Architecture
Structural
Geotechnical

ROCKY MOUNTAIN GROUP
EMPLOYEE OWNED

Materials Testing
Forensic
Civil/Planning

This does not meet the Geology and Soils standards report requirements in the LDC 8.4.9
For example-there are constraints such as high ground water and two significant drainage ways etc....

PRELIMINARY SUBSURFACE SOIL INVESTIGATION

Bent Grass Meadows Filing No. 2
Colorado Springs, Colorado

PREPARED FOR:

Challenger Colorado, LLC
8605 Explorer Drive, Suite 250
Colorado Springs, CO 80920

JOB NO. 169845

May 15, 2019

Respectfully Submitted,

RMG – Rocky Mountain Group

Kelli Zigler

Kelli Zigler
Project Geologist

Reviewed by,

RMG – Rocky Mountain Group

COLORADO LICENSED
GEOFF WEBSTER
5/15/19
45046
PROFESSIONAL ENGINEER

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

TABLE OF CONTENTS

GENERAL SITE AND PROJECT DESCRIPTION

Project Description

The site is located northeast of Colorado Springs, Colorado, generally north of the intersection of Woodmen Road and Meridian Road. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

The site is being considered for residential development. RMG – Rocky Mountain Group was retained to explore the subsurface conditions at the site and provide preliminary information to assess the suitability of the land for development.

Existing Site Conditions

The site is undeveloped ranch land bounded by and connecting to the developed Bent Grass Meadows Filing No. 1 to the east.

FIELD INVESTIGATION AND LABORATORY TESTING

Drilling

The subsurface conditions on the site were investigated by drilling twenty-five (25) exploratory test borings. The approximate locations of the test borings are presented in the Test Boring Location Plan, Figure 2.

The test borings were advanced with a power-driven, continuous-flight auger drill rig to depths of 15 to 30-feet below the existing ground surface. Samples were obtained in general accordance with ASTM D-1586 utilizing a 2-inch OD split-barrel sampler or in general accordance with ASTM D-3550 utilizing a 2½-inch OD modified California sampler. An Explanation of Test Boring Logs is presented in Figure 3. The Test Boring Logs are presented in Figures 4 through 16.

Laboratory Testing

The moisture content for the recovered samples was obtained in the laboratory. Grain-size analysis, Atterberg Limits, and Denver Swell/Consolidation tests were performed on selected samples for purposes of classification and to develop pertinent engineering properties. A Summary of Laboratory Test Results is presented in Figure 17 (three pages). Soil Classification Data are presented in Figures 18 through 22. Swell/Consolidation Test Results are presented in Figures 23 through 27.

SUBSURFACE CONDITIONS

Subsurface Materials

The subsurface materials encountered in the Test Borings are typical for this region of Colorado. The Dawson Formation is characterized by layers of alluvial soil of varying thickness overlying alternating

layers of sandstone and claystone. The bedding of the soils is irregular and discontinuous and each soil profile was different in the arrangement of strata. In general the surficial soils were comprised of silty to clayey sand underlain by sandstone and claystone bedrock. The bedrock was encountered at the ground surface in some locations and at shallow depths across the site.

Subsurface soils encountered in the test borings classified in accordance with the Unified Soils Classification System (USCS) as native SM-SC, silty to clayey sand, SW-SM, well-graded sand with silt, and CL, sandy lean clay. The surficial soils exhibited almost no expansive characteristics, whereas the claystone exhibited low swell potential.

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented on the Test Boring Logs. The descriptions in the logs are based upon the engineer's visual 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.

Groundwater

Groundwater was observed in several of the test borings at the time of field exploration sporadically across the site. Depth to groundwater in the various Test Borings is presented in the table below. Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Depending upon depths of excavations, groundwater may be a factor in foundation construction. The Contractor should always be prepared to control groundwater during construction.

Groundwater	
Test Boring	Depth Below Ground Surface (feet)
1	27
5	14
14	14
16	28
19	14
23	19
25	19

CONCLUSIONS AND RECOMMENDATIONS

The following discussion is based on the subsurface conditions encountered in the test borings and on the project characteristics previously described. If conditions are different from those described in this report or the project characteristics change, RMG should be retained to review our recommendations and adjust them, if necessary.

Geotechnical Considerations

Preliminary grading plans were not provided or reviewed by RMG at the time this report was issued. The relationship of existing ground surface where soil test borings were performed may differ from final

grades, and this could affect the depth to groundwater and the depth to bedrock and / or expansive soil layers.

The site is generally characterized as surficial soils of medium dense silty and clayey sand overlying hard silty sandstone and medium hard weathered to formational claystone bedrock at varying depths. Sandstone was encountered at or near the ground surface in Test Borings 8, 13, 16, 22, and 25. Claystone was encountered at or near the ground surface in Test Borings 20 and 21.

Final site grading will determine the extent to which sandstone and claystone may affect foundation construction, but in general, if basement construction is proposed, overexcavation of bedrock may be anticipated. Claystone exhibited low expansion potential in laboratory testing, but as always a minimum of 3-feet separation from foundation elements should be anticipated. If sandstone is encountered, 12-inches of sandstone removal and replacement with structural fill may be necessary to ensure foundations bear upon soil of equal bearing capacity.

Foundation design considerations, based on the field investigation and laboratory testing, are presented below. It must be understood that these considerations should be verified after the excavation for individual structures is completed.

Overexcavation and Replacement

The claystone at this site exhibited low swell potential and should not be considered suitable for direct bearing of shallow foundations. Where claystone is encountered under building sites a minimum 3-foot of separation from foundation components and floor slabs may be necessary to provide stable support.

If loose soils are encountered, they may require additional compaction to achieve the allowable bearing capacity indicated in this report. Structures should not be supported atop soil/bedrock of significantly different bearing capacities such as silty sand and sandstone bedrock. Where any portion of a structure is to be supported atop compacted structural fill, the remaining portions of the excavation should have the top 12-inches of exposed sandstone scarified and compacted, or removed and replaced with structural fill.

Open Excavation Observations

During construction, foundation excavations should be observed by RMG prior to placing structural fill, forms, or concrete to verify the foundation bearing conditions for each structure. Based on the conditions observed in the foundation excavation, the recommendations made at the time of construction may vary from those contained herein. In the case of differences, the Open Excavation Observation report shall be considered to be the governing document. The recommendations presented herein are intended only as preliminary guidelines to be used for interpreting the subsurface soil conditions exposed in the excavation and determining the final recommendations for foundation construction.

Proposed Grading, Cuts and Masses of Fill

Preliminary grading plans were not provided or reviewed by RMG at the time the report was issued. Based on the test borings for this investigation soils that will be encountered include native silty and clayey sand, silty sandstone, and claystone. The on-site sand soils can generally be used as site grading fill or structural fill. Any clay or claystone encountered is not recommended for use as structural fill or for use as site grading fill in areas that will be below or directly adjacent to the proposed structures.

Prior to placement of overlot fill or removal and recompaction of the existing materials, topsoil, fill and organic matter should be removed from fill areas. The subgrade should be scarified and 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.

- ***Guideline Site Grading Specifications are included in the Appendix A.***

Anticipated Foundation Concepts

Final grades as they relate to the top of soil test borings were not available at the time this report was prepared. The in situ site soil encountered in the test borings is generally suitable to support conventional shallow foundation systems consisting of standard spread footings/stemwalls or stiffened slabs. Alternative foundation systems are not anticipated. It is assumed that the deepest excavation cuts will be approximately 6 to 8 feet below the final ground surface, not including overexcavation or subexcavation which may be required. The native silty sand is generally suitable as structural fill when prepared in accordance with recommendations herein.

Foundations in general

Structures should not be supported atop soils and bedrock of significantly different bearing capacities. Formational sandstone bedrock for instance, if encountered at bottom of footing grade, should be overexcavated 12-inches and either recompacted or replaced with structural fill.

The foundation system for each proposed structure should be designed based upon recommendations developed in a detailed Subsurface Soil Investigation completed after overlot grading and site development activities are complete. The results presented in this Preliminary Subsurface Soils Investigation should be verified following the excavation for each structure and evaluation of the building loads.

The allowable bearing pressures to be used for design of foundation components should be determined by a detailed site specific Subsurface Soils Investigation. An allowable bearing pressure of 2,500 psf is anticipated for the native granular, non-expansive soils or imported structural fill compacted as indicated herein. The foundation design should be prepared by a qualified Colorado Registered Professional Engineer using the recommendations presented in this report. Bottoms of foundations should be at least 30 inches below finished grade for frost protection. Settlements of 1-inch or less overall and ½-inch or less differential may be anticipated. Settlement in granular soil will occur immediately upon construction loads. Long term consolidation settlement is not anticipated.

Foundation and basement walls should be designed to resist lateral pressures. For granular, non-expansive soils used as exterior backfill around foundations, an equivalent fluid pressure (EFP) of 40 pcf may be used for design in addition to any lateral pressure from high groundwater conditions. Expansive soils as exterior backfill around foundations should typically be avoided. However, if the client elects to use expansive soils (claystone bedrock is not recommended) as backfill against foundation walls, higher lateral pressures should be anticipated. The lateral pressures presented herein apply to level, drained backfill conditions. Lateral pressures for sloping/undrained conditions or for expansive backfill soils should be determined on an individual basis.

Stiffened Slab-on-grade Foundations

The native silty sand soil is suitable for stiffened slab-on-grade foundations. When site soil is properly prepared a maximum allowable bearing pressure of 2,500 psf may be used for design. Expansive soils should not be used beneath slabs-on-grade as the potential for swell can lead to slab movement and heaving and cracking of slabs.

Floor Slabs

Floor slabs should be supported on 12-inches of structural fill to control slab movement due to potential moisture changes in the supporting soil. Structural fill material for support of the floor slab should be placed in 6-inch loose lifts near optimum moisture content and compacted to 95 percent of Standard Proctor maximum dry density (ASTM D698). To provide uniform support and to aid controlling moisture consideration may be given to installing 4-inches of free-draining gravel beneath concrete slabs. Depending upon interior floor finish, the use of a vapor retarding barrier over the gravel may be considered. Floor slabs should be separated from all bearing walls, columns, mechanical equipment and piping with an expansion joint that allows unrestrained vertical movement. Contraction joints should be placed in the slab in accordance with American Concrete Institute (ACI) guidelines.

Structural Fill - General

Areas to receive 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 Modified Proctor test (ASTM D-1557) prior to placing structural fill.

Structural fill shall consist of granular, non-expansive material. It should be placed in loose lifts not exceeding 10-inches, 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 Modified Proctor test, ASTM D-1557. The materials should be compacted by mechanical means.

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 should not be placed on frozen subgrade or allowed to freeze during moisture conditioning and placement. The on-site clay soils are not recommended for use as structural fill below foundation components.

Foundations Drains

A subsurface perimeter drain is recommended around portions of the structure which will have habitable or storage space located below the finished ground surface. This includes crawlspace areas but not walkout trenches, if applicable. Groundwater encountered during the subsurface investigation was intermittent in the borings and showed at 14 to 29 feet below existing ground surface where present. Depending on the conditions encountered during the lot specific Subsurface Soils Investigation and the conditions observed at the time of the Open Excavation Observation, additional subsurface drainage systems may be recommended.

One such system is an underslab drainage layer to help intercept groundwater before it enters the slab area should the groundwater levels rise. In general, if groundwater was encountered within 4 to 6 feet of the proposed basement slab elevation, an underslab drain should be anticipated. Another such system would consist of a subsurface drain and/or vertical drain board placed around the perimeter of the overexcavation to help intercept groundwater and allow for proper placement and compaction of the replacement structural fill. Careful attention should be paid to grade and discharge of the drain pipes of these systems.

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.

Surface Grading and Drainage

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.

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.

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.

Concrete

Type I/II cement is recommended for concrete in contact with the subsurface materials. Calcium chloride should be used with caution for soils with high sulfate contents. The concrete should not be placed on frozen ground. If placed during periods of cold temperatures, the concrete should be kept from freezing. This may require covering the concrete with insulated blankets and heating. Concrete

work should be completed in accordance with the latest applicable guidelines and standards published by ACI.

Exterior Backfill

Backfill 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 85 percent of the maximum dry density as determined by the Modified Proctor test, ASTM D-1557 on exterior sides of walls in landscaped areas. In areas where backfill supports pavement and concrete flatwork, the materials should be compacted to 95 percent of the maximum dry density.

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. The backfill should not be placed on frozen subgrade or allowed to freeze during moisture conditioning and placement. Backfill should be compacted by mechanical means, and foundation walls should be braced during backfilling and compaction.

BURIED UTILITIES

Based upon the conditions encountered in the exploratory test borings, we anticipate that the soils encountered in the individual utility trench excavations will consist of native silty to clayey sand sandy lean clay, silty sandstone and sandy claystone. It is anticipated that the sand and sandstone will be encountered at loose to hard relative densities and the clays and claystone at stiff to hard consistencies.

We believe the sand and sandstone will classify as Type C materials and the clay and claystone will classify as Type B materials as defined by OSHA in 29 CFR Part 1926. OSHA requires that temporary excavations made in Type B and C materials be laid back at ratios no steeper than 1:1 (horizontal to vertical) and 1½:1 (horizontal to vertical), respectively, 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.

Utility mains such as water and sanitary sewer lines are typically placed beneath paved roadways. The settlement of the utility trench backfill can have a detrimental effect on pavements and roadway surfaces. We recommend that utility trench backfill be placed in thin loose lifts, moisture conditioned as required and compacted to the recommendations outlined in the **Structural Fill** section of this report. The placement and compaction of utility trench backfill should be observed and tested by a representative of RMG Engineers during construction. Use of “flowable fill,” (i.e., a controlled low strength material (CLSM), or a similar material) should be considered in lieu of compacted soil backfill for areas with low tolerances for surface settlements in deep excavations and areas with difficult access.

It is a common local practice for underdrains to be placed at the bottom of sanitary sewer trenched within drive lanes. Underdrains placed in the sanitary sewer trenches in areas where groundwater is anticipated will likely be the "active" type, which uses a perforated drain pipe. In areas where groundwater is not anticipated, “passive” type underdrains may be used. The outfall for the sanitary sewer trench underdrain was not known at the time of this investigation because the development plan and grading plan were not available for our review.

PRELIMINARY PAVEMENT RECOMMENDATIONS

Roadway plans had not been provided at the time of the report issue date. However, roadways throughout the proposed development are anticipated to be classified mainly as Local in accordance with the Colorado Springs Engineering Criteria Manual. The actual pavement section design for individual streets will be completed following overlot grading and installation of utilities. A site specific pavement design should be conducted to determine the design pavement sections for the proposed roadways.

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 site specific Subsurface Soil Investigation be performed for all proposed structures including (but not limited to) residences, community or common buildings, retaining walls and pumphouses, commercial buildings, etc.**

To develop recommendations for construction of the proposed roadways, a pavement design investigation should be performed. This investigation should consist of additional test borings, soil laboratory testing and specific recommendations for the design and construction of roadway pavement sections.

CLOSING

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

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

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

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

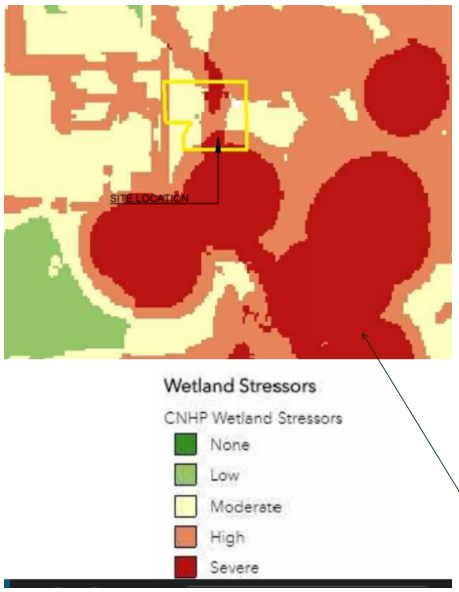
If we can be of further assistance in discussing the contents of this report or analysis of the proposed development, from a geotechnical engineering point-of-view, please feel free to contact us.

in the north east seems squishy?

A map for this specific application indicating constraints and hazards should be included and any mitigation techniques

FIGURES

Please see 8.4.9 (2019 revisions in effect) of the Code and the relative sections of the ECM for the report requirements



The water wastewater comt is for 121 lots. 177 as indicated in the application form, the LOI states 181 lots; The plat numbering is so confusing - its unknown how many lots are proposed

This stock pond is also in natural features report is it to be mitigated- not sure where is though?

this is in the natural features report submitted with this application. is this correct?

REFERENCE
NOT TO SCALE

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ROCKY MOUNTAIN GROUP

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(303) 688-9475
Northern Office:
Greeley / Evans, CO 80620
(970) 330-1071

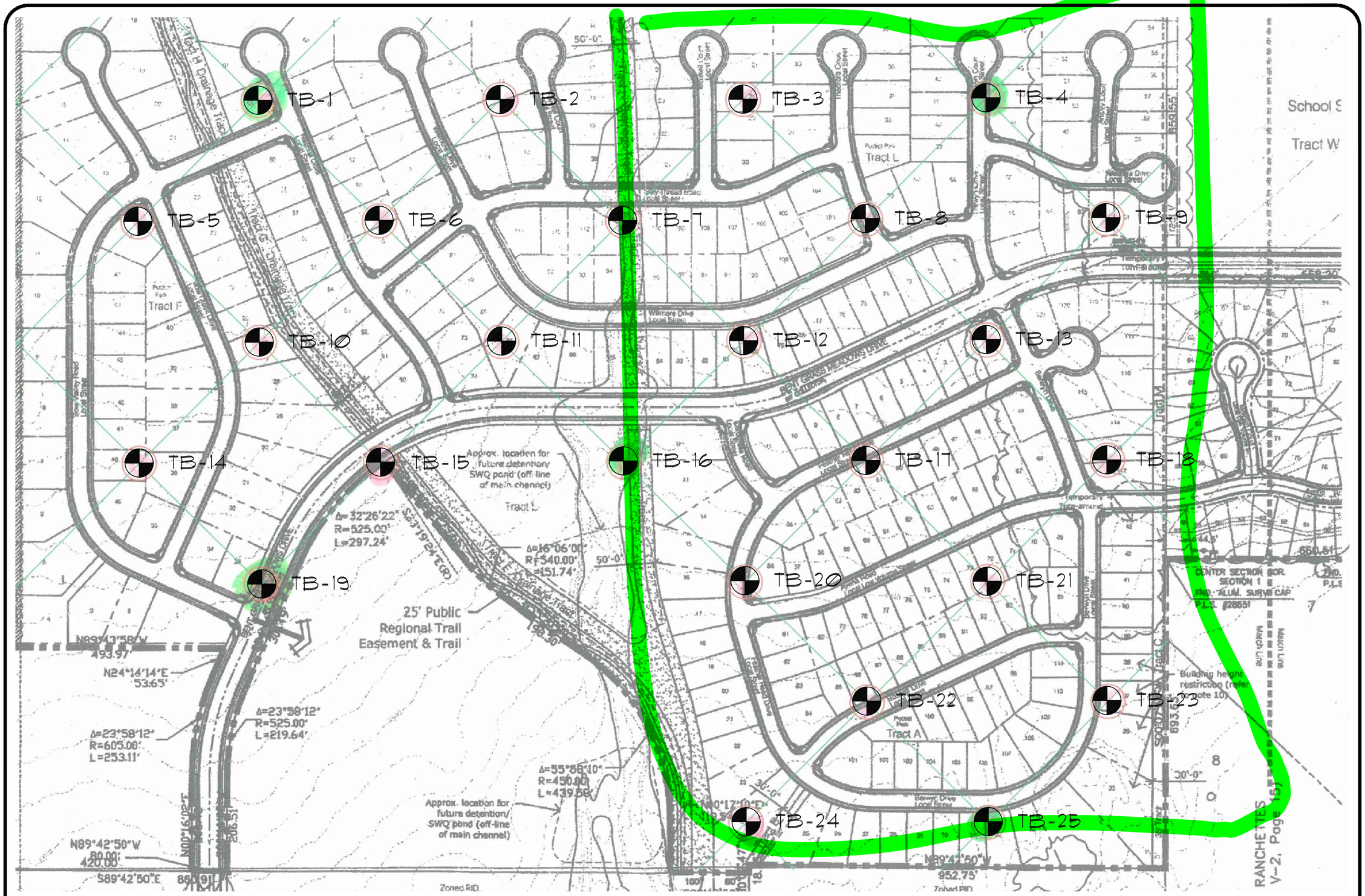
SITE VICINITY MAP

PRELIMINARY SUBSURFACE SOILS
INVESTIGATION
BENT GRASS, FILING NO. 2
EL PASO COUNTY, CO
CHALLENGER COLORADO, LLC

JOB No. 169845

FIG No. 1

DATE 5-14-2019



NOT TO SCALE

DENOTES APPROXIMATE LOCATION OF TEST BORINGS

JOB No. 169845

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(719) 687-6077
Monument Office:
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Pueblo / Canon City:
(719) 544-7750

PRELIMINARY SUBSURFACE SOILS INVESTIGATION
THE MEADOWS, FILING NO. 3
EL PASO COUNTY, CO
CHALLENGER COLORADO, LLC

ENGINEER:	CR
DRAWN BY:	BG
CHECKED BY:	CR
ISSUED:	5-14-19
REVISION:	DATE:
	JOB #:
REVISION:	
REVISION:	

TEST BORING LOCATION PLAN

SHEET No.
FIG-2

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 (%)

ROCKY MOUNTAIN GROUP

Architectural
Structural
Forensics

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Materials Testing
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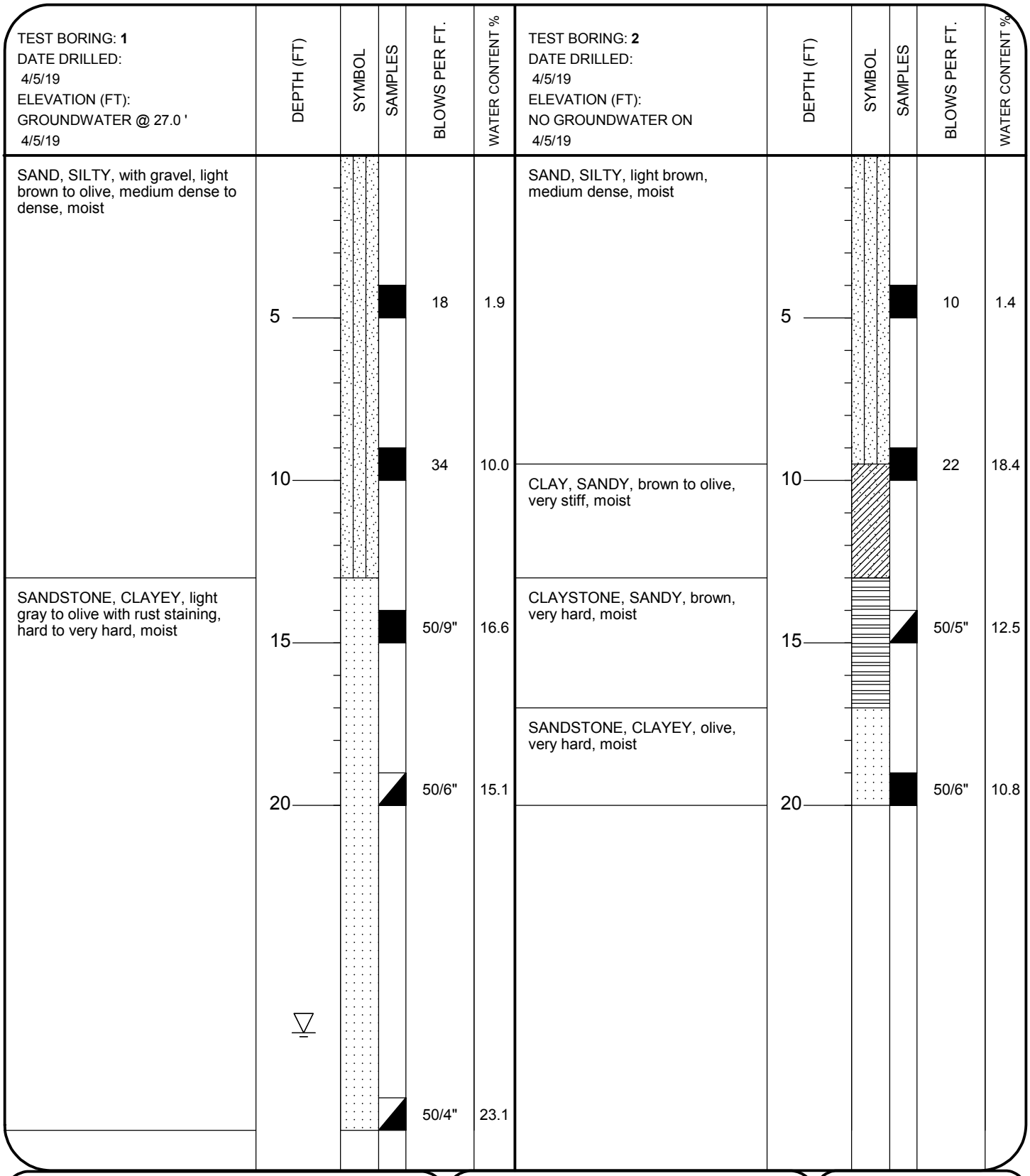
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

EXPLANATION OF TEST BORING LOGS

JOB No. 169845

FIGURE No. 3

DATE 5/14/19



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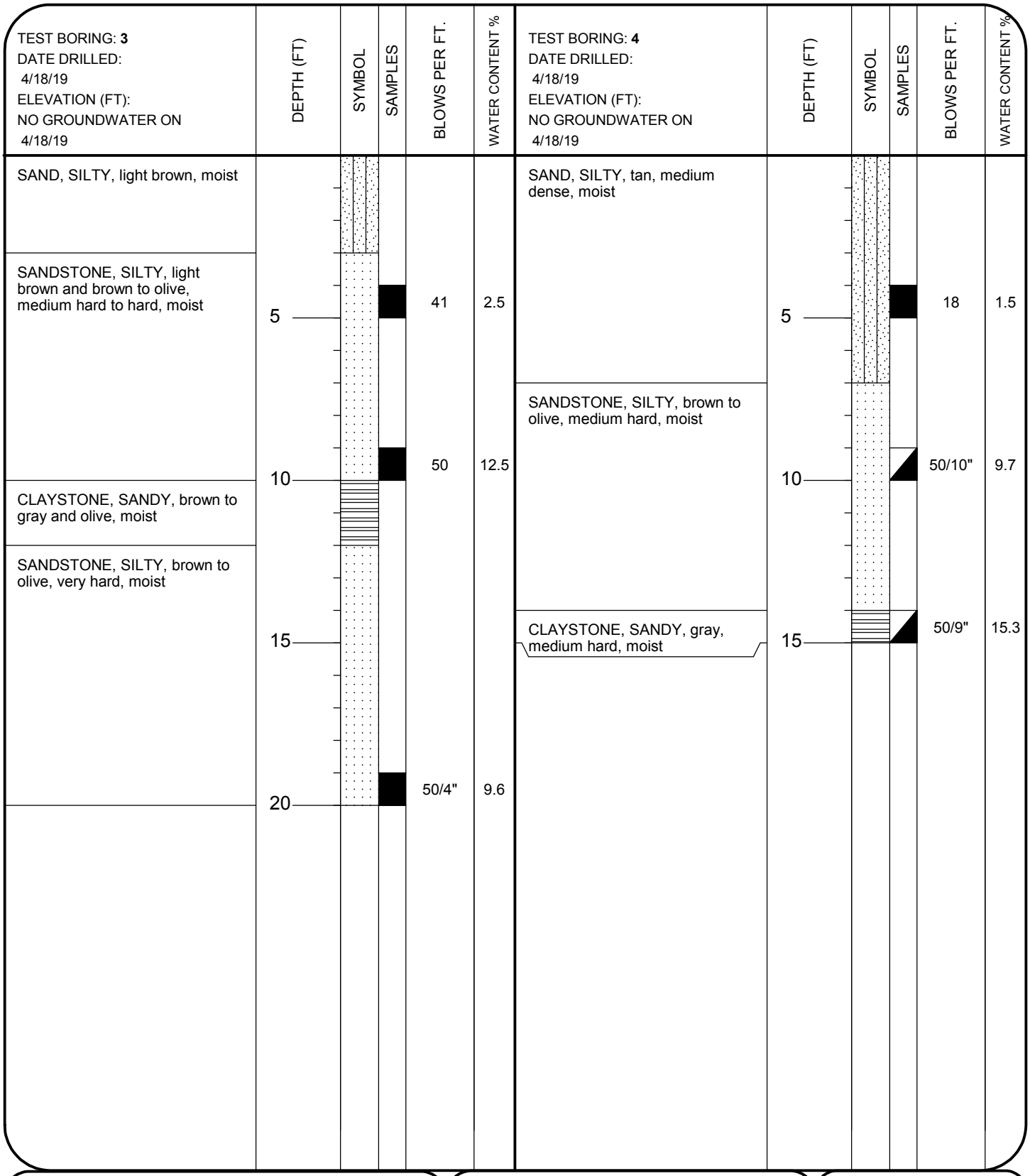
TEST BORING LOG

JOB No. 169845

FIGURE No. 4

DATE 5/14/19



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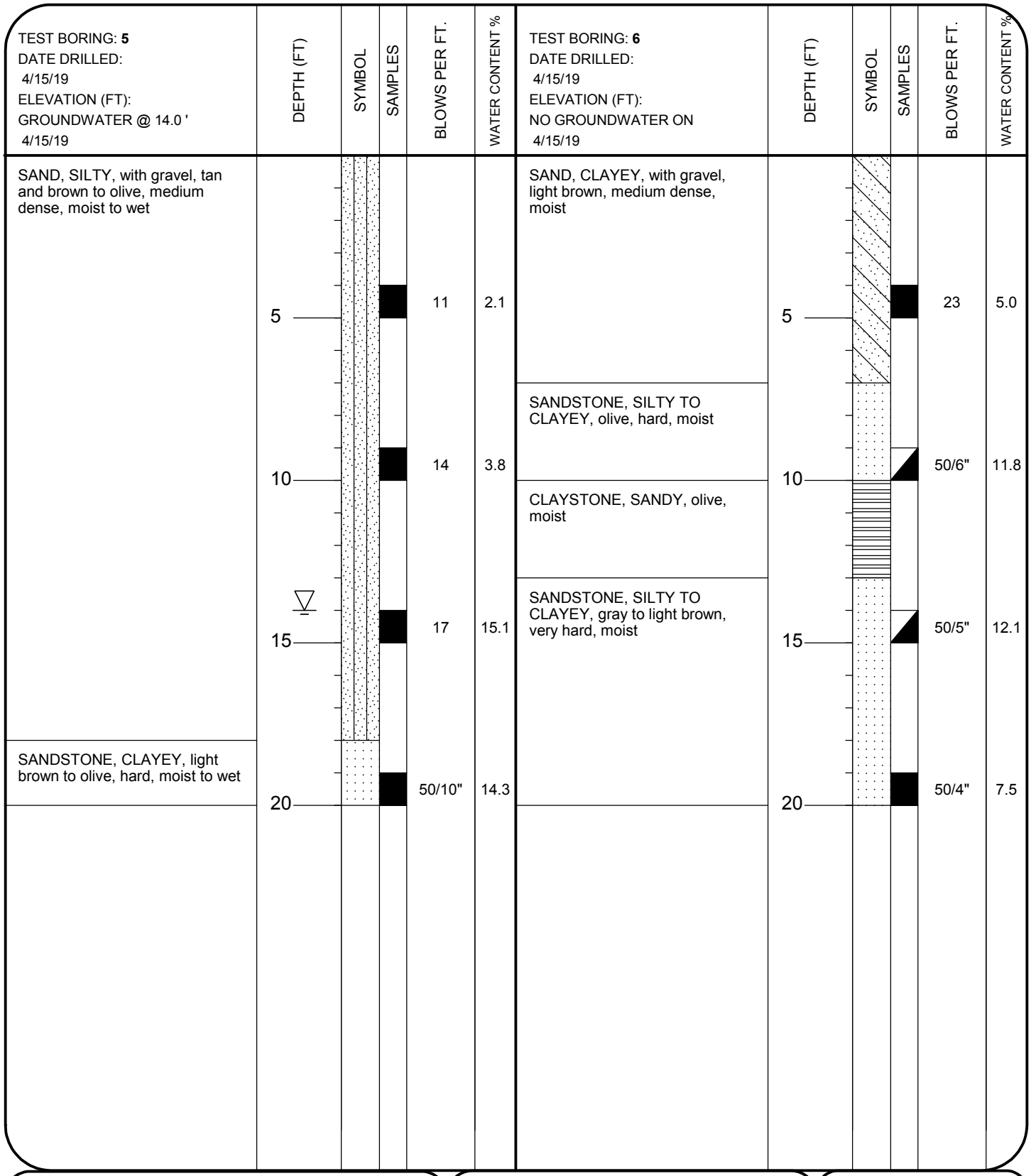
TEST BORING LOG

JOB No. 169845

FIGURE No. 5

DATE 5/14/19



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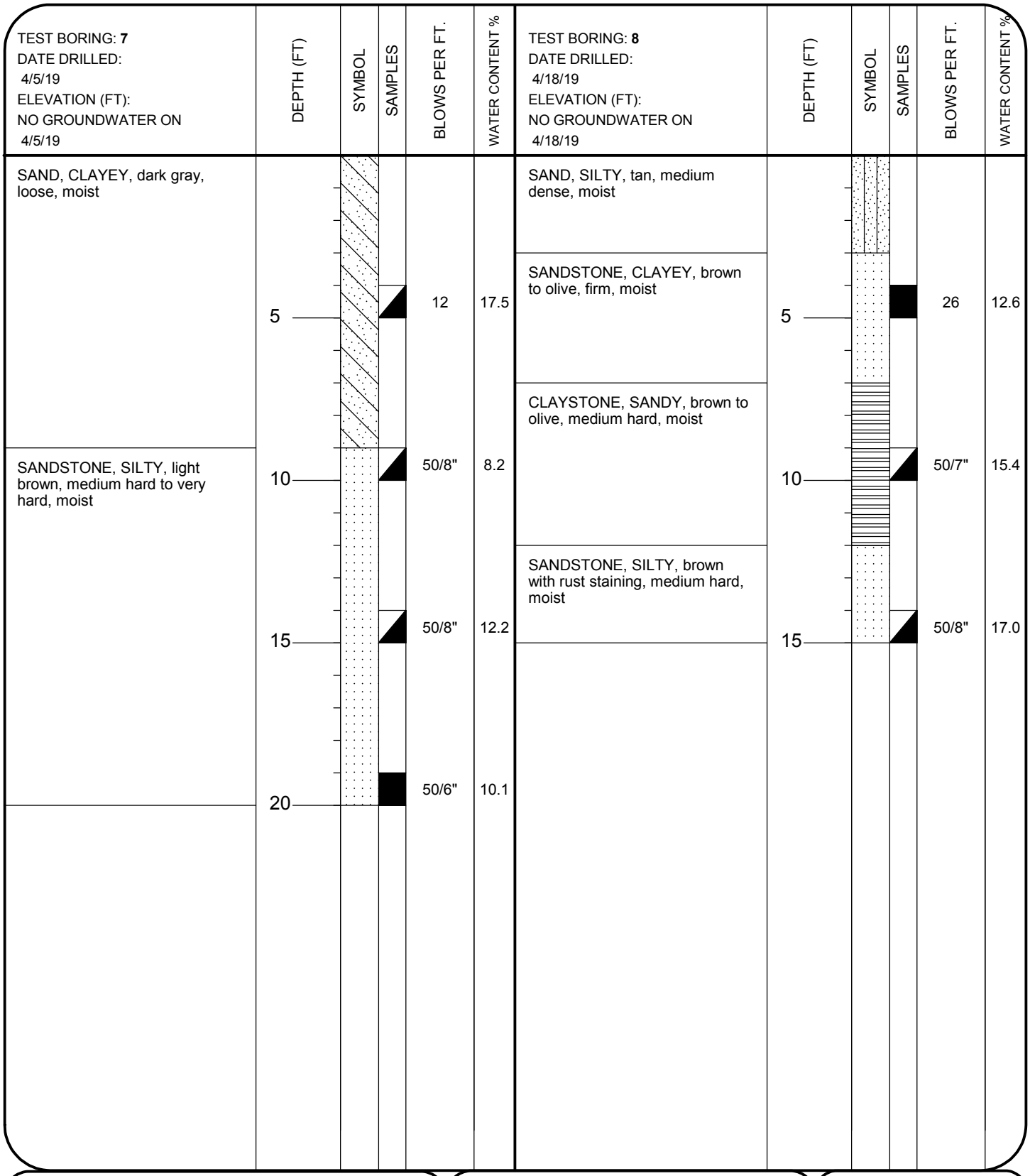
TEST BORING LOG

JOB No. 169845

FIGURE No. 6

DATE 5/14/19



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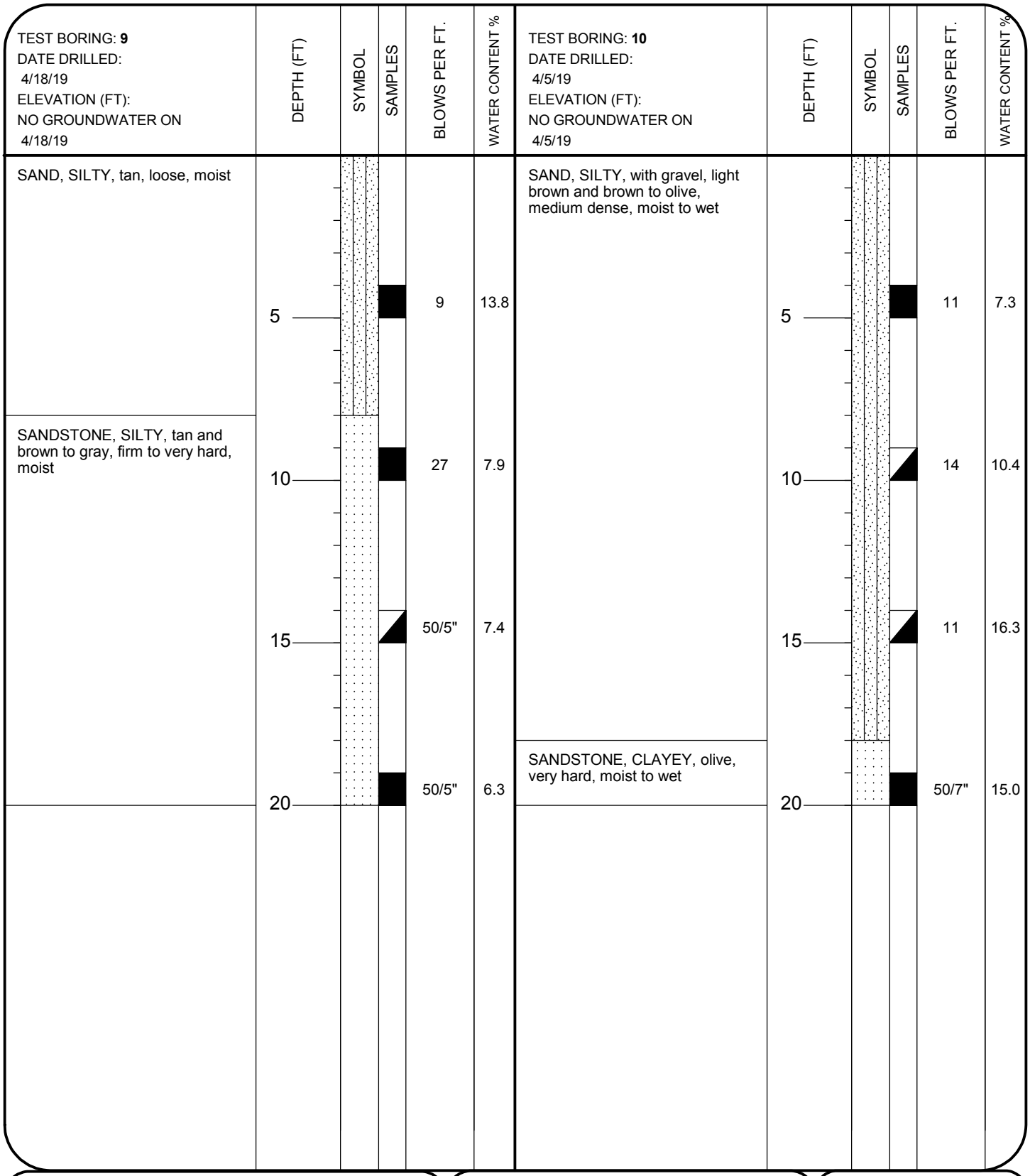
TEST BORING LOG

JOB No. 169845

FIGURE No. 7

DATE 5/14/19



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TEST BORING LOG

JOB No. 169845

FIGURE No. 8

DATE 5/14/19

TEST BORING: **11**
DATE DRILLED:
4/5/19
ELEVATION (FT):
NO GROUNDWATER ON
4/5/19

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	SAND, SILTY TO CLAYEY, tan to olive, loose, moist			
5			13	19.6
	SANDSTONE, CLAYEY, brown to olive with rust staining, medium hard, moist			
10			50/7"	16.5
	CLAYSTONE, SANDY, brown to gray and olive with rust staining, medium hard, moist			
15			50/7"	14.1
	SANDSTONE, CLAYEY, gray, very hard, moist			
20			50/6"	9.1

TEST BORING: **12**
DATE DRILLED:
4/18/19
ELEVATION (FT):
NO GROUNDWATER ON
4/18/19

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	SAND, SILTY, tan, medium dense, moist			
5			15	2.5
	SANDSTONE, SILTY TO CLAYEY, brown to gray, hard to very hard, moist			
10			50/11"	9.0
15				
20			50/4"	--

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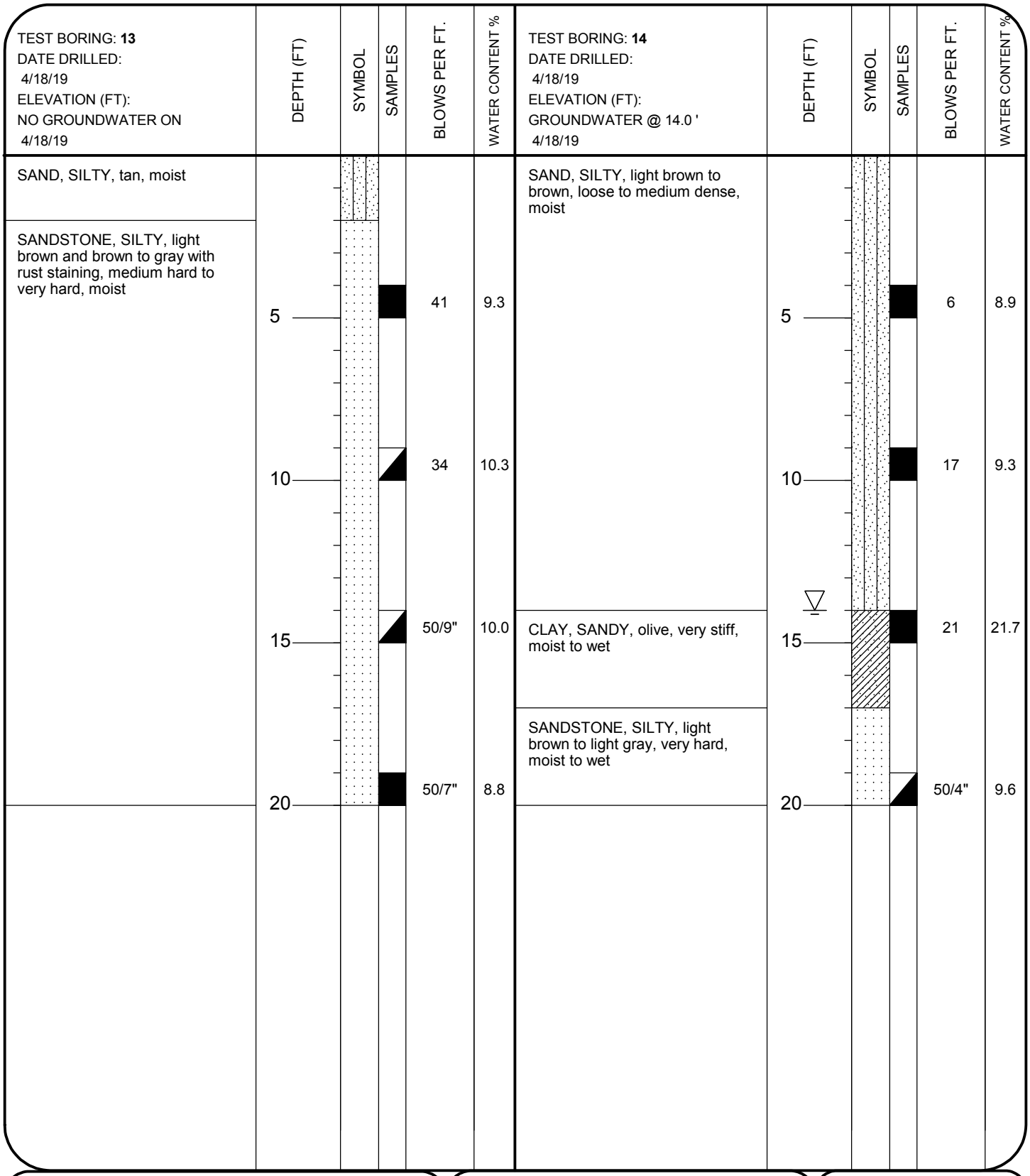
TEST BORING LOG

JOB No. 169845

FIGURE No. 9

DATE 5/14/19



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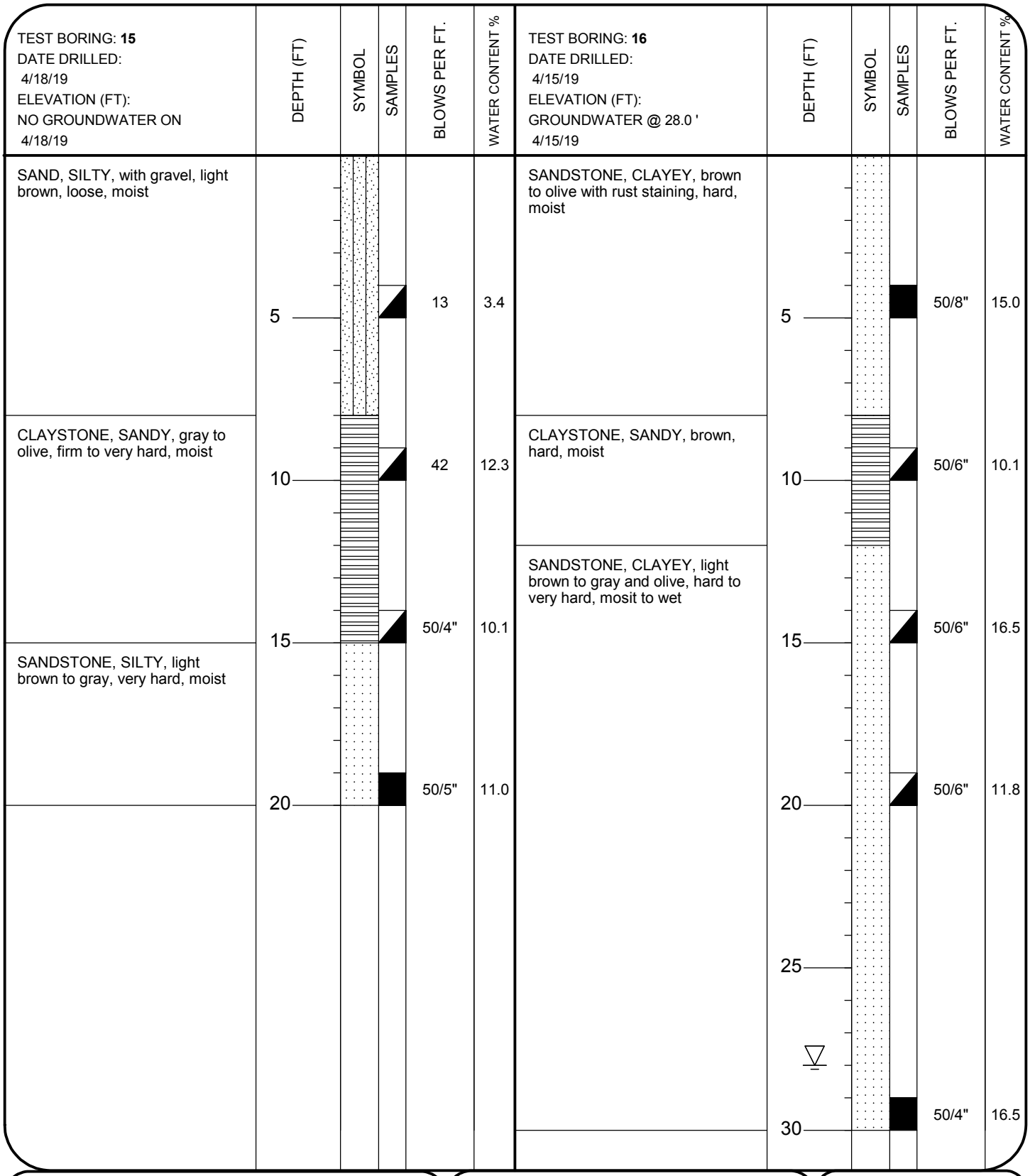
TEST BORING LOG

JOB No. 169845

FIGURE No. 10

DATE 5/14/19



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TEST BORING LOG

JOB No. 169845

FIGURE No. 11

DATE 5/14/19

TEST BORING: **17** DATE DRILLED: 4/18/19 ELEVATION (FT): NO GROUNDWATER ON 4/18/19	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, tan to brown, medium dense, moist	5			24	5.0
SANDSTONE, SILTY TO CLAYEY, gray to olive, medium hard, moist	10			50/8"	10.0
	15				

TEST BORING: **18** DATE DRILLED: 4/18/19 ELEVATION (FT): NO GROUNDWATER ON 4/18/19	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, tan, medium dense, moist	5			30	2.9
SANDSTONE, SILTY, brown to olive, firm to hard, moist	10			13/6"	8.4
	15			50/6"	18.3
SANDSTONE, CLAYEY, light brown, hard, moist	20			50/9"	9.6

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TEST BORING LOG

JOB No. 169845

FIGURE No. 12

DATE 5/14/19

TEST BORING: **19**
DATE DRILLED:
4/18/19
ELEVATION (FT):
GROUNDWATER @ 14.0 '
4/18/19

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	SAND, SILTY, with gravel, tan, medium dense, moist			
5			25	3.3
10			25	4.6
		▽		
15	SANDSTONE, CLAYEY, light brown to olive, medium hard, moist to wet		50/11"	10.6
20	CLAYSTONE, SANDY, gray to olive, medium hard, moist to wet		35	15.7
	SANDSTONE, CLAYEY, light brown to olive, hard, moist to wet			
25			50/6"	15.2

TEST BORING: **20**
DATE DRILLED:
4/18/19
ELEVATION (FT):
NO GROUNDWATER ON
4/18/19

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	CLAYSTONE, SANDY, olive, medium hard, moist			
5			50/11"	14.6
	SANDSTONE, CLAYEY, light brown to olive, medium hard to very hard, moist			
10			50/8"	15.5
15			50/5"	8.3
20			50/6"	10.0

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TEST BORING LOG

JOB No. 169845

FIGURE No. 13

DATE 5/14/19

TEST BORING: **21** DATE DRILLED: 4/18/19 ELEVATION (FT): NO GROUNDWATER ON 4/18/19	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, CLAYEY, with gravel, brown to olive, medium dense, moist	5			28	7.4
CLAYSTONE, SANDY, brown to olive, medium hard to hard, moist	10			50/11"	17.1
	15			50/6"	12.1

TEST BORING: **22** DATE DRILLED: 4/18/19 ELEVATION (FT): NO GROUNDWATER ON 4/18/19	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SANDSTONE, SILTY TO CLAYEY, light brown to light gray, hard to very hard, moist	5			50/9"	6.3
	10			50/4"	7.7
	15			50/4"	9.2

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TEST BORING LOG

JOB No. 169845

FIGURE No. 14

DATE 5/14/19

TEST BORING: **23**
DATE DRILLED:
4/18/19
ELEVATION (FT):
GROUNDWATER @ 19.0 '
4/18/19

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	SAND, CLAYEY, light brown, medium dense, moist			
5			10	12.6
	SANDSTONE, SILTY TO CLAYEY, with gravel, light brown to light gray and gray, hard to very hard, moist to wet			
10			50/6"	6.0
15			50/5"	7.8
20			50/3"	14.0

TEST BORING: **24**
DATE DRILLED:
4/18/19
ELEVATION (FT):
NO GROUNDWATER ON
4/18/19

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	SAND, SILTY, with gravel, tan, medium dense, moist			
5			21	2.2
	SANDSTONE, SILTY, light brown, medium hard to hard, moist			
10			46	8.0
15			50/6"	11.1

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TEST BORING LOG

JOB No. 169845

FIGURE No. 15

DATE 5/14/19

TEST BORING: **25**
DATE DRILLED:
4/3/19
ELEVATION (FT):
GROUNDWATER @ 19.0 '
4/3/19

DEPTH (FT)	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SANDSTONE, SILTY, light brown, hard to very hard, moist to wet			
5		50/10"	6.7
10		50/7"	6.4
15		50/7"	9.7
20 ▽		50/6"	12.7
CLAYSTONE, SANDY, dark gray, very hard, moist to wet			
25			
30		50/6"	15.7

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TEST BORING LOG

JOB No. 169845

FIGURE No. 16

DATE 5/14/19

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	FHA Expansion Pressure (psf)	% Swell/ Collapse	USCS Classification
1	4.0	1.9								
1	9.0	10.0		NP	NP	4.1	25.0			SM
1	14.0	16.6								
1	19.0	15.1								
1	29.0	23.1								
2	4.0	1.4								
2	9.0	18.4								
2	14.0	12.5		33	19	0.7	52.6			CL
2	19.0	10.8								
3	4.0	2.5								
3	9.0	12.5		NP	NP	0.3	36.4			SM
3	19.0	9.6								
4	4.0	1.5								
4	9.0	9.7		NP	NP	3.9	13.8			SM
4	14.0	15.3								
5	4.0	2.1								
5	9.0	3.8		NP	NP	9.0	6.2			SW-SM
5	14.0	15.1								
5	19.0	14.3								
6	4.0	5.0								
6	9.0	11.8	107.8	35	21	0.2	48.7		- 0.4	SC
6	14.0	12.1								
6	19.0	7.5								
7	4.0	17.5	100.5	51	36	3.9	48.8		1.3	SC
7	9.0	8.2								
7	14.0	12.2								
7	19.0	10.1								
8	4.0	12.6								
8	9.0	15.4	112.1	36	18	1.1	54.3		0.6	CL
8	14.0	17.0								
9	4.0	13.8								
9	9.0	7.9		NP	NP	13.5	9.2			SW-SM
9	14.0	7.4								
9	19.0	6.3								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 169845
FIGURE No. 17

DATE 5/14/19

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	FHA Expansion Pressure (psf)	% Swell/ Collapse	USCS Classification
10	4.0	7.3								
10	9.0	10.4		NP	NP	5.7	18.4			SM
10	14.0	16.3								
10	19.0	15.0								
11	4.0	19.6								
11	9.0	16.5	109.2	39	20	0.4	48.2		0.3	SC
11	14.0	14.1								
11	19.0	9.1								
12	4.0	2.5								
12	9.0	9.0								
12	14.0	9.0								
13	4.0	9.3								
13	9.0	10.3		NP	NP	15.9	10.0			SW-SM
13	14.0	10.0								
13	19.0	8.8								
14	4.0	8.9								
14	9.0	9.3		NP	NP	6.0	15.7			SM
14	14.0	21.7								
14	19.0	9.6								
15	4.0	3.4								
15	9.0	12.3	124.0	25	14	0.2	47.7		- 0.6	SC
15	14.0	10.1								
15	19.0	11.0								
16	4.0	15.0								
16	9.0	10.1	107.3	29	17	0.4	53.2		- 1.3	CL
16	14.0	16.5	96.9	37	17	0.0	39.7		- 1.3	SC
16	19.0	11.8								
16	29.0	16.5								
17	4.0	5.0		NP	NP	18.8	10.0			SP-SM
17	9.0	10.0								
17	19.0	10.4								
18	4.0	2.9								
18	9.0	8.4								
18	14.0	18.3	102.6	43	16	4.0	49.0		- 1.1	SM

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 169845
FIGURE No. 17

DATE 5/14/19

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	FHA Expansion Pressure (psf)	% Swell/ Collapse	USCS Classification
18	19.0	9.6								
19	4.0	3.3		NP	NP	10.3	6.6			SW-SM
19	9.0	4.6								
19	14.0	10.6								
19	19.0	15.7								
19	24.0	15.2								
20	4.0	14.6	117.0	39	22	1.9	56.3		0.3	CL
20	9.0	15.5								
20	14.0	8.3								
20	19.0	10.0								
21	4.0	7.4								
21	9.0	17.1	106.8	38	22	0.0	73.1		- 0.6	CL
21	14.0	12.1								
22	4.0	6.3								
22	9.0	7.7								
22	14.0	9.2								
23	4.0	12.6		25	12	6.6	12.7			SC
23	9.0	6.0								
23	14.0	7.8								
23	19.0	14.0								
24	4.0	2.2		NP	NP	9.0	5.2			SP-SM
24	9.0	8.0								
24	14.0	11.1								
25	4.0	6.7								
25	9.0	6.4		NP	NP	5.6	10.3			SW-SM
25	14.0	9.7								
25	19.0	12.7								
25	29.0	15.7				0.0	58.4			CL

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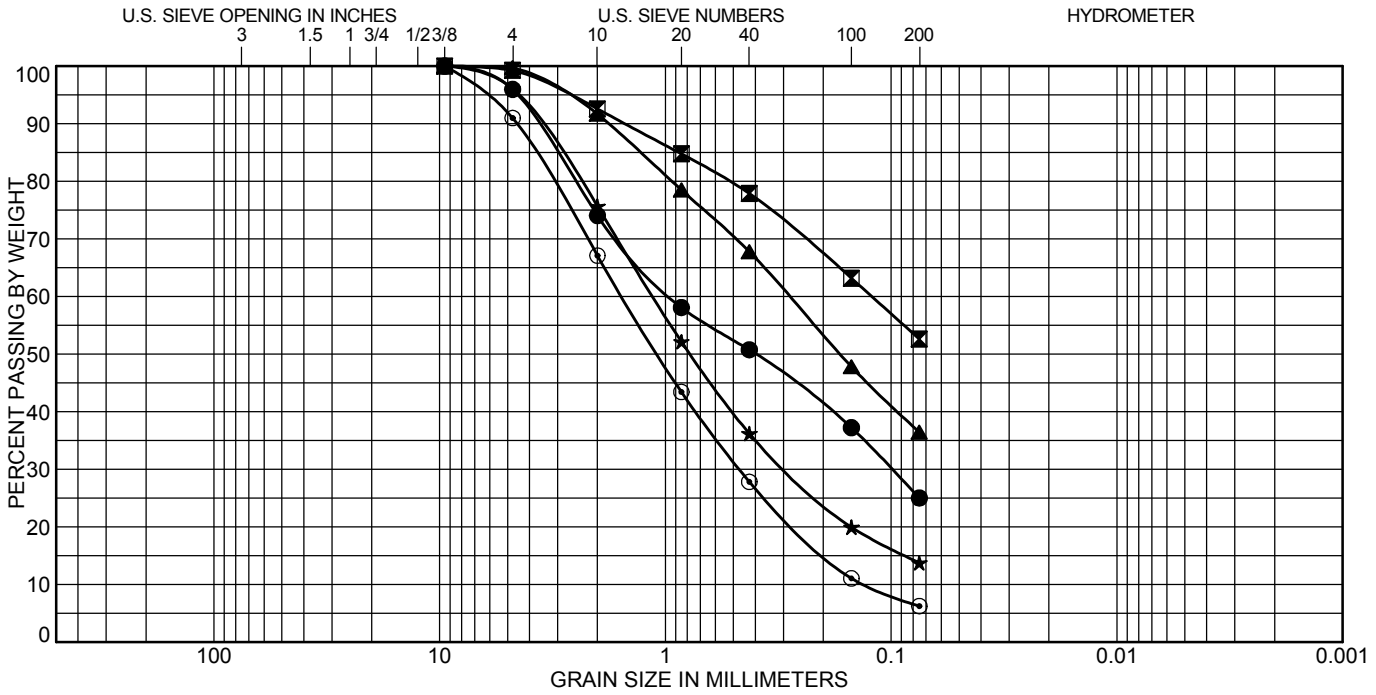
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 169845
FIGURE No. 17
PAGE 3 OF 3
DATE 5/14/19



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring		Depth (ft)	Classification	LL	PL	PI
●	1	9.0	SILTY SAND(SM)	NP	NP	NP
⊠	2	14.0	SANDY LEAN CLAY(CL)	33	14	19
▲	3	9.0	SILTY SAND(SM)	NP	NP	NP
★	4	9.0	SILTY SAND(SM)	NP	NP	NP
⊙	5	9.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	9.0	4.1	70.9	25.0	
⊠	2	14.0	0.7	46.7	52.6	
▲	3	9.0	0.3	63.3	36.4	
★	4	9.0	3.9	82.3	13.8	
⊙	5	9.0	9.0	84.7	6.2	

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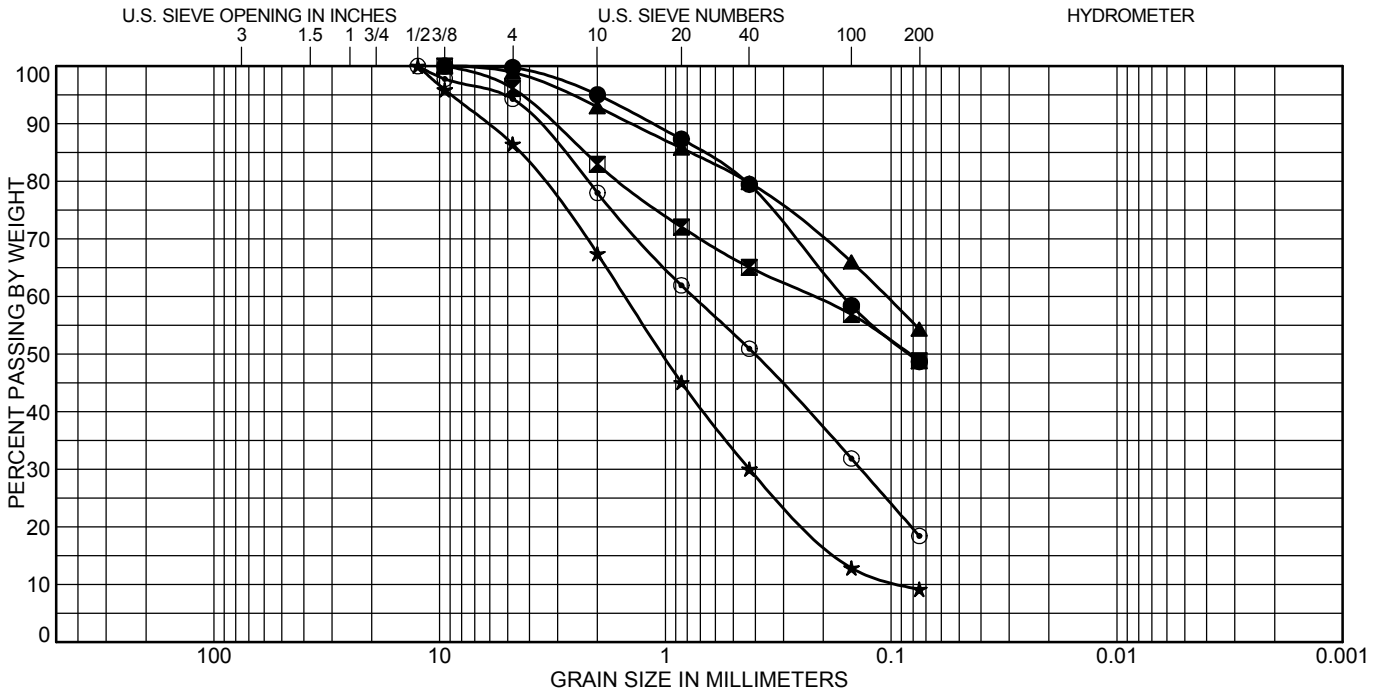
SOIL CLASSIFICATION DATA

JOB No. 169845

FIGURE No. 18

DATE 5/14/19



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring		Depth (ft)	Classification	LL	PL	PI
●	6	9.0	**CLAYEY SAND(SC)**	35	14	21
⊠	7	4.0	**CLAYEY SAND(SC)**	51	15	36
▲	8	9.0	**SANDY LEAN CLAY(CL)**	36	18	18
★	9	9.0	**WELL-GRADED SAND with SILT(SW-SM)**	NP	NP	NP
⊙	10	9.0	**SILTY SAND(SM)**	NP	NP	NP

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	6	9.0	0.2	51.1	48.7	
⊠	7	4.0	3.9	47.3	48.8	
▲	8	9.0	1.1	44.6	54.3	
★	9	9.0	13.5	77.3	9.2	
⊙	10	9.0	5.7	75.9	18.4	

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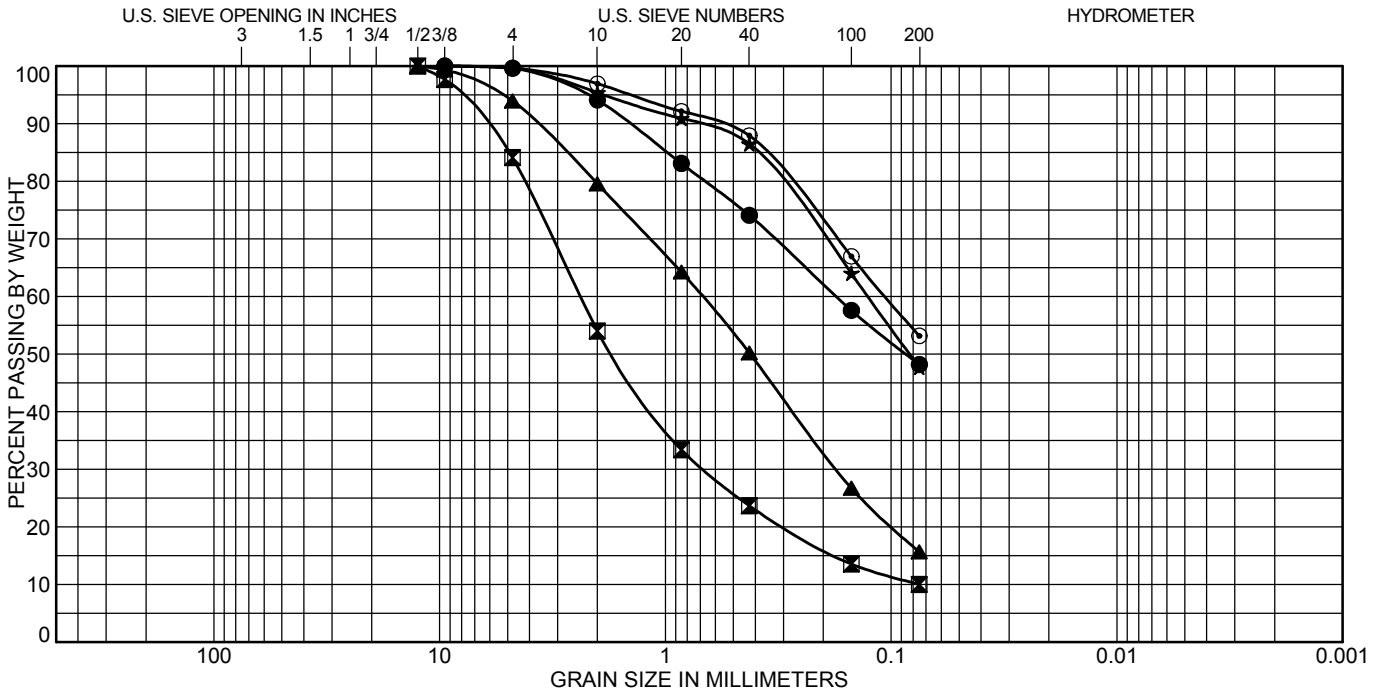
SOIL CLASSIFICATION DATA

JOB No. 169845

FIGURE No. 19

DATE 5/14/19



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring		Depth (ft)	Classification	LL	PL	PI
●	11	9.0	CLAYEY SAND(SC)	39	19	20
⊠	13	9.0	WELL-GRADED SAND with SILT and GRAVEL(SW-SM)	NP	NP	NP
▲	14	9.0	SILTY SAND(SM)	NP	NP	NP
★	15	9.0	CLAYEY SAND(SC)	25	11	14
⊙	16	9.0	SANDY LEAN CLAY(CL)	29	12	17

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	11	9.0	0.4	51.4	48.2	
⊠	13	9.0	15.9	74.1	10.0	
▲	14	9.0	6.0	78.3	15.7	
★	15	9.0	0.2	52.1	47.7	
⊙	16	9.0	0.4	46.5	53.2	

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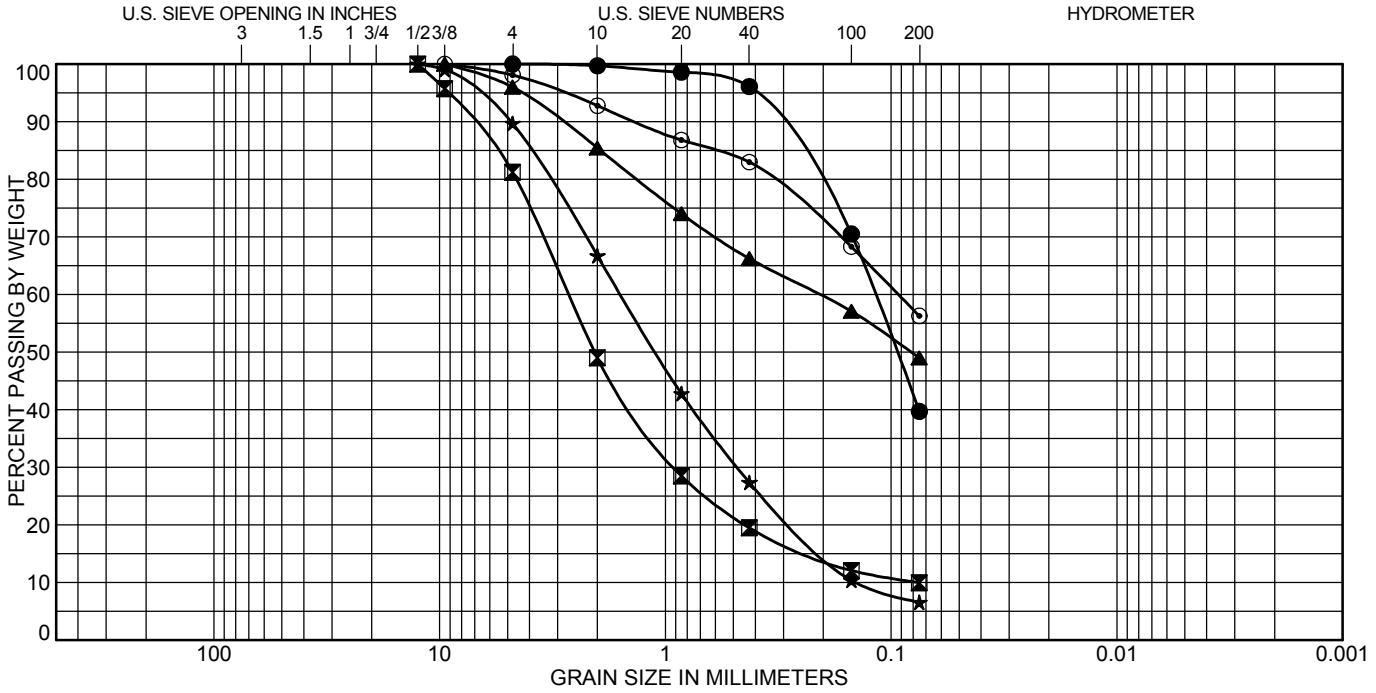
SOIL CLASSIFICATION DATA

JOB No. 169845

FIGURE No. 20

DATE 5/14/19



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring		Depth (ft)	Classification	LL	PL	PI
●	16	14.0	CLAYEY SAND(SC)	37	20	17
⧓	17	4.0	POORLY GRADED SAND with SILT and GRAVEL(SP-SM)	NP	NP	NP
▲	18	14.0	SILTY SAND(SM)	43	27	16
★	19	4.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP
⊙	20	4.0	SANDY LEAN CLAY(CL)	39	17	22

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	16	14.0	0.0	60.3	39.7	
⧓	17	4.0	18.8	71.3	10.0	
▲	18	14.0	4.0	47.0	49.0	
★	19	4.0	10.3	83.1	6.6	
⊙	20	4.0	1.9	41.8	56.3	

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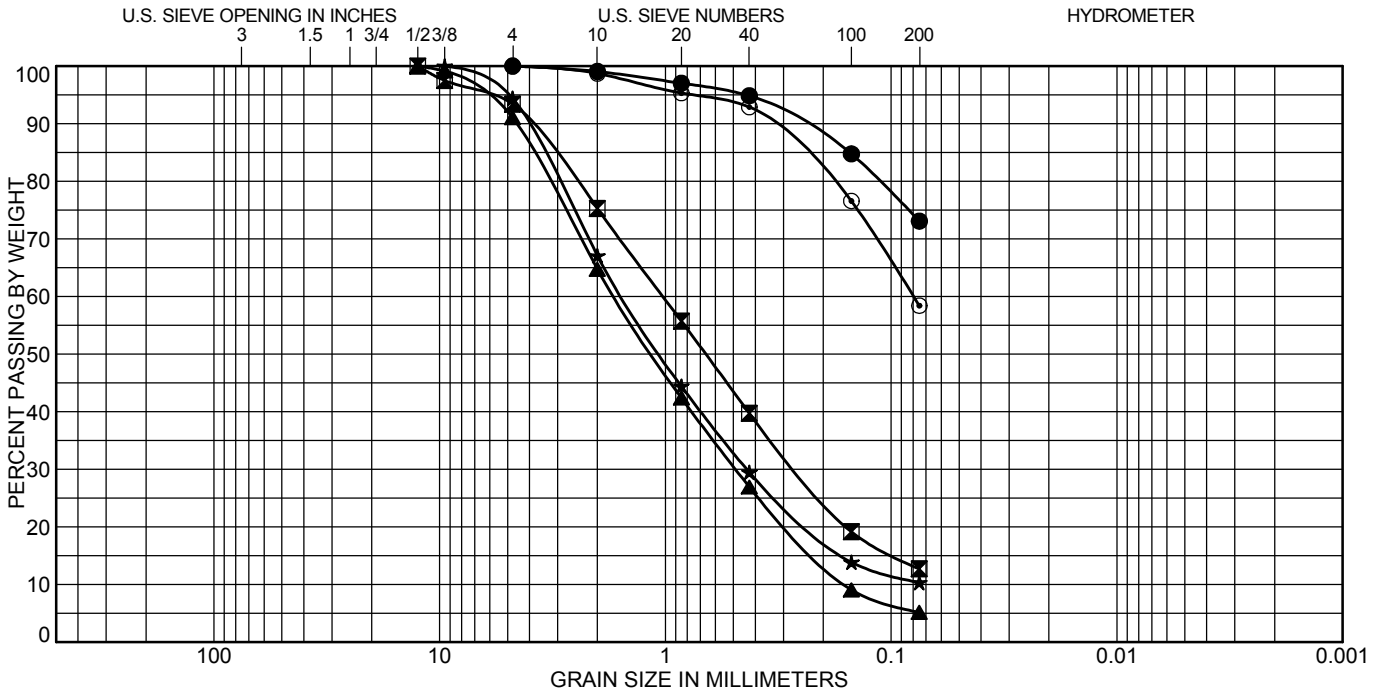
SOIL CLASSIFICATION DATA

JOB No. 169845

FIGURE No. 21

DATE 5/14/19



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring		Depth (ft)	Classification	LL	PL	PI
●	21	9.0	LEAN CLAY with SAND(CL)	38	16	22
⊠	23	4.0	CLAYEY SAND(SC)	25	13	12
▲	24	4.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP
★	25	9.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP
⊙	25	29.0	LEAN CLAY with SAND(CL)			

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	21	9.0	0.0	26.9	73.1	
⊠	23	4.0	6.6	80.7	12.7	
▲	24	4.0	9.0	85.9	5.2	
★	25	9.0	5.6	84.1	10.3	
⊙	25	29.0	0.0	41.6	58.4	

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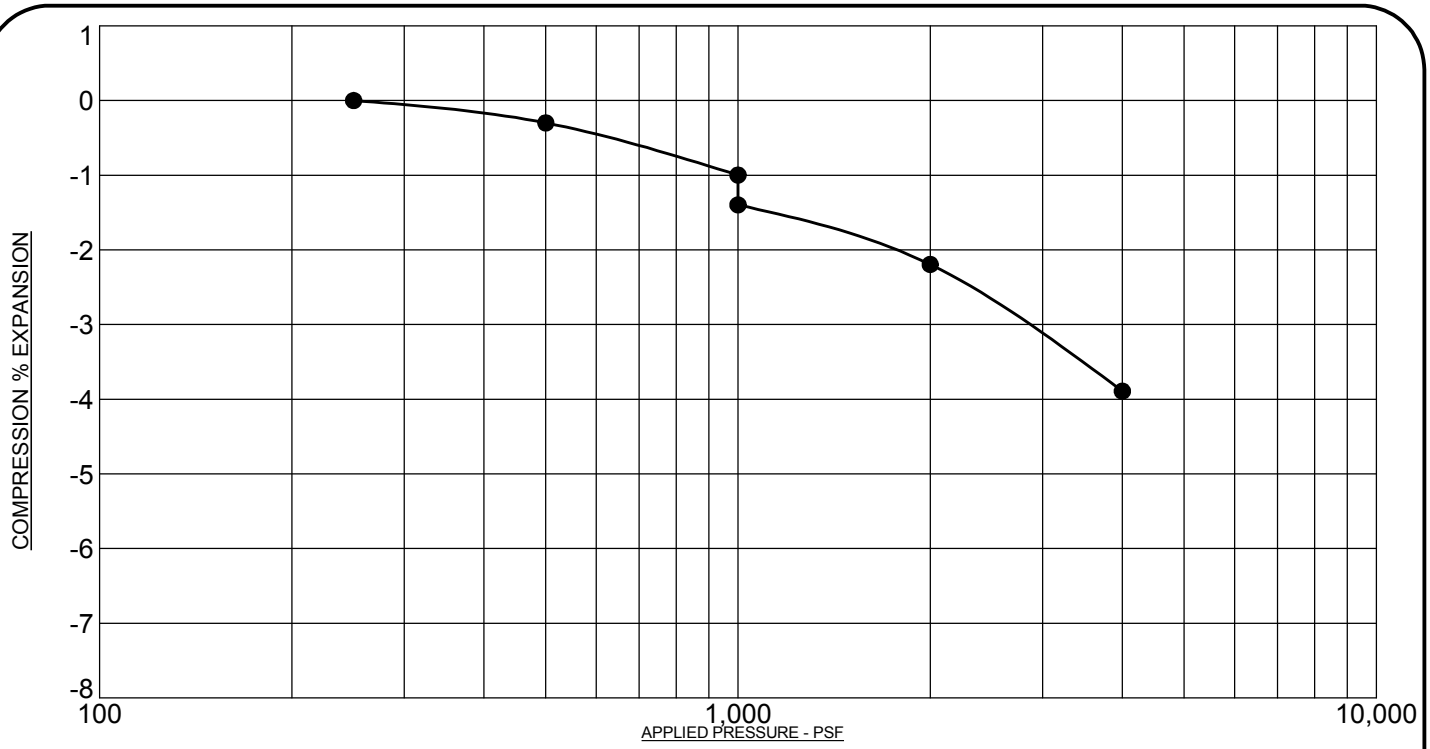
SOIL CLASSIFICATION DATA

JOB No. 169845

FIGURE No. 22

DATE 5/14/19



PROJECT: **Bent Grass Meadows, Filing No. 2, El Paso County, Colorado**
SAMPLE DESCRIPTION: **SANDSTONE, SILTY TO CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **6 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **107.8 PCF**
NATURAL MOISTURE CONTENT: **11.8%**
PERCENT SWELL/COMPRESSION: **- 0.4**

PROJECT: **Bent Grass Meadows, Filing No. 2, El Paso County, Colorado**
SAMPLE DESCRIPTION: **SAND, CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **7 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **100.5 PCF**
NATURAL MOISTURE CONTENT: **17.5%**
PERCENT SWELL/COMPRESSION: **1.3**

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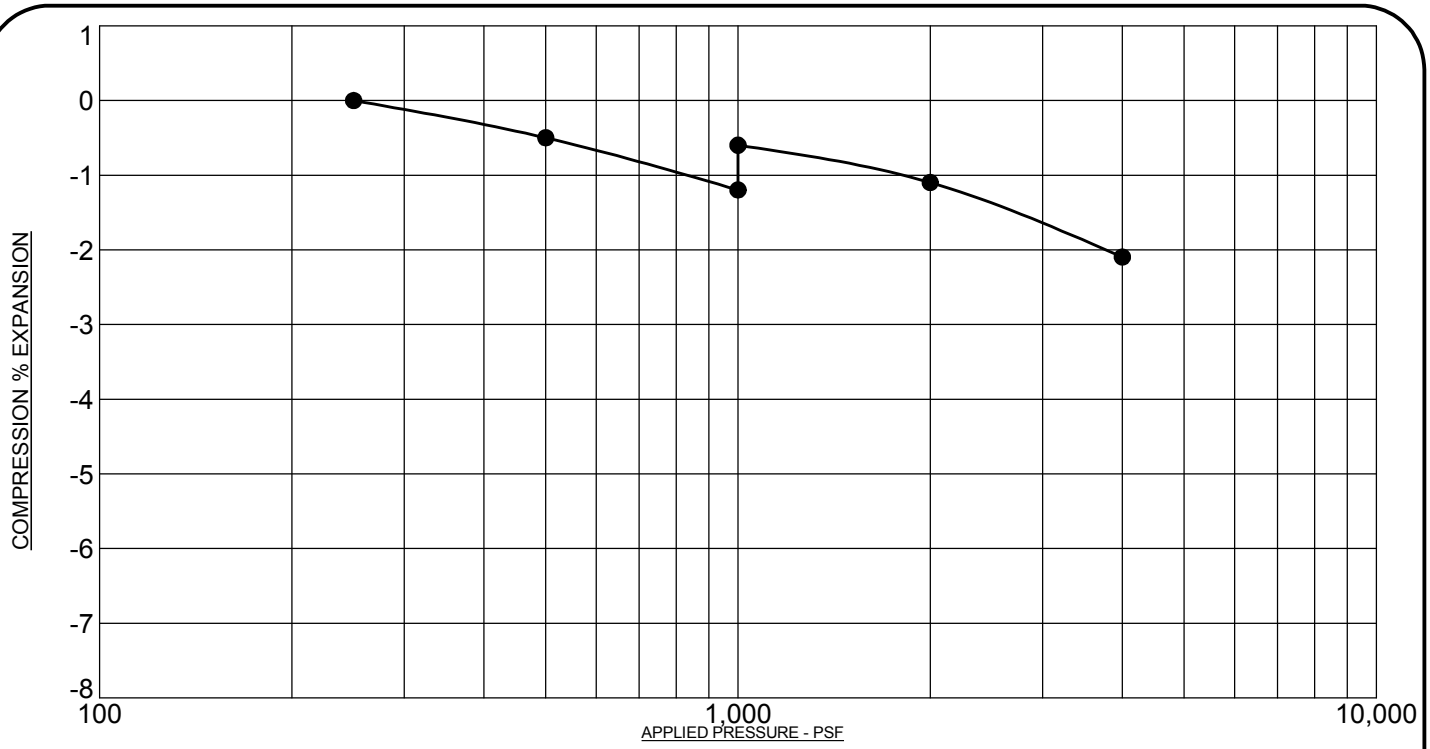
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 169845

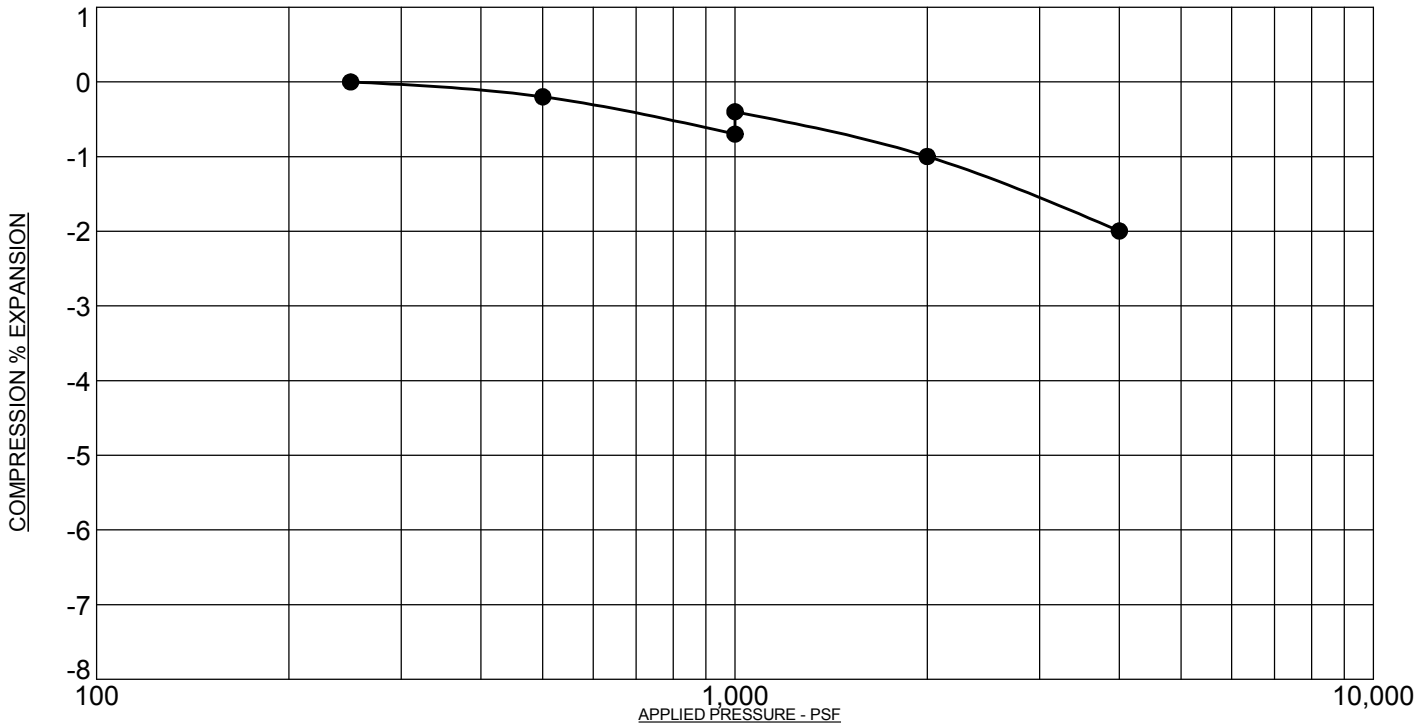
FIGURE No. 23

DATE 5/14/19



PROJECT: **Bent Grass Meadows, Filing No. 2, El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **8 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **112.1 PCF**
NATURAL MOISTURE CONTENT: **15.4%**
PERCENT SWELL/COMPRESSION: **0.6**



PROJECT: **Bent Grass Meadows, Filing No. 2, El Paso County, Colorado**
SAMPLE DESCRIPTION: **SANDSTONE, CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **11 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **109.2 PCF**
NATURAL MOISTURE CONTENT: **16.5%**
PERCENT SWELL/COMPRESSION: **0.3**

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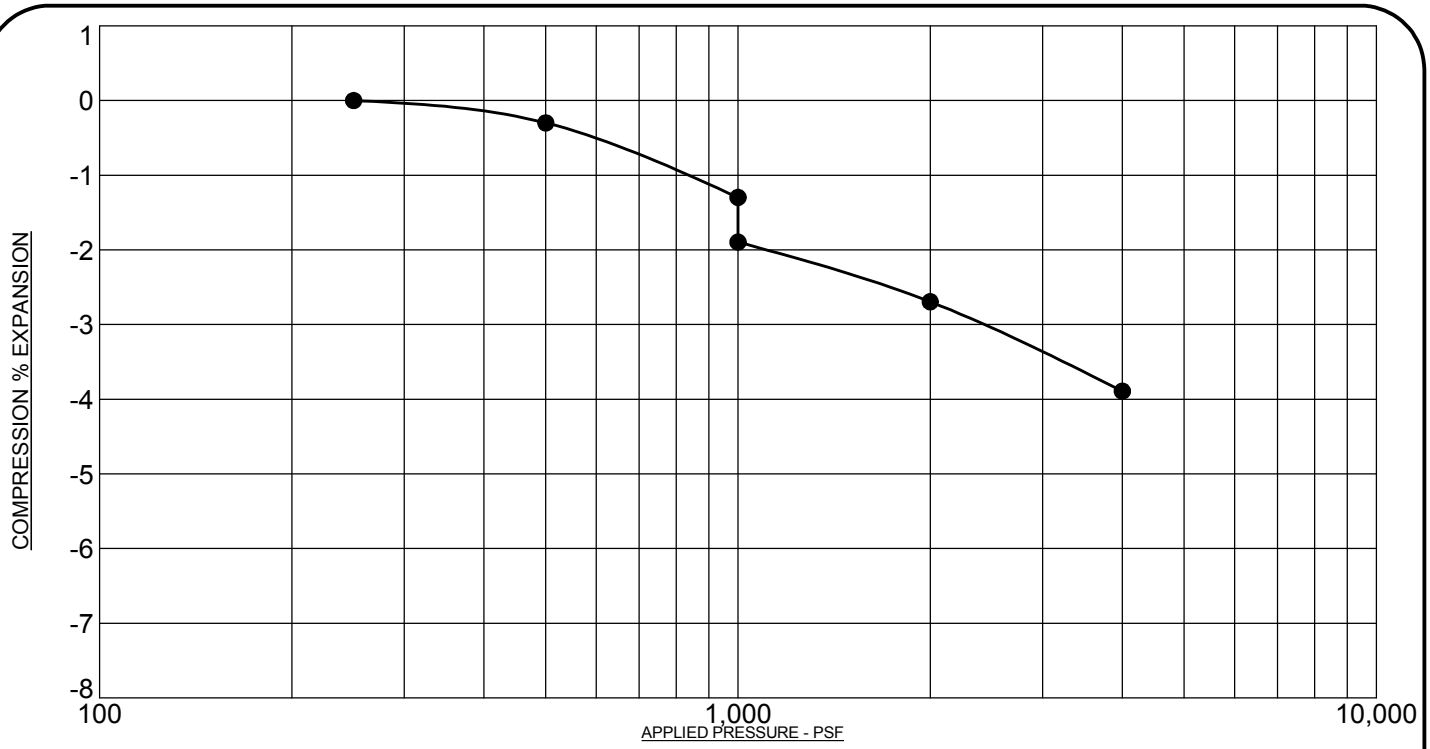
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 169845

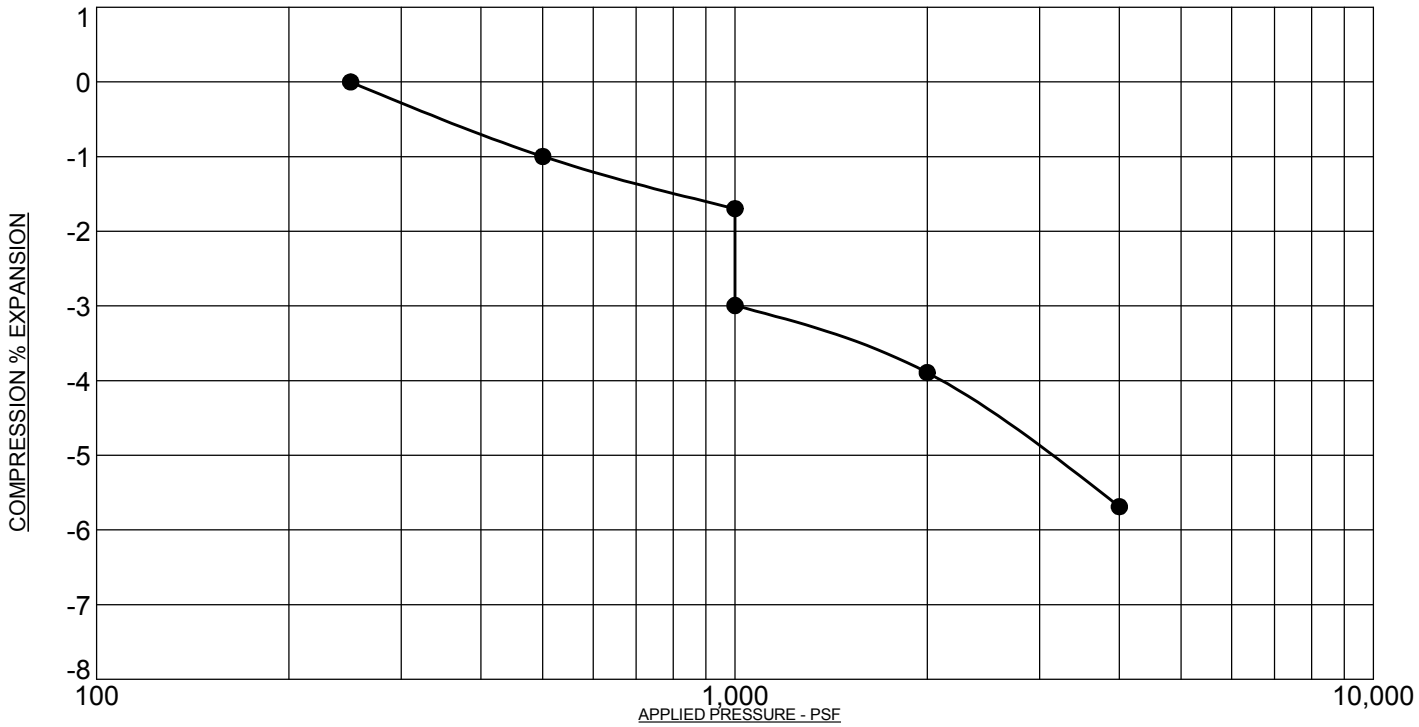
FIGURE No. 24

DATE 5/14/19



PROJECT: **Bent Grass Meadows, Filing No. 2, El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **15 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **124.0 PCF**
NATURAL MOISTURE CONTENT: **12.3%**
PERCENT SWELL/COMPRESSION: **- 0.6**



PROJECT: **Bent Grass Meadows, Filing No. 2, El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **16 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **107.3 PCF**
NATURAL MOISTURE CONTENT: **10.1%**
PERCENT SWELL/COMPRESSION: **- 1.3**

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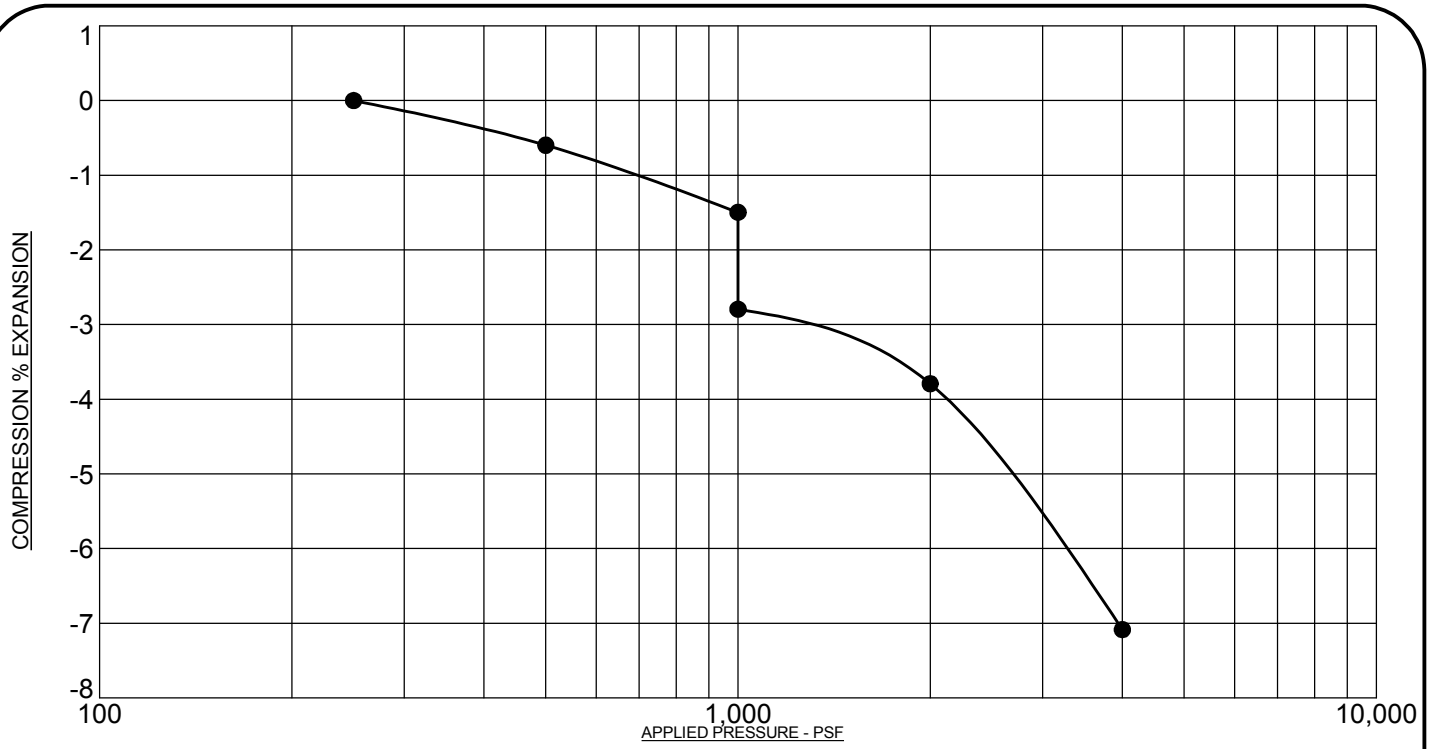
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 169845

FIGURE No. 25

DATE 5/14/19



PROJECT: **Bent Grass Meadows, Filing No. 2, El Paso County, Colorado**
SAMPLE DESCRIPTION: **SANDSTONE, CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **16 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **96.9 PCF**
NATURAL MOISTURE CONTENT: **16.5%**
PERCENT SWELL/COMPRESSION: **- 1.3**

PROJECT: **Bent Grass Meadows, Filing No. 2, El Paso County, Colorado**
SAMPLE DESCRIPTION: **SANDSTONE, CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **18 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **102.6 PCF**
NATURAL MOISTURE CONTENT: **18.3%**
PERCENT SWELL/COMPRESSION: **- 1.1**

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SWELL/CONSOLIDATION TEST RESULTS

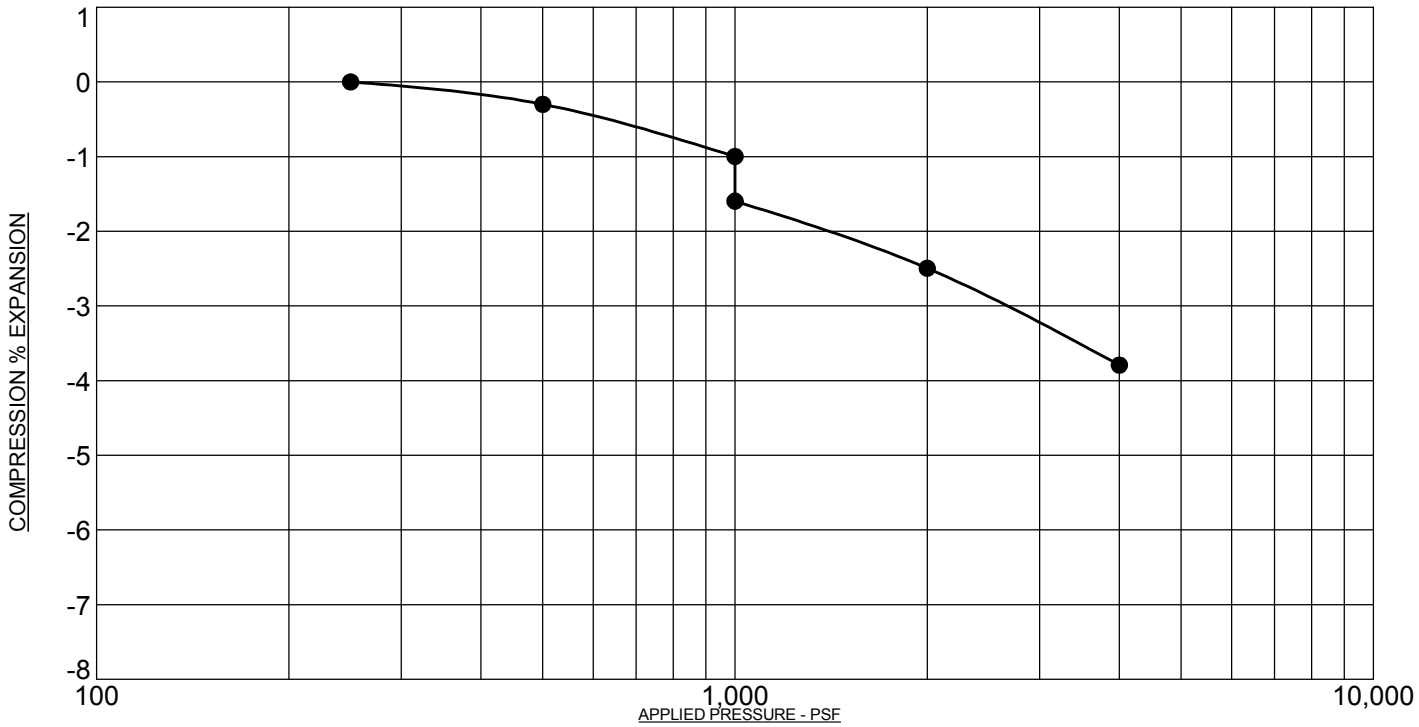
JOB No. 169845

FIGURE No. 26

DATE 5/14/19

PROJECT: **Bent Grass Meadows, Filing No. 2, El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **20 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **117.0 PCF**
NATURAL MOISTURE CONTENT: **14.6%**
PERCENT SWELL/COMPRESSION: **0.3**



PROJECT: **Bent Grass Meadows, Filing No. 2, El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **21 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **106.8 PCF**
NATURAL MOISTURE CONTENT: **17.1%**
PERCENT SWELL/COMPRESSION: **- 0.6**

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SWELL/CONSOLIDATION TEST RESULTS

JOB No. 169845

FIGURE No. 27

DATE 5/14/19

APPENDIX A

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.

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. For on-site, structural fills and fills supporting utilities, roadways and buildings, 95% maximum Standard Proctor dry density at 2% ± of optimum moisture content.

B. For imported, granular, structural fills and granular fills supporting utilities, roadways and buildings, 90% maximum Modified Proctor dry density at 2% ± of optimum moisture content.

C. For general grading fills, 92% maximum Standard Proctor dry density at 2% ± of optimum moisture content.

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.

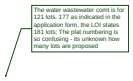
Reporting of Field Density Tests: Density tests made by the Geotechnical Engineer shall be submitted progressively to the Owner. Dry density, moisture content, percent compaction, and approximate location shall be reported for each test taken.

Markup Summary 9-18-2019

dsdparsons (11)

Subject: Callout
Page Label: 1
Author: dsdparsons
Date: 9/17/2019 10:37:50 AM
Color:

This does not meet the Geology and Soils standards report requirements in the LDC 8.4.9 For example-there are constraints such as high ground water and two significant drainage ways etc....



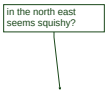
Subject: Callout
Page Label: 12
Author: dsdparsons
Date: 9/17/2019 10:59:38 AM
Color:

The water wastewater comt is for 121 lots. 177 as indicated in the application form, the LOI states 181 lots; The plat numbering is so confusing - its unknown how many lots are proposed

---

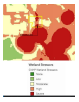
Subject: Image
Page Label: 12
Author: dsdparsons
Date: 9/17/2019 11:30:03 AM
Color:

Subject: Image
Page Label: 12
Author: dsdparsons
Date: 9/17/2019 11:37:34 AM
Color:



Subject: Callout
Page Label: 12
Author: dsdparsons
Date: 9/17/2019 11:49:43 AM
Color:

in the north east seems squishy?



Subject: Image
Page Label: 12
Author: dsdparsons
Date: 9/17/2019 11:50:02 AM
Color:

Subject: Highlight
Page Label: 14
Author: dsdparsons
Date: 9/18/2019 10:13:24 AM
Color:

Subject: Callout
Page Label: 12
Author: dsdparsons
Date: 9/18/2019 10:14:10 AM
Color:

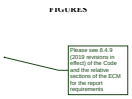
This stock pond is also in natural features report is it to be mitigated- not sure where is though?

Subject: Callout
Page Label: 12
Author: dsdparsons
Date: 9/18/2019 10:14:13 AM
Color:

this is in the natural features report submitted with this application. is this correct?

Subject: Callout
Page Label: 12
Author: dsdparsons
Date: 9/18/2019 10:14:39 AM
Color:

A map for this specific application indicating constraints and hazards should be included and any mitigation techniques



Subject: Callout
Page Label: 12
Author: dsdparsons
Date: 9/18/2019 10:15:11 AM
Color:

Please see 8.4.9 (2019 revisions in effect) of the Code and the relative sections of the ECM for the report requirements