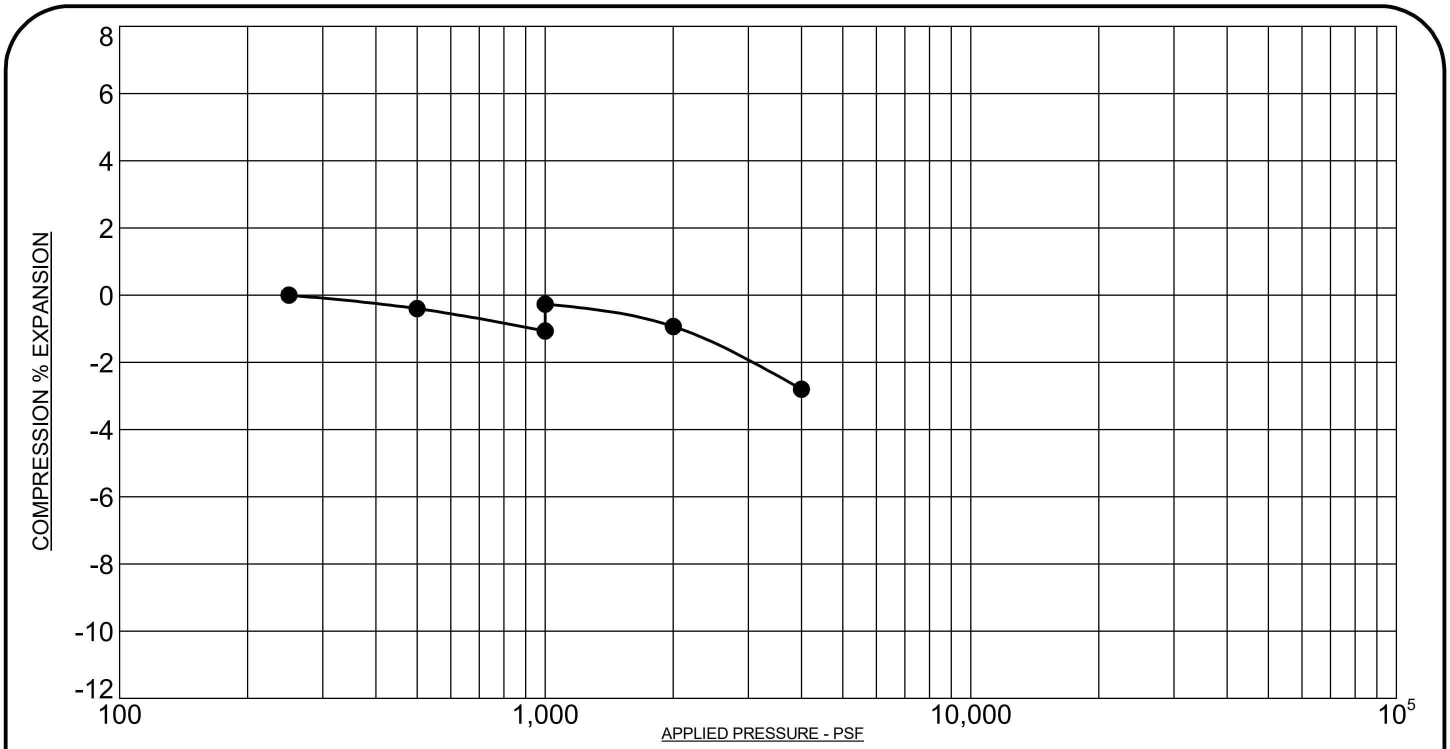
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

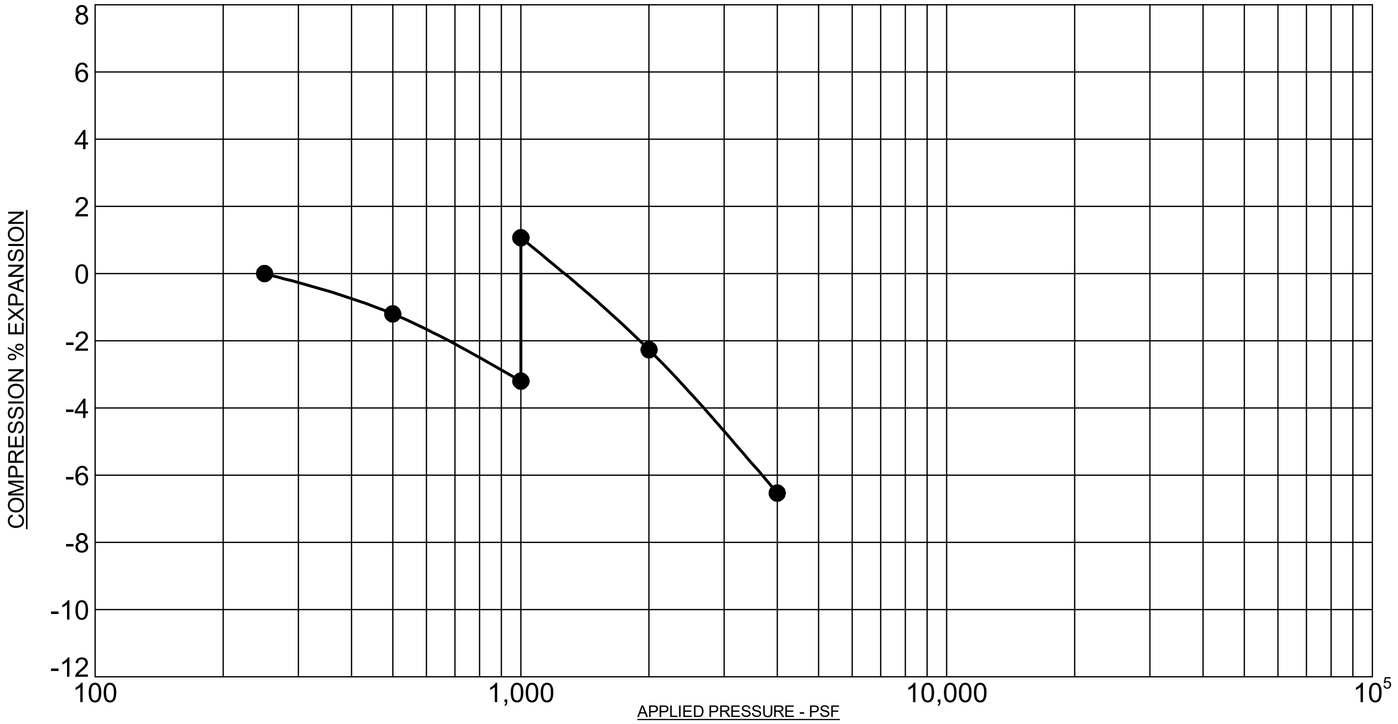
FIGURE No. 64

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **26 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **114.8 PCF**
NATURAL MOISTURE CONTENT: **9.3%**
PERCENT SWELL/COMPRESSION: **0.8**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **27 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **85.0 PCF**
NATURAL MOISTURE CONTENT: **7.3%**
PERCENT SWELL/COMPRESSION: **4.3**

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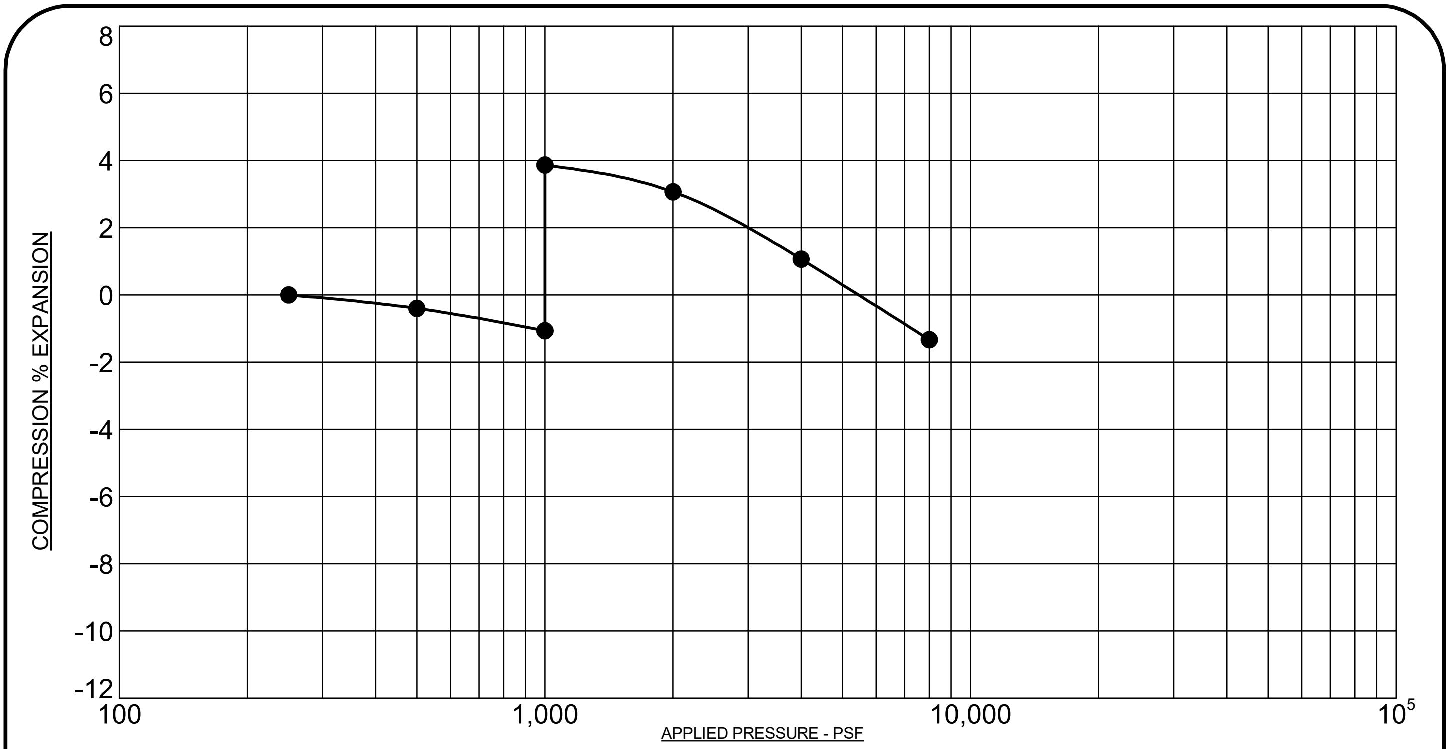
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

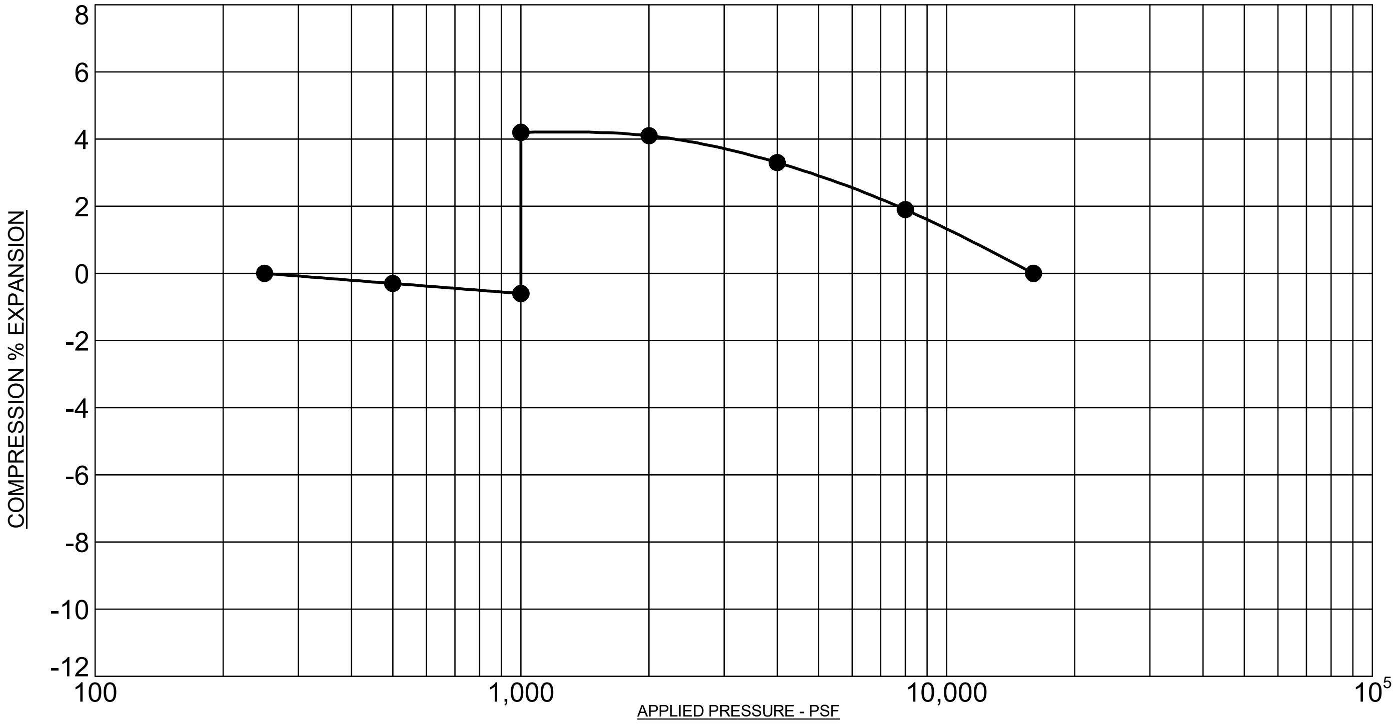
FIGURE No. 65

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **29 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **117.0 PCF**
NATURAL MOISTURE CONTENT: **14.3%**
PERCENT SWELL/COMPRESSION: **4.9**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **31 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **127.4 PCF**
NATURAL MOISTURE CONTENT: **5.5%**
PERCENT SWELL/COMPRESSION: **4.8**

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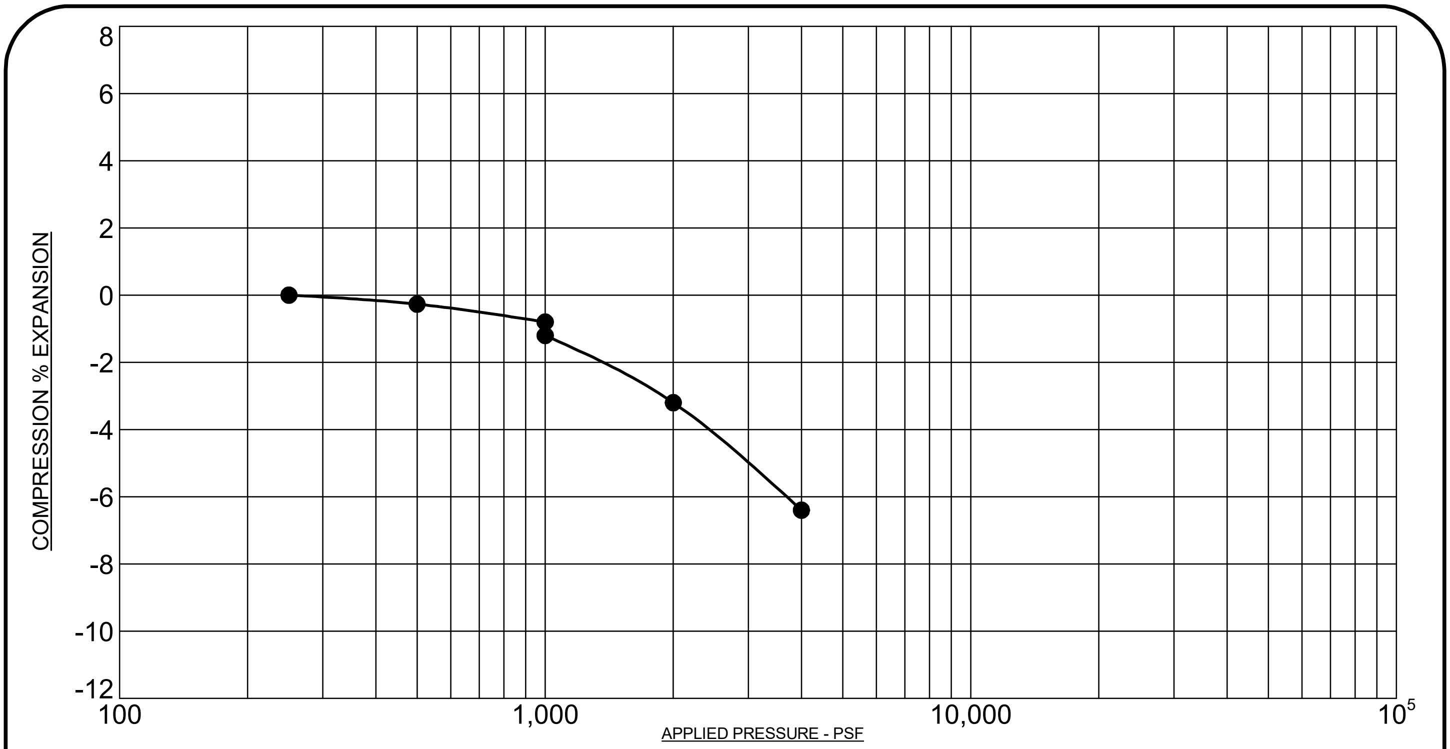
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

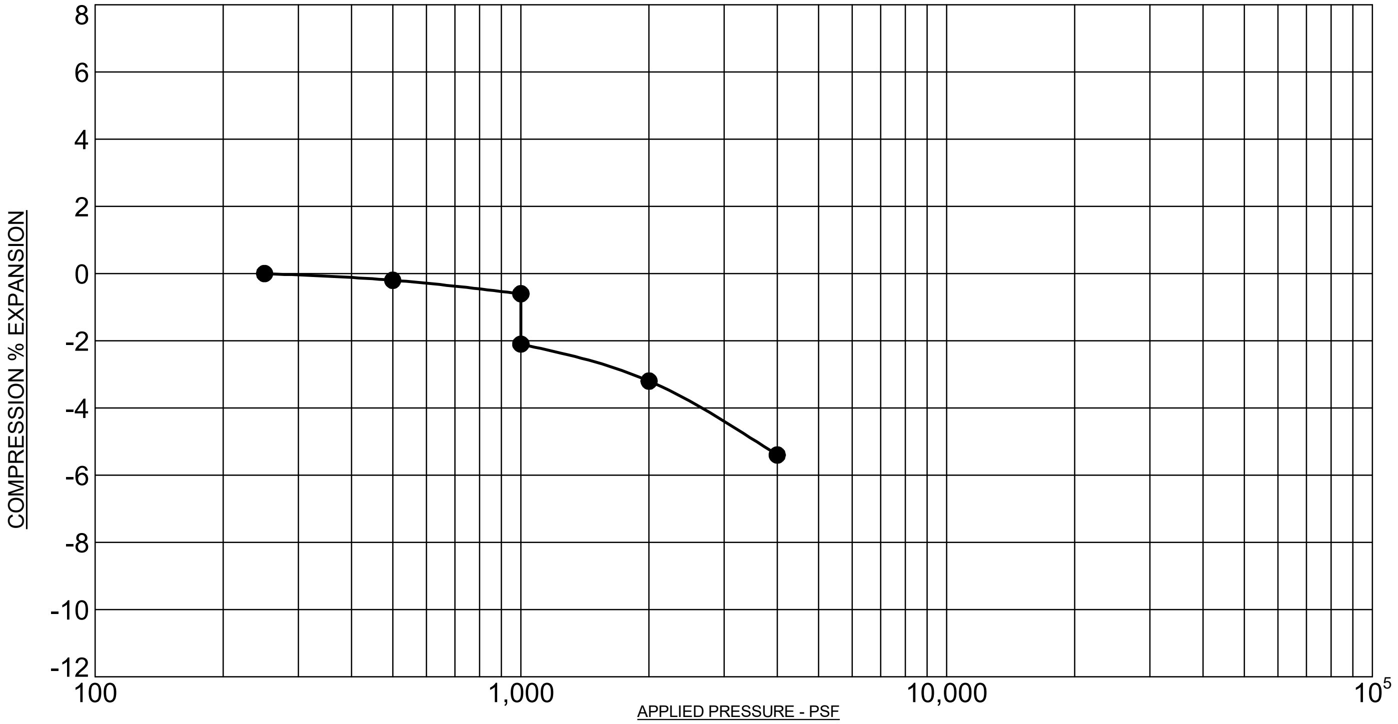
FIGURE No. 66

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **32 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **96.4 PCF**
NATURAL MOISTURE CONTENT: **13.4%**
PERCENT SWELL/COMPRESSION: **- 0.4**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **36 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **101.6 PCF**
NATURAL MOISTURE CONTENT: **6.0%**
PERCENT SWELL/COMPRESSION: **- 1.5**

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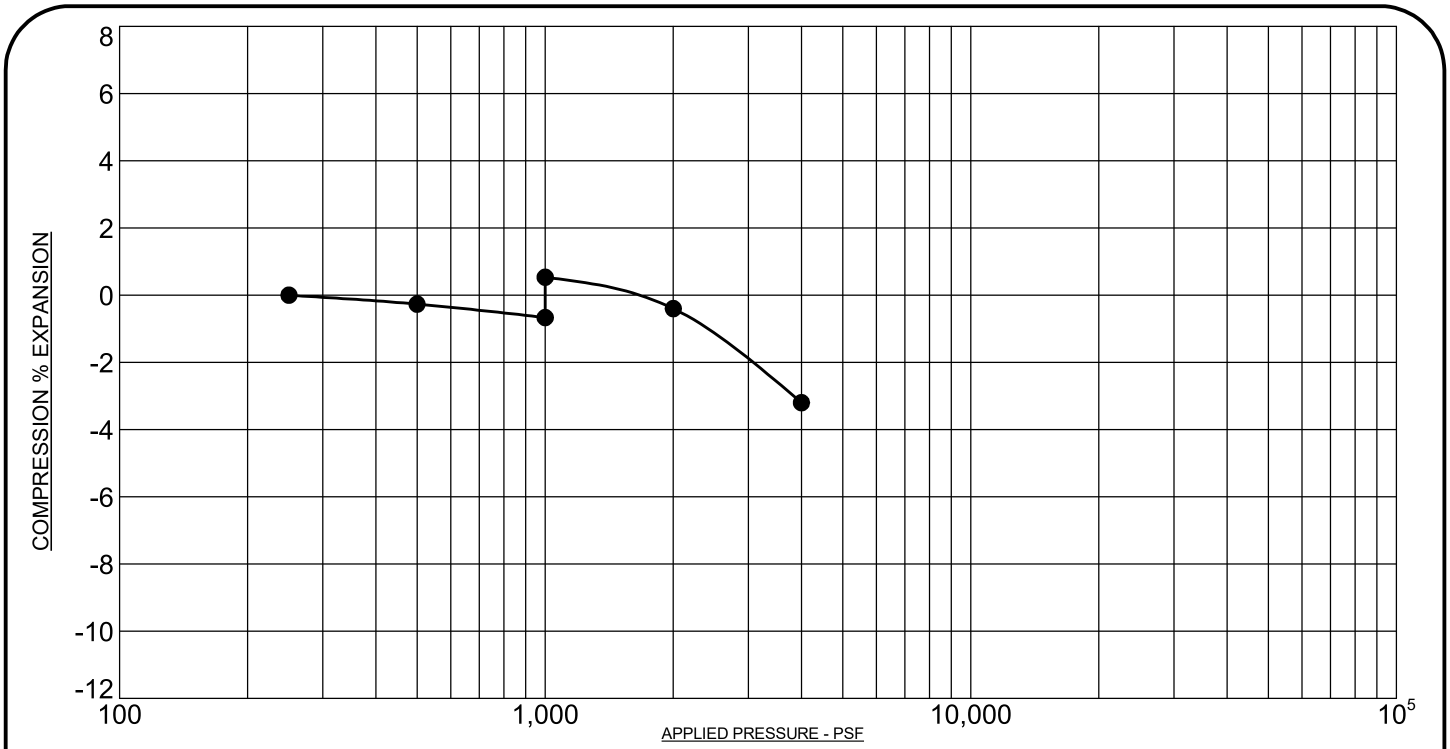
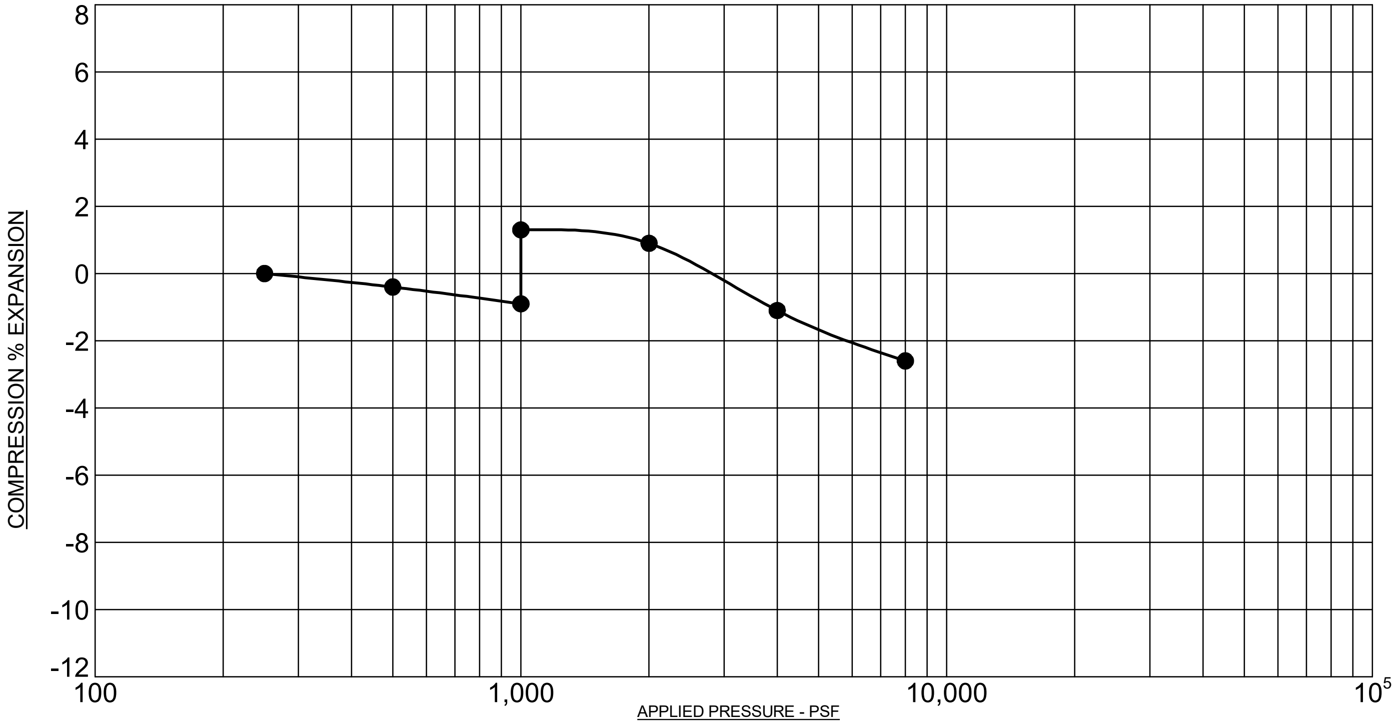
FIGURE No. 67

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **37 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **106.2 PCF**
NATURAL MOISTURE CONTENT: **10.2%**
PERCENT SWELL/COMPRESSION: **1.2**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **38 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **102.5 PCF**
NATURAL MOISTURE CONTENT: **20.4%**
PERCENT SWELL/COMPRESSION: **2.2**

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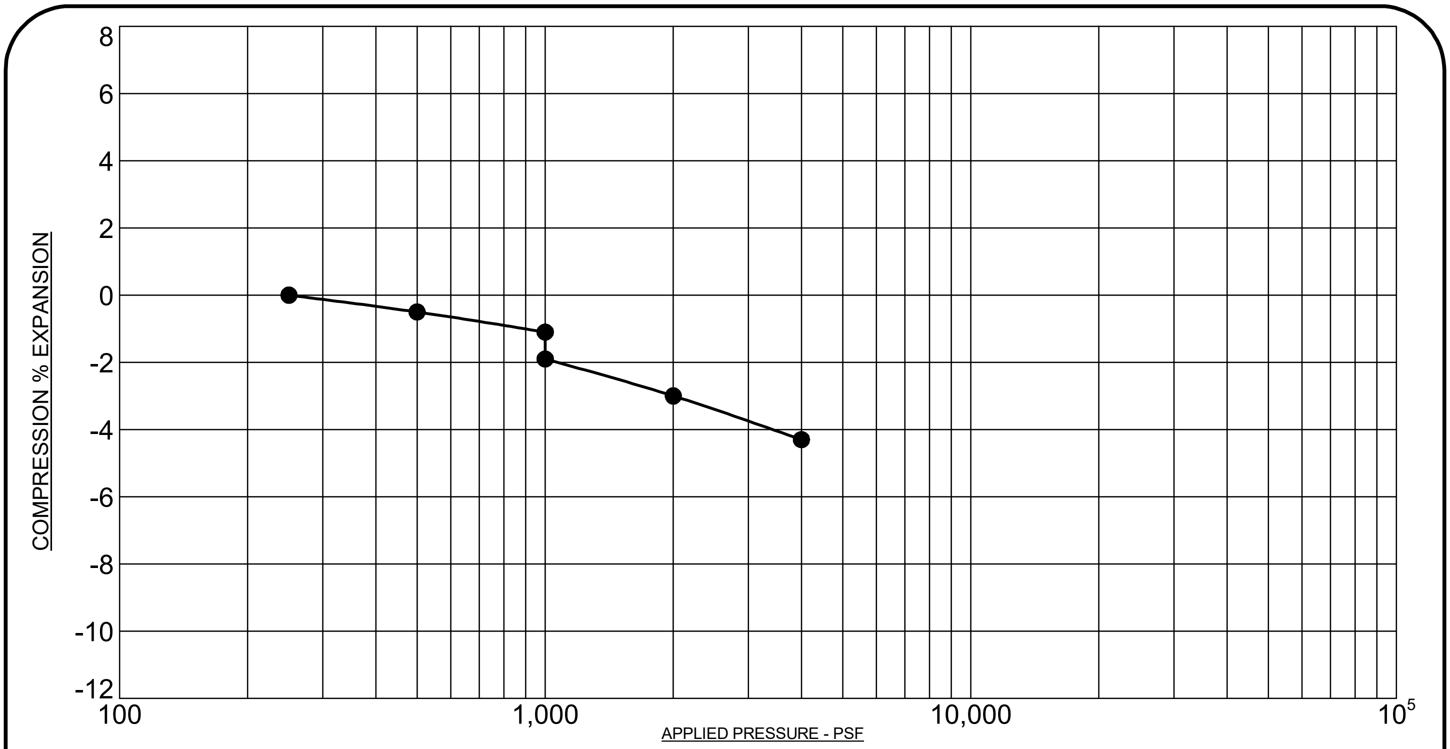
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

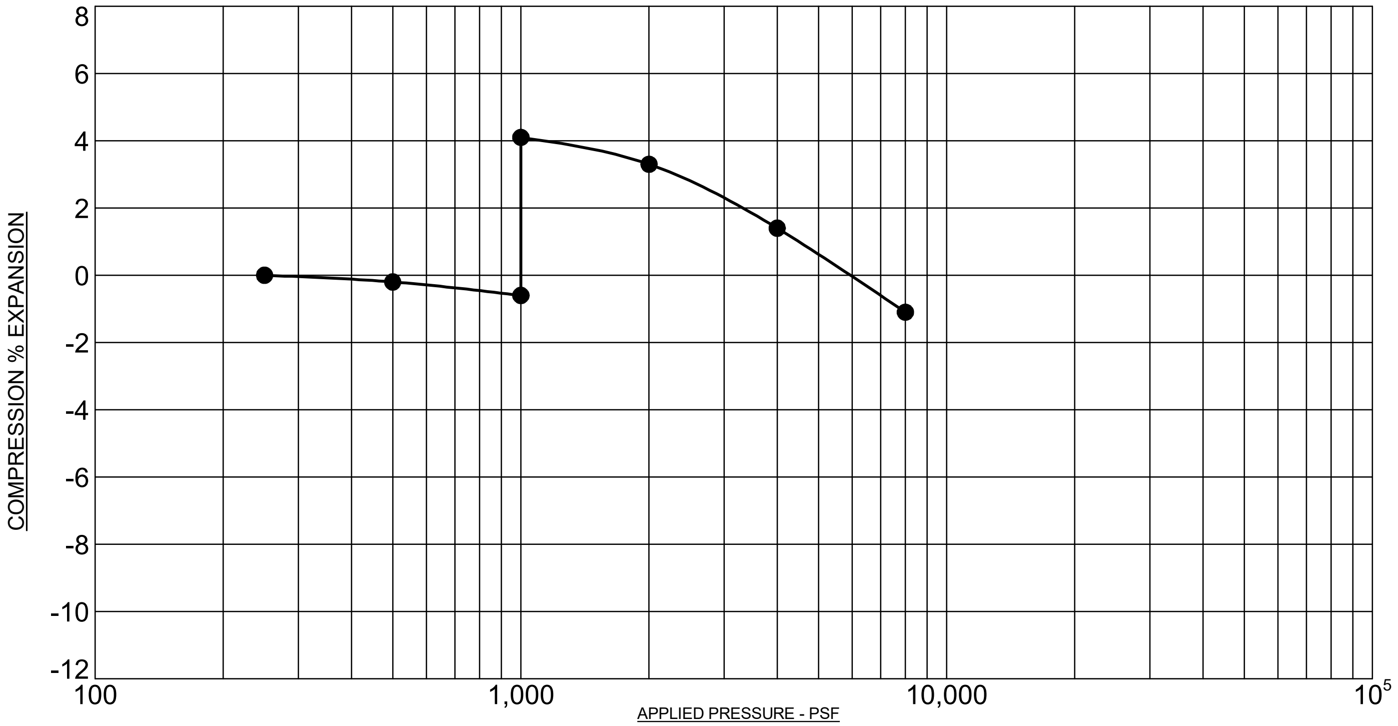
FIGURE No. 68

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **38 @ 29 FT**
NATURAL DRY UNIT WEIGHT: **108.9 PCF**
NATURAL MOISTURE CONTENT: **17.5%**
PERCENT SWELL/COMPRESSION: **- 0.8**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **42 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **111.8 PCF**
NATURAL MOISTURE CONTENT: **10.2%**
PERCENT SWELL/COMPRESSION: **4.7**

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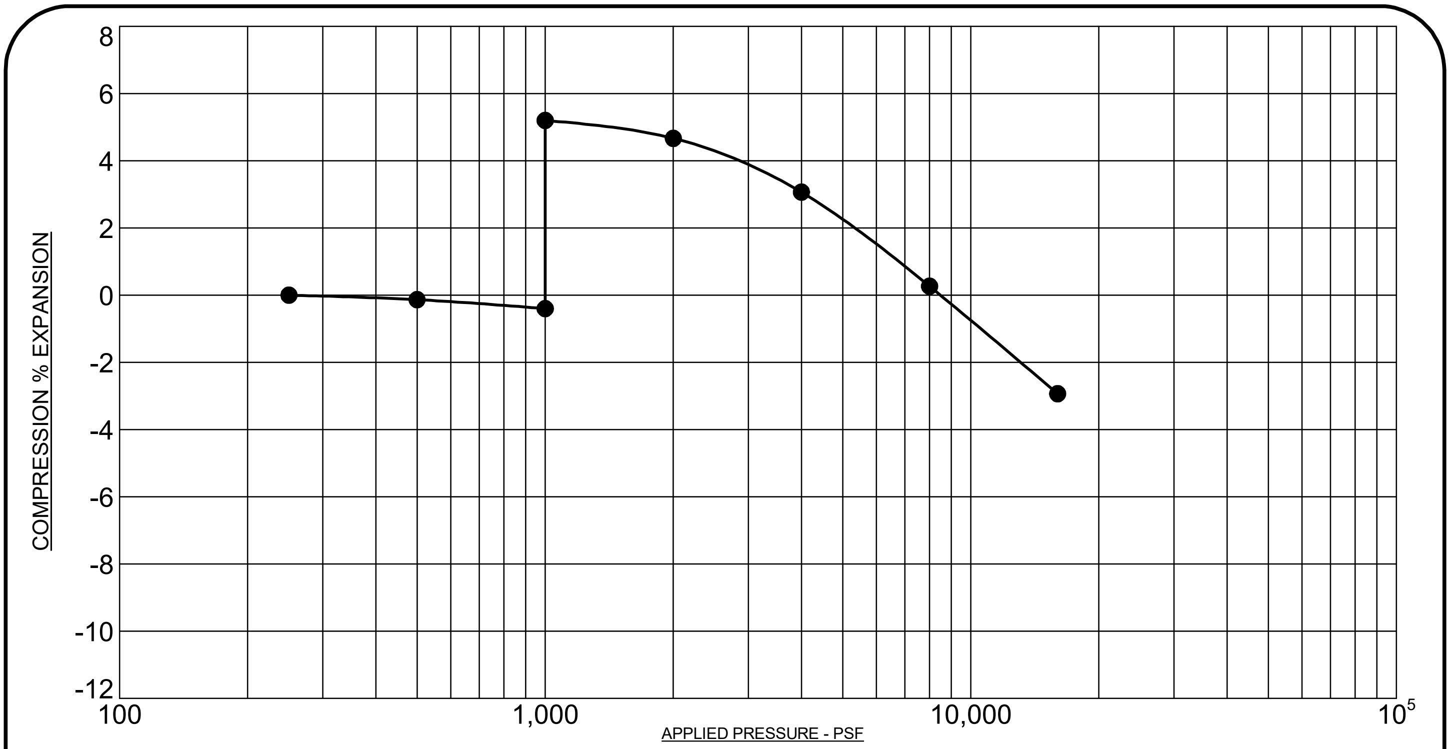
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

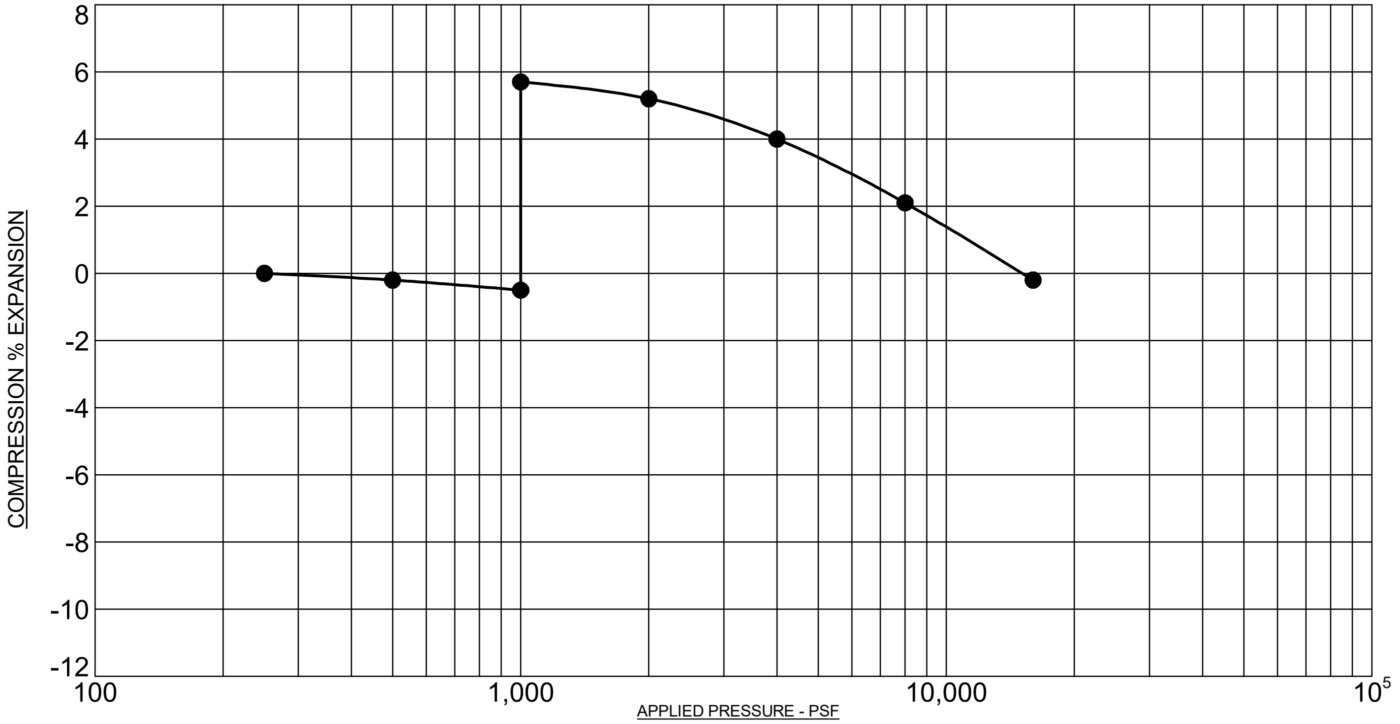
FIGURE No. 69

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **43 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **112.0 PCF**
NATURAL MOISTURE CONTENT: **12.9%**
PERCENT SWELL/COMPRESSION: **5.6**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **44 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **118.6 PCF**
NATURAL MOISTURE CONTENT: **13.2%**
PERCENT SWELL/COMPRESSION: **6.2**

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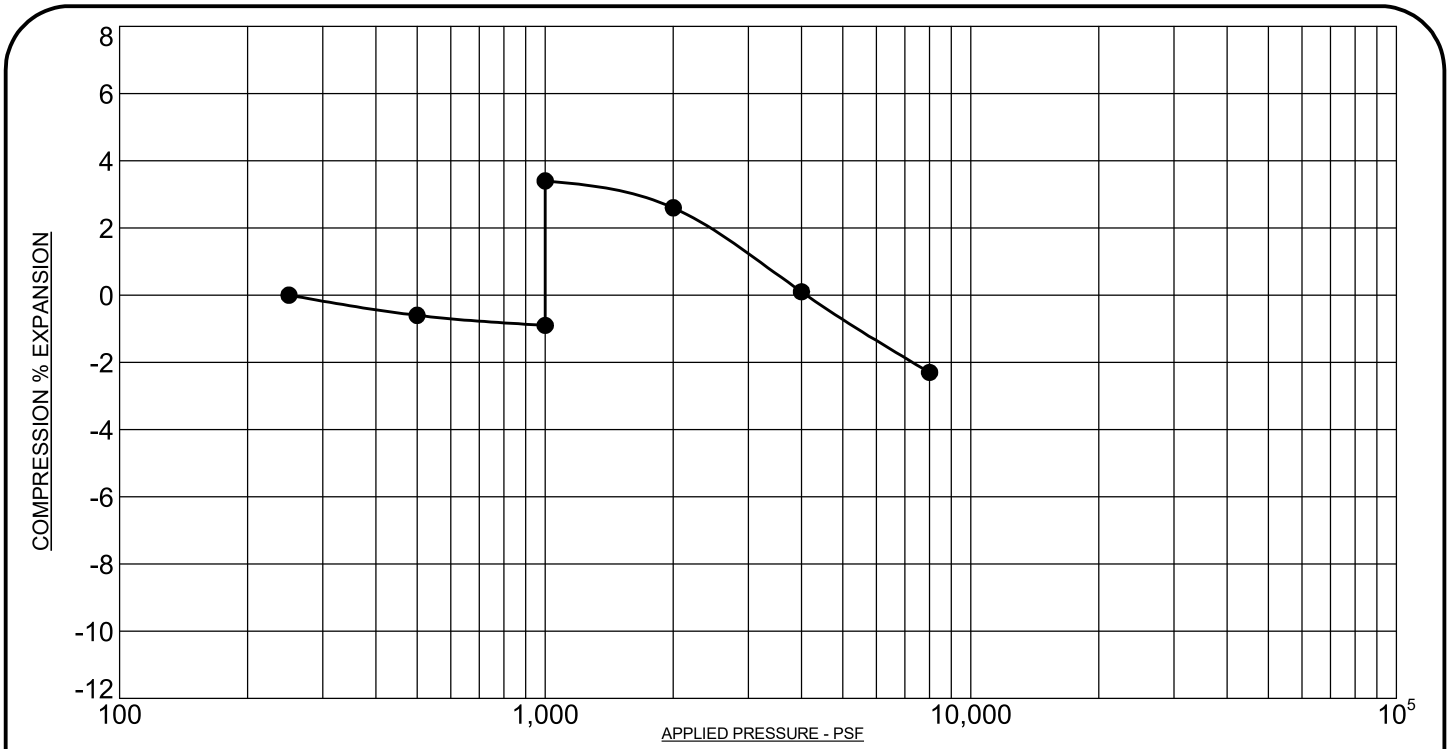
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

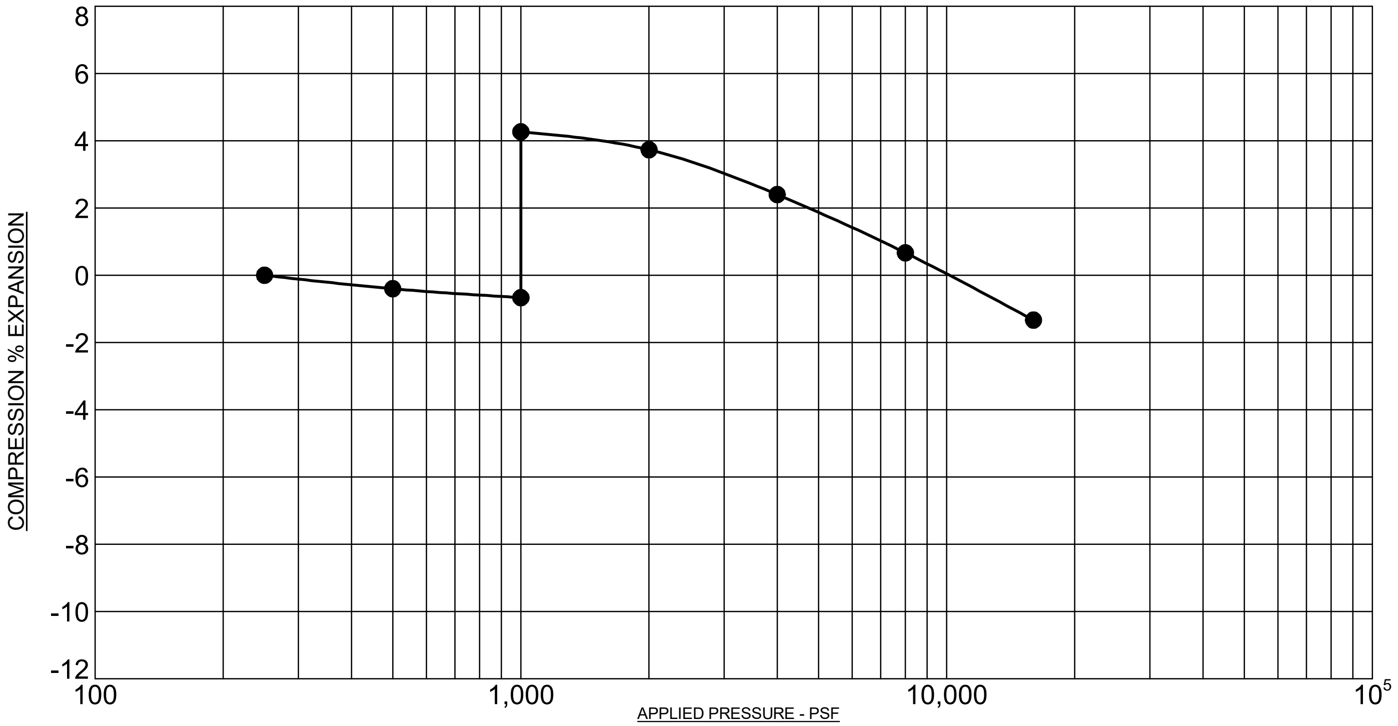
FIGURE No. 70

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **46 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **118.9 PCF**
NATURAL MOISTURE CONTENT: **9.6%**
PERCENT SWELL/COMPRESSION: **4.3**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **48 @ 29 FT**
NATURAL DRY UNIT WEIGHT: **121.2 PCF**
NATURAL MOISTURE CONTENT: **13.7%**
PERCENT SWELL/COMPRESSION: **4.9**

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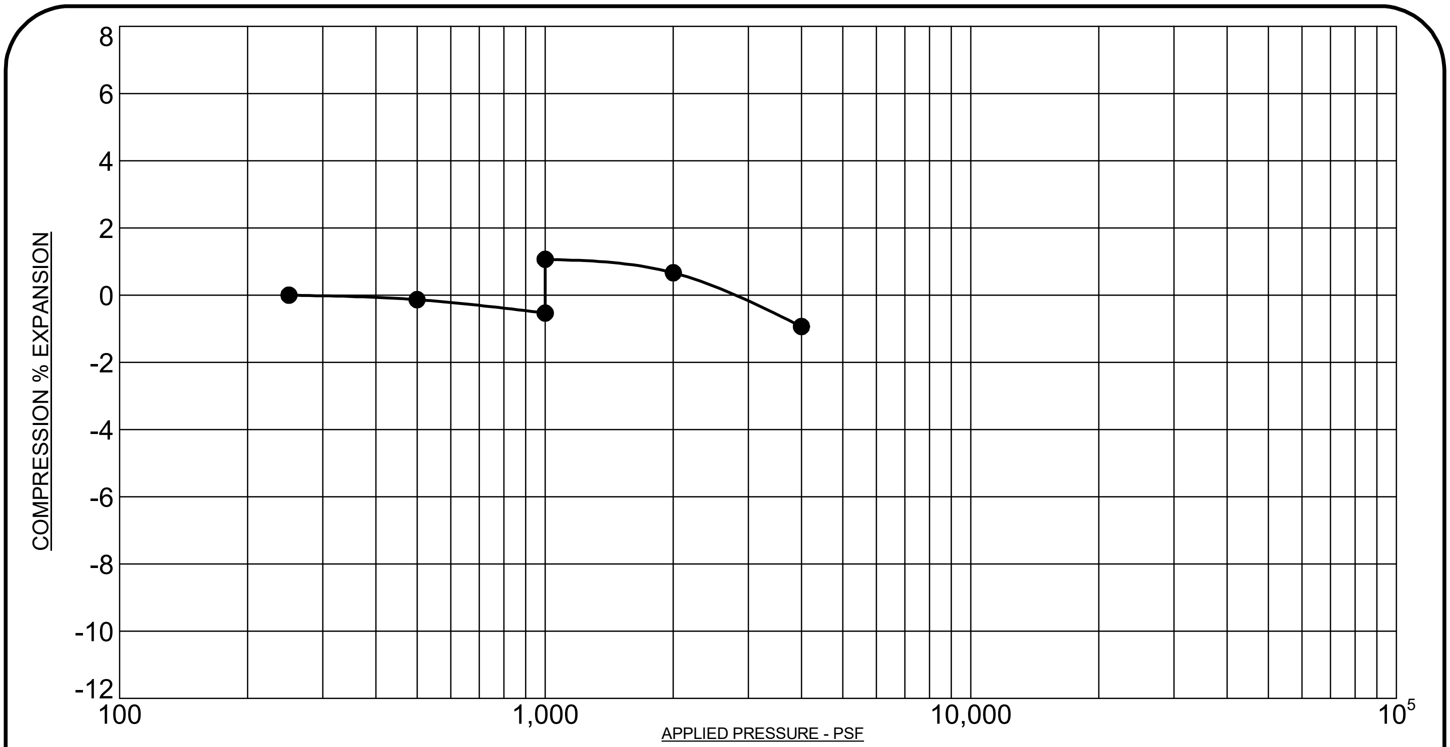
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

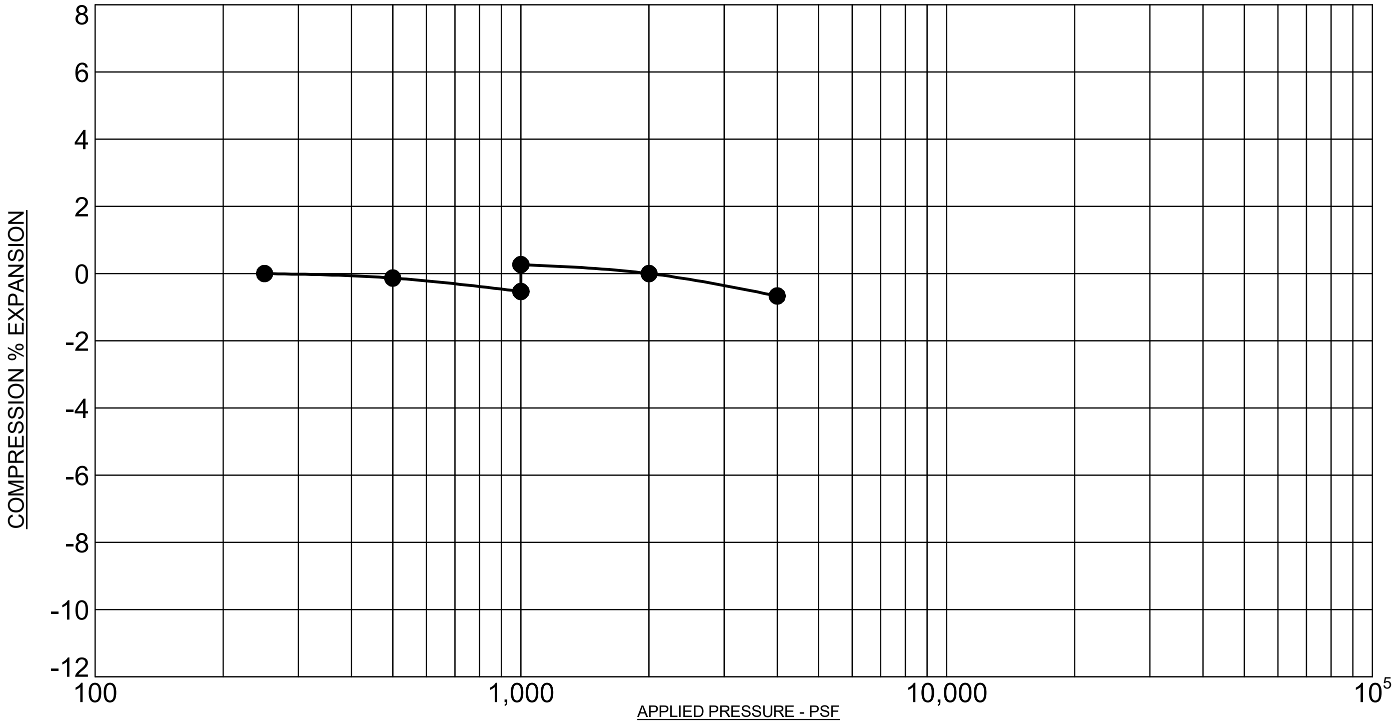
FIGURE No. 71

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **50 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **111.1 PCF**
NATURAL MOISTURE CONTENT: **10.3%**
PERCENT SWELL/COMPRESSION: **1.6**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **51 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **119.2 PCF**
NATURAL MOISTURE CONTENT: **6.1%**
PERCENT SWELL/COMPRESSION: **0.8**

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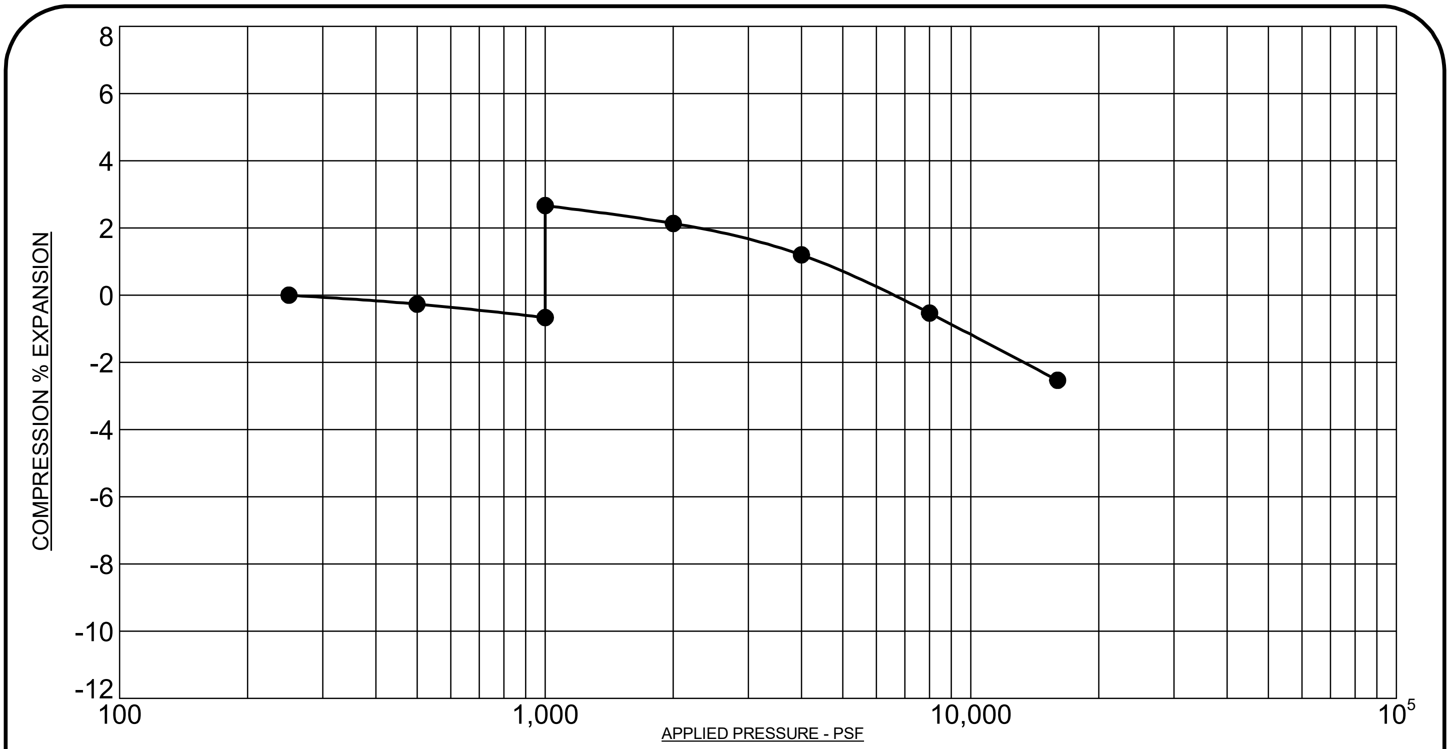
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

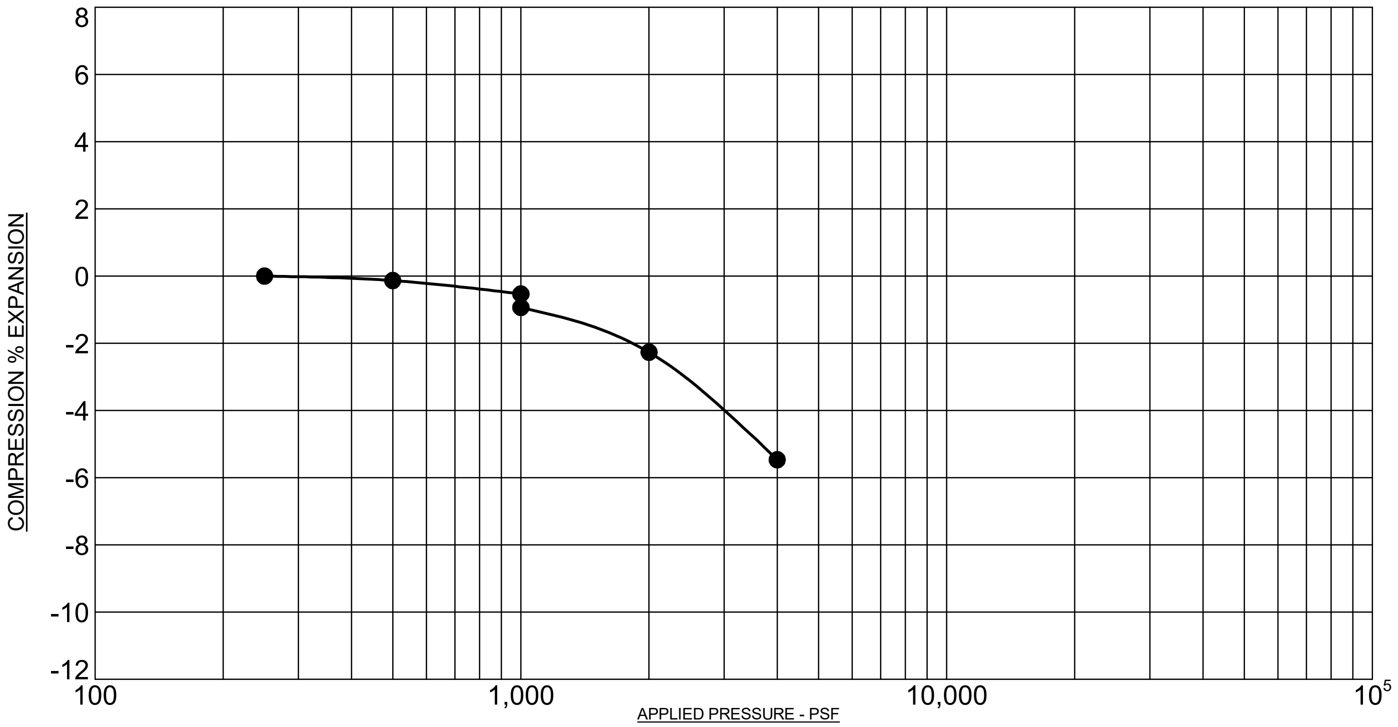
FIGURE No. 72

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **53 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **106.6 PCF**
NATURAL MOISTURE CONTENT: **17.4%**
PERCENT SWELL/COMPRESSION: **3.3**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **54 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **89.0 PCF**
NATURAL MOISTURE CONTENT: **12.9%**
PERCENT SWELL/COMPRESSION: **- 0.4**

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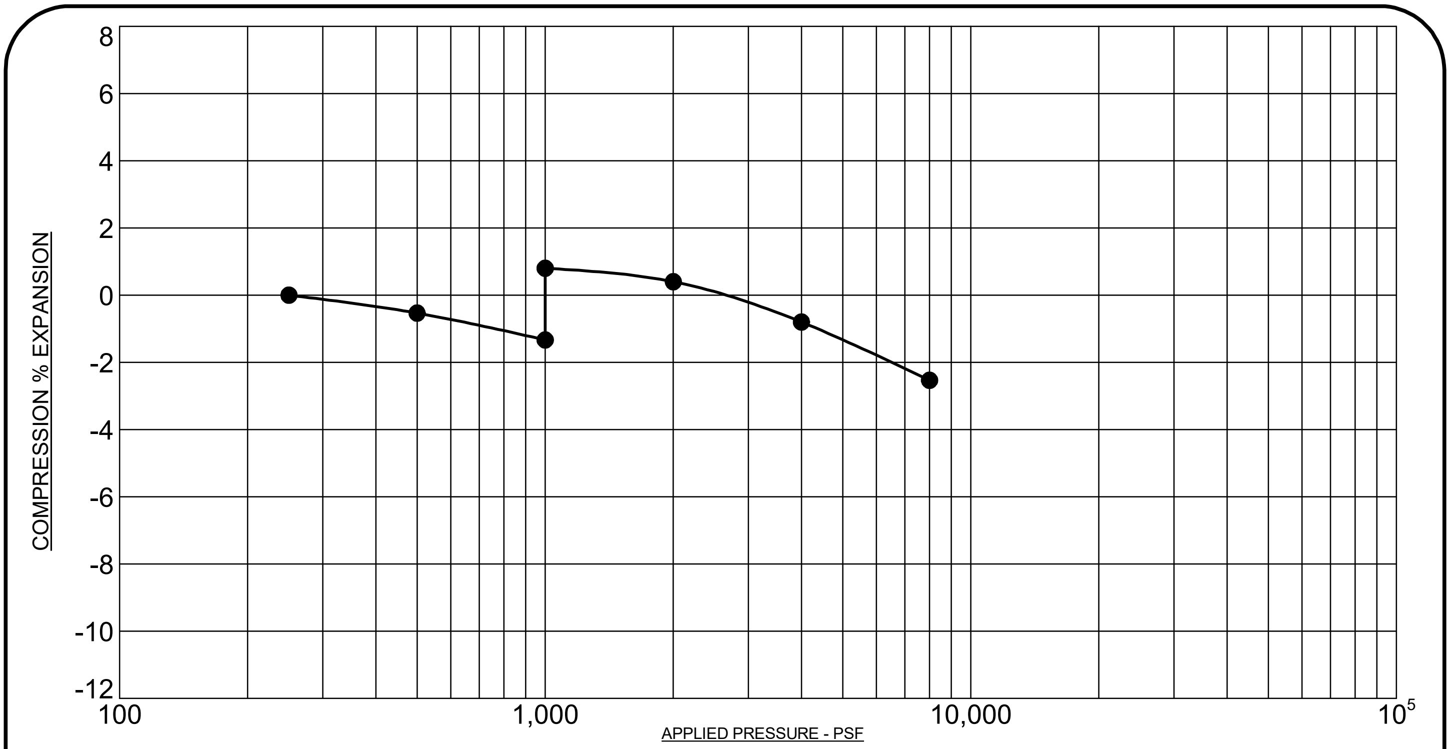
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

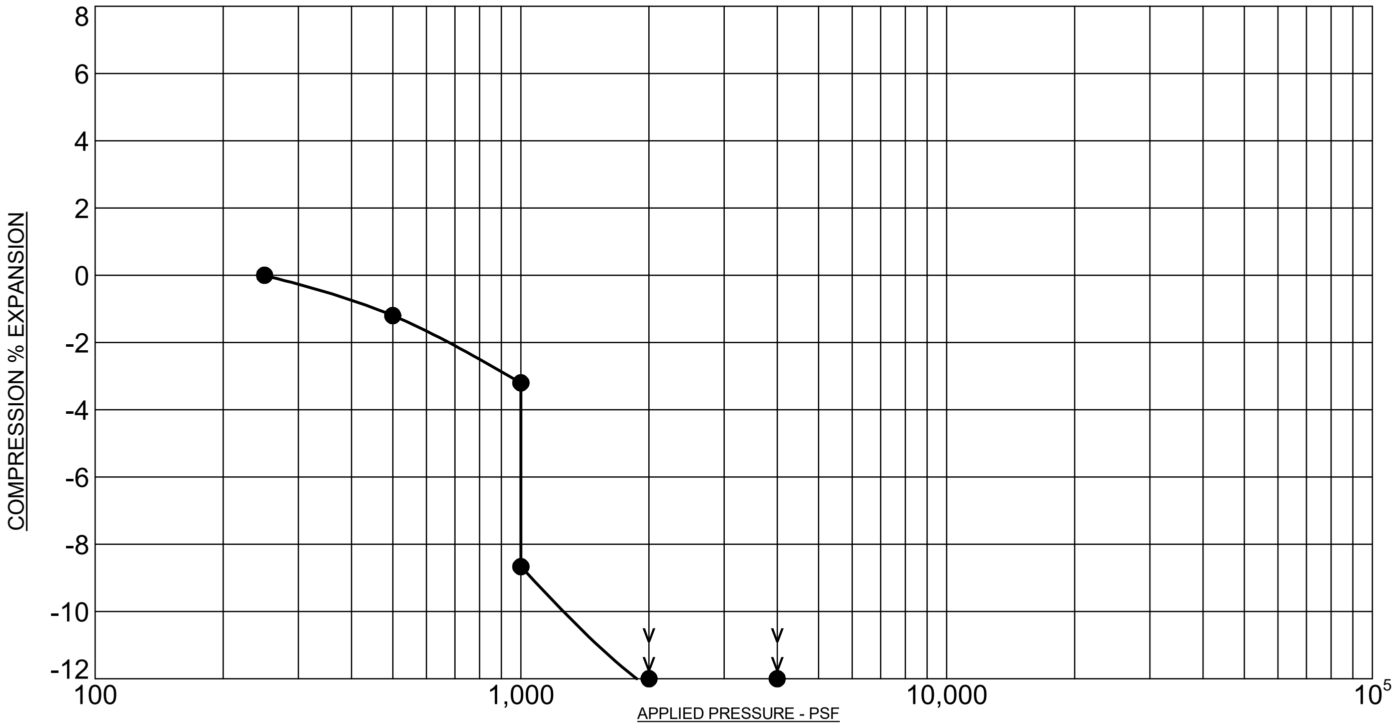
FIGURE No. 73

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **57 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **116.4 PCF**
NATURAL MOISTURE CONTENT: **14.5%**
PERCENT SWELL/COMPRESSION: **2.1**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **SAND, SILTY TO CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **58 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **99.6 PCF**
NATURAL MOISTURE CONTENT: **6.5%**
PERCENT SWELL/COMPRESSION: **- 5.5**

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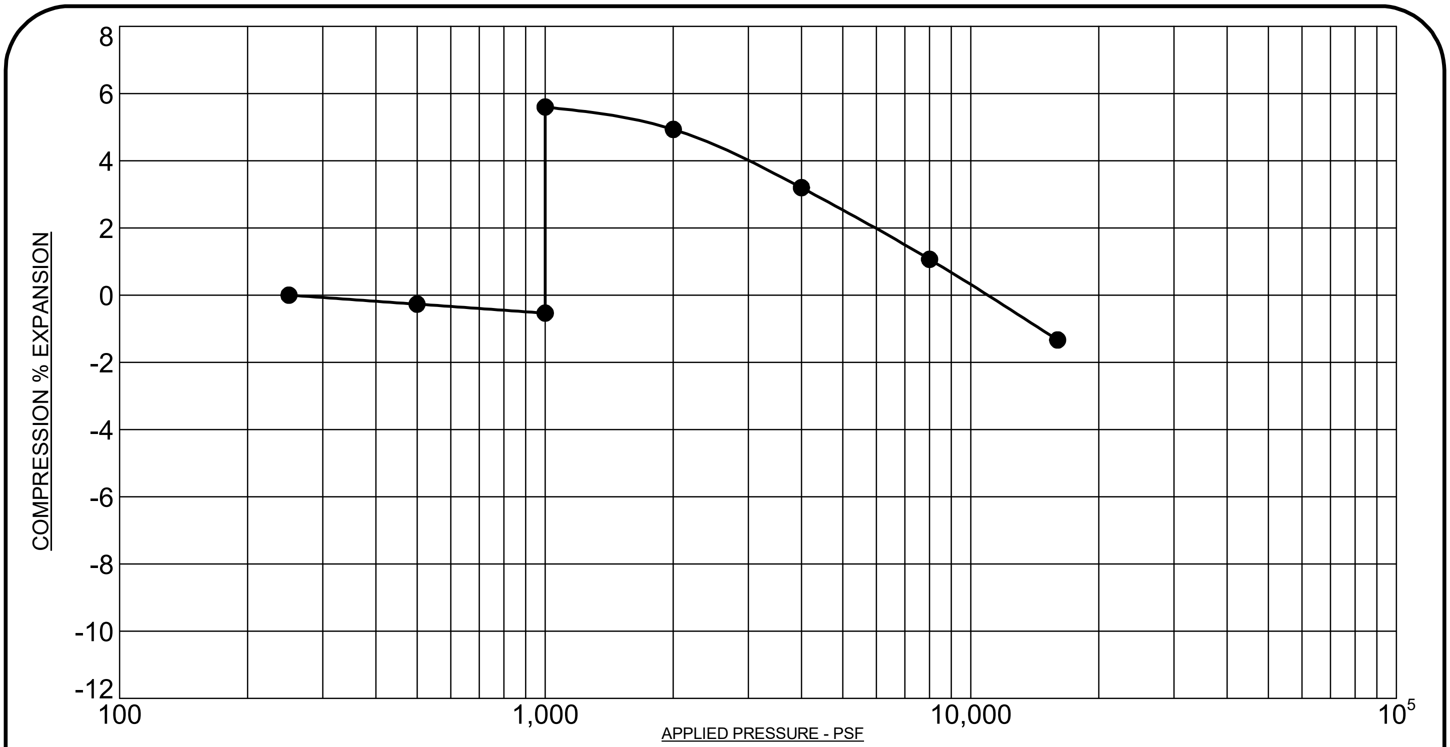
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

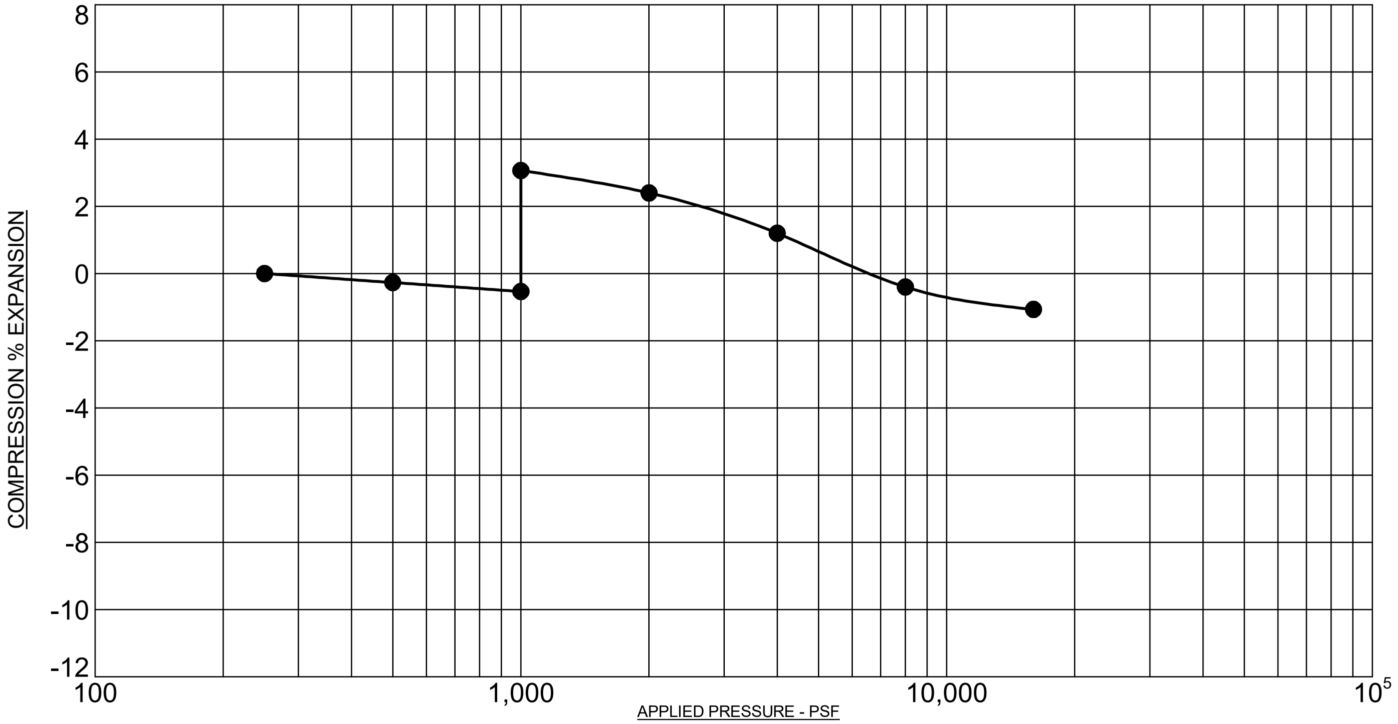
FIGURE No. 74

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **59 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **116.6 PCF**
NATURAL MOISTURE CONTENT: **11.9%**
PERCENT SWELL/COMPRESSION: **6.1**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **61 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **124.4 PCF**
NATURAL MOISTURE CONTENT: **9.5%**
PERCENT SWELL/COMPRESSION: **3.6**

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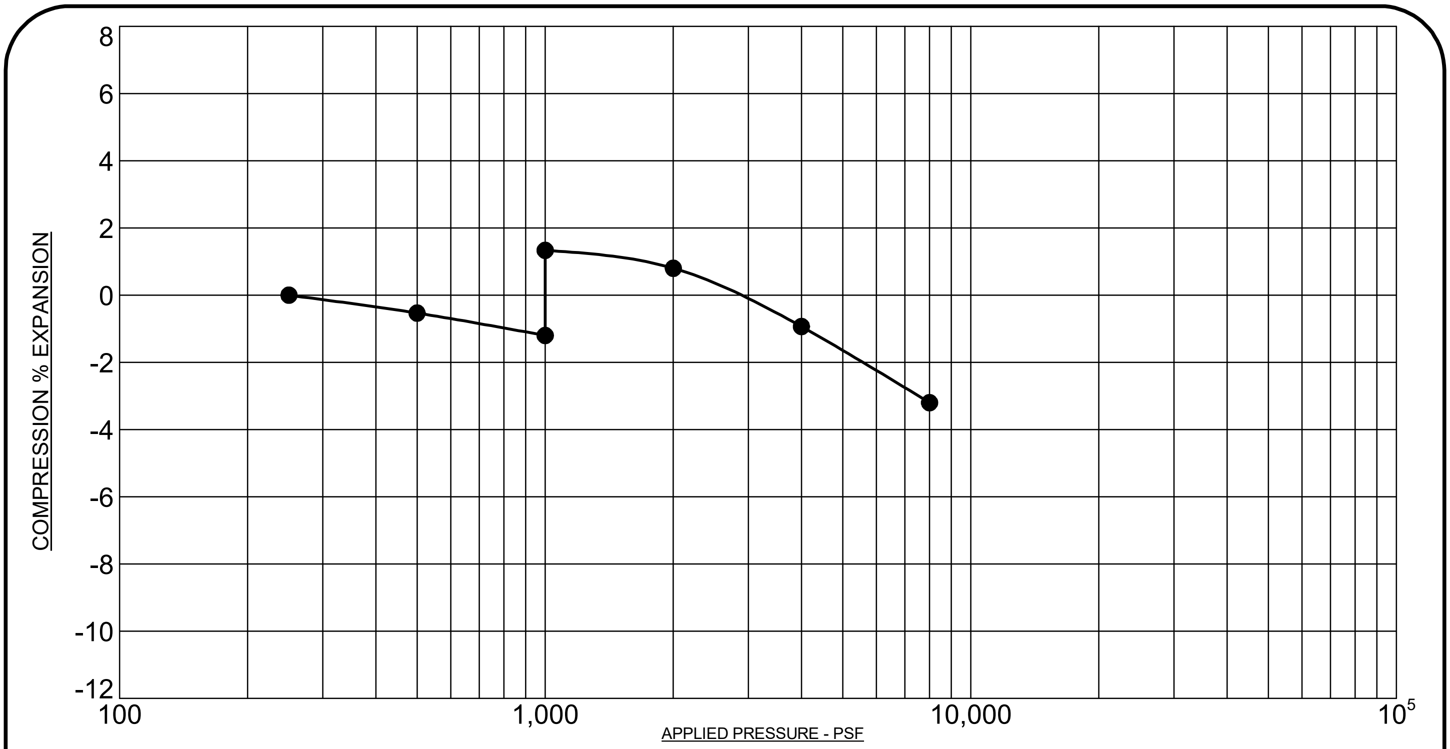
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

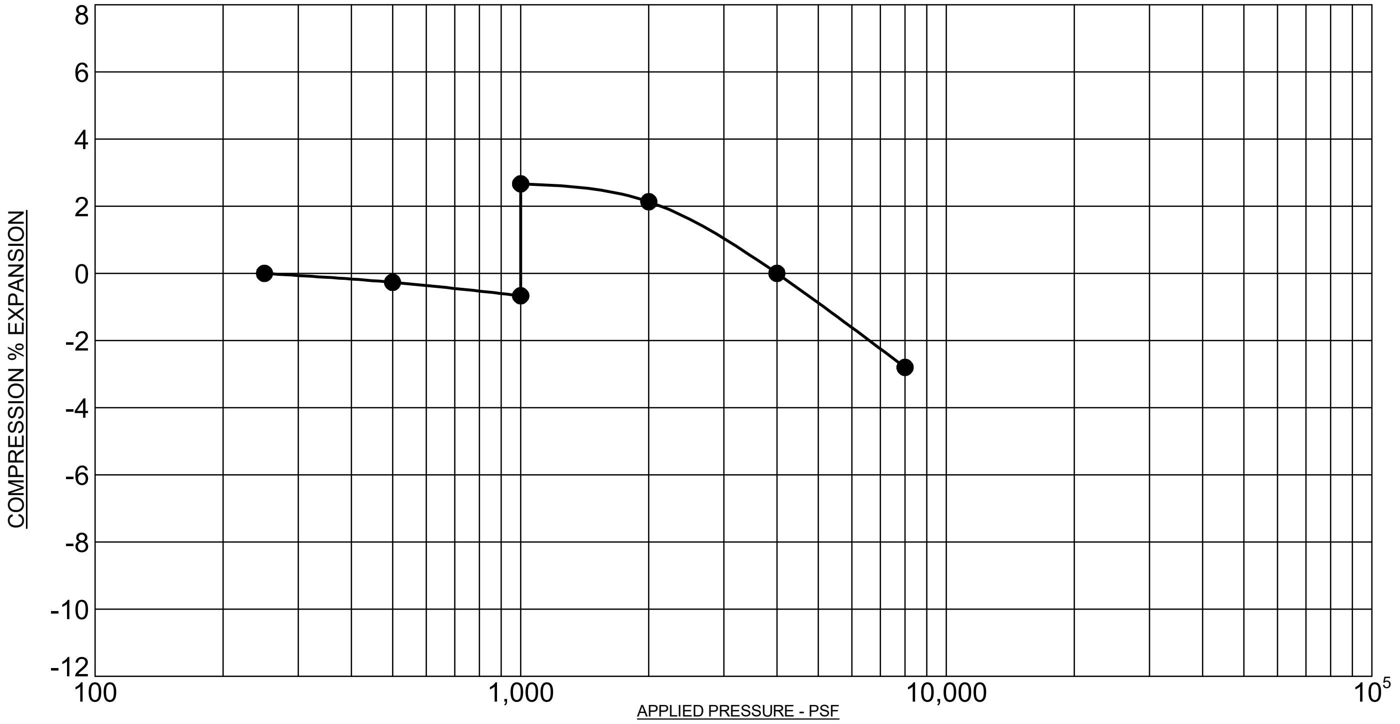
FIGURE No. 75

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **62 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **117.2 PCF**
NATURAL MOISTURE CONTENT: **10.9%**
PERCENT SWELL/COMPRESSION: **2.5**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **63 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **111.1 PCF**
NATURAL MOISTURE CONTENT: **10.9%**
PERCENT SWELL/COMPRESSION: **3.3**

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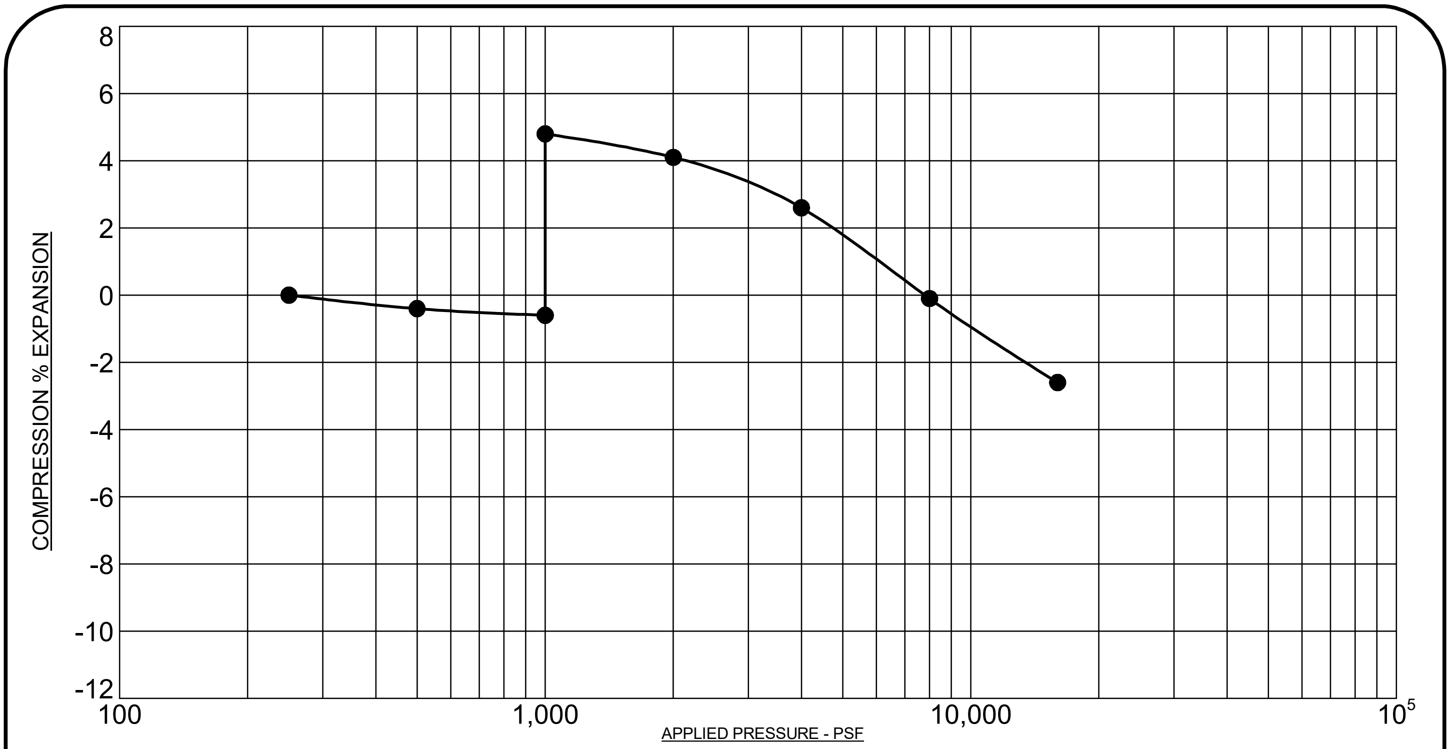
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

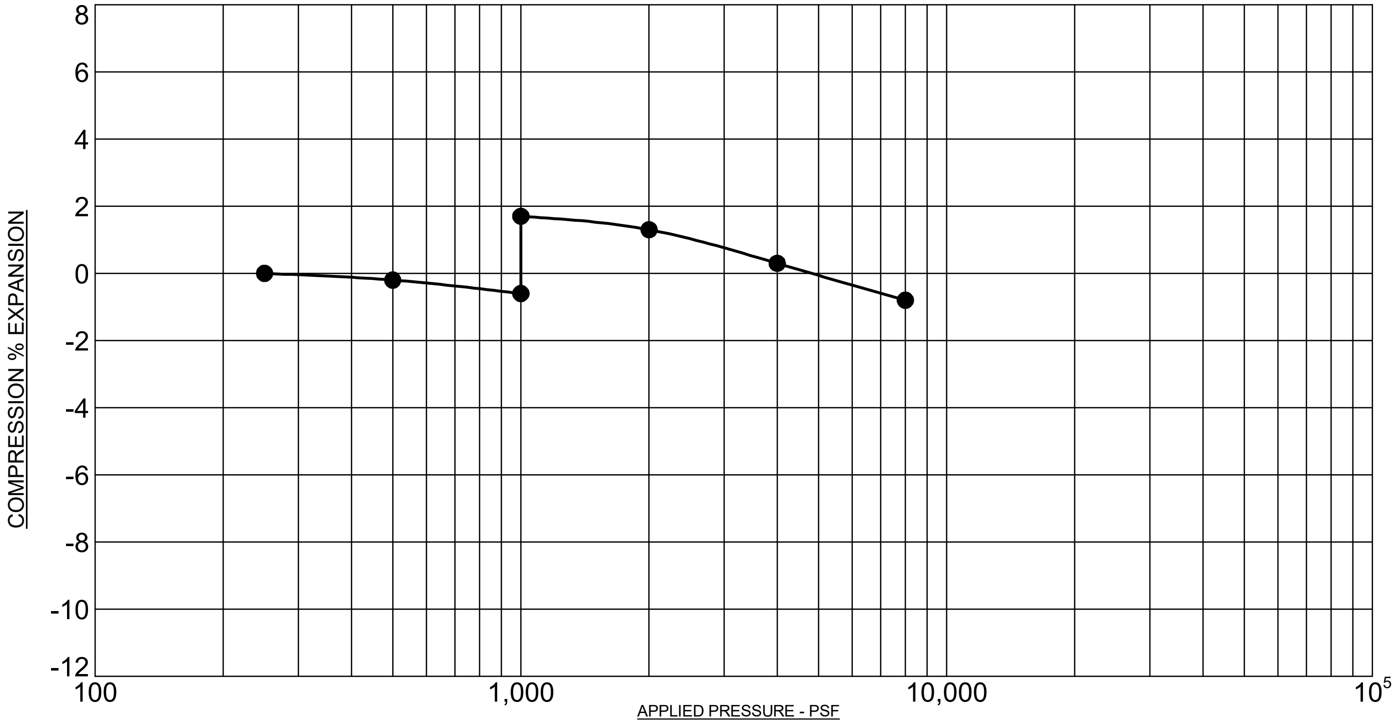
FIGURE No. 76

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **65 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **118.5 PCF**
NATURAL MOISTURE CONTENT: **10.4%**
PERCENT SWELL/COMPRESSION: **5.4**



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **66 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **122.2 PCF**
NATURAL MOISTURE CONTENT: **12.3%**
PERCENT SWELL/COMPRESSION: **2.3**

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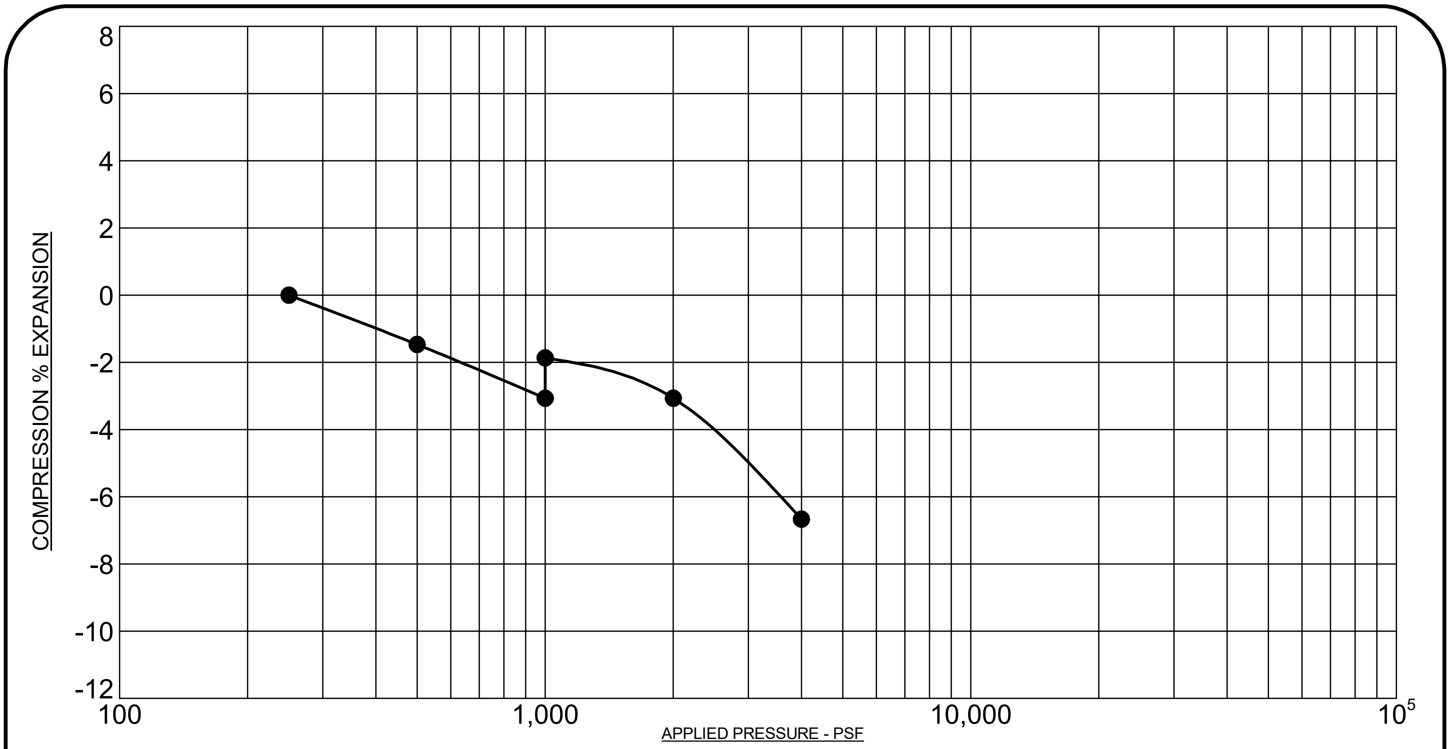
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

FIGURE No. 77

DATE Aug/05/2022



PROJECT: **Rolling Hills El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **69 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **102.4 PCF**
NATURAL MOISTURE CONTENT: **10.2%**
PERCENT SWELL/COMPRESSION: **1.2**

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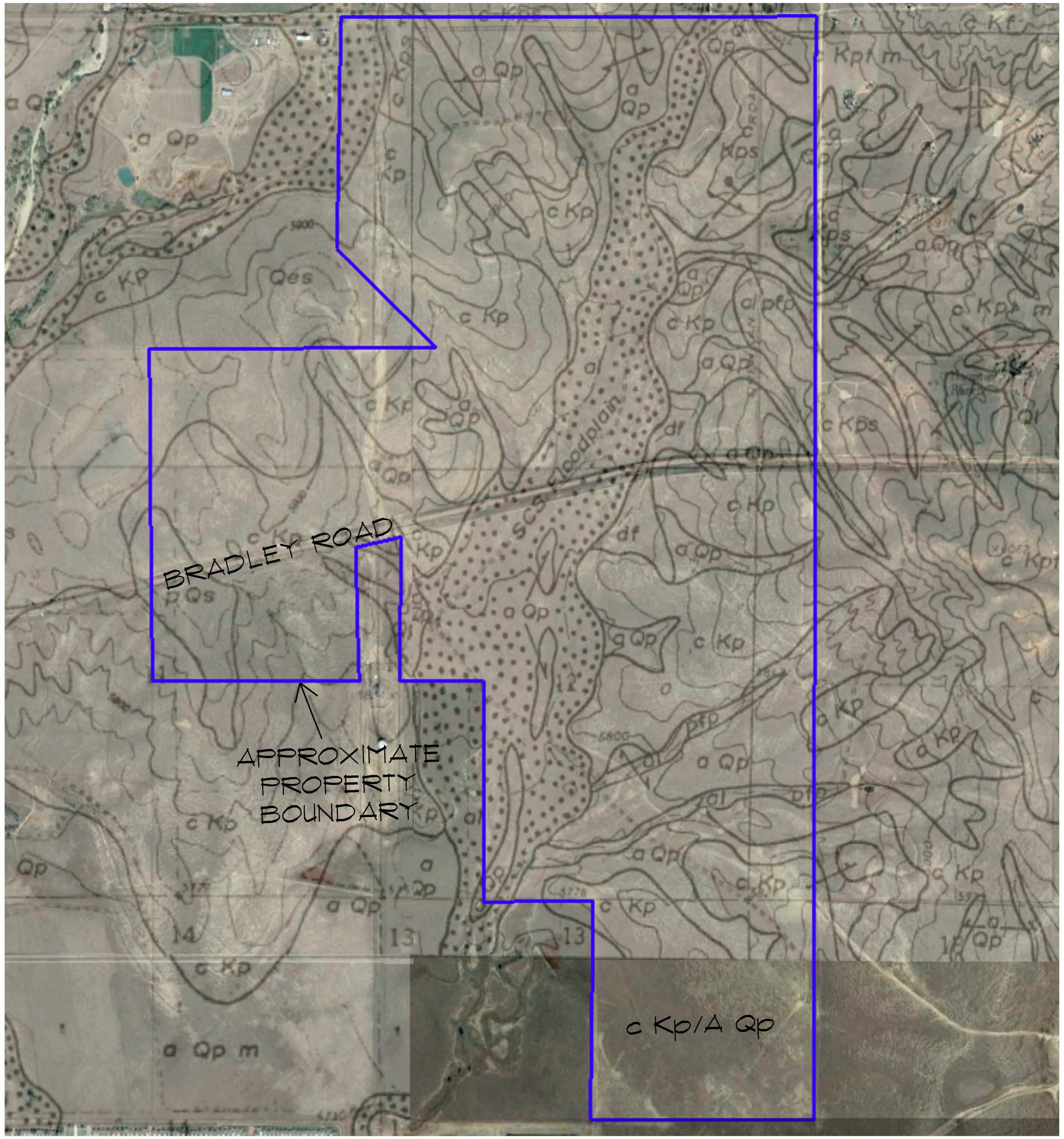
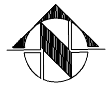
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 187746

FIGURE No. 78

DATE Aug/05/2022





NOT TO SCALE

ENGINEERING CONDITIONS

p Qs - Slocum Alluvium

a Qp - Piney Creek Alluvium

al - Alluvium

Qes - Eolian Sand

df - Debris Fan

c Kp/c Kps - Colluvium, Pierre Shale (locally subdivided)

pfp - Physiographic Floodplain

SCS Floodplain - Soil Conservation Service Floodplain

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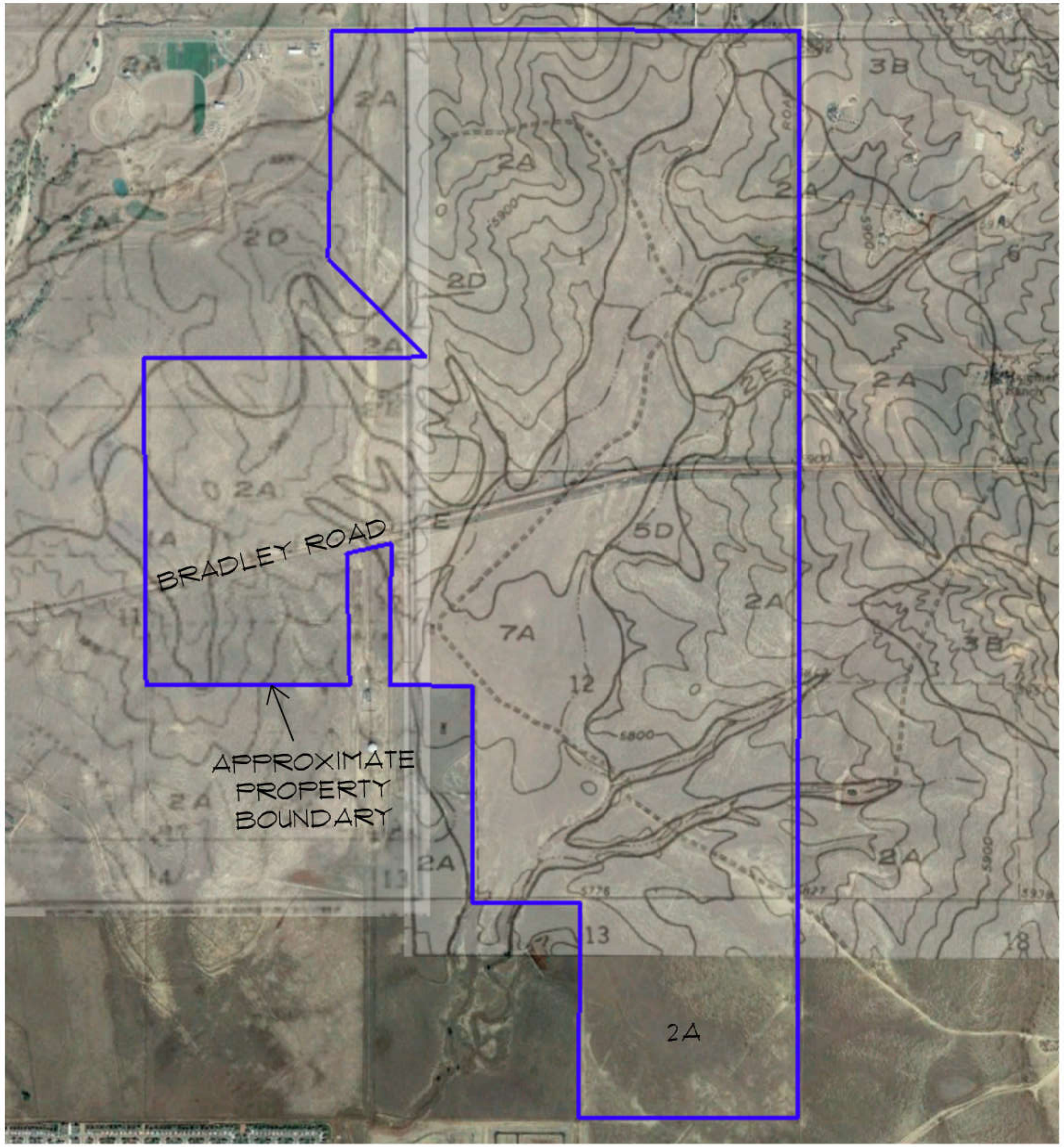
ROLLING MEADOWS
BRADLEY ROAD
EL PASO COUNTY, COLORADO
LANDUIS COMPANY

ENGINEER: TPM
DRAWN BY: KCR
CHECKED BY: TPM
ISSUED: 8-5-2022

ENGINEERING MAP OF POTENTIAL GEOLOGIC HAZARDS AND SURFICIAL DEPOSITS

SHEET No.
FIG-79



NOT TO SCALE

ENGINEERING CONDITIONS

1A - Stable alluvium, colluvium and bedrock on flat to gentle slopes (0-5%)

2A - Stable alluvium, colluvium and bedrock on gentle to moderate slopes (5-12%)

2D - Eiolian deposits generally on flat to gentle slopes of upland areas

2E - Low terraces and valleys of minor tributary streams

3B - Expansive and potentially expansive soil and bedrock on flat to moderate slopes (0-12%)

5D - Debris Fan

7A - Physiographic floodplain were erosion and deposition presently occur and is generally subject to recurrent flooding. Includes 100-year floodplain along major streams where floodplain studies have been conducted

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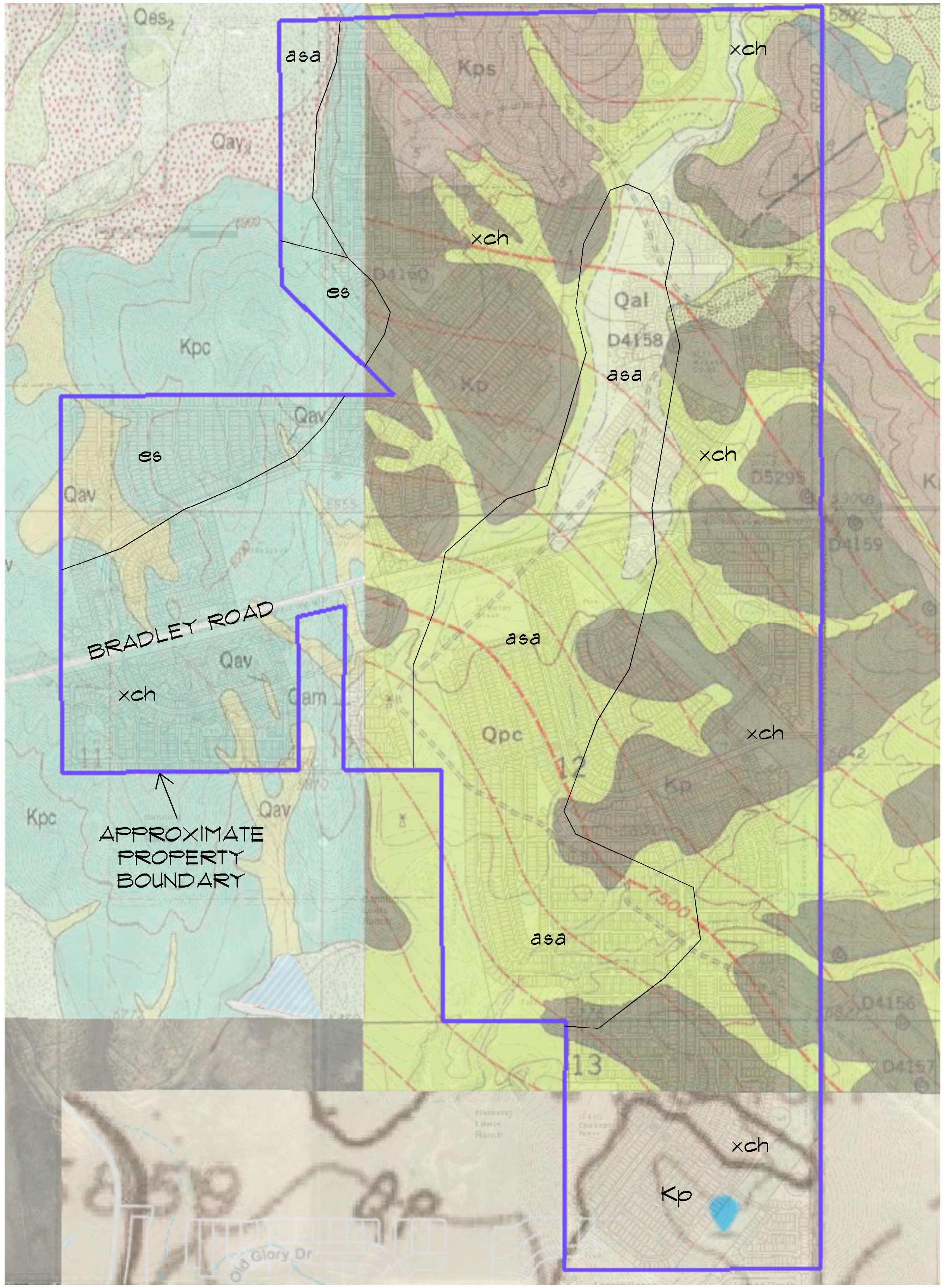
ENVIRONMENTAL AND ENGINEERING GEOLOGIC MAP FOR LAND USE

SHEET No.
FIG-80



NOT TO SCALE

GEOLOGIC CONDITIONS

es - Eolian Sand

asa - Alluviual sand, silt, clay, and gravel

xch - clayey, calcareous disintegration residuum

Qam - Middle Alluvium (Late Pleistocene)

Qav - Valley-side Alluvium, Undivided (Holocene and Late Pleistocene)

Kpc - Cone-in-cone of Lavington (1933)

Kpts - Lower Part of Upper Transition Member

Qay2 - Young Alluvium Two (Late and Middle? Holocene)

Qs - Slocum Alluvium (Sangamon Interglaciation or Illinoian Glaciation

Kps - Pierre Shale, Sandstone at or Just Above Base of Upper Transition Member

Kp - Pierre Shale, Main Part of Formation

Qpc - Piney Creek Alluvium

Qal - Alluvium

Kpt - Pierre Shale, Main Part of Upper Transition Member

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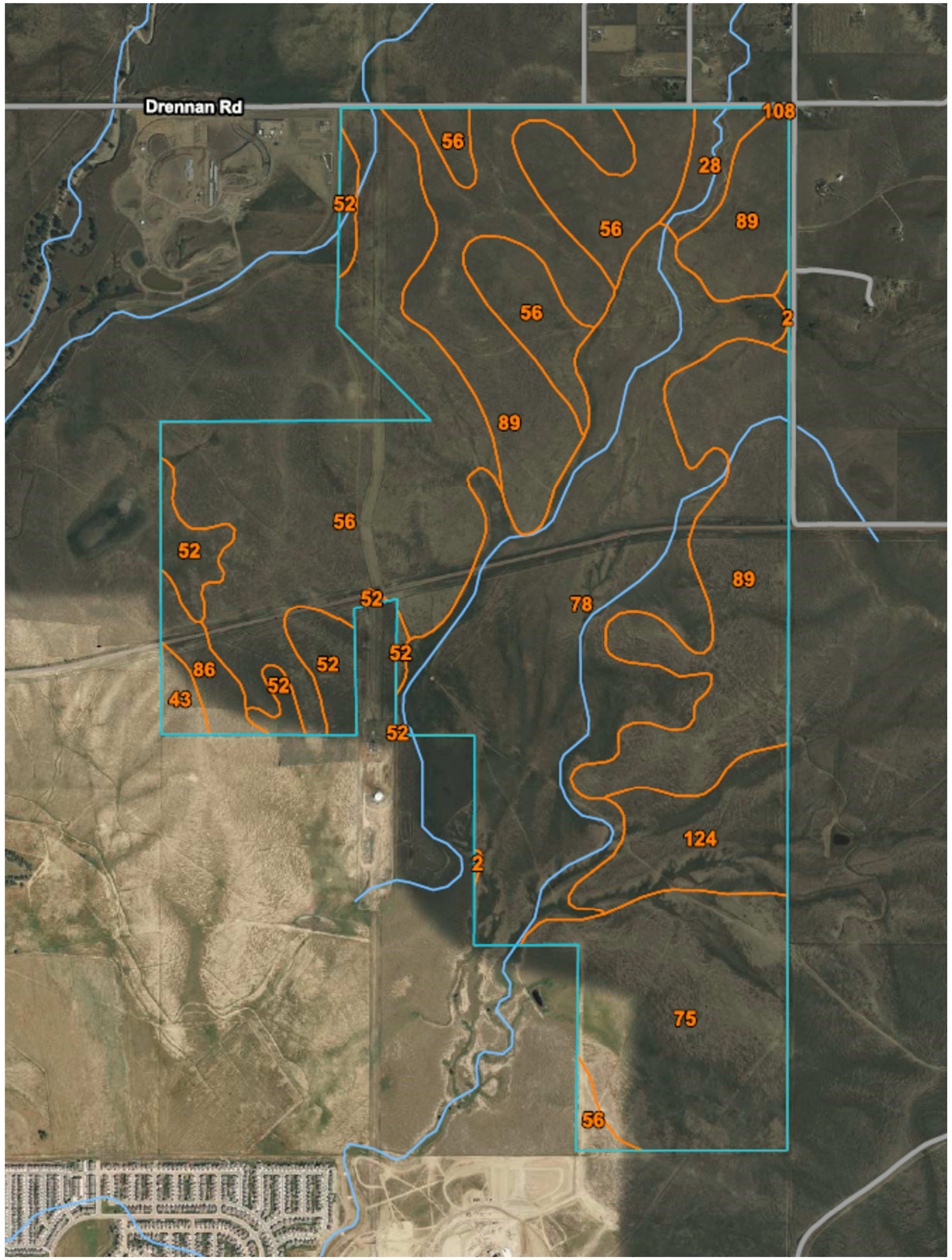
GENERAL GEOLOGIC MAP

SHEET No.
FIG-81



NOT TO SCALE

USDA SOIL SURVEY MAP UNITS

56 - Nelson-Tassel fine sandy loam, 3 to 18 percent slopes

108 - Wiley silt loam, 3 to 9 percent slopes

2 - Ascalon sandy loam, 1 to 3 percent slopes

28 - Ellicott loamy coarse sand, 0 to 5 percent slopes

43 - Kim loam, 1 to 8 percent slopes

52 - Manzanst clay loam, 0 to 3 percent slopes

75 - Razor-Midway Complex

78 - Sampson loam, 0 to 3 percent slopes

86 - Stoneham sandy loam, 3 to 8 percent slopes

89 - Tassel fine sandy loam, 3 to 18 percent slopes

124 - Olnest sandy loam, 0 to 3 percent slopes

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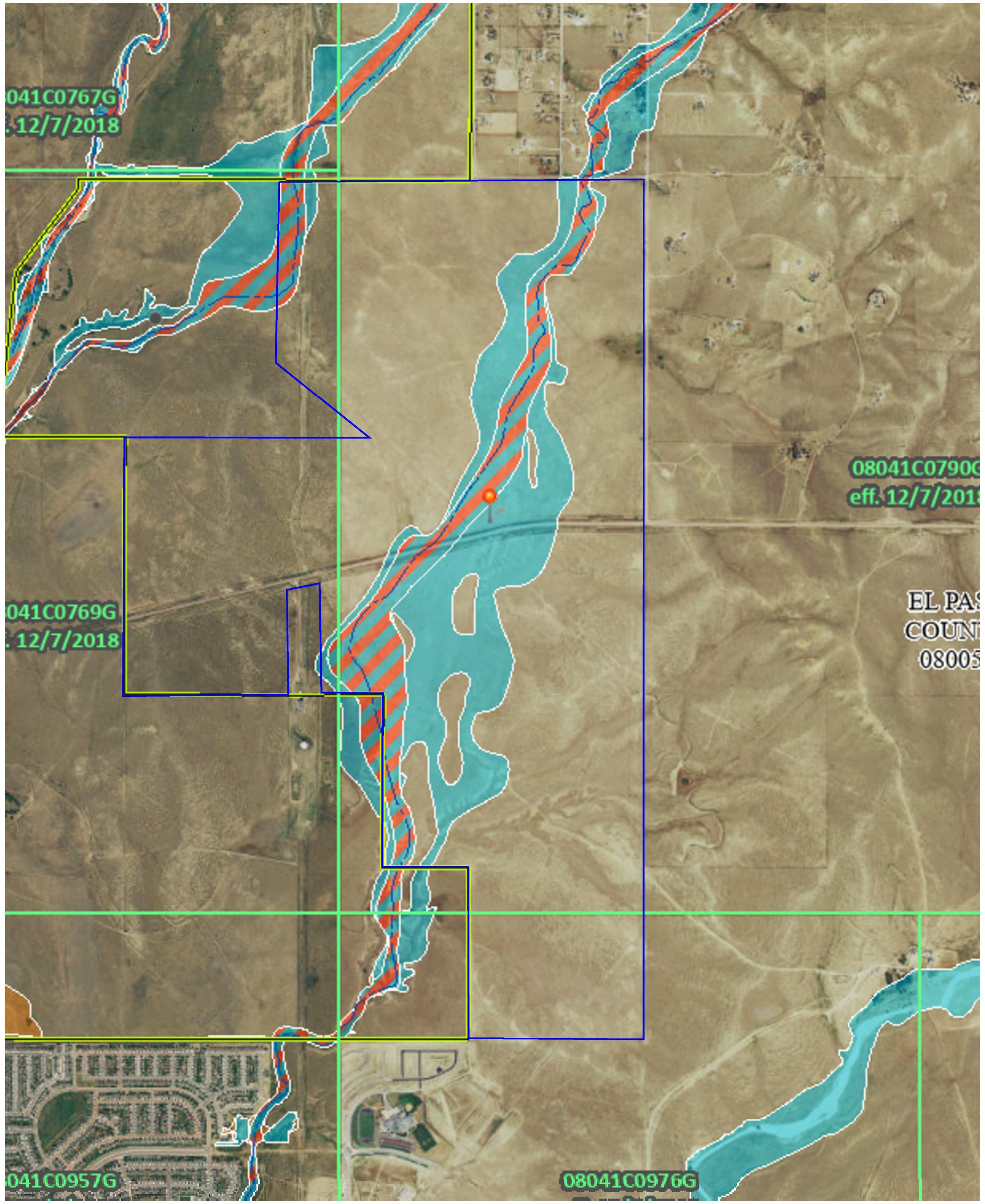
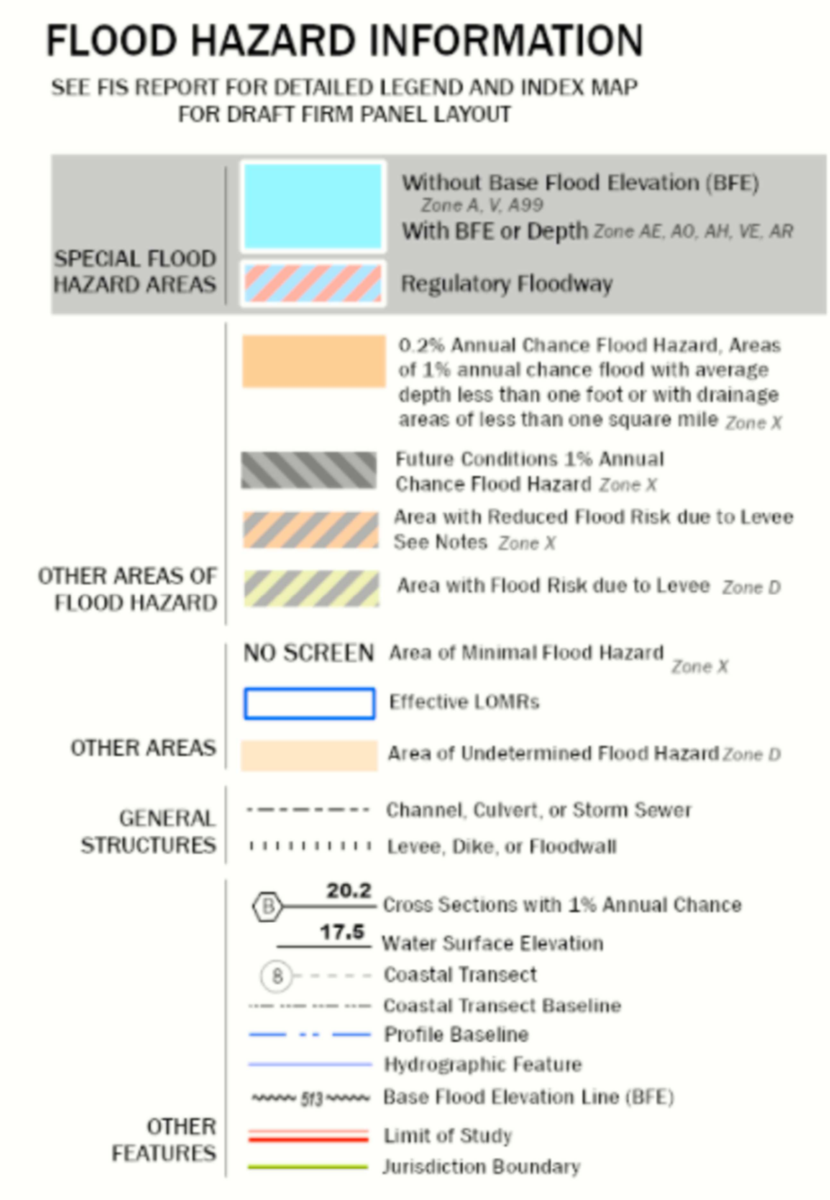
ENGINEER: TPM
DRAWN BY: KCR
CHECKED BY: TPM
ISSUED: 8-5-2022

USDA SOIL SURVEY MAP

SHEET No.
FIG-82



NOT TO SCALE



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP
FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	🟦	Without Base Flood Elevation (BFE) *Zone A, V, A99* With BFE or Depth *Zone AE, AO, AH, VE, AR*
	▨	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	🟧	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	▨	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	▨	Area with Reduced Flood Risk due to Levee See Notes *Zone X*
	▨	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
	☐	Effective LOMRs
	🟧	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	— - — - —	Channel, Culvert, or Storm Sewer
	ı ı ı ı ı ı ı ı ı	Levee, Dike, or Floodwall
OTHER FEATURES	(B) 20.2	Cross Sections with 1% Annual Chance
	17.5	Water Surface Elevation
	(8) - - - -	Coastal Transect
	— - — - —	Coastal Transect Baseline
	— · —	Profile Baseline
	—	Hydrographic Feature
	~~ 513 ~~~	Base Flood Elevation Line (BFE)
	—	Limit of Study
	—	Jurisdiction Boundary

JOB No. 187746

Materials Testing
Forensics
Civil / Planning

Architecture
Structural
Geotechnical

RMG

Engineers / Architects

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BRADLEY ROAD
EL PASO COUNTY, COLORADO
LANDUIS COMPANY

ENGINEER: TPM
DRAWN BY: KCR
CHECKED BY: TPM
ISSUED: 8-5-2022

FEMA MAP

SHEET No.
FIG-83

APPENDIX A
Additional Reference Documents

1. *Overall Sketch Plan,* received via electronic email from Matrix, plan not dated.
2. *Conceptual Layout 01, Rolling Hills – Bull Hill,* prepared by Matrix Design Group, dated November 9, 2021.
3. *Conceptual Layout 03, Rolling Hills – Bull Hill,* prepared by Matrix Design Group, dated January 27, 2022.
4. *Overall Conceptual Layout, Rolling Hills – Bull Hill,* prepared by Matrix Design Group, dated October 25, 2021.
5. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 08041C0790G, 08041C0769G,* Federal Emergency Management Agency (FEMA), effective December 7, 2018.
6. *Corral Bluffs Quadrangle, Environmental and Engineering Geologic Map for Land Use*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
7. *Corral Bluffs Quadrangle, Map of Potential Geologic Hazards and Surficial Deposits*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
8. *Elsmere Quadrangle, Environmental and Engineering Geologic Map for Land Use*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
9. *Elsmere Quadrangle, Map of Potential Geologic Hazards and Surficial Deposits*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
10. *Geologic Map of the Elsmere 7.5 Minute Quadrangle, El Paso County, Colorado,* Madole, R.F., and Thorson, J.P., CGS, Open-File Report OF02-02, 2003.
11. *Generalized Surficial Geologic Map of the Pueblo 1 degree x 2 degree Quadrangle, Colorado,* Moore, D.E., Straub, A.W., Berry, M.E., Baker, M.L., and Brandt, T.R., USGS, Miscellaneous Field Studies Map MF-2388, 2002.
12. *Geologic Map of the Corral Bluffs Quadrangle, El Paso County, Colorado,* Soister, P.E., USGS, Geologic Quadrangle Map GQ-783, 1968.
13. *Geologic Map of the Pueblo 1 degree x 2 degrees quadrangle, south central Colorado,* Scott, G.R., Taylor, R.B., Epis, R.C., and Wobus, R.A., Miscellaneous Investigations Series Map I-1022, 1978.
14. *Geologic map of the Pueblo 1 degree x 2 degrees quadrangle, south-central Colorado,* Scott, G.R., Taylor, R.B., Epis, R.C., and Wobus, R.A., Miscellaneous Field Studies Map MF-775, 1976.
15. *El Paso County Aggregate Resource Evaluation Map, Master Plan for Mineral Extraction, Map 1*
16. *Evaluation of Mineral and Mineral Fuel Potential of El Paso County, State and Mineral Lands, Open-File Report OF-03-07*
17. *Colorado Springs and Vicinity Natural Hazard Explorer ArcGIS WebViewer* https://www.arcgis.com/apps/MapSeries/index.html?appid=dce03f88b282442d8ec751fd439e357e
18. *USDA Web Soil Survey* https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

19. *Pikes Peak Regional Building Department:* https://www.pprbd.org/.
20. El Paso County Assessor Real Property Search https://property.spatialest.com/co/elpaso/#/property/
21. *USGS National Geologic Map Database* https://ngmdb.usgs.gov/mapview/?center=-97,39.6&zoom=4
22. *Historical Aerials:* https://www.historicaerials.com/viewer, Images dated 1947, 1955, 1960, 1969, 1983, 1999, 2005, 2009, 2011, 2013, 2015, 2017, and 2019.
23. *USGS TopoView Historical Topographic Map Viewer* https://ngmdb.usgs.gov/topoview/viewer/#15/38.7488/-104.6183 *Fountain Quadrangle, Colorado*, dated 1948, 1950, 1951, 1961, 2010, 2013, 2016, 2019, and 2022.
24. *USGS TopoView Historical Topographic Map Viewer* https://ngmdb.usgs.gov/topoview/viewer/#15/38.7488/-104.6183 *Corral Bluffs Quadrangle, Colorado*, dated 1961, 2010, 2013, 2016, 2019, and 2022.
25. *USGS TopoView Historical Topographic Map Viewer* https://ngmdb.usgs.gov/topoview/viewer/#15/38.7488/-104.6183 *Fountain NE Quadrangle, Colorado*, dated 1950, 1961, 2010, 2013, 2016, 2019, and 2022.
26. *USGS TopoView Historical Topographic Map Viewer* https://ngmdb.usgs.gov/topoview/viewer/#15/38.7488/-104.6183 *Elsmere Quadrangle, Colorado*, dated 1950, 1961, 2010, 20113, 2016, 2019, and 2022.
27. *Google Earth Pro*, Imagery dated 1999, 2003, 2004, 2005, 2006, 2011, 2015, 2017, 2019, 2020 and 2021.

APPENDIX B

Guideline Site Grading Specifications

Description: Unless specified otherwise by local or state regulatory agencies, these guideline specifications are for the excavation, placement and compaction of material from locations indicated on the plans, or staked by the Engineer, as necessary to achieve the required elevations. These specifications shall also apply to compaction of materials that may be placed outside of the project.

General: The Geotechnical Engineer shall approve fill materials, method of placement, moisture contents and percent compactions, and shall give written approval of the compacted fill.

Clearing Site: The Contractor shall remove trees, brush, rubbish, vegetation, topsoil and existing structures before excavation or fill placement is commenced. The Contractor shall dispose of the cleared material to provide the Owner with a clean job site. Cleared material shall not be placed in areas to receive fill or where the material will support structures. Clearing shall also include removal of existing fills that do not meet the requirements of this specification and existing structures.

Preparation of Slopes or Drainage Areas to Receive Fill: Natural slopes or slopes of drainage gullies where grades are 20 percent (5:1, horizontal to vertical) or steeper shall be benched prior to fill placement. Benches shall be at least 10 feet wide. Benches may require additional width to accommodate excavation or compaction equipment. At least one bench shall be provided for each 5 feet or less of vertical elevation difference. The bench surface shall be essentially horizontal perpendicular to the slope or at a slight incline into the slope.

Scarifying: Topsoil and vegetation shall be removed from the ground surface in areas to receive fill. The surface shall be plowed or scarified a minimum of 12 inches until the surface is free from ruts, hummocks or other uneven features which would prevent uniform compaction by the equipment to be used.

Compacting Area to Receive Fill: After the area to receive fill has been cleared and scarified, it shall be disked or bladed until it is free from large clods, moisture conditioned to a proper moisture content and compacted to the maximum density as specified for the overlying fill. Areas to receive fill shall be worked, stabilized, or removed and replaced, if necessary, in accordance with the Geotechnical Engineer's recommendations in preparation for fill.

Fill Materials: Fill material shall be free from organic material or other deleterious substances, and shall not contain rocks or lumps having a diameter greater than six inches. Fill materials shall be obtained from cut areas shown on the plans or staked in the field by the Engineer or imported to the site and shall be approved by the Geotechnical Engineer prior to placement. It is recommended that the fill materials have nil to low expansion potential, i.e., consist of silty to slightly clayey sand.

- The moisture-conditioned materials should be placed in maximum 6" compacted lifts. These materials should be compacted to a minimum of 92 percent of the maximum

- Modified Proctor dry density or 95 percent of the maximum Standard Proctor dry density. Material not meeting the above requirements shall be reprocessed.

Materials used for moisture-conditioned structural fill should be approved by RMG prior to use. Moisture-conditioned structural fill should not be placed on frozen subgrade or allowed to freeze during moisture conditioning and placement.

Moisture Content: Fill materials shall be moisture conditioned to within limits of optimum moisture content specified. Sufficient laboratory compaction tests shall be made to determine the optimum moisture content for the various soils encountered in borrow areas or imported to the site.

The contractor may be required to add moisture to the excavation materials in the borrow area if, in the opinion of the Geotechnical Engineer, it is not possible to obtain uniform moisture content by adding water to the fill material during placement. The Contractor may be required to rake or disk the fill soils to provide uniform moisture content through the soils.

The application of water to embankment materials shall be made with watering equipment, approved by the Geotechnical Engineer, which will give the desired results. Water jets from the spreader shall not be directed at the embankment with such force that fill materials are eroded.

Should too much water be added to the fill, such that the material is too wet to permit the desired compaction to be obtained, compacting and work on that section of the fill shall be delayed until the material has been allowed to dry to the required moisture content. The Contractor will be permitted to rework the wet material in an approved manner to hasten its drying.

Compaction of Fill Areas: Selected fill material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted to not less than the specified percentage of maximum density. Fill materials shall be placed such that the thickness of loose material does not exceed 10 inches and the compacted lift thickness does not exceed 6 inches.

Compaction, as specified above, shall be obtained by the use of sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other equipment approved by the Geotechnical Engineer. Granular fill shall be compacted using vibratory equipment or other equipment approved by the Geotechnical Engineer. Compaction shall be accomplished while the fill material is at the specified moisture content. Compaction of each layer shall be continuous over the entire area.

Moisture Content and Density Criteria:

A. Fill placed in roadways and utility trenches should be moisture conditioned and compacted in accordance with El Paso County Specifications.

B. Fill placed outside of roadways and utility trenches should be compacted to at least 92% of the maximum Modified Proctor density (ASTM D-1557) or at least 95% of the maximum Standard Proctor density (ASTM D-698) at a moisture content within 2% of optimum.

Compaction of Slopes: Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until slopes are stable, but not too dense for planting, and such that there is no appreciable amount of loose soil on the slopes. Compaction of slopes may be done progressively in increments of three to five feet in height or after the fill is brought to its total height. Permanent fill slopes shall not exceed 3:1 (horizontal to vertical).

Density Testing: Field density testing shall be performed by the Geotechnical Engineer at locations and depths of his choosing. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted material below the disturbed surface. When density tests indicate the density or moisture content of any layer of fill or portion thereof is below that required, the particular layer or portion shall be reworked until the required density or moisture content has been achieved.

Observation and Testing of Fill: Observation by the Geotechnical Engineer shall be sufficient during the placement of fill and compaction operations so that he can declare the fill was placed in general conformance with Specifications. All observations necessary to test the placement of fill and observe compaction operations will be at the expense of the Owner.

Seasonal Limits: No fill material shall be placed, spread or rolled while it is frozen, thawing, or during unfavorable weather conditions. When work is interrupted by heavy precipitation, fill operations shall not be resumed until the Geotechnical Engineer indicates the moisture content and density of previously placed materials are as specified.

Reporting of Field Density Tests: Density tests made by the Geotechnical Engineer shall be submitted progressively to the Owner. Dry density, moisture content, percent compaction, and approximate location shall be reported for each test taken.