Job No. 172445

December 6, 2019
Amended September 3, 2020

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

Re: Response to CGS Comments
Lots 1-49, Carriage Meadows South at Lorson Ranch, Filing No. 2
El Paso County, Colorado

Dear Landhuis Company:

RMG – Rocky Mountain Group (RMG) prepared the *Geology and Soils Study* (RMG Job No. 172445, originally dated October 7, 2019) for the proposed development to consist of 49 multi-family residential lots on 85.32 acres located south and east of the intersection of Marksheffel Road and Fontaine Boulevard in El Paso County, Colorado. The report was reviewed by personnel of the Colorado Geological Survey (CGS). A copy of the review comment from CGS was provided to us by personnel of Thomas + Thomas. This comment appears to have been downloaded from the El Paso County EDARP system, and is included at the end of this document.

The purpose of this letter is to provide RMG's response to the CGS review comment. For clarity and ease of review we have reiterated the CGS comment followed by our response.

Concerning Geology and Soils Study (CGS)

- **CGS Comment:**
  "RMG's description of the project location (page 4, section 1.1) is incorrect."

  RMG Response:
  The description of the project location has been updated in the amended *Geology and Soils Study* report.

- **CGS Comment:**
  "RMG's description of access (page 4, section 1.2) is inconsistent with the current plans."

  RMG Response:
  The description of access has been updated in the amended *Geology and Soils Study* report.

- **CGS Comment:**
  "RMG states (page 7, section 5.0) that laboratory tests included dry density, but no dry density test results are reported. This matters because CGS's primary concern on this site is loose, low density, potentially compressible,

collapsible, or hydrocompactive soils, and dry density is typically inversely correlated with collapse susceptibility. Loose, low blow count, relatively dry soils are described from the ground surface to the drilled depth of 29 feet in RMG's previously drilled boring TB-2, located in the southern portion of proposed Filing 2, and from 6 to 12 feet in test boring TB-1 drilled on 8/29/2019 (not to be confused with Carriage Meadows South boring TB-1 drilled on 5/6/2016 a few hundred feet to the west).

RMG Response:
That wording was originally pasted in from a previous report and modified to represent the testing performed for this investigation. However, the mention of dry density testing was inadvertently left in the paragraph. No additional dry density testing was performed as part of this investigation.

- **CGS Comment:**
*"RMG states (page 12, section 8.2) that '*the silty to clayey sand generally possesses low to moderate hydrocompactive potential and the sandy clay generally possesses low hydrocompactive potential,*' and (page 16, section 12.1), '*Based upon the field exploration and laboratory testing for this development and surrounding developments, subexcavation and replacement is not anticipated.*' The basis for these assessments is not known, since no density or swell-consolidation tests were performed on samples from either of the two borings located within proposed Filing 2.*

RMG Response:
Regarding a matter of terminology, the terms collapse, consolidation, settlement, compaction, and hydrocompaction (as well as the variations of these) are frequently utilized interchangeably by local and regional governments within their geotechnical/geologic regulations. While all of these terms relate in some way to compression of the soil (a reduction in total volume of a soil mass due to an internal rearrangement of the constituent particles, and expulsion of either air or water from the voids between the soil particles), there are some notable differences between the processes that cause them. However, in the interest of matching our format to that of the governing jurisdiction, RMG will also frequently use those terms interchangeably. Since "hydrocompaction" is the term utilized within the "Geologic Constraints" section of the El Paso County Engineering Criteria Manual (ECM), RMG utilized "hydrocompaction" in our report as well, when referring to compressible soils. However, as the CGS comment above references several of these terms, we will switch to the term "compression" within this document. Additionally, our *Geology and Soils Study* report has been amended to utilize the terms "compression" or "compressibility" in reference to these conditions.

Addressing the basis for our assessments, as noted in the CGS quotation of the RMG report verbiage on page 16, section 12.1, our recommendations are based upon the field exploration and laboratory testing for this development **and surrounding developments**. RMG has performed extensive subsurface investigation, sampling, and laboratory testing (including dry density testing) of the Lorson Ranch area over the last 15 years. In the interest of clarity and conciseness, RMG did not feel that it was beneficial to incorporate the laboratory test results for every report performed during that time into the report for this investigation. As stated in our original report, our recommendations are based on that entire "body" of work, not just on the 2 borings that were completed within this filing.

- **CGS Comment:**
Loose, low density soils can lose strength, consolidate, compress, or collapse under a structural load and/or when water infiltrates the deposits. Thick columns of compressible or collapsible soils, such as appear to be present on this site, can result in significant settlement and structural damage if not identified and mitigated.

In the absence of swell-consolidation or, at a minimum, dry density testing, the site's collapse potential cannot be determined. RMG has therefore not satisfactorily characterized the consolidation/hydrocompaction potential on this site.

RMG Response:

RMG agrees that compressible soils can result in settlement and structural damage if not identified and mitigated. We have identified the presence of compressible soils on the site, and we have indicated several means by which those compressible soils can be mitigated at the time of construction.

However, RMG disagrees with the CGS statement that we have not satisfactorily characterized the compressibility potential on this site. Their statement appears to be predicated upon a perceived lack of swell/consolidation testing and/or dry density testing. As noted both in our original report and in our responses above, our characterization of the compressibility potential of the site is based on laboratory test data obtained over the last 15 years' worth of subsurface investigations within the Lorson Ranch neighborhood. Our decision not to duplicate the entirety of the previous 15-years' worth of test data within this one report doesn't invalidate its use in informing our characterization of the site, or the resulting recommendations we made.

The soil conditions encountered within Carriage Meadows South, Filing No. 2 (including the loose, low blow count, relatively dry soils noted by CGS) are consistent with, and in some cases better than, the soil conditions encountered in the surrounding filings. The mitigation recommendations presented in our *Geology and Soils Study* report (referenced above) are consistent with the recommendations that have been used to successfully mitigate those compressible soils within the Lorson Ranch neighborhood over the last 15 years.

- **CGS Comment:**

If overexcavation is proposed, the consultant should specify depth of overexcavation beneath foundation bearing elevations and slabs, and lateral extent beyond the foundation footprint, to reduce differential settlement to acceptable tolerances (typically less than one inch)."

RMG Response:

This is not consistent with typical construction practices in this region of Colorado. The ECM does not require determination of lot-specific overexcavation recommendations be provided in a preliminary (development-level) investigation such as the *Geology and Soils Investigation* report referenced above. Rather, the ECM specifies that the conclusions shall identify "*generally whether the intended use of the land is compatible with the investigation site conditions; and if mitigation measures are necessary.*" Our report satisfies this requirement. Specific overexcavation recommendations are typically presented in the lot-specific subsurface soil investigations performed for each structure.

Our report does, on page 12, section 8.2, provide conceptual mitigation recommendations for the potentially compressible soils and expressly states that the final determination is to be made in a lot-specific subsurface soil investigation. There are several reasons why that is a more appropriate time to make that determination:

- The scope of investigation (including boring frequency) established by El Paso County for this type of preliminary investigation does not provide sufficient data to determine specific overexcavation depths for each lot, nor do they require that we do so. The purpose of the *Geology and Soils Study* is only to demonstrate the feasibility of the proposed development/construction and provide conceptual mitigation recommendations and anticipated foundation types that are considered suitable for use on the soil conditions encountered. Our investigation has accomplished this.
- Furthermore, changes to the site conditions (overlot grading, significant changes in the moisture content of the soil, etc.) can impact the recommendations. The soil conditions encountered at the time of construction may significantly differ from the soil conditions encountered at this time.

- Finally, the determination of specific overexcavation depth must take into consideration the type of foundation to be utilized and the foundation bearing requirements for the specific foundation design, if already completed. The foundation type and/or bearing conditions determined for use at the time of construction may differ from those presented in this report, and a different overexcavation depth (or a different mitigation strategy altogether) may be required to achieve the desired foundation system.
- All of this information must be considered when determining the specific overexcavation depth for a given lot.

As such, to provide lot-specific overexcavation recommendations for 49 lots based on one (or even two) borings is impractical and potentially misleading. Recommendations presented based on the current information may not be appropriate at the time of construction. The specific overexcavation depth, as well as any other mitigations necessary to achieve the desired foundation support, cannot be determined with a reasonable degree of reliability until the actual foundation type to be utilized, foundation support requirements, and soil conditions at (or near) the time of construction on that lot are known.

- **CGS Comment:**

"CGS recommends that the county require additional analysis to more accurately characterize consolidation/hydrocompaction potential within Filing 2 and, if necessary, specific mitigation recommendations."

RMG Response:

RMG disagrees with this recommendation. CGS's recommendation for an additional analysis appears to be based on a choice to disregard any information that isn't specifically presented within this one *Geology and Soils Study* report. However, discounting the data presented in our prior investigations is contrary to their stated goal of more accurately characterizing the compressibility potential of the site. The best way to more accurately characterize the compressibility potential of the site would be to incorporate as much relevant information as possible. By also considering the test results obtained from our previous investigations throughout the Lorson Ranch area over the last 15 years, RMG is able to identify characteristics and trends that may not be apparent if you only considered data from a single investigation.

As described above, it is our opinion that we have sufficient test data to accurately characterize the compressibility potential of the site. Based on our extensive experience in characterizing and successfully mitigating compressible soil conditions throughout the Lorson Ranch neighborhood on soils of similar (or worse) compressibility characteristics than those encountered within Carriage Meadows South, it is our opinion that additional analyses are not required at this time.

If we can be of further assistance in discussing the contents of the *Geology and Soils Study*, this response document, or analysis of the proposed development (from a geologic/geotechnical engineering point-of-view) please feel free to contact our office.

I hope this provides the information you have requested. Should you have questions, please feel free to contact our office.

Cordially,

RMG – Rocky Mountain Group

Kelli Zigler

Kelli Zigler
Project Geologist

Reviewed by,

RMG – Rocky Mountain Group

Tony Munger, P.E.
Geotechnical Project Manager

ARCHITECTS RMG ENGINEERS

ROCKY MOUNTAIN GROUP

GEOLOGY AND SOILS STUDY

Lots 1-49
Carriage Meadows South at Lorson Ranch
Filing No. 2
El Paso County, Colorado

PREPARED FOR:

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

JOB NO. 172445

October 7, 2019
Last Amended September 3, 2020

Respectfully Submitted,

RMG – Rocky Mountain Group

Kelli Zigler

Kelli Zigler
Project Geologist

Reviewed by,

RMG – Rocky Mountain Group

COLORADO REGISTERED ANTHONY P. MUNGER 39818 PROFESSIONAL ENGINEER

Sept. 3, 2020

Tony Munger, P.E.
Geotechnical Project Manager

TABLE OF CONTENTS

FIGURES

APPENDIX A

Additional Reference Documents

APPENDIX B

Test Boring Log, Summary of Laboratory Test Results, and Soil Classification Data for Test Boring No. 2, Job No. 152427, prepared by RMG – Rocky Mountain Group, last amended October 7, 2016.

APPENDIX C

Subsurface Soil Investigation, Lots 1-49, Carriage Meadows South at Lorson Ranch, Filing No. 2, El Paso County, Colorado, Job No. 177446, dated August 24,2020

APPENDIX D

Perimeter Drain Outfall Plan, Carriage Meadows South at Lorson Ranch, Filing No, 2, prepared by Core Engineering Group, Project NO. 100.046

1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in a portion of the northeast one-quarter of Section 22 and a portion of the northwest one-quarter of Section 23, Township 15 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 1/2 mile to the south and east of the intersection of Marksheffel Road and Fontaine Boulevard. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

1.2 Project Description

The proposed site development is to consist of multi-family residential construction on a total of 49 lots. The development is to utilize sewer and water services provided by Widefield Water and Sanitation District. Individual wells and on-site wastewater treatment systems are not proposed.

Carriage Meadows Drive (along the western boundary of the development) is currently paved. The main access to the filing is to be from the west, from Carriage Meadows Drive via Firesteel Trail. The lots can also be accessed from the south, via Rubicon Trail. Firesteel Trail is to be constructed as a private drive. Mandan Drive is to connect to Rubicon Drive to the east, and both roadways are to be constructed with a 50-foot improved public ROW that will meet the requirements of an El Paso County Urban Residential Collector roadway. The interior roadways (Tolt Trail and Paluxy Trail) are to be privately owned and maintained by Lorson Ranch Metro District No. 1-4. However, it is assumed these roadways are to be classified as Local and will need to meet the El Paso County requirements for roadway construction. The Proposed Lot Layout is presented in Figure 2.

It is our understanding that the Fountain Mutual Irrigation Company (FMIC) ditch and the main tributary of Jimmy Camp Creek are to remain undisturbed during land development and construction of the proposed residences.

2.0 QUALIFICATIONS OF PREPARERS

This Geology and Soils 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 19 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 19 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 Previous Studies and Field Investigation

Reports of previous geotechnical engineering/geologic investigations for this site and nearby sites were available for our review and are listed below:

1. *Geology and Soils Report, Carriage Meadows South, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 152427, last amended October 7, 2016.
2. *Fill Observation and Testing, Lorson Ranch Roadways and Drainage Construction*, El Paso County, Kumar and Associates, Inc., Project Number 052-253, Daily Report No: 12-16, 26, 27, 48, 53, 54, 56, 59, 60, 80-90, 102, 107, 112, 117-121, dated Dec. 14, 2005 through July 17, 2006.

3.4 Additional Documents

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

4.0 SITE CONDITIONS

4.1 Proposed Land Use and Zoning

The site consists of one parcel with a total acreage of approximately 5.32 acres. The included parcel has a Schedule No. of 5522105006 and is currently zoned *PUD – Planned Unit Development.* The zoning is to remain PUD. It is our understanding the proposed site development is to consist of multi-family construction on 49 lots. The development is to utilize sewer services provided by Widefield Water and Sanitation District. Individual wells and on-site wastewater treatment systems are not proposed. Figure 1 presents the general boundaries of our investigation.

4.2 Topography

Based on our site observation on September 18, 2019 and the Final Grading plan prepared by Core Engineering Group, the site topography is generally fairly flat and does not contain slopes other than the banks of the embankment and FMIC ditch that parallel the eastern property line. Jimmy Camp Creek is

located directly east of the embankment. The approximate elevation difference from the northeast corner to the southwest corner of the property is 10 feet.

4.3 Vegetation

The majority of the site consists of low lying native grasses and weeds. Very few deciduous trees are scattered across the property.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

The subsurface conditions within the property were explored by drilling one (1) additional exploratory test boring to supplement the Geology and Soils Report referenced above. The new test boring was performed by RMG and extended to a depth of approximately 20 feet below the existing ground surface. This is in compliance with the minimum of one test boring per 10 acres of development up to 100 acres, required by the ECM.

The test boring was 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 Preliminary Lot Layout with Test Boring Location plan is presented in Figure 2. An Explanation of Test Boring Logs is shown in Figure 3, and the Test Boring Log is shown in Figure 4.

Soil laboratory testing was performed as part of this investigation. The laboratory tests included moisture content, dry density, grain-size analyses and Atterberg Limits testing. A Summary of Laboratory Test Results is presented in Figure 7. Soils Classification Data is presented in Figure 8. Swell/Consolidation Test Results are presented in Figure 9. The Test Boring Log and Summary of Laboratory Test Results for Test Boring No. 2 drilled previously is presented in Appendix B.

5.1 Groundwater

Groundwater was not encountered in the test boring performed for this study on August 29, 2019 during the field exploration or when checked five days subsequent to drilling. Based on this test boring and a review of the previous reports referenced above, the average depth of groundwater below the currently proposed multi-family development is anticipated to be greater than 20 feet below the ground surface.

Conditions consistent with a wide-spread shallow groundwater table were not encountered nor observed within the lots o the proposed development, nor have we encountered significant signs of a wide-spread shallow groundwater table in the course of investigations we have performed on the surrounding properties.

Based on our knowledge of the area and engineering design and construction techniques 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. If shallow groundwater conditions are found to exist at the time of the site-specific Subsurface Soil Investigations, the feasibility of basement construction and/or any recommended mitigation measures are to be addressed at that time.

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.

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 boring performed for this study were classified within the laboratory using the Unified Soil Classification System (USCS). The materials were identified and classified as clayey sand fill, native poorly graded sand with silt (SP-SM), and native low plasticity clay (CL).

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented on the Test Boring Log. 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 not encountered in the test boring performed for this investigation or in the engineering/geologic investigations listed above. Bedrock conditions are not anticipated to be encountered in the excavations or 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:

- 28 – Ellicott loamy coarse sand, 0 to 5 percent slopes. The Ellicott loamy coarse sand was mapped by the USDA to be located near the eastern portion of the property. The Ellicott loamy coarse sand encompasses approximately 3.7 acres for a total of 61.5 percent of the property. Properties of the Ellicott loamy coarse sand include, somewhat excessively drained soil, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be very low, frequency of flooding is none, and landforms are flood plains and stream terraces.

- 52 – Manzanst clay loam, 0 to 3 percent slopes. The Manzanst clay loam was mapped by the USDA to encompass the eastern portion of the property. The Manzanst clay loam encompasses

approximately 2.3 acres for a total of 38.5 percent of the property. Properties of the clay loam include, well-drained soils, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be low, frequency of flooding is none, and landforms include terraces and drainage-ways.

The USDA Soil Survey Map is presented in Figure 8.

6.4 General Geologic Conditions

Based on our field observations, the USDA map, and the Geologic Map of the Fountain 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 Engineering and Geology Map, Figure 7.

The site generally consists of sand with various amounts of silt and sandy clay (alluvium). Three geologic units were mapped at the site as:

- *Qa_3 – Alluvium three (lower to middle? Holocene)* – well sorted sand and clayey to silty sand that is occasionally mottled and stratified. Unit may contain gravel lenses. The unit forms broad terraces along Jimmy Camp creek. The unit is up to 50 ft thick with increased gravel content in the lower 15 feet. The soils may be prone to settlement or swelling. The alluvium was encountered in the test borings performed by RMG to a depth of 20 to 29 feet.

- *Qa – Alluvium, undivided (upper Holocene)* – sand and clayey to silty stratified sand with occasional thin gravel lenses. The unit is prominent along the floor of Jimmy Camp Creek. The thickness is unknown since the Qa deposit has cut into the thicker Qa_3. The deposit is prone to flooding and high groundwater levels. The sediments maybe prone to settlement and may contain swelling clay minerals. The alluvium was encountered in the test borings performed by RMG to a depth of 20 to 29 feet.

- *Af/da – Artificial fill/disturbed areas (latest Holocene)* – fill placed along the banks of the embankment during the 2006 reconstruction. The banks of the embankment range between 10 and 13 feet in height. The site also includes disturbed areas and fill soils placed during the construction of Carriage Meadows Drive.

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. The alluvial deposits are non-marine terrace deposits that have been reworked from either conglomerates in the Dawson Formation up-valley along Jimmy Camp Creek or reworked from gravel-capped mesas from the Pleistocene.

6.7 Engineering Geology

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

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

The Engineering Geology is presented in the Engineering and Geology Map, Figure 7.

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 of the site slopes down from the north to the south, southeast away from the FMIC Ditch and Jimmy Camp Creek. The FMIC and Jimmy Camp Creek are currently defined drainageways that are located along the eastern property boundary. It is anticipated the direction of groundwater is towards Jimmy Camp Creek. The ditch and creek are not anticipated to adversely impact the placement of the residences in the subdivision. Construction during land development and of the residential structures are not to encroach with in these areas.

Groundwater was encountered in engineering/geologic investigations, referenced above, at depths greater than 20 feet. The groundwater was not encountered at depths anticipated to affect basement foundation construction. Indications of groundwater or seasonally shallow groundwater were not observed in the test borings performed for this investigation at the time of the field observation or when checked five days subsequent to drilling.

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 2* indicates the site is identified as valley fill comprised of sand and gravel with silt and clay deposited by water in one or a series of stream valley. Extraction of the sand and gravel 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 Denver Basin Coal Region. However, the area of the site has been mapped "Poor" for coal resources, no active or inactive mines have been mapped in the area of the site. No metallic mineral resources have been mapped on the site.

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
- Floodplains
- Ground Subsidence
- Landslides
- Rockfall
- Ponding water
- Steeply Dipping Bedrock
- Unstable or Potentially Unstable Slopes
- Scour, Erosion, accelerated erosion along creek banks and drainageways
- Springs and High Groundwater
- Corrosive Minerals

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

8.1 Expansive Soils and Bedrock

Based on the test borings performed by RMG for this investigation and the previous geotechnical engineering/geologic investigation referenced above, the silty to clayey sand generally possesses low swell potential and the sandy clay generally possess low to moderate swell potential. Bedrock was not encountered in the test boring performed for this study, and is not anticipated to be encountered at depths that will impact the proposed development. Should expansive soils be encountered beneath foundations, mitigation will be required. It is anticipated that if these materials are encountered, they can readily be mitigated with typical construction practices common to this region of El Paso County, Colorado.

Mitigation

Shallow foundations are anticipated for structures within this development. Foundation design and construction typically can be adjusted for expansive soils. Mitigation of expansive soils and bedrock are typically accomplished by 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 final determination of mitigation alternatives and foundation design criteria are to be determined in site-specific subsurface soil investigations for each lot.

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

8.2 Compressible Soils

Based on the test borings performed by RMG for this investigation and the previous geotechnical engineering/geologic investigations referenced above, the silty to clayey sand generally possesses low to moderate compressibility potential and the sandy clay generally possesses low compressibility potential. Should compressibile soils be encountered beneath foundations, mitigation will be required. It is anticipated that if these materials are encountered, they can readily be mitigated with typical construction practices common to this region of El Paso County, Colorado.

Mitigation

Shallow foundations are anticipated for structures within this development. Foundation design and construction typically can be adjusted for compressible soils. If loose or compressible sands are encountered, mitigation can be accomplished by overexcavation and replacement with structural fill, subexcavation and replacement with on-site moisture-conditioned soils, the installation of deep foundation systems, and/or the use of a geogrid reinforced fill, all of which are considered common construction practices for this area. The final determination of mitigation alternatives and foundation design criteria are to be determined in site-specific subsurface soil investigations for each lot.

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

8.3 Drainageways – FMIC ditch and Jimmy Camp Creek

Per the current Drainage Report for Carriage Meadows South, Filing No. 1, referenced in Appendix A, which included this parcel, Jimmy Camp Creek was reconstructed and realigned in 2006 within Lorson Ranch. The construction consisted of a trapezoidal channel section and armored creek banks with a sand bottom. The embankment and FMIC ditch were relocated along the western side of Jimmy Camp Creek concurrently with the creek improvements. According to the referenced documentation within the Drainage Report*, "all major drainage infrastructure has been constructed and there are no new requirements for channel/bridge improvements on Jimmy Camp Creek for development of Carriage Meadows South at Lorson Ranch Filing No. 1".*

The FMIC ditch is a privately held and maintained irrigation canal. The water level inside the canal is reportedly controlled by personnel of the Fountain Mutual Irrigation Company (FMIC) and/or the water users. The water is typically maintained at a level intended to provide the required water to downstream users without overtopping the ditch. The sides of the ditch are reportedly maintained by personnel of the FMIC and/or water users. It is not anticipated the sides of the ditch will erode to the point that water would be released onto the proposed development.

Mitigation

Additional mitigation for the lots along the FMIC ditch and Jimmy Camp Creek is not anticipated.

8.4 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 0.185g for a short period (S_s) and 0.059g 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.

8.5 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 80925 zip code located in Lorson Ranch, 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. Black Forest 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: http://county-radon.info/CO/El_Paso.html. 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.

8.6 Erosion

Due to the fine-grain nature of the soils on the site, the upper sands encountered at the site are susceptible to erosion by wind and flowing water.

Mitigation:
Minor wind erosion and dust problems may arise during and immediately after construction. If the problem becomes severe during this time, watering of the cut areas may be required to control dust. Installation of erosion protection or vegetation after completion of the structures is anticipated to mitigate the majority of the erosion and dust problems.

8.7 Fill Soils

Fill soils were encountered at the time of drilling. If fill soils are encountered, they may be considered unsuitable for a variety of reasons. These include (but are not limited to) non-engineered fills, fill soils containing trash or debris, fill soils that appear to have been improperly placed and/or compacted, etc. If unsuitable soils are encountered during the site-specific Subsurface Soil Investigation and/or the Open Excavation Observation, they may require removal (overexcavation) and replacement with compacted structural fill.

Based on review of the Kumar & Associates, Inc compaction testing and the construction plans for Jimmy Camp Creek Realignment the fill soils encountered in this area will be considered "engineered". The fill soils should be acceptable for the overlot grading process. Based on our review of these reports, it appears that the fill soils described above were (in general) placed with adequate compactive effort. However, even in approved fill soils, isolated areas of unsuitable fill may exist.

Mitigation
If unsuitable fill soils are encountered during construction, 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.

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

The Early Overlot Grading and Erosion Control Plan for Carriage Meadows South was reviewed and considered in the preparation of this report. Limited cuts and fills are proposed. Based on the test borings for this investigation, the excavations are anticipated encounter silty to clayey sand with interbedded sandy clay. The on-site soils can be used as site grading fill, though use of the clay should be avoided in areas where the proposed foundations are not anticipated to penetrate through the overlot grading fill.

Prior to placement of overlot fill or removal and recompaction 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.

Mitigation:
We anticipate that the deepest excavation cuts for basement level construction will be approximately 6 to 8 feet below the existing ground surface. We believe the surficial soils will classify as Type C materials as defined by OSHA in 29CFR Part 1926, dated January 2, 1990. OSHA requires temporary slopes made in Type C materials be laid back at ratios no steeper than 1.5:1 (horizontal to vertical) unless the excavation is shored or braced. 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).

9.0 BEARING OF GEOLOGIC CONDITIONS UPON PROPOSED DEVELOPMENT

Geologic hazards (as described in Section 8.0 of this report) were not found to be present at this site. Geologic constraints (also as described in section 8.0 of this report) such as: expansive and compressible soils, faults, seismicity, radon, erosion and fill soils were found on the site. It is our opinion that the existing geologic and engineering conditions can be satisfactorily mitigated through proper engineering and design contraction practices and avoidance when deemed necessary.

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 of native silty to clayey sand with interbedded sandy clay. It is anticipated the sands will be encountered at loose to medium dense relative densities, the sandy clay at stiff to very stiff densities and sandstone (if encountered) at medium hard to hard relative densities. Bedrock conditions are not anticipated within the utility trenches.

We believe the sand will classify as Type C materials and the clay 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.

11.0 PAVEMENTS

The proposed roadways with in this development will require a new pavement design prepared in accordance with the El Paso County regulations.

The site plan provided by Thomas and Thomas has the interior roadways classified as “private drives”. Exterior roadways surrounding the proposed new development are proposed to be classified as Urban/Residential Local and/or Non-Residential Collector. It is our assumption that the “private drives” will be classified as Local in accordance with Appendix D of the El Paso County Engineering Criteria Manual. ***The actual pavement section design for individual streets will be completed following overlot grading and rough cutting of the street subgrade.***

The Lorson Ranch area 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-6(3), A-3(0) and A-1-b with an estimated design subgrade "R-values" on the order of approximately 5 to 15.

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 foundation systems consisting of standard spread footings/stemwalls are anticipated to be suitable for the proposed residential structures. It is our understanding that basement excavations are proposed and the anticipated cut will be approximately 6 to 8 feet below the final ground surface not including overexcavation, if needed.

Expansive claystone was not encountered in the test borings performed for this study. However, interbedded seams of sandy clay are anticipated. If expansive soils are encountered near foundation or floor slab bearing levels, overexcavation and replacement with nonexpansive structural fill will be required. Overexcavation depths of 3 to 4 feet are typical for the soil conditions encountered. However, the final overexcavation depths may vary, and are to be determined in site-specific Subsurface Soil Investigations and confirmed at the time of the Open Excavation Observations for each lot.

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. Similarly, if shallow groundwater conditions are encountered and result in unstable soils unsuitable for bearing of residential foundations, these soils may require stabilization prior to construction of foundation components.

The foundation systems for the attached single family structures should be designed and constructed based upon recommendations developed in the site-specific Subsurface Soil Investigation. The recommendations presented in the Subsurface Soil Investigation should be verified following the excavations of each structure and evaluation of the building loads. The site-specific Subsurface Soil Investigation is presented in Appendix C.

12.1 Subexcavation and Moisture-Conditioned Fill

Based upon the field exploration and laboratory testing for this development and surrounding developments, subexcavation and replacement is not anticipated. However, prior to performing excavation and/or filling operations, vegetation, organic and deleterious material shall be cleared and disposed of in accordance with applicable requirements. The excavation should extend to a minimum depth below and laterally beyond the bottom of foundations as determined based the final grading plans.

12.2 Uncontrolled Fill

If undocumented fill is encountered during construction of the structures, it will be assumed that this fill was not moisture conditioned and compacted in a manner consistent with the **Structural Fill** recommendations contained within this report, unless appropriate documentation can be provided. If such fill is encountered, it is not considered suitable for support of shallow foundations. This unsuitable fill will require removal (overexcavation) and replacement with non-expansive, granular structural fill below foundation components and floor slabs. The structural fill should be observed and tested during placement as indicated under the **Structural Fill** section of this report, to ensure proper compaction.

Following completion of the overexcavation and moisture conditioning process, it is imperative that the "as-compacted" moisture content be maintained prior to construction.

12.3 Foundation Stabilization

Shallow groundwater conditions were not encountered in the test boring performed for this study or the previously reviewed geotechnical engineering/geologic investigations. Based on a review of previous geotechnical engineering/geologic investigations in the area, it is anticipated the groundwater will have adequate separation from the bottom of the proposed basement foundation components and floor slabs. However, if moisture conditions encountered at the time of the foundation excavation result in water flow into the excavation and/or destabilization of the foundation bearing soils, stabilization techniques should be implemented. Various stabilization methods can be employed, and can be discussed at the time of construction. However, a method that affords potentially a reduced amount of overexcavation (versus other methods) and provides increased performance under moderately to severely unstable conditions is the use of a layered geogrid and structural fill system.

Additionally, if groundwater were to flow into the excavation, a geosynthetic vertical drain and an overexcavation perimeter drain may be required around the lower portions of the excavation to allow for installation of the layered geogrid and structural fill system.

12.4 Foundations 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. A Perimeter Drain Outfall Plan has been designed by Core Engineering Group and is presented in Appendix D. Each subsurface perimeter drain is to be tied into the perimeter drain outfall, and no water shall be discharged onto the public easements and sidewalks. Additional subsurface drains are not anticipated.

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.

12.5 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.

12.6 Moisture-Conditioned Structural Fill

Areas to receive moisture-conditioned expansive soils used as 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.

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.

Moisture conditioned 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.

- 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.

- 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.

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.

13.0 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.

A site-specific Subsurface Soil Investigation has been completed for all proposed structures.

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.

14.0 CONCLUSIONS

Based upon our evaluation of the geologic conditions, it is our opinion that the proposed development is feasible. The geologic conditions identified (expansive and compressible soils, seismicity, radon, erosion and fill soils) 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.

The foundation systems for the attached single family structures should be designed and constructed based upon recommendations developed in the 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.

We believe the surficial sand soils will classify as Type C materials and the clay soils will classify as Type B as defined by OSHA in 29CFR Part 1926, date January 2, 1990. OSHA requires temporary slopes made in Type C materials be laid back at ratios no steeper than 1.5:1 (horizontal to vertical) and slopes made in Type B materials be laid back at ratios no steeper than 1:1 (horizontal to vertical) unless the excavation is shored or 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.

15.0 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

REFERENCE
NOT TO SCALE

ARCHITECTS RMG ENGINEERS
ROCKY MOUNTAIN GROUP

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

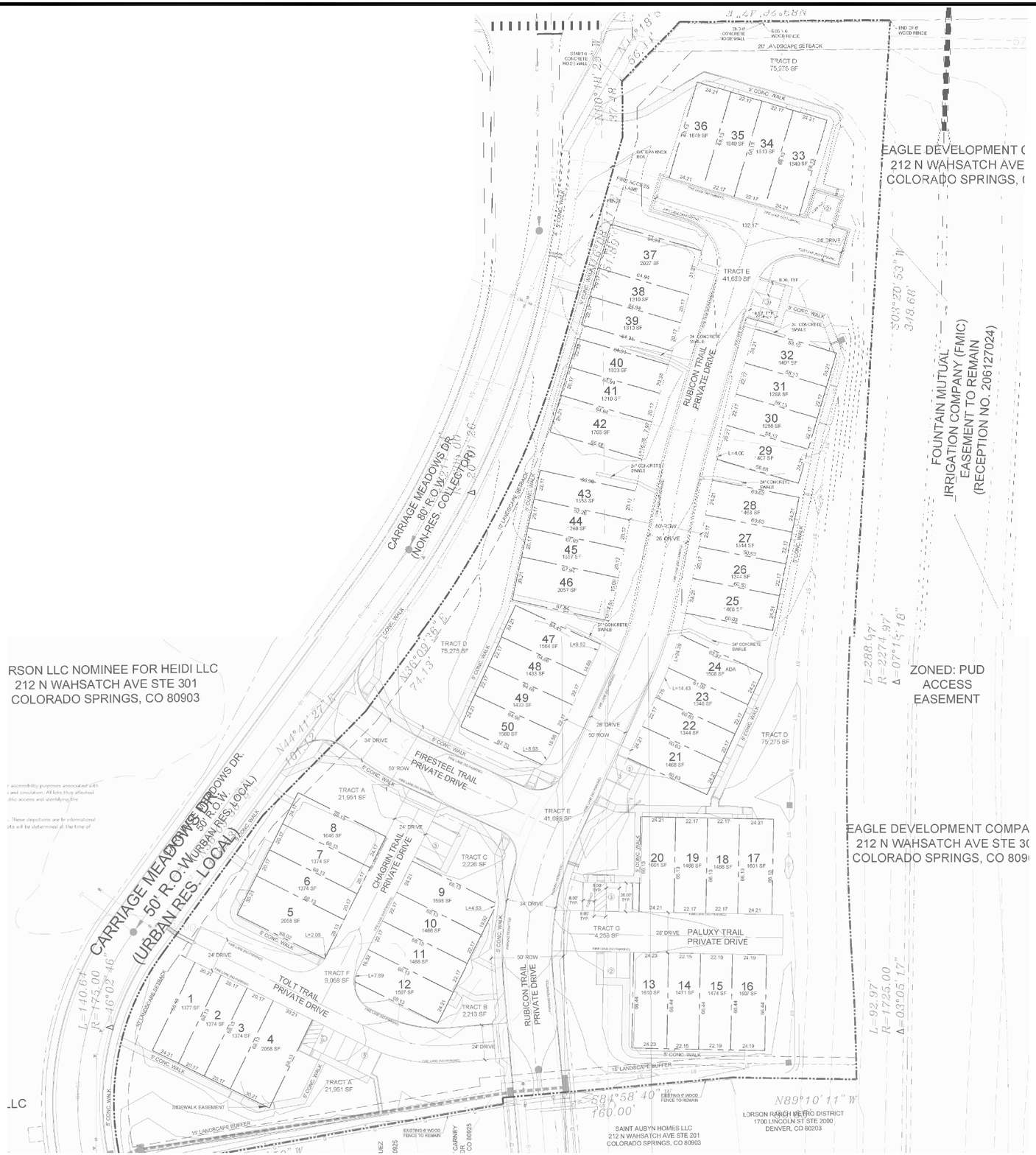
SITE VICINITY MAP

LOTS 1-50
CARRIAGE MEADOWS SOUTH AT
LORSON RANCH, FILING NO. 2
EL PASO COUNTY, CO
LANDHUIS COMPANY

JOB No. 172445

FIG No. 1

DATE 10-7-2019



NOT TO SCALE

BASE MAP PROVIDED BY: THOMAS AND THOMAS

JOB No. 172445

ARCHITECTS RMG ENGINEERS
ROCKY MOUNTAIN GROUP

Southern Office
Colorado Springs, CO 80918
(719) 548-0600
Central Office:
Englewood, CO 80112
(303) 688-9475
Northern Office:
Greeley / Evans, CO 80620
(970) 330-1071
Woodland Park Office:
(719) 687-6077
Monument Office:
(719) 488-2145
Pueblo / Canon City:
(719) 544-7750

LOTS 1-50 CARRIAGE MEADOWS SOUTH AT LORSON RANCH, FILING NO. 2 EL PASO COUNTY, CO LANDHUIS COMPANY

ENGINEER:	TPM
DRAWN BY:	KZ
CHECKED BY:	TPM
ISSUED:	10-1-2019
REVISION:	DATE:
	JOB #:

PROPOSED LOT LAYOUT

SHEET No. FIG-2

SOILS DESCRIPTION


SANDY CLAY


SILTY 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

ARCHITECTS RMG ENGINEERS

Geotechnical
Materials Testing
Civil, Planning

Colorado Springs: (Corporate Office)
2910 Austin Bluffs Parkway
Colorado Spings, CO 80918
(719) 548-0600
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

EXPLANATION OF TEST BORING LOGS

JOB No. 172445

FIGURE No. 3

DATE 10/7/19

TEST BORING: **1**
DATE DRILLED:
8/29/19
NO GROUNDWATER ON
9/3/19

DEPTH (IN)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, medium dense, moist				
5			20	11.2
SAND, SILTY, light brown, loose, moist				
10			8	7.3
CLAY, SANDY, light brown, stiff, moist				
15			15	2.8
SAND, SILTY, with gravel, light brown, medium dense, moist				
20			17	3.2

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Geotechnical
Materials Testing
Civil, Planning

Colorado Springs: (Corporate Office)
2910 Austin Bluffs Parkway
Colorado Spings, CO 80918
(719) 548-0600
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

TEST BORING LOG

JOB No. 172445

FIGURE No. 4

DATE 10/7/19

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	11.2		28	11	0.3	54.1			CL
1	9.0	7.3		NP	NP	0.0	8.1			SP-SM
1	14.0	2.8								
1	19.0	3.2								

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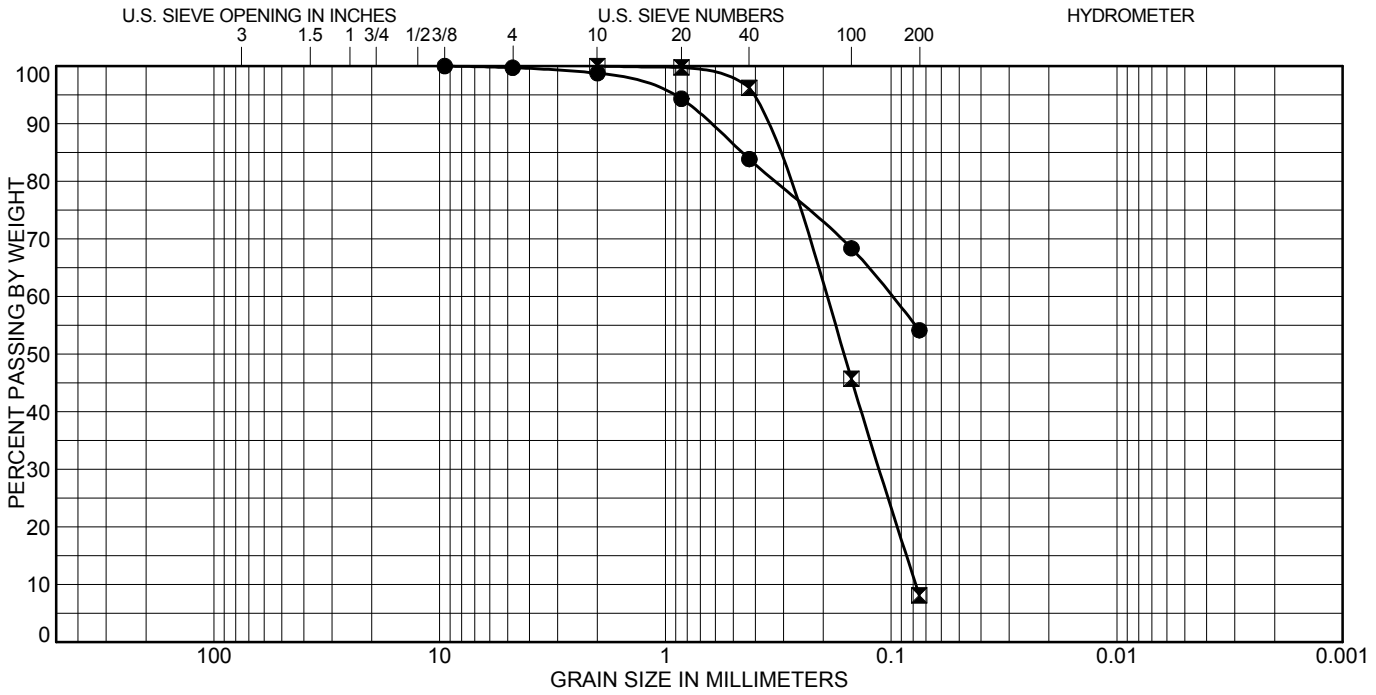
Geotechnical
Materials Testing
Civil, Planning

Colorado Springs: (Corporate Office)
2910 Austin Bluffs Parkway
Colorado Spings, CO 80918
(719) 548-0600
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

SUMMARY OF LABORATORY TEST RESULTS

JOB No. 172445
FIGURE No. 5
PAGE 1 OF 1
DATE 10/7/19



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	1	4.0	**SANDY LEAN CLAY(CL)**	28	17	11
⧓	1	9.0	**POORLY GRADED SAND with SILT(SP-SM)**	NP	NP	NP

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	4.0	0.3	45.6	54.1	
⧓	1	9.0	0.0	91.9	8.1	

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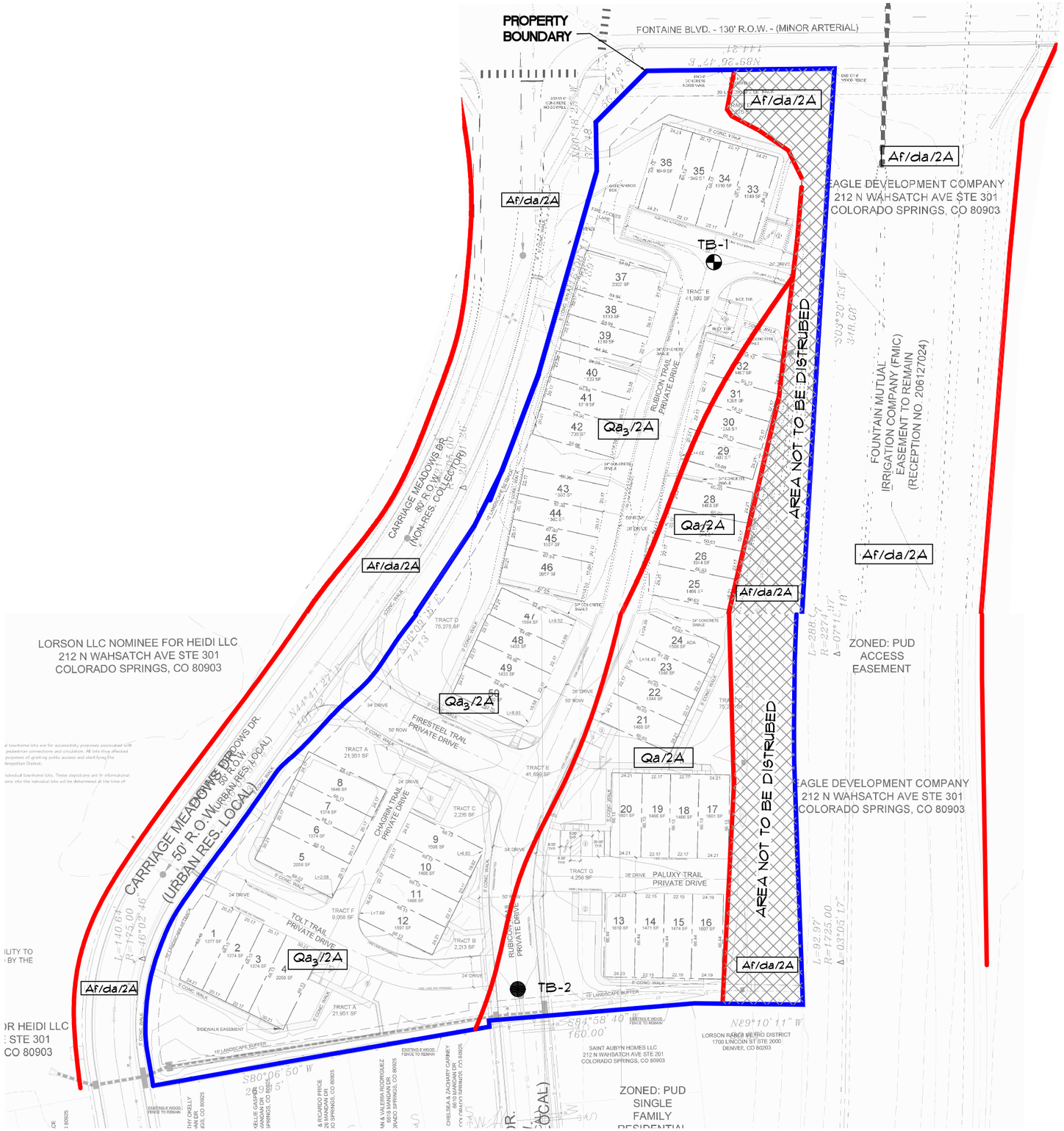
Colorado Springs: (Corporate Office)
2910 Austin Bluffs Parkway
Colorado Spings, CO 80918
(719) 548-0600
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

SOIL CLASSIFICATION DATA

JOB No. 172445

FIGURE No. 6

DATE 10/7/19



Geologic

Qa_3 - Alluvium three: well sorted sand and clayey to silty sand with gravel lenses. Forms broad terraces along Jimmy Camp Creek. The estimated depth of this unit is 50 feet.

Qa - Alluvium undivided: sand and clayey to silty sand with thin gravel lenses. The unit is prominent along the floor of Jimmy Camp Creek. The alluvium was encountered in the test borings performed by RMG up to a depth of 29 feet.

Af/da - fill placed along the banks of the FMIC ditch during the 2006 reconstruction. Includes disturbed areas that may have occurred placed during the construction of Carriage Meadows Drive.

Engineering

2A - stable alluvium, colluvium and bedrock on gentle to moderate slopes

Banks of the FMIC ditch that are not to be disturbed during construction

DENOTES APPROXIMATE LOCATION OF TEST BORING PERFORMED FOR THIS INVESTIGATION

DENOTES APPROXIMATE LOCATION OF TEST BORING PERFORMED BY RMG- ROCKY MOUNTAIN GROUP, JOB NO. 152427, LAST AMENDED OCTOBER 7, 2016

NOT TO SCALE

BASE MAP PROVIDED BY: THOMAS AND THOMAS

JOB No. 172445

ARCHITECTS RMG ENGINEERS
ROCKY MOUNTAIN GROUP

Southern Office
Colorado Springs, CO 80918
(719) 548-0600
Central Office:
Englewood, CO 80112
(303) 688-9475
Northern Office:
Greeley / Evans, CO 80620
(970) 330-1071
Woodland Park Office:
(719) 687-6077
Monument Office:
(719) 488-2145
Pueblo / Canon City:
(719) 544-7750

LOTS 1-50
CARRIAGE MEADOWS SOUTH AT LORSON RANCH, FILING NO. 2
EL PASO COUNTY, CO
LANDHUIS COMPANY

ENGINEER:	TPM
DRAWN BY:	KZ
CHECKED BY:	TPM
ISSUED:	10-7-2019
REVISION:	DATE: / JOB #:

ENGINEERING AND GEOLOGY MAP

SHEET No. FIG-7

NOT TO SCALE
BASE MAP PROVIDED BY: USDA

ARCHITECTS RMG ENGINEERS
ROCKY MOUNTAIN GROUP

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

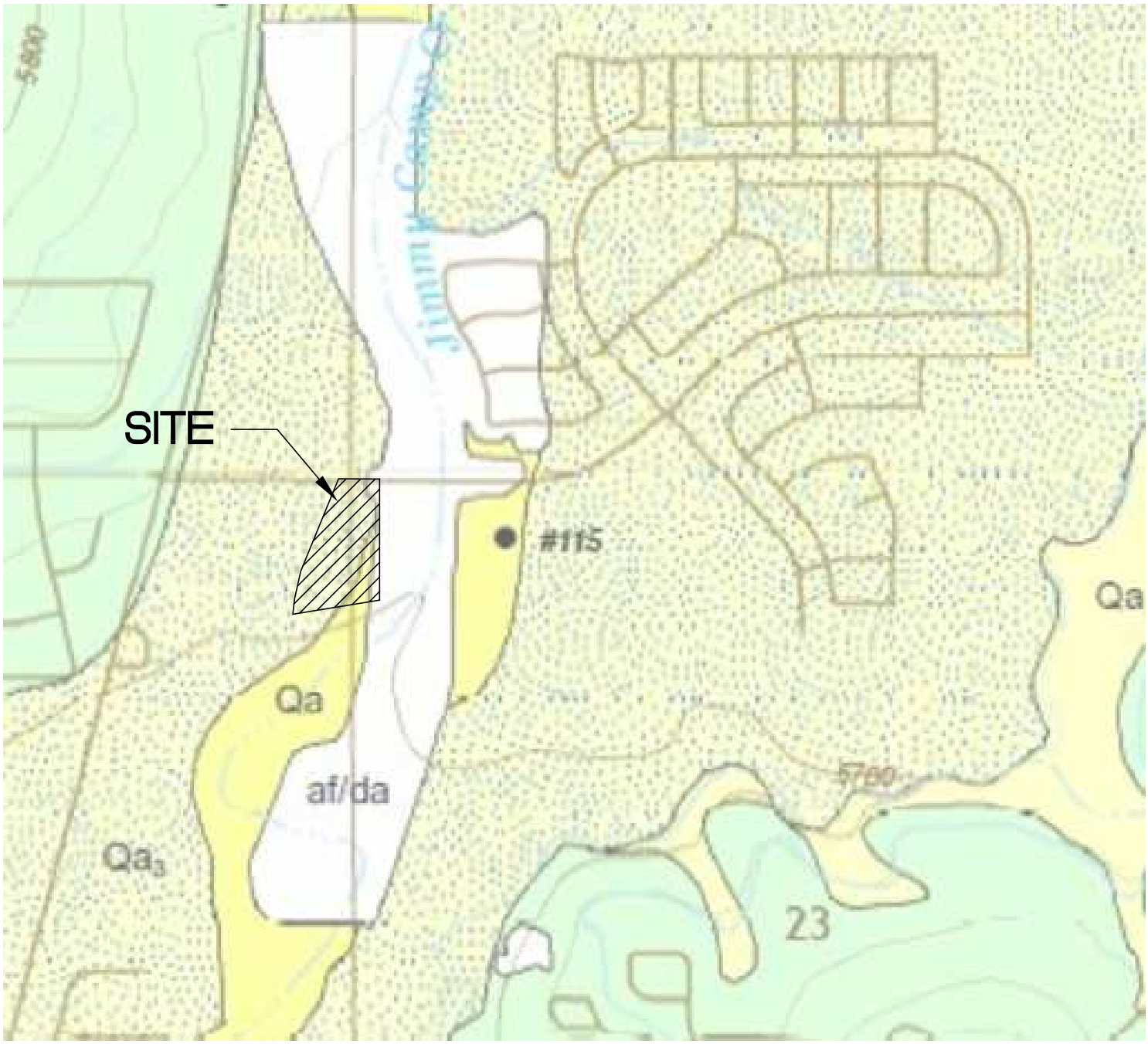
USDA SOILS SURVEY MAP

LOTS 1-50
CARRIAGE MEADOWS SOUTH AT
LORSON RANCH, FILING NO. 2
EL PASO COUNTY, CO
LANDHUIS COMPANY

JOB No. 172445

FIG No. 8

DATE 10-7-2019



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BASE MAP PROVIDED BY: CGS

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Colorado Springs,CO
80918
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(303) 688-9475
Northern Office:
Greeley / Evans, CO 80620
(970) 330-1071

FOUNTAIN QUADRANGLE

LOTS 1-50
CARRIAGE MEADOWS SOUTH AT
LORSON RANCH, FILING NO. 2
EL PASO COUNTY, CO
LANDHUIS COMPANY

JOB No. 172445

FIG No. 9

DATE 10-7-2019

NOT TO SCALE

BASE MAP PROVIDED BY: FEMA

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ROCKY MOUNTAIN GROUP

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

FEMA MAP

LOTS 1-50
CARRIAGE MEADOWS SOUTH AT
LORSON RANCH, FILING NO. 2
EL PASO COUNTY, CO
LANDHUIS COMPANY

JOB No. 172445

FIG No. 10

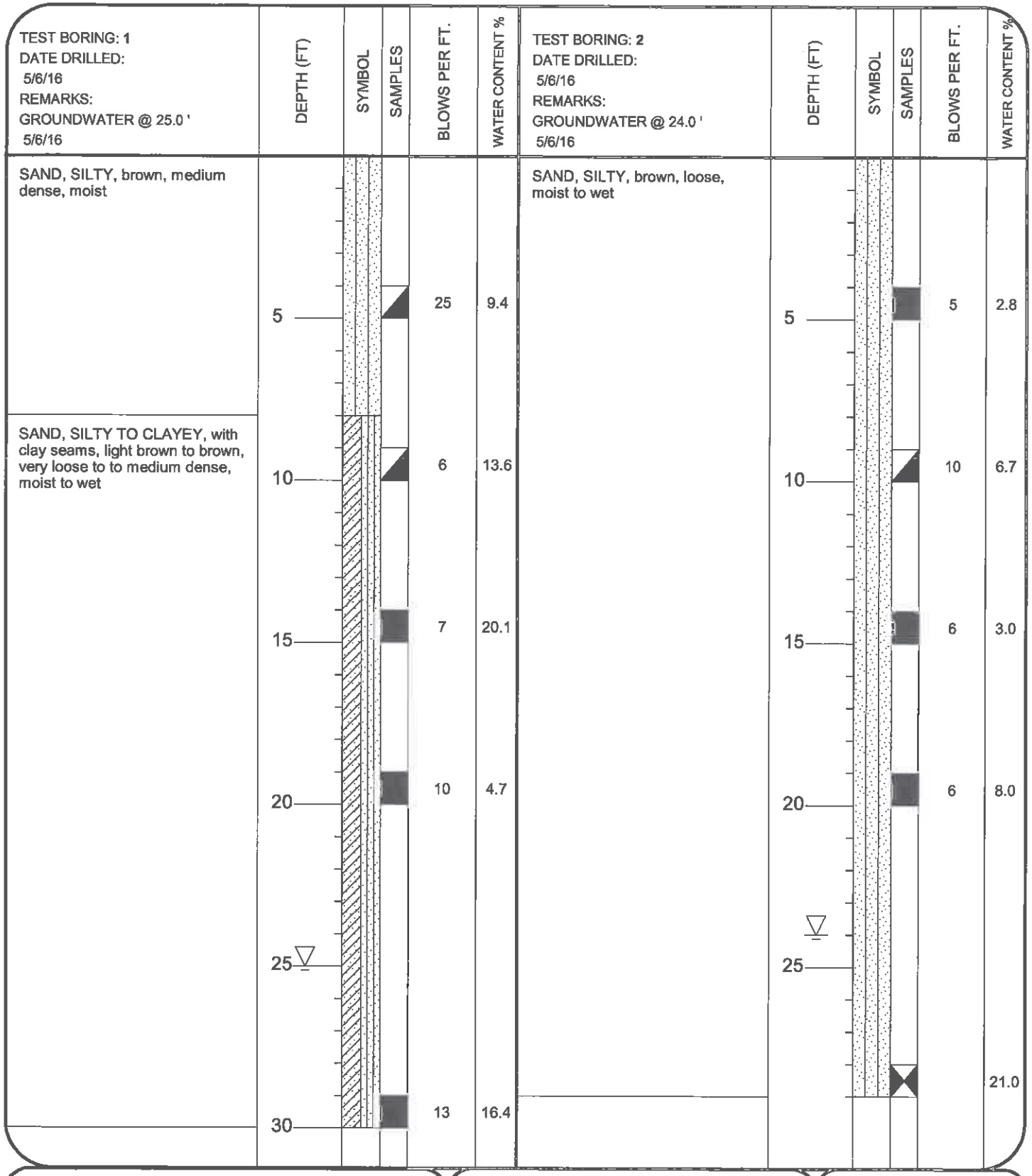
DATE 10-7-2019

APPENDIX A
Additional Reference Documents

1. *PUD & Preliminary Plan, Carriage Meadows South at Lorson Ranch, Filing No. 2, El Paso County, Colorado*, prepared by Thomas and Thomas., Project No. 2816.16, last dated April 11, 2019.
2. *Carriage Meadows South Early Overlot Grading and Erosion Control Plan, El Paso County Colorado,* prepared by Core Engineering Group, Project No. 100.030, last dated August 10, 2017.
3. *Final Drainage Plan Carriage Meadows South at Lorson Ranch Filing No., SF 17-011*, prepared by Core Engineering Group, Project No. 100.030, last dated August 10, 2017.
4. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 081041C0729G,* Federal Emergency Management Agency (FEMA), effective December 7, 2018.
5. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 081041C957F,* Federal Emergency Management Agency (FEMA), effective December 7, 2018, revised to reflect LOMR effective August 29, 2007.
6. *Geologic Map of the Fountain quadrangle, El Paso County, Colorado*, Jonathan L. White, Kassandra O. Lindsey, Matthew L. Morgan, and Shannon A. Mahan. Colorado Geological Survey Open-File Report OF-17-05.
7. *Fountain, Quadrangle, Environmental and Engineering Geologic Map for Land Use*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
8. *Fountain, Quadrangle, Map of Potential Geologic Hazards and Surficial Deposits*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
9. *Pikes Peak Regional Building Department:* https://www.pprbd.org/.
10. https://property.spatialest.com/co/elpaso/#/property/5522105006 Schedule No.: 5522105006.
11. *Colorado Geological Survey, USGS Geologic Map Viewer*: http://coloradogeologicalsurvey.org/geologic-mapping/6347-2/.
12. *Historical Aerials:* https://www.historicaerials.com/viewer, Images dated 1947, 1960, 1969, 1999, 2005, 2009, 2011, 2013, and 2015.
13. *USGS Historical Topographic Map Explorer:* http://historicalmaps.arcgis.com/usgs/ Colorado Springs Quadrangles dated 1950, 1951, 1958, 1963, 1969, 1970, 1975, 1978, 1981, 1994, 2013 and 2016.
14. *Google Earth Pro*, Imagery dated 1999, 2003, 2004, 2005, 2006, 2011, 2015, and 2017.

APPENDIX B

Test Boring Log and Summary of Laboratory Test Results for Test Boring No. 2, Job No. 152427, prepared by RMG – Rocky Mountain Group, last amended October 7, 2016.



Colorado Springs: (Corporate Office)
2910 Austin Bluffs Parkway
Colorado Spings, CO 80918
Voice (719) 548-0600
Fax (719) 548-0223

ARCHITECTS RMG ENGINEERS

TEST BORING LOGS

JOB No. 152427

FIGURE No. 5

DATE 6/14/16

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	% Swell/ Collapse	FHA Expansion Pressure (psf)
1	4.0	9.4							
1	9.0	13.6		32	14		48.7		364
1	14.0	20.1							
1	19.0	4.7							
1	29.0	16.4							
2	4.0	2.8		NP	NP	0.3	5.5		
2	9.0	6.7							
2	14.0	3.0							
2	19.0	8.0							
2	28.0	21.0							
3	4.0	5.7							
3	9.0	8.8							
3	14.0	5.0		NP	NP	10.8	6.5		
3	19.0	1.9							
3	29.0	13.9							
4	4.0	19.7							
4	9.0	3.2							
4	14.0	8.1							
4	19.0	3.1		NP	NP	9.3	3.2		
4	28.0	16.6							
5	4.0	8.7							
5	9.0	4.1		NP	NP	0.8	20.4		
5	14.0	1.6							
5	19.0	3.3							
5	24.0	15.3							
6	4.0	8.2		NP	NP	0.0	37.3		
6	9.0	8.2							
6	14.0	2.8							
6	19.0	19.0	97.1	NP	NP		54.0	- 0.1	
6	24.0	28.4							
7	4.0	4.5							
7	9.0	10.0							
7	14.0	13.4	98.0	31	14		82.6	0.5	
7	19.0	16.2							

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2910 Austin Bluffs Parkway
Colorado Spings, CO 80918
Voice (719) 548-0600
Fax (719) 548-0223

ARCHITECTS RMG ENGINEERS

SUMMARY OF LABORATORY TEST RESULTS

JOB No. 152427
FIGURE No. 14

DATE 6/29/16

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	% Swell/ Collapse	FHA Expansion Pressure (psf)
7	29.0	27.2							
8	4.0	6.3							
8	9.0	8.8	101.0	NP	NP		59.4	1.2	
8	14.0	9.9							
8	19.0	1.9							
8	28.0	12.3							
9	4.0	5.3		NP	NP	0.0	6.3		
9	9.0	4.4							
9	14.0	1.9							
9	19.0	4.3							
9	24.0	21.8							
10	4.0	15.6							
10	9.0	13.7							
10	14.0	6.4	95.4	NP	NP	0.0	34.3	- 1.1	
10	19.0	7.4							
10	29.0	9.7							
11	4.0	9.9							
11	9.0	8.2							
11	14.0	3.4							
11	19.0	9.1		NP	NP	1.2	21.1		
11	24.0	3.6							
12	4.0	5.0							
12	9.0	10.6							
12	14.0	9.3		NP	NP	0.0	58.3		
12	19.0	11.8							
12	24.0	21.6							
13	4.0	8.4		NP	NP	1.5	14.9		
13	9.0	4.0							
13	14.0	4.4							
13	19.0	5.1							
13	24.0	17.1							
14	4.0	12.8		NP	NP	0.3	40.2		
14	9.0	2.0							
14	14.0	6.6							

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2910 Austin Bluffs Parkway
Colorado Spings, CO 80918
Voice (719) 548-0600
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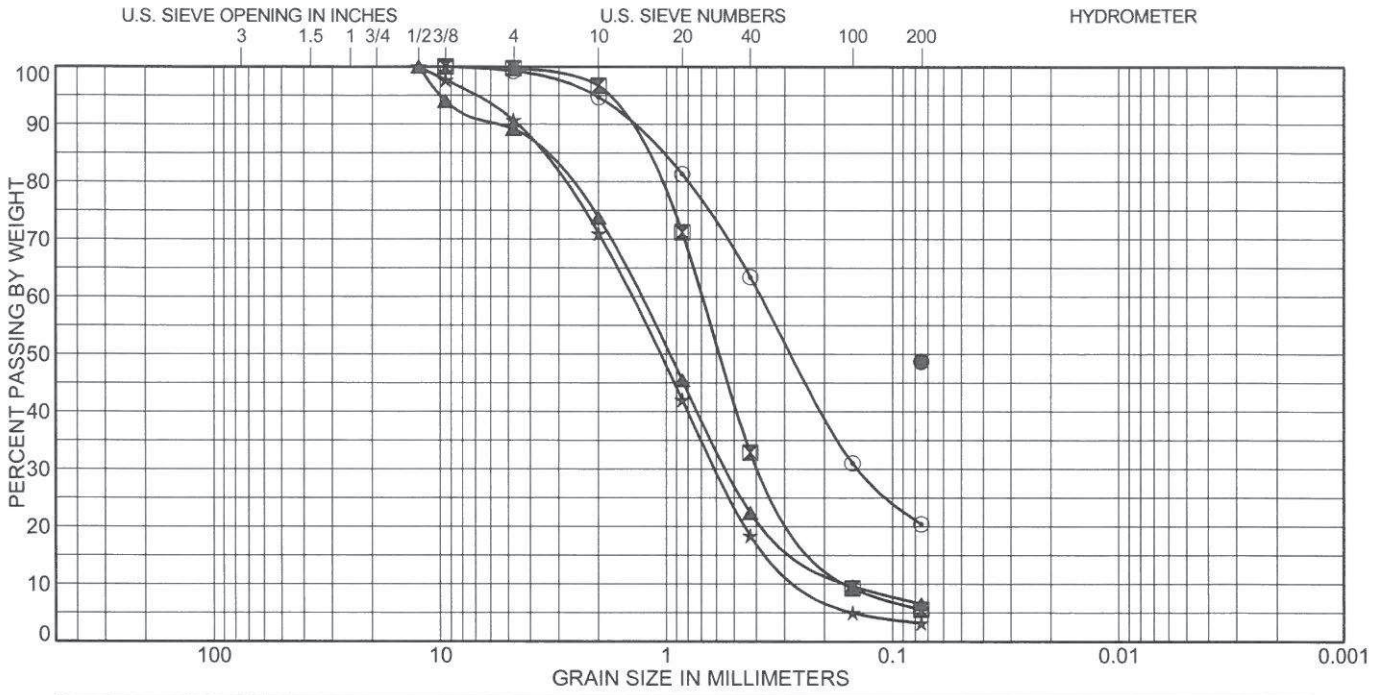
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 152427
FIGURE No. 14

DATE 6/29/16



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring		Depth (ft)	Classification	LL	PL	PI
●	1	9.0	CLAYEY SAND(SC)	32	18	14
⊠	2	4.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP
▲	3	14.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP
★	4	19.0	WELL-GRADED SAND(SW)	NP	NP	NP
⊙	5	9.0	SILTY SAND(SM)	NP	NP	NP

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	9.0			48.7	
⊠	2	4.0	0.3	94.2	5.5	
▲	3	14.0	10.8	82.6	6.5	
★	4	19.0	9.3	87.5	3.2	
⊙	5	9.0	0.8	78.8	20.4	

Colorado Springs: (Corporate Office)
2910 Austin Bluffs Parkway
Colorado Spings, CO 80918
Voice (719) 548-0600
Fax (719) 548-0223

ARCHITECTS RMG ENGINEERS

SOIL CLASSIFICATION DATA

JOB No. 152427

FIGURE No. 15

DATE 6/29/16

APPENDIX C

Subsurface Soil Investigation, Lots 1-49, Carriage Meadows South at Lorson Ranch, Filing No. 2, El Paso County, Colorado, Job No. 177446, dated August 24, 2020

Architecture
Structural
Geotechnical

Materials Testing
Forensic
Civil/Planning

ROCKY MOUNTAIN GROUP
EMPLOYEE OWNED

SUBSURFACE SOIL INVESTIGATION

Lots 1-49
Carriage Meadows South at Lorson Ranch, Filing No. 2
El Paso County, Colorado

PREPARED FOR:

Saint Aubyn Homes
212 North Wahsatch Avenue, Suite 201
Colorado Springs, CO 80903

JOB NO. 177446

August 24, 2020

Respectfully Submitted,
RMG – Rocky Mountain Group

Brian Griffith, E.I.
Geotechnical Staff Engineer

Reviewed by,
RMG – Rocky Mountain Group

COLORADO REGISTERED
ANTHONY P. MUNGER
8/26/20
39818
PROFESSIONAL ENGINEER

Tony Munger, P.E.
Geotechnical Project Manager

TABLE OF CONTENTS

GENERAL SITE AND PROJECT DESCRIPTION

Project Description

The site is located in the south and west portion of El Paso County, Colorado, south and east of the intersection of Fontaine Blvd and Marksheffel Road. More specifically, the site is located along Rubicon Heights, Rubicon Drive, Firesteel Drive, Chagrin Heights, Ambling Heights, and Paluxy Heights. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

The project is to consist of single-family residential construction on forty-nine lots at the Carriage Meadows South at Lorson Ranch, Filing No. 2. The structures are anticipated to be one to two-stories in height with multi-car garages. The homes may either be constructed with or without basements. RMG – Rocky Mountain Group was retained to explore the subsurface conditions at the site and develop geotechnical engineering recommendations for design and construction.

Existing Site Conditions

The site is presently developed as residential lots. Significant vegetation was not present due to overlot grading. Curb-and-gutter has been installed within the roadway alignments, and the roads have been paved. The topography across the site is relatively flat.

Previous Studies and Field Investigation

Reports of previous geotechnical engineering/geologic investigations for this site were available for our review and are listed below:

1. *"Geology and Soils Report, Carriage Meadows South," El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 152427, last amended October 7, 2016.
2. *"Geology and Soils Study, Lots 1-50, Carriage Meadows South at Lorson Ranch, Filing No. 2," El Paso County, Colorado,* RMG – Rocky Mountain Group, Job No. 172445, dated October 7, 2019, amended December 12, 2019.

The findings, conclusions and recommendations contained in these reports were considered during the preparation of this report.

FIELD INVESTIGATION AND LABORATORY TESTING

Drilling

The subsurface conditions on the site were investigated by drilling twenty-six exploratory test borings. The approximate locations of the test borings are presented in the Lot Layout Plan, Figure 2.

The test borings were advanced with a power-driven, continuous-flight auger drill rig to depths of about 20 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. Soil Classification Data are presented in Figures 18 through 23. Swell/Consolidation Test Results are presented in Figure 24.

SUBSURFACE CONDITIONS

Subsurface Materials

The subsurface materials encountered in the test borings were classified using the Unified Soils Classification System (USCS) and the materials were grouped into the general categories of native silty to clayey sand and native sandy clay.

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.

Groundwater

Groundwater was not encountered in the test borings during field exploration. 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.

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

Fill soils were not encountered during our investigation. However, some limited overlot grading fills may be present, even on lots where none are indicated on the boring logs. As of the issue date of this report, no documentation has been provided to RMG indicating that final overlot fill was placed in a controlled manner, or that it was observed or tested during placement. Until such documentation is provided, any fill soils encountered on the site are considered non-engineered and are not suitable for support of foundation components. These unsuitable fill soils may be encountered in the excavations, even on lots where none are indicated on the test boring logs. Furthermore, any fill placed atop those unsuitable fill soils will also be considered unsuitable for support of foundation components, unless the new fill soils comprise one component of a foundation bearing enhancement system. This report does

not include recommendations for design or construction of such a bearing enhancement system. If such recommendations are desired, contact personnel of RMG for more information.

Additionally, very loose to loose soils and soft soils were encountered in twenty-three of the test borings and expansive soils were encountered in three of the test borings. As with fill soils, loose soils and/or expansive soils may be encountered in the excavations, even on lots where none are indicated on the test boring logs. If encountered in the excavation, these materials will require additional compaction and/or removal (overexcavation) and replacement as indicated under the **Overexcavation and Replacement** section of this report.

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

Overexcavation and Replacement

Fill soils may be considered unsuitable for a variety of reasons. These include (but are not limited to) non-engineered fills, fill soils containing trash or debris, fill soils that appear to have been improperly selected, placed and/or compacted, etc. If unsuitable fill soils are encountered during the Open Excavation Observation, they will require removal (overexcavation) and replacement 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 the fill, if encountered first).

If very loose to loose soils or soft 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 2 feet 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/soft soils to reduce the likelihood of loss of stability during excavation.

The sandy clay has low to moderate swell potential and is not suitable for direct bearing of shallow foundations. If clay soils are determined to be within 3 feet of foundation components or floor slabs, it/they will require removal (overexcavation) and replacement with compacted structural fill to a depth which results in at least 3 feet of compacted structural fill below foundation components and floor slabs. The zone of overexcavation shall extend at least 3 feet beyond the building perimeter, and at least that same distance beyond the perimeter of counterfort and "T" wall footings.

All structural fill should be observed and tested during placement as indicated under the **Structural Fill** section of this report, to ensure proper compaction.

Foundation Recommendations

A spread footing foundation is suitable for the proposed residential structures. For a structure supported atop moderately dense sand soils and/or compacted structural fill, a maximum allowable bearing pressure of 2,000 psf may be used for design. We have anticipated that the deepest excavation cuts for basement level construction will be approximately 6 to 8 feet below the existing ground surface.

The foundation design 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.

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.

Floor Slabs

Vertical slab movement of one to three inches is considered possible for soils/bedrock of low expansion potential and for structural fill after recommended removal (overexcavation) of expansive soils/bedrock. In some cases, vertical movement may exceed this range. If movement and associated damage to floors and finish cannot be tolerated, a structural floor system should be used.

Floor slabs should be separated from structural components to allow for vertical movement. Control and construction joints should be placed in accordance with the latest guidelines and standards published by the American Concrete Institute (ACI) and applicable local Building Code requirements.

Recommendations for exterior concrete slabs, such as patios, driveways, and sidewalks, are not included in this report.

Interior Partitions

Interior non-bearing partitions and attached furnishings (e.g., cabinets, shower stalls, etc.) on concrete slabs should be constructed with a void so that they do not transmit floor slab movement to the roof or overlying floor. A void of at least 1-1/2 inches is recommended beneath non-bearing partitions. The void may require reconstruction over the life of the structure to re-establish the void due to vertical slab movement.

Lateral Earth Pressures

Foundation and basement walls should be designed to resist lateral pressures. For non-expansive backfill materials, we recommend an equivalent fluid pressure of 40 pcf for design. Expansive soils or bedrock should not be used as backfill against walls.

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.

Perimeter Drain

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 the walkout trench, if applicable. A typical drain detail is presented in Figure 25.

A subsurface perimeter 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.

Overexcavation Drain

If an overexcavation is performed and granular, non-expansive backfill is used for the replacement soils, a subsurface drain may be recommended around the perimeter of the excavation. This drain is to be placed at the bottom of the overexcavated portion of the excavation (in this case 3 feet below the bottom of the foundation components) prior to backfilling. A typical drain detail is presented in Figure 26.

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.

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 92 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 appropriate government/utility specifications should be used for fill placed in utility trenches. If material is imported for backfill, the material should be approved by the Geotechnical Engineer prior to hauling it to the site.

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.

Structural Fill

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 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 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 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). The materials should be compacted by mechanical means.

Materials used for structural fill should be approved by the RMG prior to use. 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.

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.

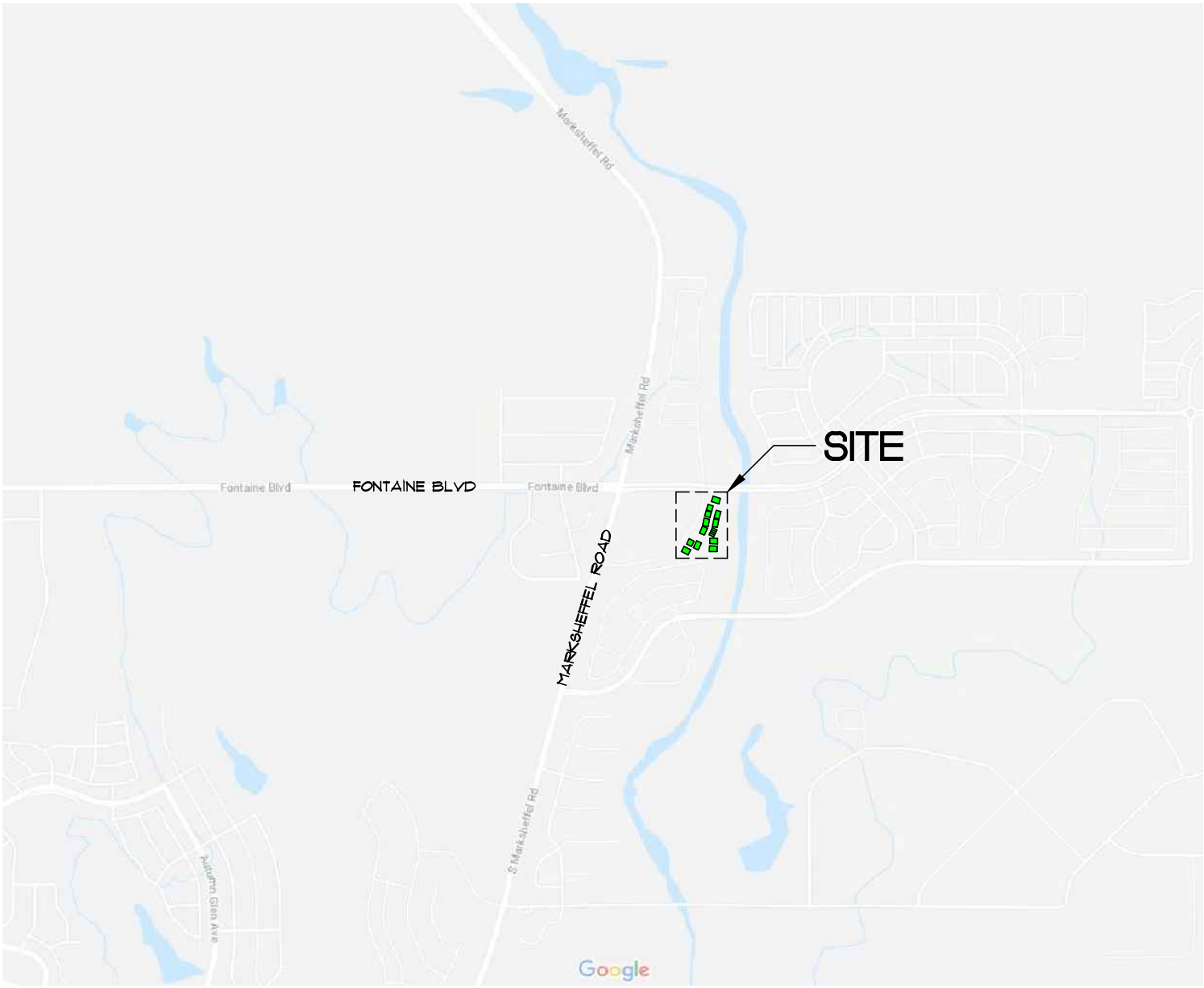
This report has been prepared for the exclusive use by **Saint Aubyn Homes** for application as an aid in the design and construction of the proposed development in accordance with generally accepted geotechnical engineering practices. The analyses and recommendations in this report are based in part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

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

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

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

FIGURES



NOT TO SCALE

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Greeley / Evans, CO 80620
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SITE VICINITY MAP

LOTS 1-49
CARRIAGE MEADOWS SOUTH
AT LORSON RANCH, FILING NO. 2
EL PASO COUNTY, COLORADO
SAINT AUBYN

JOB No. 177446

FIG No. 1

DATE 8-24-2020

NOT TO SCALE

LOTS WHERE IT IS ANTICIPATED THAT OVEREXCAVATION WILL BE REQUIRED FOR EXPANSIVE SOILS WITHIN **3** FEET OF FOUNDATION COMPONENTS

LOTS WHERE IT IS ANTICIPATED THAT OVEREXCAVATION WILL BE REQUIRED FOR EXPANSIVE SOILS WITHIN **3** FEET OF FOUNDATION COMPONENTS. ADDITIONALLY, IT IS ANTICIPATED THAT A 2-FOOT REMOVAL AND RECOMPATION OF SAND SOILS WILL BE REQUIRED

LOTS WHERE IT IS ANTICIPATED THAT A 2-FOOT REMOVAL AND RECOMPATION OF SAND SOILS WILL BE REQUIRED

LOTS WHERE ADDITIONAL COMPACTION OR A 2-FOOT REMOVAL AND RECOMPATION OF SAND SOILS MAY BE REQUIRED, AS DETERMINED AT THE TIME OF THE EXCAVATION OBSERVATION

LOTS WHERE OVEREXCAVATION IS NOT ANTICIPATED. HOWEVER, IF UNSUITABLE SOILS ARE ENCOUNTERED AT THE TIME OF THE EXCAVATION OBSERVATION, OVEREXCAVATION OR RECOMPACTION MAY BE REQUIRED

DENOTES LOTS WHERE TEST BORINGS WERE PERFORMED

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LOTS 1-49
CARRIAGE MEADOWS SOUTH
AT LORSON RANCH, FILING NO. 2
EL PASO COUNTY, COLORADO
SAINT AUBYN

ENGINEER:	TM
DRAWN BY:	BG
CHECKED BY:	TM
ISSUED:	8-24-2020

LOT LAYOUT PLAN

SHEET No.
FIG-2

SOILS DESCRIPTION


CLAYEY SAND


SANDY CLAY


SILTY SAND


SILTY TO CLAYEY SAND

UNLESS NOTED OTHERWISE, ALL LABORATORY
TESTS PRESENTED HEREIN WERE PERFORMED BY:
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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. 177446

FIGURE No. 3

DATE Aug/24/2020

LOT No.: **1** DATE DRILLED: 7/13/20 REMARKS: NO GROUNDWATER ON 7/13/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			5	4.7
	10			10	4.6
	15			9	19.2
	20			13	6.6

LOT No.: **4** DATE DRILLED: 7/13/20 REMARKS: NO GROUNDWATER ON 7/13/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			7	4.5
	10			6	7.2
	15			15	10.3
	20			15	4.5

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TEST BORING LOGS

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FIGURE No. 4

DATE Aug/24/2020

LOT No.: **5** DATE DRILLED: 7/13/20 REMARKS: NO GROUNDWATER ON 7/13/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			7	8.1
	10			7	6.0
	15			11	3.2
	20			15	4.7

LOT No.: **7** DATE DRILLED: 7/13/20 REMARKS: NO GROUNDWATER ON 7/13/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			8	7.0
	10			12	4.2
	15			12	6.1
	20			17	5.8

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TEST BORING LOGS

JOB No. 177446

FIGURE No. 5

DATE Aug/24/2020

LOT No.: **8** DATE DRILLED: 7/13/20 REMARKS: NO GROUNDWATER ON 7/13/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			8	2.9
	10			7	6.0
	15			7	5.2
	20			13	4.8

LOT No.: **11** DATE DRILLED: 7/13/20 REMARKS: NO GROUNDWATER ON 7/13/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			8	3.7
	10			7	3.3
	15			11	5.5
	20			11	3.8

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FIGURE No. 6

DATE Aug/24/2020

LOT No.: **12** DATE DRILLED: 7/1/20 REMARKS: NO GROUNDWATER ON 7/1/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			8	7.6
	10			7	16.3
	15			10	7.5
	20			9	9.6

LOT No.: **15** DATE DRILLED: 7/1/20 REMARKS: NO GROUNDWATER ON 7/1/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			11	2.4
	10			7	3.4
	15			13	5.1
	20			8	8.7

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FIGURE No. 7

DATE Aug/24/2020

LOT No.: **16** DATE DRILLED: 7/1/20 REMARKS: NO GROUNDWATER ON 7/1/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, medium dense, moist	5			13	3.5
	10			19	2.4
	15			22	2.9
	20			10	9.3

LOT No.: **19** DATE DRILLED: 7/1/20 REMARKS: NO GROUNDWATER ON 7/1/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, medium dense, moist	5			17	3.2
	10			15	9.1
	15			13	5.2
	20			12	4.7

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FIGURE No. 8

DATE Aug/24/2020

LOT No.: **20** DATE DRILLED: 7/1/20 REMARKS: NO GROUNDWATER ON 7/1/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, medium dense, moist	5			12	2.5
	10			11	7.6
	15			14	3.0
	20				3.6

LOT No.: **23** DATE DRILLED: 7/1/20 REMARKS: NO GROUNDWATER ON 7/1/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			9	10.0
	10			10	6.0
	15			16	2.9
	20			8	3.0

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FIGURE No. 9

DATE Aug/24/2020

LOT No.: **24** DATE DRILLED: 7/1/20 REMARKS: NO GROUNDWATER ON 7/1/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, brown, loose to medium dense, moist	5			9	10.0
	10			10	6.0
	15			10	2.9
	20			17	3.0

LOT No.: **27** DATE DRILLED: 7/1/20 REMARKS: NO GROUNDWATER ON 7/1/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, brown, loose to medium dense, moist	5			6	13.8
	10			9	7.3
	15			10	2.8
	20			10	4.3

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FIGURE No. 10

DATE Aug/24/2020

LOT No.: **28**
DATE DRILLED:
7/1/20
REMARKS:
NO GROUNDWATER ON
7/1/20

SAND, CLAYEY, brown, loose, moist

SAND, SILTY, brown, loose to medium dense, moist

DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
5	7	17.3
10	6	6.3
15	8	2.6
20	12	2.8

LOT No.: **31**
DATE DRILLED:
7/1/20
REMARKS:
NO GROUNDWATER ON
7/1/20

SAND, SILTY, brown, loose to medium dense, moist

DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
5	15	8.4
10	7	10.4
15	10	4.6
20	15	3.2

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FIGURE No. 11

DATE Aug/24/2020

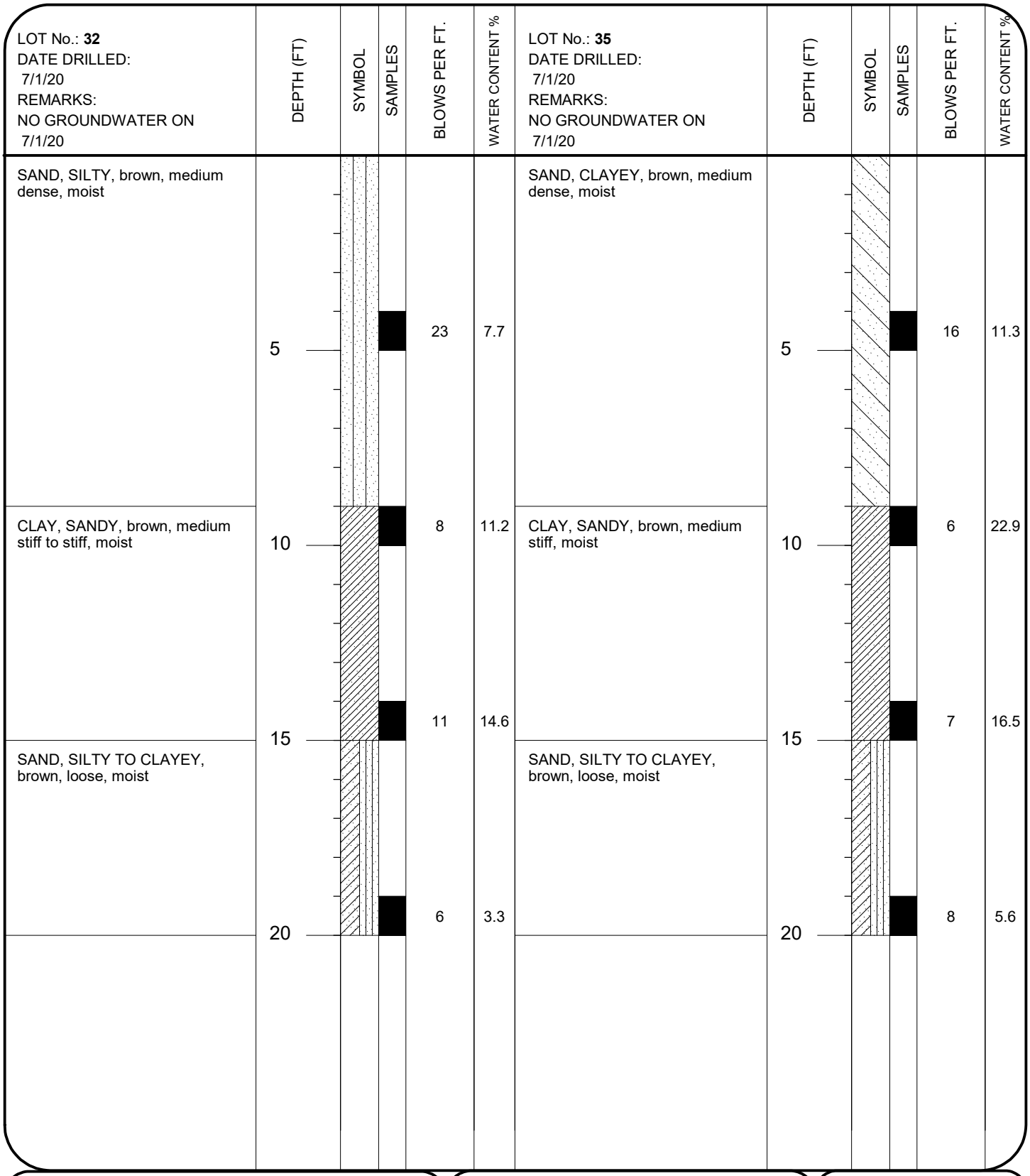

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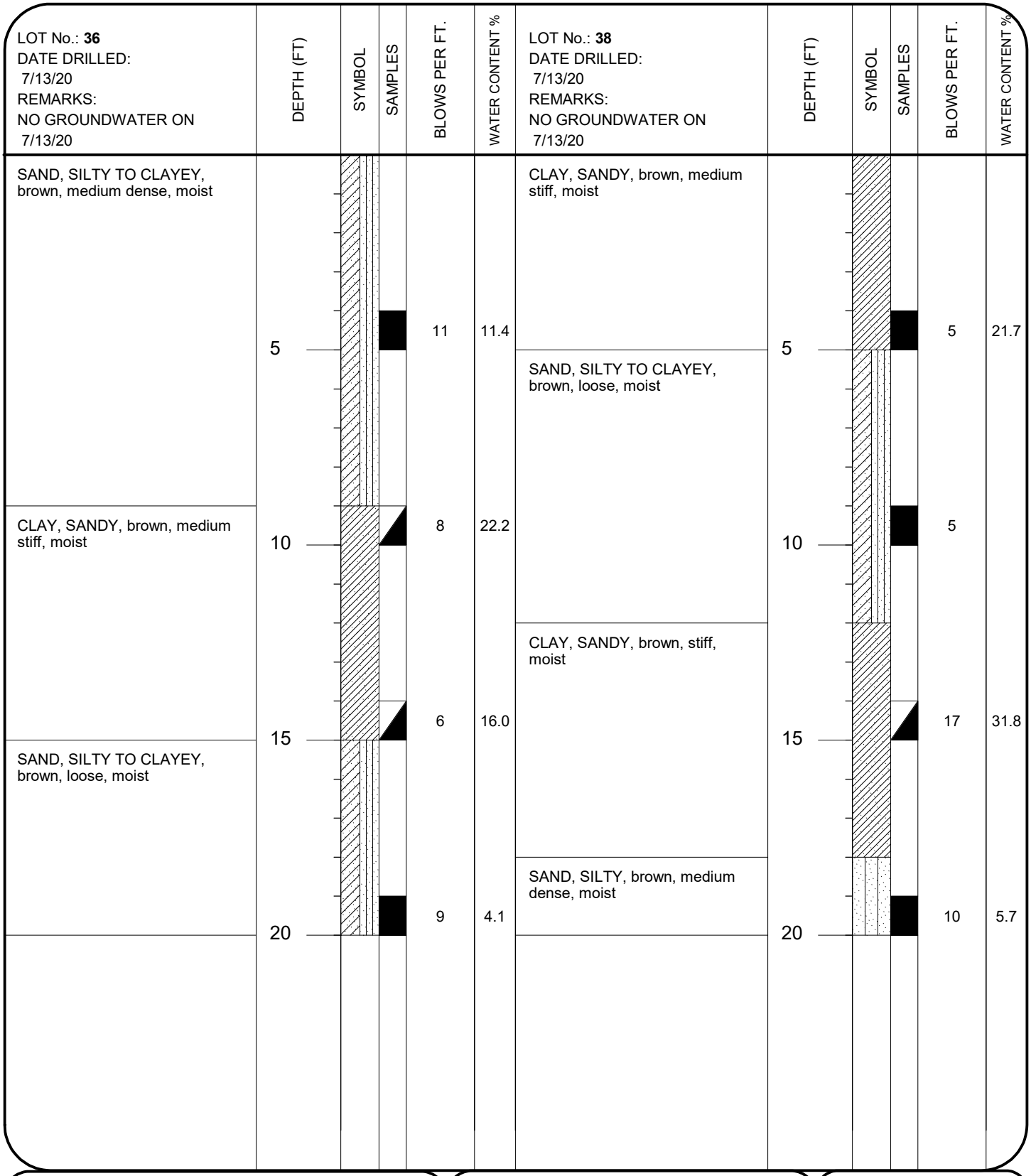
FIGURE No. 12

DATE Aug/24/2020



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JOB No. 177446

FIGURE No. 13

DATE Aug/24/2020

LOT No.: **39**
DATE DRILLED:
7/13/20
REMARKS:
NO GROUNDWATER ON
7/13/20

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	CLAY, SANDY, brown, soft, moist			
5			4	21.2
	SAND, SILTY TO CLAYEY, brown, loose to medium dense, moist			
10			5	26.8
15			7	4.3
20			12	6.7

LOT No.: **41**
DATE DRILLED:
7/13/20
REMARKS:
NO GROUNDWATER ON
7/13/20

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	SAND, SILTY TO CLAYEY, brown, very loose to medium dense, moist			
5			3	14.5
10			6	14.9
15			10	2.9
20			6	4.2

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JOB No. 177446

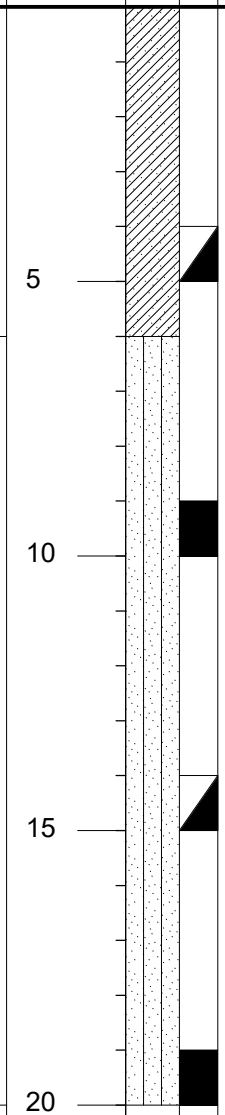
FIGURE No. 14

DATE Aug/24/2020

LOT No.: **42**
DATE DRILLED:
7/13/20
REMARKS:
NO GROUNDWATER ON
7/13/20

CLAY, SANDY, brown, medium stiff, moist

SAND, SILTY, brown, loose to medium dense, moist

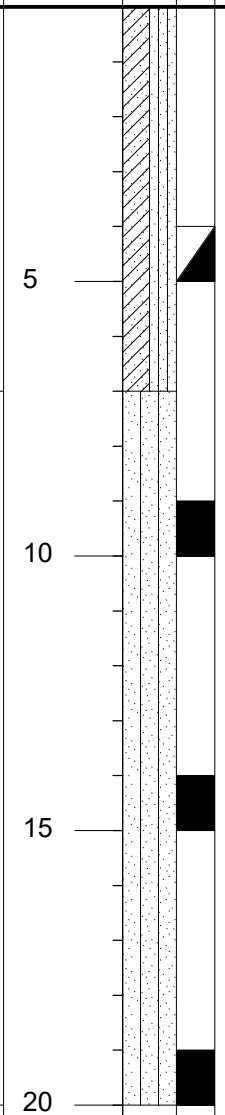


DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
5	9	25.3
10	6	9.3
15	13	3.9
20	15	5.4

LOT No.: **45**
DATE DRILLED:
7/13/20
REMARKS:
NO GROUNDWATER ON
7/13/20

SAND, SILTY TO CLAYEY, brown, loose, moist

SAND, SILTY, brown, very loose to loose, moist



DEPTH (FT)	BLOWS PER FT.	WATER CONTENT %
5	7	16.2
10	3	8.6
15	4	5.0
20	7	4.3

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TEST BORING LOGS

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FIGURE No. 15

DATE Aug/24/2020

LOT No.: **46** DATE DRILLED: 7/13/20 REMARKS: NO GROUNDWATER ON 7/13/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			4	13.9
	10			6	11.9
	15			9	10.0
	20			15	8.0

LOT No.: **49** DATE DRILLED: 7/13/20 REMARKS: NO GROUNDWATER ON 7/13/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			5	6.8
	10			10	5.6
	15			13	2.5
	20			13	3.0

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TEST BORING LOGS

JOB No. 177446

FIGURE No. 16

DATE Aug/24/2020

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	4.7		NP	NP	0.0	17.4			SM
1	9.0	4.6								
1	14.0	19.2								
1	19.0	6.6								
4	4.0	4.5								
4	9.0	7.2		NP	NP	1.9	13.0			SM
4	14.0	10.3								
4	19.0	4.5								
5	4.0	8.1		NP	NP	0.0	26.4			SM
5	9.0	6.0								
5	14.0	3.2								
5	19.0	4.7								
7	4.0	7.0								
7	9.0	4.2		NP	NP	0.0	6.5			SP-SM
7	14.0	6.1								
7	19.0	5.8								
8	4.0	2.9								
8	9.0	6.0								
8	14.0	5.2		NP	NP	2.0	9.6			SW-SM
8	19.0	4.8								
11	4.0	3.7		NP	NP	0.6	5.2			SP-SM
11	9.0	3.3								
11	14.0	5.5								
11	19.0	3.8								
12	4.0	7.6		NP	NP	2.6	6.6			SP-SM
12	9.0	16.3								
12	14.0	7.5								
12	19.0	9.6								
15	4.0	2.4								
15	9.0	3.4		NP	NP	0.0	3.2			SP
15	14.0	5.1								
15	19.0	8.7								
16	4.0	3.5								
16	9.0	2.4								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 177446
FIGURE No. 17
PAGE 1 OF 4
DATE Aug/24/2020

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
16	14.0	2.9		NP	NP	0.1	13.7			SM
16	19.0	9.3								
19	4.0	3.2								
19	9.0	9.1		NP	NP	0.1	14.1			SM
19	14.0	5.2								
19	19.0	4.7								
20	4.0	2.5		NP	NP	0.0	10.7			SW-SM
20	9.0	7.6								
20	14.0	3.0								
20	19.0	3.6								
23	4.0	10.0								
23	9.0	6.0								
23	14.0	2.9		NP	NP	0.3	16.5			SM
23	19.0	3.0								
24	4.0	10.0								
24	9.0	6.0		NP	NP	0.0	14.3			SM
24	14.0	2.9								
24	19.0	3.0								
27	4.0	13.8				0.0	46.1			
27	9.0	7.3								
27	14.0	2.8								
27	19.0	4.3								
28	4.0	17.3								
28	9.0	6.3		NP	NP	0.0	22.9			SM
28	14.0	2.6								
28	19.0	2.8								
31	4.0	8.4		NP	NP	0.0	21.3			SM
31	9.0	10.4								
31	14.0	4.6								
31	19.0	3.2								
32	4.0	7.7								
32	9.0	11.2		35	15	0.0	56.7			CL
32	14.0	14.6								
32	19.0	3.3								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 177446
FIGURE No. 17
PAGE 2 OF 4
DATE Aug/24/2020

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
35	4.0	11.3		NP	NP	0.3	27.5			SM
35	9.0	22.9								
35	14.0	16.5								
35	19.0	5.6								
36	4.0	11.4				0.2	19.5			
36	9.0	22.2								
36	14.0	16.0								
36	19.0	4.1								
38	4.0	21.7								
38	14.0	31.8	88.9	45	28	0.0	80.7		0.0	CL
38	19.0	5.7								
39	4.0	21.2								
39	9.0	26.8		NP	NP	0.0	53.2			ML
39	14.0	4.3								
39	19.0	6.7								
41	4.0	14.5				0.1	38.7			
41	9.0	14.9								
41	14.0	2.9								
41	19.0	4.2								
42	4.0	25.3	92.3	45	27	0.0	81.1		- 0.3	CL
42	9.0	9.3								
42	14.0	3.9								
42	19.0	5.4								
45	4.0	16.2								
45	9.0	8.6		NP	NP	0.0	21.0			SM
45	14.0	5.0								
45	19.0	4.3								
46	4.0	13.9		NP	NP	0.0	40.8			SM
46	9.0	11.9								
46	14.0	10.0								
46	19.0	8.0								
49	4.0	6.8								
49	9.0	5.6		NP	NP	0.0	37.7			SM
49	14.0	2.5								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 177446
FIGURE No. 17
PAGE 3 OF 4
DATE Aug/24/2020

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
49	19.0	3.0								

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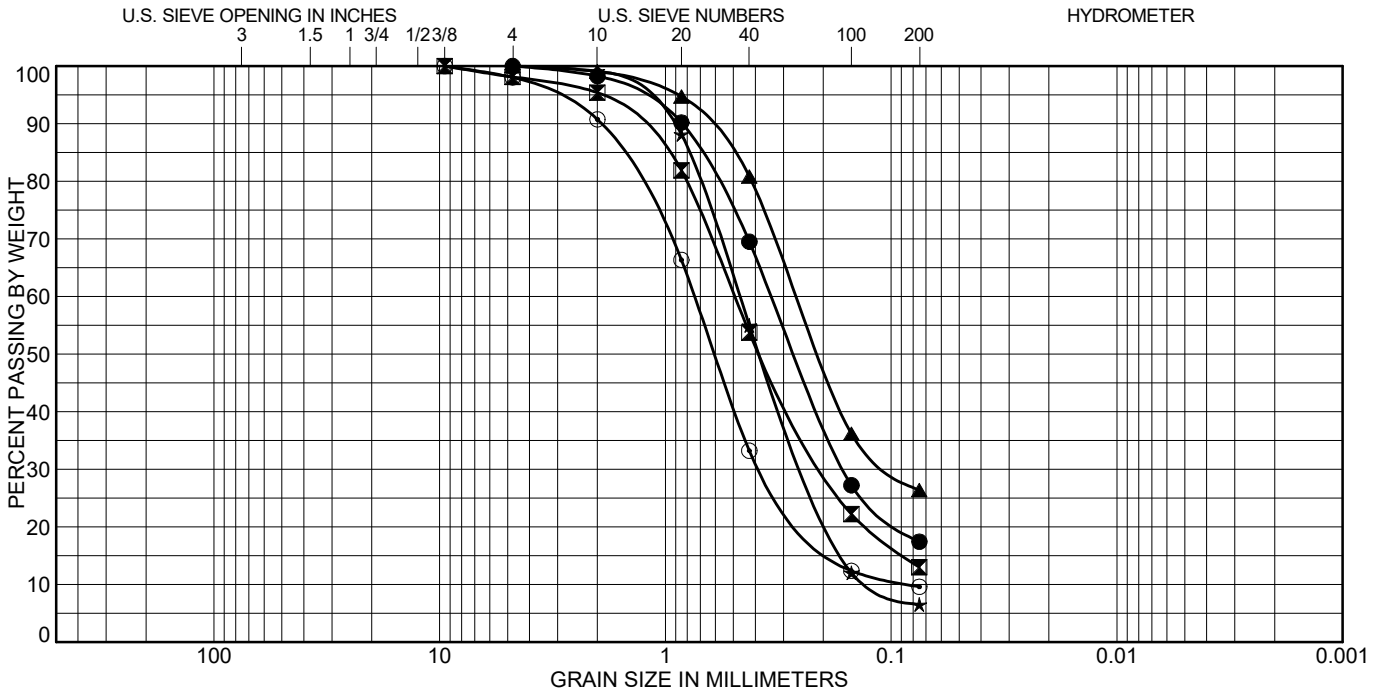
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 177446
FIGURE No. 17

DATE Aug/24/2020



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	1	4.0	SILTY SAND(SM)	NP	NP	NP
⧓	4	9.0	SILTY SAND(SM)	NP	NP	NP
▲	5	4.0	SILTY SAND(SM)	NP	NP	NP
★	7	9.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP
⊙	8	14.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	4.0	0.0	82.6	17.4	
⧓	4	9.0	1.9	85.1	13.0	
▲	5	4.0	0.0	73.6	26.4	
★	7	9.0	0.0	93.5	6.5	
⊙	8	14.0	2.0	88.4	9.6	

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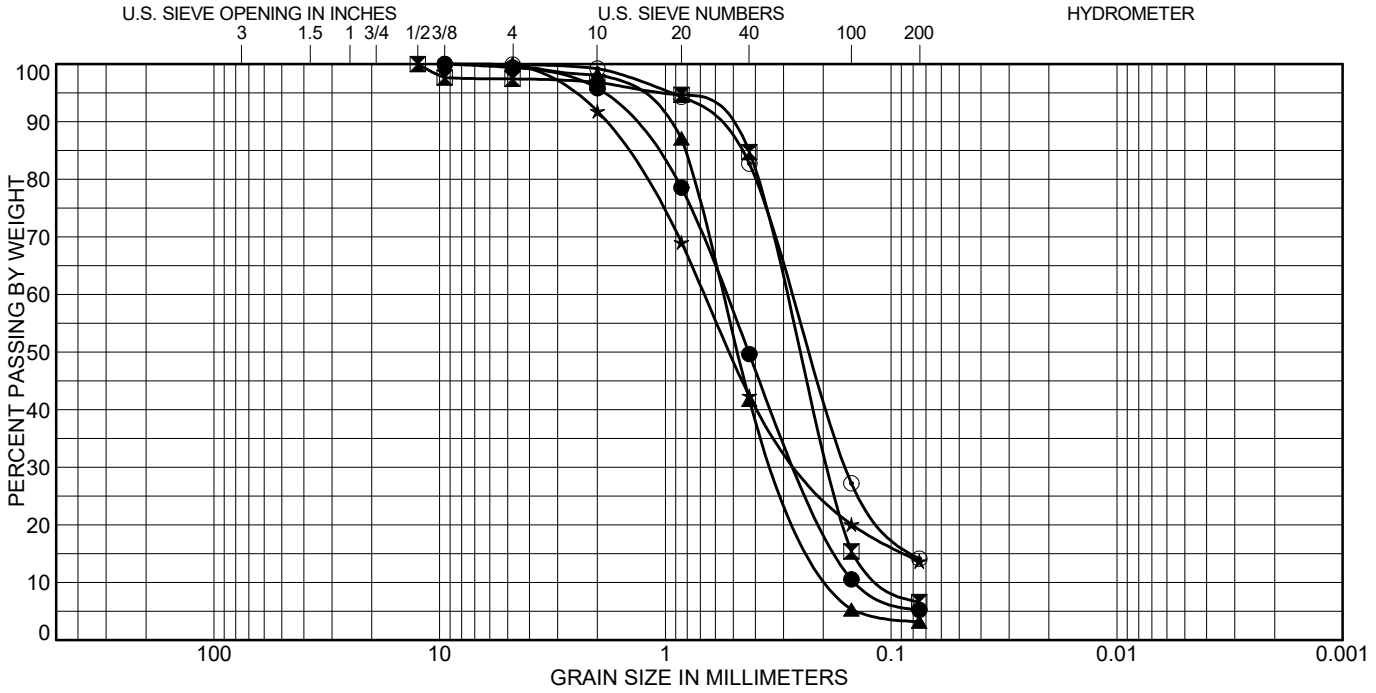
SOIL CLASSIFICATION DATA

JOB No. 177446

FIGURE No. 18

DATE Aug/24/2020



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	11	4.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP
⧓	12	4.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP
▲	15	9.0	POORLY GRADED SAND(SP)	NP	NP	NP
★	16	14.0	SILTY SAND(SM)	NP	NP	NP
⊙	19	9.0	SILTY SAND(SM)	NP	NP	NP

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	11	4.0	0.6	94.2	5.2	
⧓	12	4.0	2.6	90.8	6.6	
▲	15	9.0	0.0	96.8	3.2	
★	16	14.0	0.1	86.3	13.7	
⊙	19	9.0	0.1	85.8	14.1	

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Colorado Spings, CO 80918
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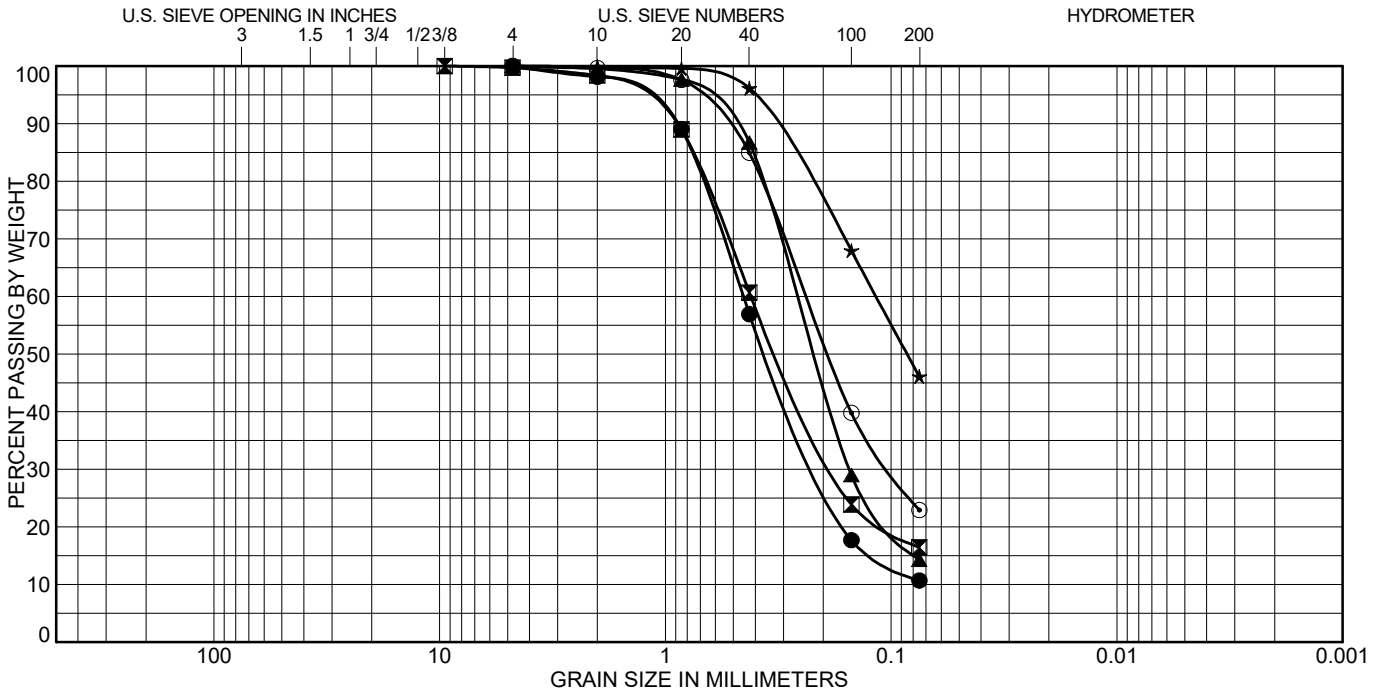
SOIL CLASSIFICATION DATA

JOB No. 177446

FIGURE No. 19

DATE Aug/24/2020



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	20	4.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP
⧓	23	14.0	SILTY SAND(SM)	NP	NP	NP
▲	24	9.0	SILTY SAND(SM)	NP	NP	NP
★	27	4.0				
⊙	28	9.0	SILTY SAND(SM)	NP	NP	NP

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	20	4.0	0.0	89.3	10.7	
⧓	23	14.0	0.3	83.2	16.5	
▲	24	9.0	0.0	85.7	14.3	
★	27	4.0	0.0	53.9	46.1	
⊙	28	9.0	0.0	77.1	22.9	

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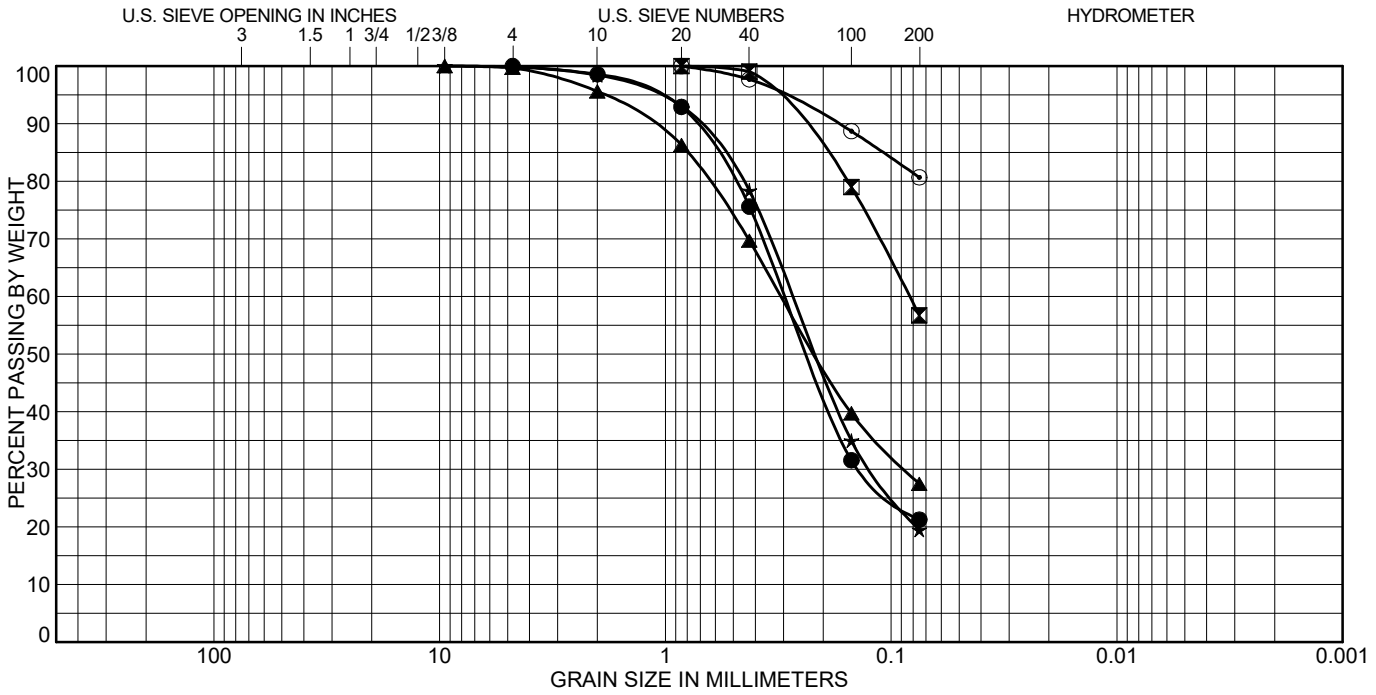
SOIL CLASSIFICATION DATA

JOB No. 177446

FIGURE No. 20

DATE Aug/24/2020



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	31	4.0	SILTY SAND(SM)	NP	NP	NP
⧓	32	9.0	SANDY LEAN CLAY(CL)	35	20	15
▲	35	4.0	SILTY SAND(SM)	NP	NP	NP
★	36	4.0				
⊙	38	14.0	LEAN CLAY with SAND(CL)	45	17	28

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	31	4.0	0.0	78.7	21.3	
⧓	32	9.0	0.0	43.3	56.7	
▲	35	4.0	0.3	72.2	27.5	
★	36	4.0	0.2	80.4	19.5	
⊙	38	14.0	0.0	19.3	80.7	

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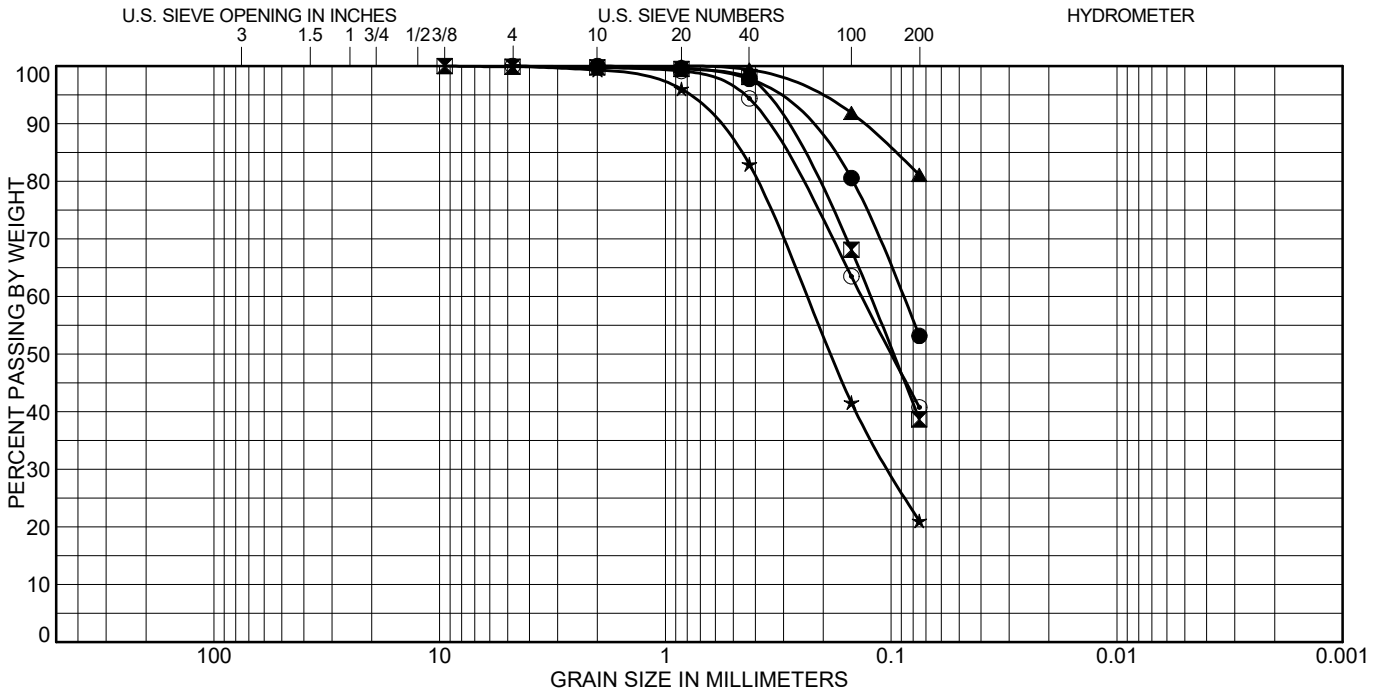
SOIL CLASSIFICATION DATA

JOB No. 177446

FIGURE No. 21

DATE Aug/24/2020



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	39	9.0	SANDY SILT(ML)	NP	NP	NP
⧓	41	4.0				
▲	42	4.0	LEAN CLAY with SAND(CL)	45	18	27
★	45	9.0	SILTY SAND(SM)	NP	NP	NP
⊙	46	4.0	SILTY SAND(SM)	NP	NP	NP

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	39	9.0	0.0	46.8	53.2	
⧓	41	4.0	0.1	61.2	38.7	
▲	42	4.0	0.0	18.9	81.1	
★	45	9.0	0.0	79.0	21.0	
⊙	46	4.0	0.0	59.2	40.8	

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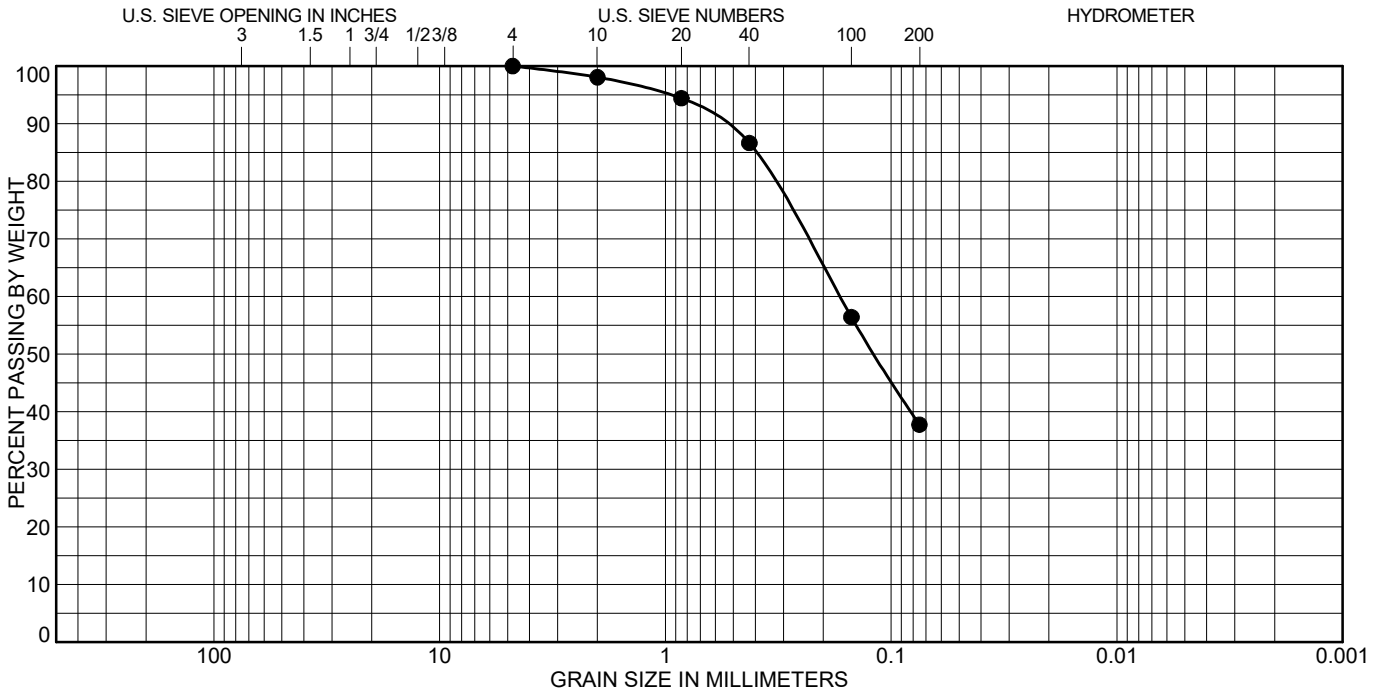
SOIL CLASSIFICATION DATA

JOB No. 177446

FIGURE No. 22

DATE Aug/24/2020



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**49**	**9.0**	**SILTY SAND(SM)**	**NP**	**NP**	**NP**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**49**	**9.0**	**0.0**	**62.3**	**37.7**	

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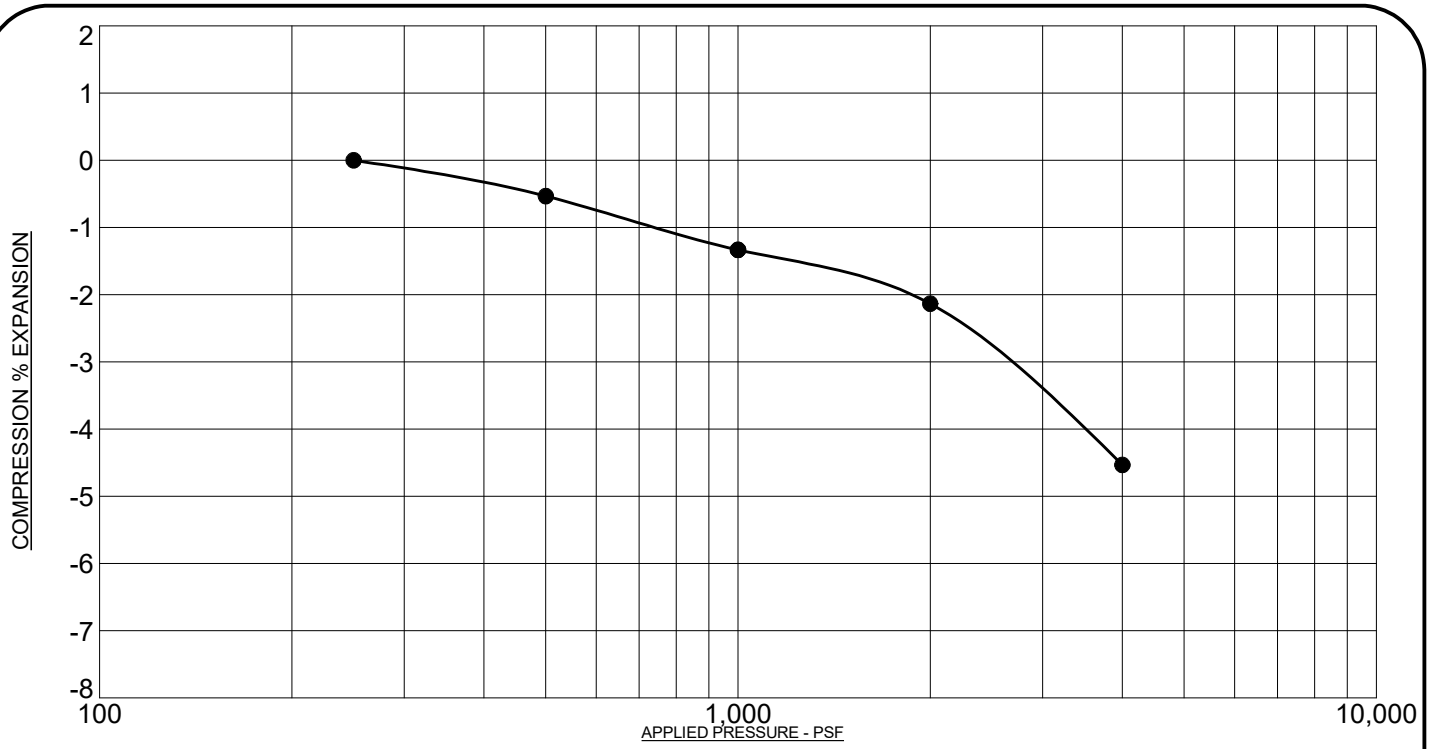
SOIL CLASSIFICATION DATA

JOB No. 177446

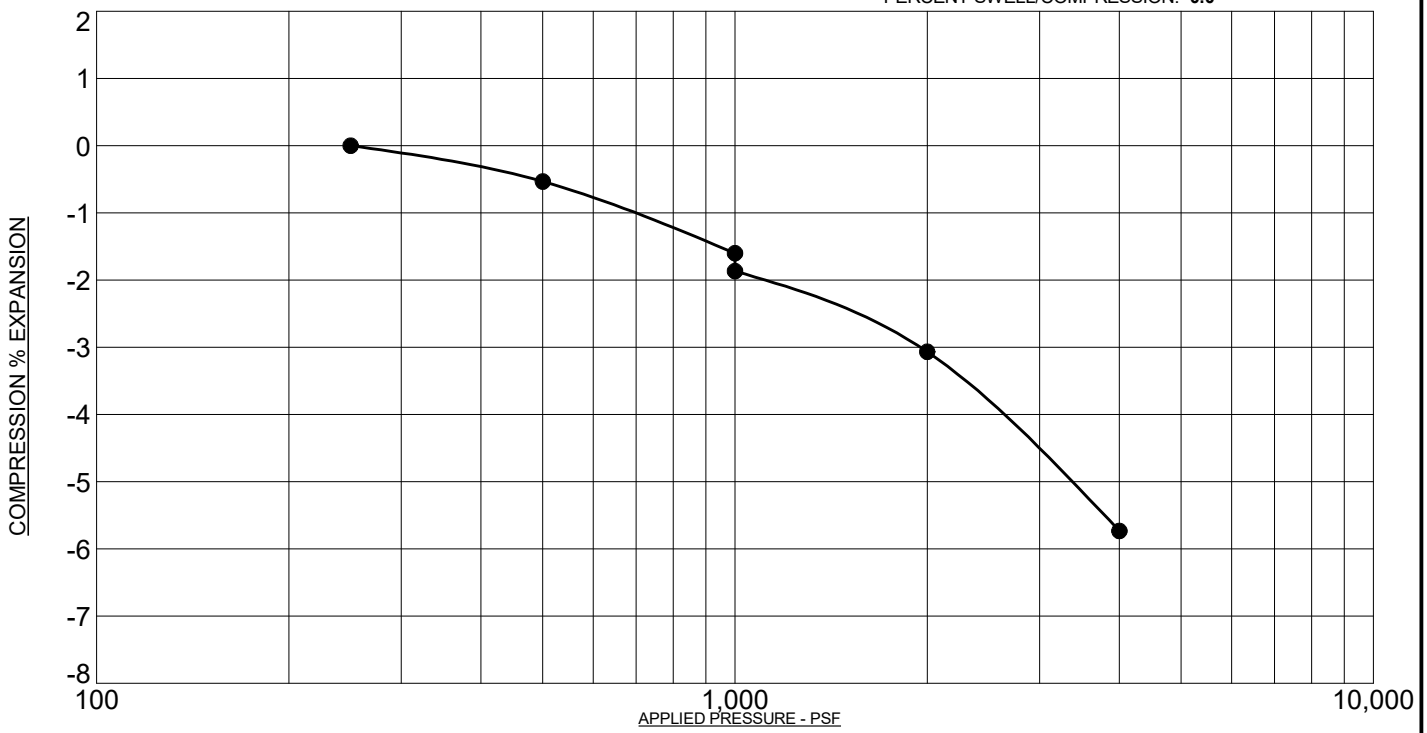
FIGURE No. 23

DATE Aug/24/2020



PROJECT: **Carriage Meadows South at Lorson Ranch, Filing No. 2, El Paso County, CO**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **38 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **88.9 PCF**
NATURAL MOISTURE CONTENT: **31.8%**
PERCENT SWELL/COMPRESSION: **0.0**



PROJECT: **Carriage Meadows South at Lorson Ranch, Filing No. 2, El Paso County, CO**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **42 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **92.3 PCF**
NATURAL MOISTURE CONTENT: **25.3%**
PERCENT SWELL/COMPRESSION: **- 0.3**

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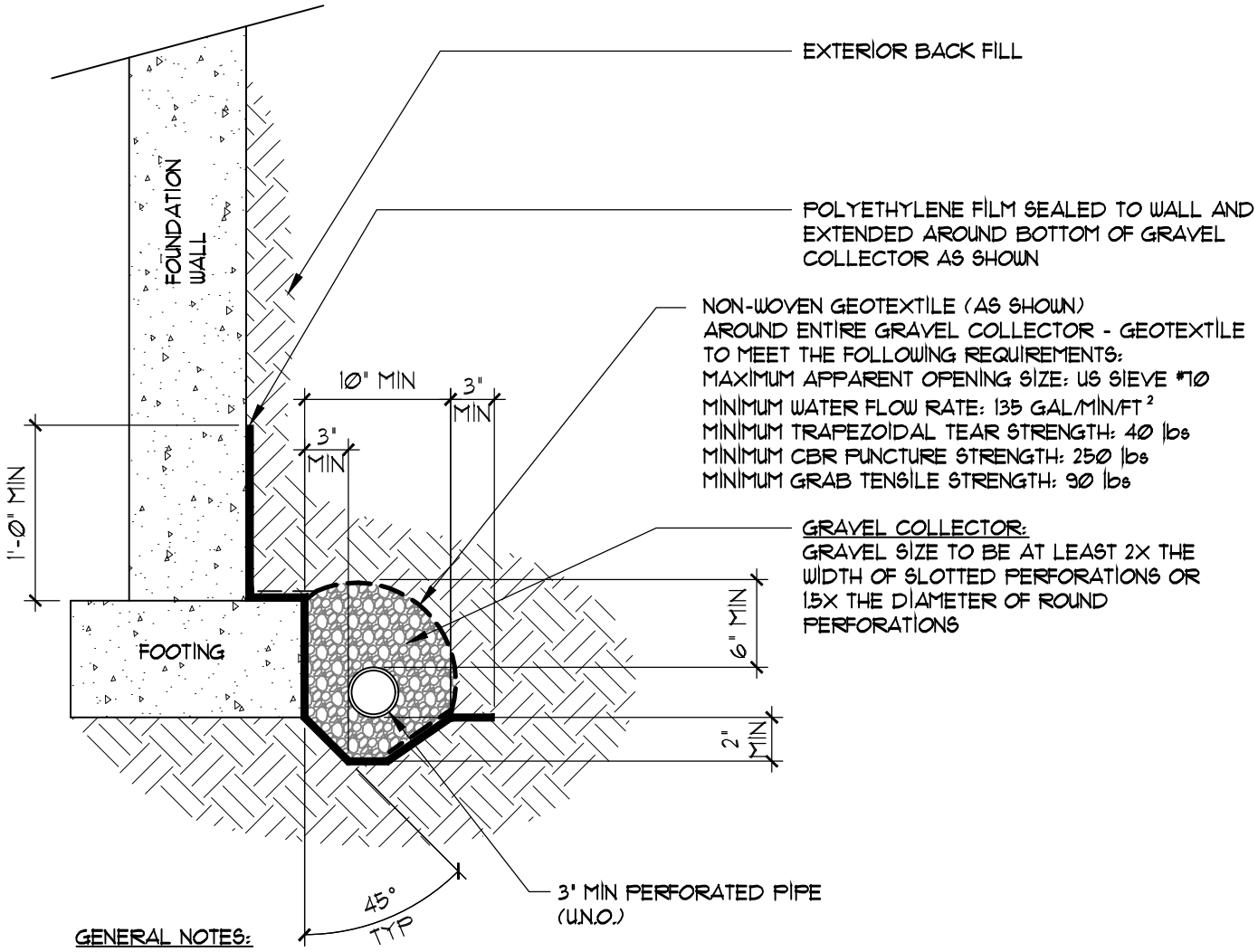
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 177446

FIGURE No. 24

DATE Aug/24/2020



GENERAL NOTES:

1. BOTTOM OF DRAIN PIPE SHALL BE AT OR BELOW BOTTOM OF FOOTING AT ALL LOCATIONS
2. ALL DRAIN PIPE SHALL BE PERFORATED PLASTIC, WITH THE EXCEPTION OF THE DISCHARGE PORTION WHICH SHALL BE SOLID, NON-PERFORATED PIPE.
3. DRAIN PIPE SHALL HAVE POSITIVE FALL THROUGHOUT.
4. DRAIN PIPE SHALL BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. IF A GRAVITY OUTFALL CANNOT BE ACHIEVED, THEN A SUMP PIT AND PUMP SHALL BE USED. THE OUTFALL SHOULD EXTEND PAST BACKFILL ZONES AND DISCHARGE TO A LOCATION THAT IS GRADED TO DIRECT WATER OFF-SITE.
5. ALL DRAIN COMPONENTS SHALL BE RATED/APPROVED BY THE MANUFACTURER FOR THE INSTALLED DEPTH AND APPLICATION
6. DRAIN SYSTEM, INCLUDING THE OUTFALL OF THE DRAIN, SHALL BE OBSERVED BY QUALIFIED PERSONNEL PRIOR TO BACKFILLING TO VERIFY INSTALLATION.
7. A VERTICAL SEGMENT OF PERFORATED DRAIN PIPE, CAPPED AT THE TOP, SHALL EXTEND TO FINISH GRADE WITHIN ALL WINDOW WELLS.

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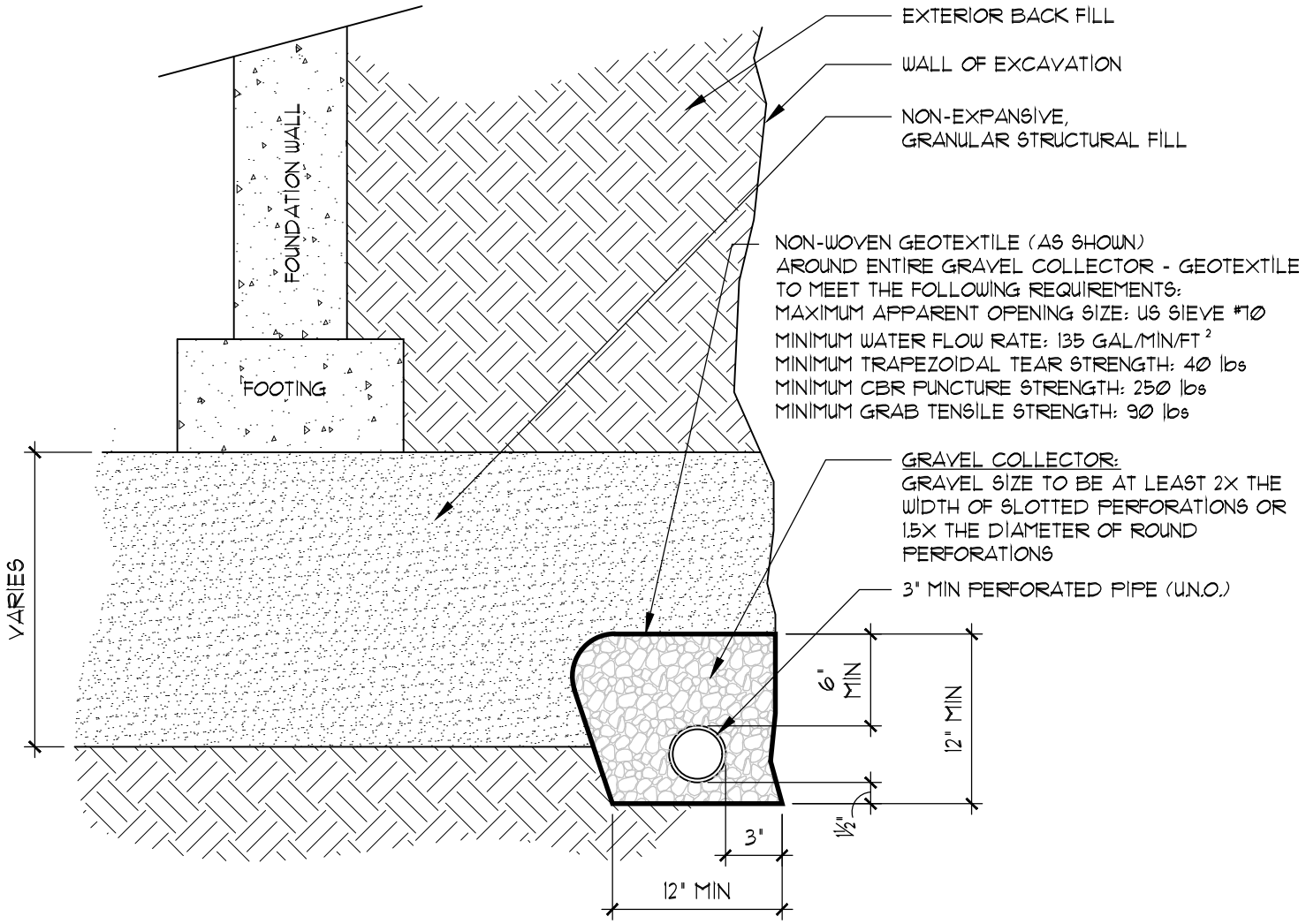
ROCKY MOUNTAIN GROUP

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

PERIMETER DRAIN

FIG No. 25



GENERAL NOTES:

1. ALL DRAIN PIPE SHALL BE PERFORATED PLASTIC, WITH THE EXCEPTION OF THE DISCHARGE PORTION WHICH SHALL BE SOLID, NON-PERFORATED PIPE.
2. DRAIN PIPE SHALL HAVE POSITIVE FALL THROUGHOUT.
3. DRAIN PIPE SHALL BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. IF A GRAVITY OUTFALL CANNOT BE ACHIEVED, THEN A SUMP PIT AND PUMP SHALL BE USED. THE OUTFALL SHOULD EXTEND PAST BACKFILL ZONES AND DISCHARGE TO A LOCATION THAT IS GRADED TO DIRECT WATER OFF-SITE.
4. ALL DRAIN COMPONENTS SHALL BE RATED/APPROVED BY THE MANUFACTURER FOR THE INSTALLED DEPTH AND APPLICATION
5. DRAIN SYSTEM, INCLUDING THE OUTFALL OF THE DRAIN, SHALL BE OBSERVED BY QUALIFIED PERSONNEL PRIOR TO BACKFILLING TO VERIFY INSTALLATION.

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ROCKY MOUNTAIN GROUP

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

OVEREXCAVATION DRAIN

FIG No. 26

APPENDIX D

Perimeter Drain Outfall Plan, Carriage Meadows South at Lorson Ranch, Filing No. 2
Prepared by Core Engineering Group, Project No. 100.046

CONNECT TO EXISTING TYPE D INLET
INVERT 4" DRAIN= 5696.16
INV INLET=5694.37

CROSS EX. ELECTRIC
BTM DRAIN=5696.2
TOP ELEC=5694±

4" PVC PERIMETER DRAIN
OUTFALL 69LF@ 1.0%

CLEANOUT W/ GATE VALVE
BOX COVER
N21855.03, E20804.03
RIM=5701.00
INVERT=5696.86

4" PVC PERIMETER DRAIN
OUTFALL 181.9LF@ 0.5%

CROSS 8"WTM
BTM DRAIN=5697.20
TOP WTM=5696.12±

CURVINLINEAR DRAIN
R=300'

CLEANOUT W/ GATE VALVE
BOX COVER
N22009.93, E20898.15
RIM=5702.00
INVERT=5697.77

4" PVC PERIMETER DRAIN
OUTFALL 56.5LF@ 0.5%

CLEANOUT W/ GATE VALVE
BOX COVER
N22034.58, E20948.95
RIM=5702.90
INVERT=5698.05

4" PVC PERIMETER DRAIN
OUTFALL 161.40LF@ 0.5%

CLEANOUT W/ GATE VALVE
BOX COVER
N22162.85, E21046.90
RIM=5704.30
INVERT=5698.86

CROSS 8"WTM
BTM DRAIN=5702.60
TOP WTM=5701.55±

4" PVC PERIMETER DRAIN
OUTFALL 118.70LF@ 3.45%

CLEANOUT W/ GATE VALVE
BOX COVER
N22381.15, E21110.96
RIM=5706.35
INVERT=5700.22

4" PVC PERIMETER DRAIN
OUTFALL 227.50LF@ 0.6%

4" PVC PERIMETER DRAIN
OUTFALL 53.80LF@ 0.5%

CLEANOUT W/ GATE VALVE
BOX COVER
N22490.97, E21155.92
RIM=5707.40
INVERT=5704.32

CLEANOUT W/ GATE VALVE
BOX COVER
N22525.06, E21197.57
RIM=5708.50
INVERT=5704.60

CARRIAGE MEADOWS DRIVE

AMBLING HEIGHTS

CHAGRIN HEIGHTS

FIRESTEEL DR

15' LANDSCAPE SETBACK

25' LANDSCAPE SETBACK

RUBICON TRAIL

RUBICON HTS

RUBICON DR

PALUXY HEIGHTS

RUBICON DRIVE

THIS SECTION OF DRAIN
CAN BE MODIFIED/ELIMINATED BASED
ON LOCATION OF BASEMENT PERIMETER
DRAIN DISCHARGE CONNECTION

CLEANOUT W/ GATE VALVE
BOX COVER
N21928.08, E21046.33
RIM=5702.30
INVERT=5697.20

CROSS WTM
BTM DRAIN=5697.1
TOP WTM=5695.30

CLEANOUT W/ GATE VALVE
BOX COVER
N21838.74, E21015.62
RIM=5700.60
INVERT=5696.73

CROSS EX. ELECTRIC
BTM DRAIN=5696.62
TOP ELEC=5695±

4" PVC PERIMETER DRAIN
OUTFALL 46LF@ 0.5%

CONNECT TO INLET DP-3
INVERT 4" DRAIN= 5696.50
INV INLET=5695.78

4" PVC PERIMETER DRAIN
OUTFALL 95LF@ 0.5%

4" PVC PERIMETER DRAIN
OUTFALL 82.60LF@ 0.5%

CLEANOUT W/ GATE VALVE
BOX COVER
N22501.80, E21276.82
RIM=5708.80
INVERT=5705.00

PRIVATE STORM
SEWER SYSTEM

PRIVATE STORM
SEWER SYSTEM

PRIVATE STORM
SEWER SYSTEM

CARRIAGE MEADOWS SOUTH
AT LORSON RANCH FIL NO. 1
SF 17-011

CARRIAGE MEADOWS SOUTH
AT LORSON RANCH FIL NO. 1
SF 17-011

NOTES:

1. BASEMENT PERIMETER DRAIN DISCHARGE PIPES FOR LOTS 12-31 SHALL DISCHARGE TO THE PRIVATE STORM SEWER SYSTEM ON THE EAST/SOUTH SIDE OF THE SITE AND ARE NOT ALLOWED TO DISCHARGE TO OR ACROSS PUBLIC RIGHT OF WAYS.
2. CONNECTIONS FROM THE PERIMETER DRAIN OUTFALL/PRIVATE STORM SEWER SYSTEM TO EACH BASEMENT PERIMETER DRAIN SYSTEM ARE NOT SHOWN. HOMEBUILDER SHALL CONNECT BASEMENT PERIMETER DRAIN DISCHARGE PIPE TO THE UNDGERGROUND PIPE SYSTEM AS NECESSARY.

N

30 20 10 0 30 60

SCALE: 1"=30'

CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719-659-7800
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE, SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
CARRIAGE MEADOWS SOUTH AT LORSON RANCH FILING NO. 2
FONTAINE BLVD-CARRIAGE MEADOWS DR
COLORADO SPRINGS, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

CARRIAGE MEADOWS SOUTH AT AT LORSON RANCH FIL NO. 2 PERIMETER DRAIN OUTFALL PLAN

DATE:
FEB 12, 2020

PROJECT NO.
100.046

SHEET NUMBER
C12.3

TOTAL SHEETS: 22