

Architecture
Structural
Geotechnical



Materials Testing
Forensic
Civil/Planning

**ROCKY MOUNTAIN GROUP
EMPLOYEE OWNED**

SOILS AND GEOLOGY STUDY

**Jeanette Mose Subdivision
Halleluiah Trail
EPC Schedule No. 4208000013
El Paso County, Colorado**

PREPARED FOR:

**Perry Mose
12752 Mount Oxford Place
Falcon, CO 80831**

JOB NO. 177316

July 24, 2020

**Respectfully Submitted,
RMG – Rocky Mountain Group**

**Reviewed by,
RMG – Rocky Mountain Group**

A handwritten signature in blue ink that reads "Kelli Zigler".

**Kelli Zigler
Project Geologist**



**Tony Munger, P.E.
Geotechnical Project Manager**

TABLE OF CONTENTS

1.0 GENERAL SITE AND PROJECT DESCRIPTION.....	4
1.1 Project Location	4
1.2 Existing and Proposed Land Use.....	4
1.3 Project Description	4
2.0 QUALIFICATIONS OF PREPARERS	4
3.0 STUDY OVERVIEW	4
3.1 Scope and Objective	5
3.2 Site Evaluation Techniques	5
3.3 Previous Studies and Filed Investigation	6
3.4 Additional Documents.....	6
4.0 SITE CONDITIONS	6
4.1 Existing Site Conditions	6
4.2 Topography	6
4.3 Vegetation	6
4.4 Aerial photographs and remote-sensing imagery	6
5.0 FIELD INVESTIGATION AND LABORATORY TESTING	7
5.1 Test Borings	7
5.2 Laboratory Testing	7
5.3 Profile Pit Excavations	7
5.4 OWTS Visual and Tactile Evaluation	7
6.0 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY	8
6.1 General Physiographic Setting	8
6.2 Subsurface Soil Conditions	8
6.3 Bedrock Conditions.....	8
6.4 Soil Conservation Service	8
6.5 General Geologic Conditions	9
6.6 Structural Features.....	9
6.7 Surficial (Unconsolidated) Deposits.....	9
6.8 Engineering Geology.....	9
6.9 Features of Special Significance	10
6.10 Drainage of Water and Groundwater	10
7.0 ECONOMIC MINERAL RESOURCES.....	10
8.0 IDENTIFICATION AND MITIGATION OF POTENTIAL GEOLOGIC CONDITIONS	11
8.1 Expansive Soils	11
8.2 Hydrocompactive Soils (Moisture-Sensitive Soils)	12
8.3 Faults and Seismicity.....	12
8.4 Radon.....	12
8.5 Erosion.....	13
9.0 BEARING OF GEOLOGIC CONDITIONS UPON PROPOSED DEVELOPMENT.....	13
10.0 ADDITIONAL STUDIES.....	13
11.0 CONCLUSIONS	14
12.0 CLOSING.....	15
 FIGURES	
Site Vicinity Map	1
Proposed Lot Layout	2
Explanation of Test Boring Logs.....	3
Test Boring and Profile Pit Log.....	4
Summary of Laboratory Test Results	5
Soil Classification Data	6

USGS MAP7
 Engineering and Geology Map8
 USDA Soils Survey Map9
 Falcon NW Quadrangle10
 Septic Suitability Map11

APPENDIX A - Additional Reference Documents

APPENDIX B – Site Photos

APPENDIX C - *Soils Report ,0 Halleluiah Trail, El Paso County, Colorado*, prepared by Geoquest, LLC, Job #20-0429, lasted dated May 27, 2020

Profile Pit Evaluation, 0 Halleluiah Trail, El Paso County, Colorado, prepared by Geoquest, LLC, Job #20-0429, lasted dated May 27, 2020

1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in the southeast quarter of Section 8, Township 12 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

1.2 Existing Land Use

The site currently consists of one parcel and is vacant land. The parcel included is:

- Schedule No. 4208000013, and consists of approximately 6.12 acres and is currently partially developed.

The current zoning is "A-5, RR-2.5" – *Agricultural, Residential Rural*.

1.3 Project Description

It is our understanding the parcel is to be subdivided into two lots. Lot 1 is to consist of 3.12 acres and Lot 2 is to consist of 3.00 acres. Each lot is to contain a new single family residence, well and on-site wastewater treatment system (OWTS). The Proposed Lot Layout is presented in Figure 2.

Black Squirrel Creek extends parallel to the southern property line.

2.0 QUALIFICATIONS OF PREPARERS

This Soils and Geology Study was prepared by a professional geologist as defined by Colorado Revised Statutes 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 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 El Paso County 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 that 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 test boring and profile pit by RMG

- Laboratory testing of representative site soil samples by RMG
- Review of previous investigations by Geoquest, LLC
- 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. *Soils Report, 0 Halleluiah Trail, El Paso County, Colorado*, prepared by Geoquest, LLC, last dated May 20, 2020.
2. *Profile Pit Evaluation, 0 Halleluiah Trail, El Paso County, Colorado*, prepared by Geoquest, LLC, last dated May 20, 2020.
3. *Drainage Letter, Jeanette Mose Subdivision*, prepared by RESPEC, last dated March 5, 2020.

3.4 Additional Documents

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

4.0 SITE CONDITIONS

4.1 Existing Site Conditions

The site is currently undeveloped vacant land.

4.2 Topography

Based on the topographic survey completed by Alessi and Associates, Inc., dated February 14, 2020 the site slopes gently down to the southeast with an elevation difference of approximately 21 feet across the entire property.

4.3 Vegetation

The majority of the site consists of low lying native grasses and weeds, ranging in density from fair to good. Three deciduous trees are located near the southern boundary of the property, along Black Squirrel Creek.

4.4 Aerial photographs and remote-sensing imagery

Personnel of RMG reviewed aerial photos available through Google Earth Pro dating back to 1999, CGS surficial geologic mapping, and historical photos by historicaerials.com dating back to 1947. Prior to 1960, the surrounding area was undeveloped. After 1999, the Latigo Equestrian Center and a few single family residences were constructed to the west and north of the subject site. Since 1999, development of

single family residences has continued to the east. The subject site has remained generally undisturbed to the present.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

5.1 Test Borings

The subsurface conditions below Lot 1 were investigated by Geoquest, LLC on May 12, 2020 as part of the site specific *Soil Report* referenced above. RMG performed one test boring on Lot 2 on June 24, 2020. The locations of Geoquest, LLC's and RMG's test borings and profile pits are presented on the Engineering and Geology Map, Figure 8.

The RMG test boring was advanced with a power-driven, continuous-flight auger drill rig to a depth of about 15 to 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 and Profile Pit Log are presented in Figure 4.

5.2 Laboratory Testing

The moisture content for the recovered samples was obtained in the RMG laboratory. RMG performed grain-size analysis and Atterberg Limits tests on selected samples for purposes of classification and to develop pertinent engineering properties. A Summary of Laboratory Test Results is presented in Figure 5. Soil Classification Data are presented in Figure 6.

5.3 Profile Pit Excavations

Two profile pits were observed on Lot 1 by Geoquest, LLC. According to the *Profile Pit Evaluation* report (referenced above), the profile pits were excavated to approximately 8 feet. One additional profile pit was located on Lot 2 by RMG. The profile pit was excavated to approximately 8 feet below the existing ground surface. The RMG profile pit log is presented in the Test Boring and Profile Pit Log, Figure 4. The approximate locations of the profile pits are presented in the Engineering and Geology Map, Figure 8.

5.4 OWTS Visual and Tactile Evaluation

Visual and tactile evaluations were performed on Lot 1 by Geoquest, LLC and on Lot 2 by RMG. The profile pit logs by Geoquest indicated bedrock was encountered at a depth of 34 to 48 inches below the existing surface. Bedrock was not encountered on Lot 2 in the profile pit observed by RMG.

Restrictive layers were encountered in the profile pits. Evidence of groundwater was not observed in the profile pits by Geoquest or RMG. However, seasonal and saturated conditions were reported in both the Geoquest profile pits at a depth of 85 inches. Neither groundwater nor signs of permanent or seasonal saturation were encountered in the profile pit by RMG. A Septic Suitability Map is presented in Figure 12.

6.0 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

6.1 Geologic Conditions

The site physiographically lies in the western portion of the Great Plains Physiographic Province south of the Palmer Divide. Approximately 11 miles to the west is a major structural feature known as the Rampart Range Fault. The fault marks the boundary between the Great Plains Physiographic and Southern Rocky Mountain Province. The site exists within the southeastern edge of a large structural feature known as the Denver Basin. The bedrock underlying the site consists of the Dawson Arkose Formation. Overlying this formation are unconsolidated deposits of residual soils and alluvial soils of the Holocene and late Pleistocene Age. The residual soils are produced by the in-situ action of weathering of the bedrock onsite.

6.2 Subsurface Soil Conditions

The subsurface soils encountered in the RMG test boring were classified using the Unified Soil Classification System (USCS). The laboratory testing performed revealed the on-site soils classified as silty sand (SM) and low plasticity claystone (CL).

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented in the Test Boring and Profile Pit Logs, Figure 4. 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.

6.3 Bedrock Conditions

In general, the bedrock (as mapped by Colorado Geologic Survey - CGS) beneath the area is considered part of the Dawson Formation. Bedrock was encountered in the test borings performed by RMG and Geoquest. Based on review of the Geoquest soils report, referenced herein, the sandstone bedrock was encountered on Lot 1 at depths of 4 to 6 feet below the existing ground surface. Bedrock was encountered in RMG's test boring on Lot 2 at a depth of 7 feet. The bedrock is anticipated to be encountered in basement foundation excavations.

6.4 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:

- 19 – Columbine gravelly sandy loam, 0 to 3 percent slopes. The Columbine gravelly sandy loam was mapped by the USDA to encompass the majority of the property. Properties of the sandy 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 and/or ponding is none, and landforms include fans, floodplain and fan terraces.
- 92 – Tomah-Crowfoot loamy sands, 3 to 8 percent slopes. The Kettle gravelly loamy sand was mapped by the USDA to be located near the northwest property corner. Tomah-Crowfoot loamy sands encompasses less than 1 percent of the property. Properties of the Tomah-Crowfoot loamy sands include, well-drained soil, depth of the water table is anticipated to be greater than 6.5 feet,

runoff is anticipated to be medium, frequency of flooding and ponding is none, and landforms are alluvial fans and hills.

The USDA Soil Survey Map is presented in Figure 9.

6.5 General Geologic Conditions

Based on our field observations and the Geologic Map of the Elbert and Eastonville 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 4.

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

- *Qa – Alluvium, undivided - (early Holocene and late Pleistocene)* - generally poorly sorted sand, silty and clayey sand with beds of very fine to medium pebble-gravel. The alluvium was encountered in the test borings performed by RMG and Geoquest LLC to depths ranging between 4 to 7 feet.
- *TKda – Dawson Formation* – The Dawson Formation underlies the entire site. *Tkda* typically is light gray to tan and typically consists of arkose, arkosic conglomerate, sandstone and interbedded gray claystone seams. The residual soils overlying this formation were derived from the in-situ weathering of the bedrock materials on-site and typically weather to brown or reddish brown.

6.6 Structural Features

Structural features such as schistosity, 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 by RMG for laboratory testing.

6.7 Surficial (Unconsolidated) Deposits

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

6.8 Engineering Geology

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

- 3B – Expansive and potentially expansive soil and bedrock on flat to moderate slopes (0 to 12%).
- 7A – Physiographic floodplain where erosion and deposition presently occur and is generally subject to recurrent flooding. Includes 100-year floodplain along major streams where floodplain studies have been conducted.

The engineering geology is presented in the Engineering and Geology Map, Figure 8.

6.9 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.

6.10 Drainage of Water and Groundwater

The overall topography of the site slopes down from the northwest to the southeast, towards Black Squirrel Creek, which is a defined drainageway extending along the southern boundary. It is anticipated the direction of groundwater flow is also towards Black Squirrel Creek. The creek is not anticipated to adversely impact the placement of the structures on the proposed lots.

If shallow groundwater conditions are found to exist at the time of the lot-specific subsurface soil investigations, the feasibility of basement construction and/or any recommended mitigation measures are to be addressed at that time.

The Geoquest report referenced above indicated groundwater at approximately 9 feet in their test boring TB-1 and at approximately 10 feet below the existing surface in TB-2 during the field exploration. The test boring performed on Lot 2 by RMG for this investigation encountered groundwater at approximately 19 feet below the existing ground surface during the 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.

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 (ECM) 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 anticipated to pose a significant risk to the proposed development:

- Avalanches
- Debris Flows-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

Based on our investigation, the clay soils are anticipated to possess low to moderate expansive potential. Potentially expansive soils may be encountered at depths anticipated to affect foundations. These materials are readily mitigated with typical construction practices common to this region of El Paso County, Colorado.

Mitigation

Shallow foundations are anticipated for the structures proposed on Lot 1 and Lot 2. Foundation design and construction typically can be adjusted for expansive soils. If expansive soils are encountered, mitigation can generally be accomplished by overexcavation and replacement with structural fill, or subexcavation and replacement with on-site moisture-conditioned soils. The final determination of mitigation alternatives and foundation design criteria for the proposed structure on Lot 2 are to be determined in a site-specific subsurface soil investigation.

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

8.2 Hydrocompactive Soils (Moisture-Sensitive Soils)

Based on the test borings performed by RMG and the Geoquest report referenced above, the well graded sand with various amounts of silt and gravel generally possesses low to moderate hydrocompactive potential. It is anticipated that potentially hydrocompactive soils will be encountered at depths anticipated to affect foundations. These materials are readily mitigated with typical construction practices common to this region of El Paso County, Colorado.

Mitigation

Shallow foundations are anticipated for the structures proposed on Lot 1 and Lot 2. Foundation design and construction typically can be adjusted for hydrocompactive soils. If loose or hydrocompactive sands are encountered, mitigation can generally be accomplished by overexcavation and replacement with structural fill or subexcavation and replacement with on-site moisture-conditioned soils. The final determination of mitigation alternatives and foundation design criteria for the proposed structure on Lot 2 are to be determined in a site-specific subsurface soil investigation.

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

8.3 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.

8.4 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 80106 zip code which the site is located in, 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 unusually 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 and crawlspaces, creating slightly positive pressures within structures, and sealing of joints and cracks in the foundations, slabs, and below-grade walls can help mitigate radon hazards.

8.5 Erosion

Due to the fine-grained nature of the soils on the site, the upper sands encountered at the site are susceptible to erosion by wind and flowing water. However, based on the relatively limited flows that have historically been conveyed through the Black Squirrel Creek and its vegetated banks, significant erosion and/or scouring of the tributary is not anticipated.

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 implemented to reduce the occurrence of dust. Installation of erosion protection or vegetation after completion of the structures is anticipated to mitigate the majority of the erosion and dust problems.

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 hydrocompactive and expansive soils, faults, seismicity, and radon were found on the site. Where avoidance is not feasible, it is our opinion that the existing geologic and engineering conditions can be satisfactorily mitigated through proper engineering, design, and contraction practices.

10.0 ADDITIONAL STUDIES

The findings, conclusions and recommendations presented in this report were provided to evaluate the suitability of the site development. Unless indicated otherwise, the test borings, laboratory test results, conclusions and recommendations presented in this report are only intended for the use of the minor subdivision and are *not intended* for use for design and construction of the proposed single family residences or for any future proposed structures. We recommend that a *lot-specific Subsurface Soil Investigation* be performed on Lot 2 for any future structures. The extent of any fill soils encountered

during the lot-specific investigation(s) should be evaluated for suitability to support the proposed structures prior to construction.

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

11.0 CONCLUSIONS

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

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

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

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.

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

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

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

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

FIGURES



NOT TO SCALE



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

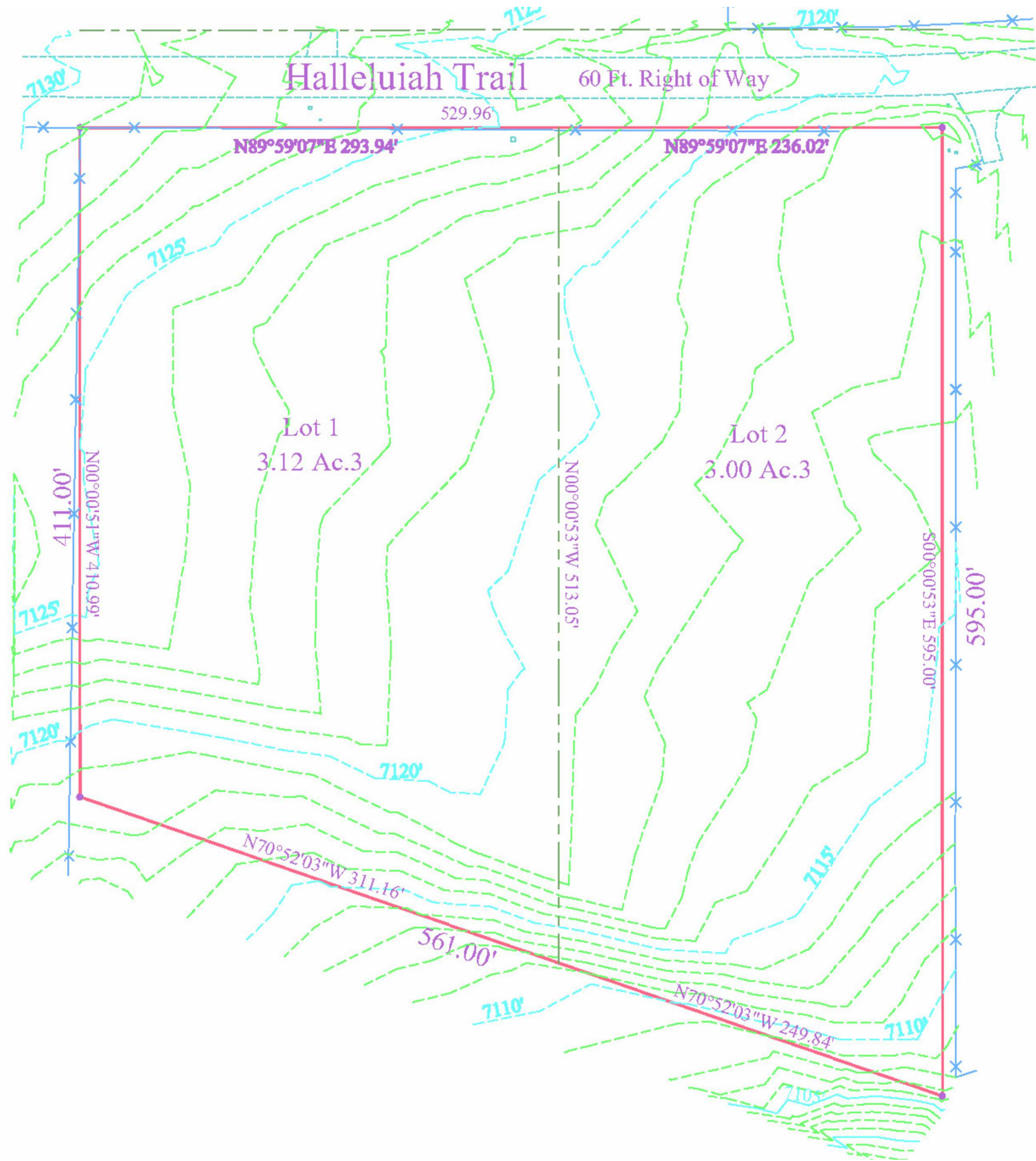
SITE VICINITY MAP

HALLELUIAH TRAIL
JEANETTE MOSE SUBD
EL PASO COUNTY, CO
PERRY MOSE

JOB No. 177316

FIG No. 1

DATE 7-24-2020



NOT TO SCALE

BASE MAP PROVIDED BY ALESSI AND ASSOCIATES, INC.

JOB No. 177316



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





HALLELUJAH TL
JEANETTE MOSE SUBDIVISION
EL PASO COUNTY, CO
PERRY MOSE

ENGINEER:	TFM
DRAWN BY:	KZ
CHECKED BY:	TFM
ISSUED:	1-24-2020
REVISION:	DATE: JOB #:

PROPOSED LOT
LAYOUT







SHEET No.
FIG-2

SOILS DESCRIPTION

-  LOW PLASTICITY CLAY
-  SANDSTONE
-  SILTY TO CLAYEY SAND
-  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



Geotechnical
Materials Testing
Civil, Planning

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

SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

EXPLANATION OF TEST BORING LOGS

JOB No. 177316

FIGURE No. 3

DATE Jul/24/2020

TEST BORING: 1 ELEVATION (FT): DATE DRILLED: 6/24/20 GROUNDWATER @ 19.0' 6/24/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: PP-1 ELEVATION (FT): DATE DRILLED: 6/26/20 NO GROUNDWATER ON 6/26/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, with gravel, brown, dense, moist	5			35	7.3	USDA SOIL TRYPE: SAND USDA SOIL TYPE: 1 USDA STRUCUTRE/GRADE: SINGLE GRAIN/STRUCTURELESS LTAR: 0.8	5				
SANDSTONE, SILTY TO CLAYEY, with gravel, gray to bluish gray, medium hard to hard, moist	10			50/10"	10.1	USDA SOIL TRYPE: SANDY CLAY USDA SOIL TYPE: R-1 USDA STRUCUTRE/GRADE: >35% ROCK (APPROXIMATELY 61%) PRESSURE DISTRIBUTION					
	15			50/11"	14.5	USDA SOIL TRYPE: SAND USDA SOIL TYPE: R0 USDA STRUCUTRE/GRADE: >35% ROCK (APPROXIMATELY 36%) PRESSURE DISTRIBUTION					
	20			50/7"	10.4						

ROCKY MOUNTAIN GROUP

Architectural
Structural
Forensics



Geotechnical
Materials Testing
Civil, Planning

Colorado Springs - (Corporate Office)
2910 Austin Bluffs Parkway
Colorado Springs, CO 80918
(719) 548-0600

SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

TEST BORING AND PROFIL PIT LOG

JOB No. 177316

FIGURE No. 4

DATE Jul/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	7.3		NP	NP	0.5	28.2			SM
1	9.0	10.1								
1	14.0	14.5								
1	19.0	10.4								

ROCKY MOUNTAIN GROUP

ARCHITECTS
RMG
ENGINEERS

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

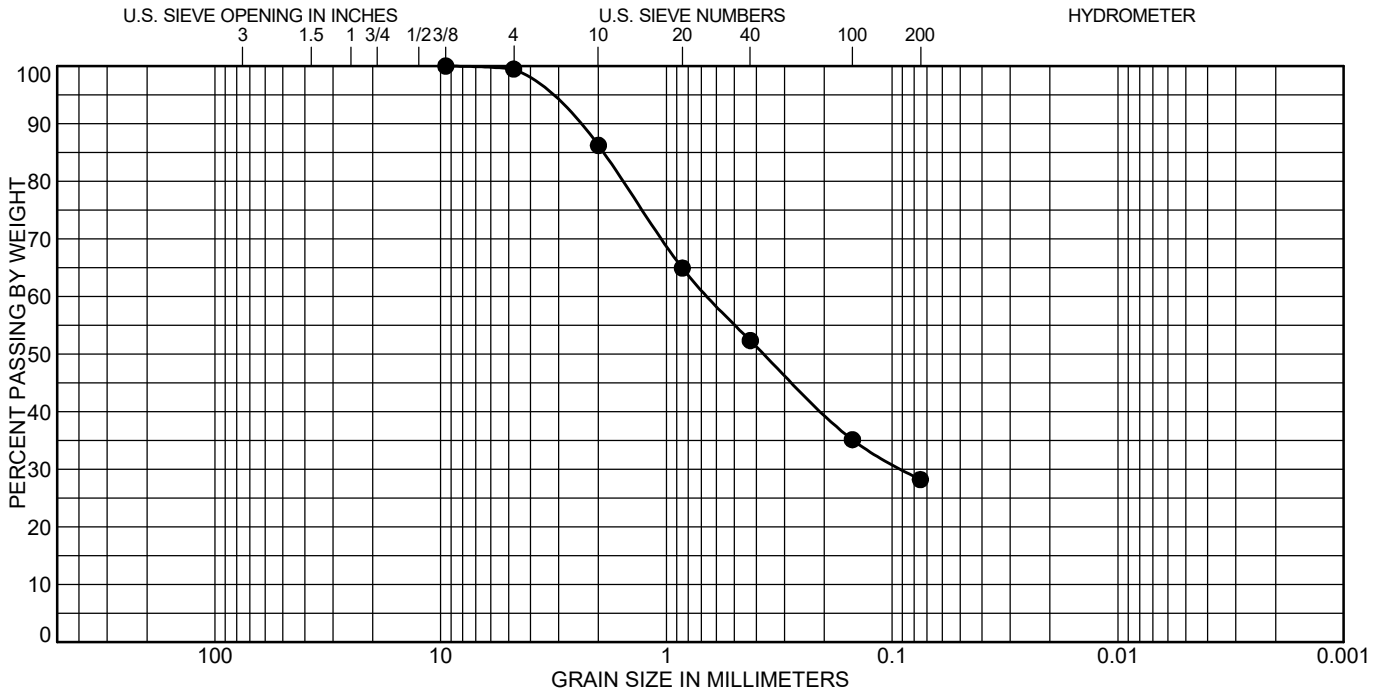
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

Geotechnical
Materials Testing
Civil, Planning

Architectural
Structural
Forensics

SUMMARY OF LABORATORY TEST RESULTS

JOB No. 177316
 FIGURE No. 5
 PAGE 1 OF 1
 DATE Jul/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

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● 1	4.0	0.5	71.3	28.2	

ROCKY MOUNTAIN GROUP

ARCHITECTS



ENGINEERS

Geotechnical
Materials Testing
Civil, Planning

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

SOIL CLASSIFICATION DATA

JOB No. 177316

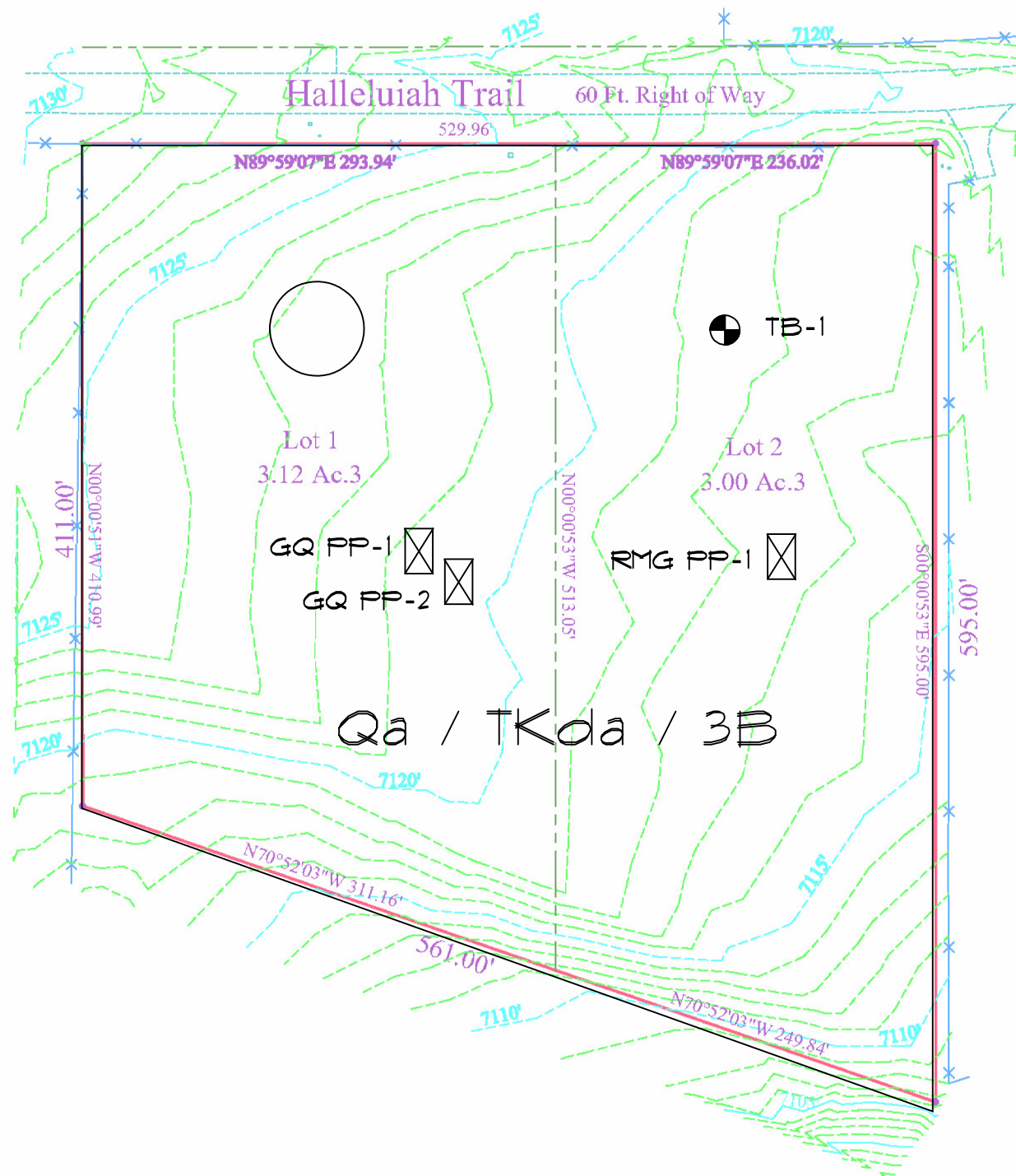
FIGURE No. 6

DATE Jul/24/2020



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



Geologic

- *Qa - Alluvium, undivided - (early Holocene and late Pleistocene)* - generally poorly sorted sand, silty and clayey sand with beds of very fine to medium pebble-gravel. The alluvium was encountered in the test borings performed by RMG and Geoquest LLC to depths ranging between 4 to 7 feet.
- *TKda - Dawson Formation* - The Dawson Formation underlies the entire site. *Tkda* typically is light gray to tan and typically consists of arkose, arkosic conglomerate, sandstone and interbedded gray claystone seams. The residual soils overlying this formation were derived from the in-situ weathering of the bedrock materials on-site and typically weather to brown or reddish brown.

Engineering

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

⊕ DENOTES APPROXIMATE LOCATION OF TEST BORING PERFORMED FOR THIS INVESTIGATION

○ DENOTES APPROXIMATE LOCATION OF TEST BORING PERFORMED BY GEOQUEST, LLC, JOB #20-0429, DATED MAY 27, 2020

⊠ DENOTES APPROXIMATE LOCATION OF A PROFILE PIT PERFORMED FOR THIS INVESTIGATION

⊠ DENOTES APPROXIMATE LOCATION OF PROFILE PITS PERFORMED BY GEOQUEST, LLC, JOB #20-0429, DATED MAY 27, 2020



NOT TO SCALE

BASE MAP PROVIDED BY: GOOGLE AND ALESSI AND ASSOCIATES, INC.

HALLELUJAH TL
 JEANETTE MOSE SUBDIVISION
 EL PASO COUNTY, CO
 PERRY MOSE

ENGINEER:	TFM
DRAWN BY:	KZ
CHECKED BY:	TFM
ISSUED:	1-24-2020
REVISION:	DATE:
	JOB #:

ENGINEERING AND GEOLOGY MAP

SHEET No.

FIG-8



- 19 - Columbine gravelly sandy loam, 0 to 3 percent slopes.
- 92 - Tomah-Crowfoot loamy sands, 3 to 8 percent slopes.



NOT TO SCALE
BASE MAP PROVIDED BY: USDA



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 SOIL SURVEY MAP

0 HALLELUIAH TRAIL
JEANETTE MOSE SUBD
EL PASO COUNTY, CO
PERRY MOSE

JOB No. 177316

FIG No. 9

DATE 7-21-2020



NOT TO SCALE
 BASE MAP PROVIDED BY: CGS



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

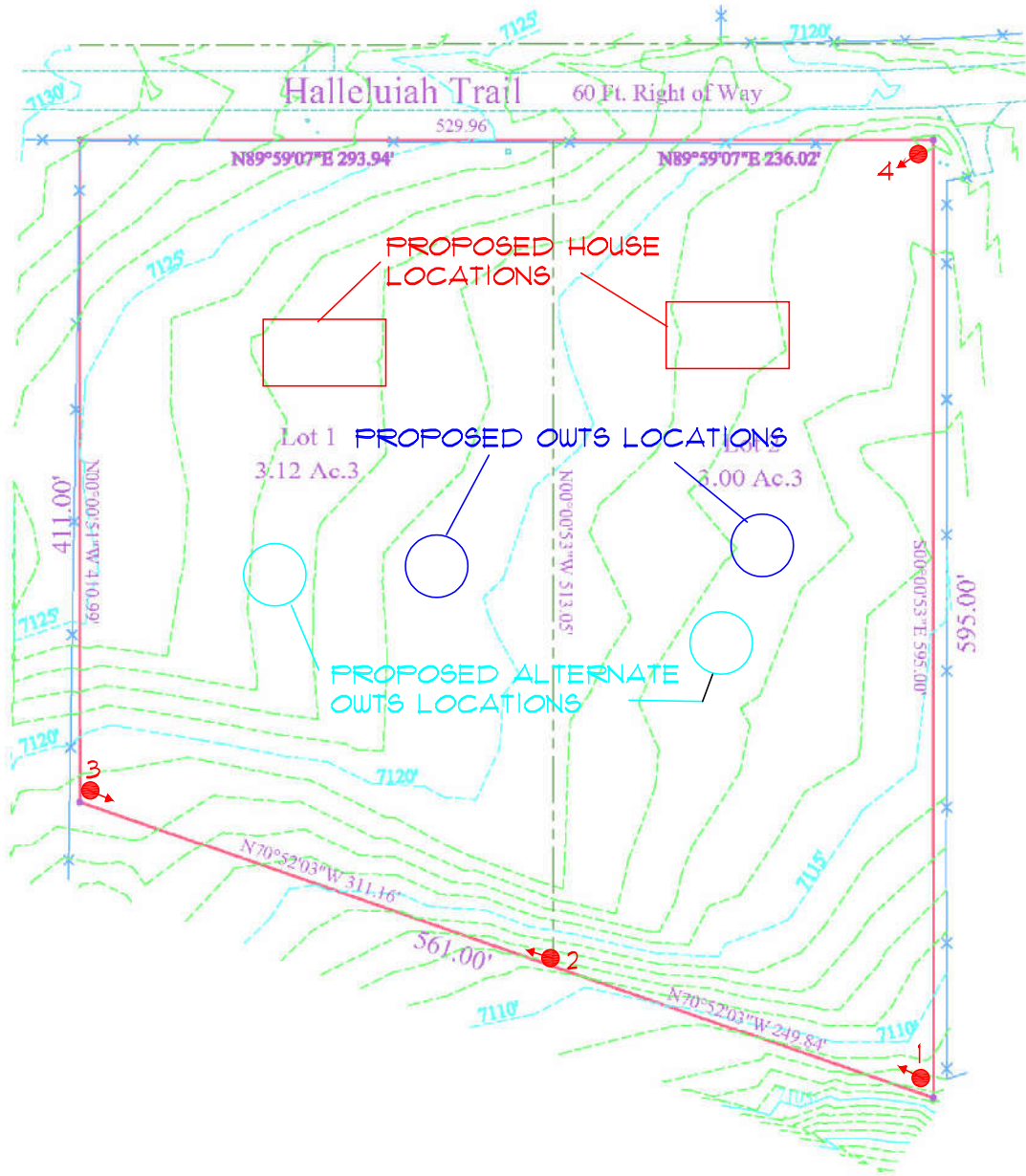
EASTONVILLE QUADRANGLE

HALLELUJAH TRAIL
 JEANETTE MOSE SUBD
 EL PASO COUNTY, CO
 PERRY MOSE

JOB No. 177316

FIG No. 10

DATE 7-24-2020



NOT TO SCALE
BASE MAP PROVIDED BY: ALESSI AND ASSOCIATES, INC.



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

SEPTIC SUITABILITY MAP

HALLELUIAH TRAIL
JEANETTE MOSE SUBD
EL PASO COUNTY, CO
PERRY MOSE

JOB No. 177316

FIG No. 11

DATE 7-24-2020

APPENDIX A

Additional Reference Documents

1. *Jeanette Mose Subdivision*, prepared by Alessi and Associates, Inc., Job No. 201005, last dated February 14, 2020.
2. *Drainage Letter, Jeanette Mose Subdivision*, prepared by RESPC., Project No. 03925.4, last dated March 5, 2020.
3. *Soils Report ,0 Halleluiaah Trail, El Paso County, Colorado*, prepared by Geoquest, LLC, Job #20-0429, lasted dated May 27, 2020
4. *Profile Pit Evaluation, 0 Halleluiaah Trail, El Paso County, Colorado*, prepared by Geoquest, LLC, Job #20-0429, lasted dated May 27, 2020
5. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 081041C0339G*, Federal Emergency Management Agency (FEMA), effective December 7, 2018.
6. *Geologic Map of the Eastonville Quadrangle, El Paso County, Colorado*, Morgan, M.L, and Barkmann, P.E., 2012. Colorado Geological Survey Open-File Report OF-12-03.
7. *Elbert and Eastonville, Quadrangle, Environmental and Engineering Geologic Map for Land Use*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
8. *Elbert and Eastonville Quadrangles, 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.spatalest.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, 1952, 1955, 1960, 1968, 1999, 2005, 2009, 2011, 2013, and 2015.
13. *USGS Historical Topographic Map Explorer*: <http://historicalmaps.arcgis.com/usgs/> Colorado Springs Quadrangles dated 1894, 1913, 1944, 1975, and 1983.
14. *Google Earth Pro*, Imagery dated 1999, 2004, 2005, 2006, 2011, 2013, 2015, 2017 and 2019.

APPENDIX B

Site Photos – June 26, 2020



Photo 1



Photo 2



Photo 3



Photo 4

APPENDIX C

Soils Report and Profile Pit Evaluation, prepared by Geoquest, LLC



27 May 2020

6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

Perry Mose
12752 Mount Oxford Place
Peyton, Colorado 80831

RE: Soil Test Receipt, 0 Halleluiah Trail, Geoquest #20-0429

Dear Sir,

Thank you for choosing Geoquest to perform the Soils Report for the property at the above location.

The attached Soils Report provided by Geoquest, LLC, has been prepared in accordance with the standard of practice. This report does not address possible geologic hazards, environmental hazards, or drainage that exist on-site. There are specific requirements for the design and construction of the foundation of a structure at the location noted in the report. Some of these requirements are placed on the homeowner of the property and may be outside of the builders' control. **Accordingly, we are requiring both the builder and the homeowner to sign this letter indicating both parties have accepted a copy of the report, have read and understood the contents, and know they each have specific responsibilities. Failure to follow the recommendations and requirements of the report by any party can result in unsatisfactory performance of the foundation or building components. Builder and Owner understand the risks, as noted in the Soils Report, and accept all risk, including movement of slabs.**

After the excavation has been completed an **Open Hole Observation is required** to be performed by the Soils Engineer. **After the Open Hole Observation is complete, the owner/builder should inform the Foundation Engineer of any changes to the soil conditions or allowable bearing. The Open Hole Observation is an additional cost.**

Geoquest, LLC, will not provide any documentation for site inspections until we have received this letter with the required signatures. If the property is being developed as a speculative investment and no homeowner has been contracted to purchase the property, you can indicate that under the homeowner signature line. Upon the sale of the property the builder understands that both this letter and a copy of the Soils Report shall be provided to the buyer, and a homeowner signed copy returned to Geoquest, LLC.

If you have any questions, feel free to contact us at (719) 481-4560.

Sincerely,

Charles E. Milligan, P.E.
Civil Engineer

Builder Representatives

Homeowner(s)



6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

SOILS REPORT

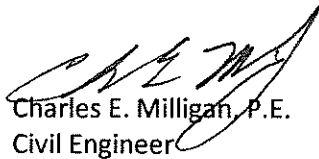
FOR

PERRY MOSE

JOB #20-0429

0 Halleluiah Trail,
El Paso County,
Colorado

Sincerely,


Charles E. Milligan, P.E.
Civil Engineer

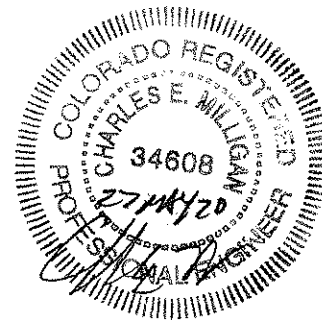


TABLE OF CONTENTS

INTRODUCTION	1
CONCLUSIONS	1
GENERAL	1
FIELD AND LABORATORY INVESTIGATION	1
TOPOGRAPHY	1
WEATHER	1
DESIGN AND CONSTRUCTION CONSIDERATIONS	2
RECOMMENDATION REMARKS	2-3
COLD TEMPERATURE CONSIDERATIONS	3
SURFACE DRAINAGE	3
SUBSURFACE DRAINAGE	3
REINFORCING	4
FOOTING DESIGN	4
CONSTRUCTION DETAILS	4
MINIMUM MATERIALS SPECIFICATIONS	4
OPEN HOLE OBSERVATION	4
FINAL OBSERVATIONS	4
LOGS	5
SITE MAP	6
SIEVE ANALYSIS RESULTS	7
EXTERIOR DRAIN DETAILS	8
LIMITATIONS	9

INTRODUCTION

The owners must be made aware of the contents of this report. If there are any questions or concerns regarding the information in this report, please contact Geoquest, LLC. It is the responsibility of the contractor on this project to make subsequent owners aware of the contents of this report. This is to ensure that the recommendations and requirements of the report, especially regarding the surface drainage, are acknowledged and followed. This report is prepared for Perry Mose, owner, 0 Halleluia Trail, El Paso County, Colorado. This report is prepared with the understanding that a single-family residence is planned for this site. The site is currently vacant.

CONCLUSIONS

Due to encountering groundwater at the depth of 9 feet, the excavation and the placement of the foundation components must not penetrate more than 5 feet. Additional drainage may be required during construction due to the high moisture content. If the bottom of the excavation becomes unstable, the use of 1' to 2' of 4" to 8" ballast rock may be required.

A satisfactory foundation for this structure is a properly designed shallow foundation system consisting of foundation components resting directly on undisturbed materials. Foundation components resting directly on undisturbed materials shall be designed for a loading of not greater than 1,500 pounds per square foot. Any design by any engineer is subject to revision based on the results of the open hole observation. The compressibility of this material is low. This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The depth of foundation elements shall be determined by the foundation engineer but should be at least as deep as the minimum depth required by the governing building authority. The laboratory testing revealed that the on-site soil is silty sand (U.S.C.S. Classification Symbol SM). The unit weight of equivalent fluid soil pressure of this material is 40 pounds per cubic foot. The owners shall be made aware that movement will occur if surface or subsurface water is allowed to collect around the foundation wall.

GENERAL

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

FIELD AND LABORATORY INVESTIGATION

Two exploratory holes were drilled on May 12, 2020, at the locations shown on the enclosed site map. The location of these test holes was determined by Perry Mose. The test holes were drilled with a 3-inch diameter auger. At intervals anticipated to be the foundation depths, and as determined by the soils conditions, the drill tools were removed, and samples were taken by the use of a 2-inch split barrel sampler connected to a 140-pound drop-hammer. This hammer is dropped 30 inches to drive the penetration sampler into the soil (ASTM D-1586). The depths and descriptions of the materials encountered in each test boring at which the samples were taken are shown on the enclosed logsheets. All samples were classified both in the field and in the laboratory to evaluate the physical and mechanical properties of the materials encountered.

Mitigation should be added as a plat note

TOPOGRAPHY

The topography of this site is that of an incline sloping down towards the east at 2%.

WEATHER

The weather at the time of the soil examination consisted of partly cloudy skies with moderate temperatures.

Hazard areas that cannot be mitigated must be shown on plat as no-build areas. Please provide graphic indicating hazard areas within site.

DESIGN AND CONSTRUCTION CONSIDERATIONS

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

1. Slabs shall be placed on well-compacted, non-expansive materials, and all soft spots shall be thoroughly excavated and replaced with non-expansive fill materials as stated above.
2. Slabs shall be separated from all foundation walls, load bearing members, and utility lines.
3. At intervals not to exceed 12 feet in each direction, provide control joints to reduce problems with shrinkage and curling as recommended by the American Concrete Institute (ACI). Moisten the ground beneath the slab prior to placement of concrete.
4. All concrete placed must be cured properly as recommended by the American Concrete Institute (ACI). Separate load bearing members from slabs, as discussed above. Care must be exercised to prevent excess moisture from entering the soil under the structure, both during and after construction.
5. Due to the exposure of exterior concrete to variations in moisture fluctuations, heaving and cracking of exterior slabs-on-grade should be expected. Placement of at least 3 feet of non-expansive fill beneath the slabs can help to reduce the impact of differential movement and cracking but may not eliminate movement. Exterior concrete shall slope away from the structure a minimum of 2% grade.
6. The silty sand (SM) has been analyzed for its expansion and/or consolidation potential. Basement slabs, garage slabs, and all concrete floor slabs, however, exert a very low dead-load pressure on the soil. Since this soil contains at least a small amount of swell potential, slabs will crack and heave or settle if excess water is allowed to penetrate the sub-grade. For example, column openings to pads below the placed slab, if exposed to precipitation during construction, will conduct water to the sub-grade, possibly causing it to expand. Also, if the slab is placed with concrete too wet, expansion may occur. We recommend 3,000 psi concrete placed at a maximum slump of 4 inches.

RECOMMENDATION REMARKS

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

RECOMMENDATION REMARKS (CONTINUED)

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

Geoquest, LLC does not assure that the contractor and/or homeowner will comply with the recommendations provided in this report. Geoquest, LLC provides recommendations and requirements only and does not supervise, direct or control the implementation of the recommendations.

COLD TEMPERATURE CONSIDERATIONS

1. Concrete shall not be placed upon frozen soil.
2. Concrete shall be protected from freezing until it has been allowed to cure for at least 7 days after placement in forms.
3. Snow or other frozen water shall not be allowed in the forms during placement of concrete.
4. Concrete shall be cured in forms for at least 72 hours.
5. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.
6. The site shall be kept well drained at all times.

SURFACE DRAINAGE

After construction of foundation walls, the backfill material shall be well compacted to 80% Modified Proctor density, to reduce future settlement. Any areas that settle after construction shall be filled to eliminate ponding of water adjacent to the foundation walls. **The finished grade shall have a positive slope away from the structure with an initial slope of 6 inch in the first 10 feet.** If a 10 foot zone is not possible on the upslope side of the structure, then a well-defined swale should be created a minimum of 5 feet from the foundation and sloped parallel with the wall at a 2% grade to intercept the surface water and carry it around and away from the structure. Homeowners shall maintain the surface grading and drainage installed by the builder to prevent water directed in the wrong direction. All downspouts shall have splash blocks that will remove runoff to outside the foundation area and carried across backfill zones. No irrigation devices shall be placed within 10 feet of the foundation. Shrubs and plants requiring minimal watering shall be established in this area. Irrigated grass shall not be located within 5 feet of the foundation. Sprinklers shall not discharge water within 5 feet of the foundation. Irrigation should be limited to the minimum amount sufficient to maintain vegetation. Application of more water will increase likelihood of floor slab and foundation movement.

All exterior grading and location of downspouts and their performance shall be inspected by Geoquest, LLC. It is the responsibility of the contractor to schedule all inspections.

SUBSURFACE DRAINAGE

Perimeter drains are required around all walls of the living area portion of the structure that are below finished grade including all common wall(s) adjacent to the basement. Crawlspace are not considered living area. Walkout areas need not be drained unless specified at the time of the Open Hole Observation. The final determination of the necessity for perimeter drains will be made at the time of the Open Hole Observation.

REINFORCING

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

FOOTING DESIGN

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

CONSTRUCTION DETAILS

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

MINIMUM MATERIALS SPECIFICATIONS

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

OPEN HOLE OBSERVATION (added cost)

If anyone other than Geoquest, LLC, performs the Open Hole Observation, that person/company assumes liability for the soils, and any possible changes to the foundation design.

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

FINAL OBSERVATIONS

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



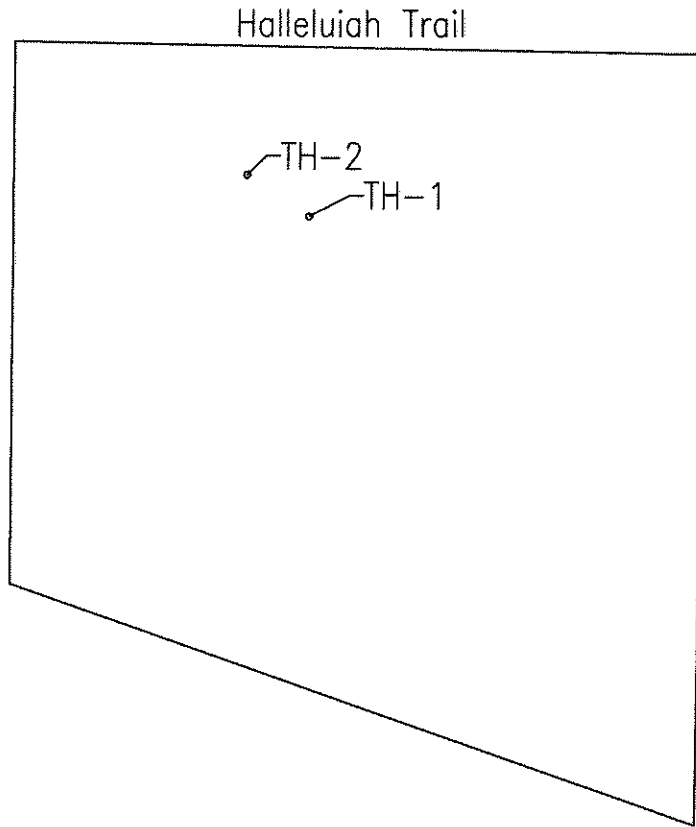
DRILL LOGS

JOB #: 20-0429	DEPTH (in ft.)	SYMBOL	SAMPLES	BLOW COUNT	WATER %	SOIL TYPE
TEST BORING NO.: TH-1						
DATE: 5/12/2020						
<u>0"-8" Topsoil</u>	0-8	X				
<u>8"-4' Sand</u>	8-4					
Fine-coarse grained Very high density Low-moderate moisture content Low-moderate clay content Low-moderate plasticity Brown color	2-4			20 12"	5.5	
<u>4'- 15' WxSS (SM)</u>	4-15					
Fine-coarse grained High density High moisture content Low-moderate clay content Low plasticity Light Brown color Oxidized @6' Groundwater @9'	8-15			Bag 12"	18.8	SM

JOB #: 20-0429	DEPTH (in ft.)	SYMBOL	SAMPLES	BLOW COUNT	WATER %	SOIL TYPE
TEST BORING NO.: TH-2						
DATE: 5/12/2020						
<u>0"-8" Topsoil</u>	0-8	X				
<u>8"-6' Sand (SM)</u>	8-6					
Fine-coarse grained Moderate density Moderate-high moisture content Low-moderate clay content Low-moderate plasticity Brown color	2-6			20 12"	12.7	SM
<u>6'- 15' WxSS</u>	6-15					
Fine-coarse grained High density High moisture content Low-moderate clay content Low plasticity Light Brown color Oxidized @5' Groundwater @10'	8-15			Bag 12"	18.0	

GEOQUEST LLC
SITE MAP

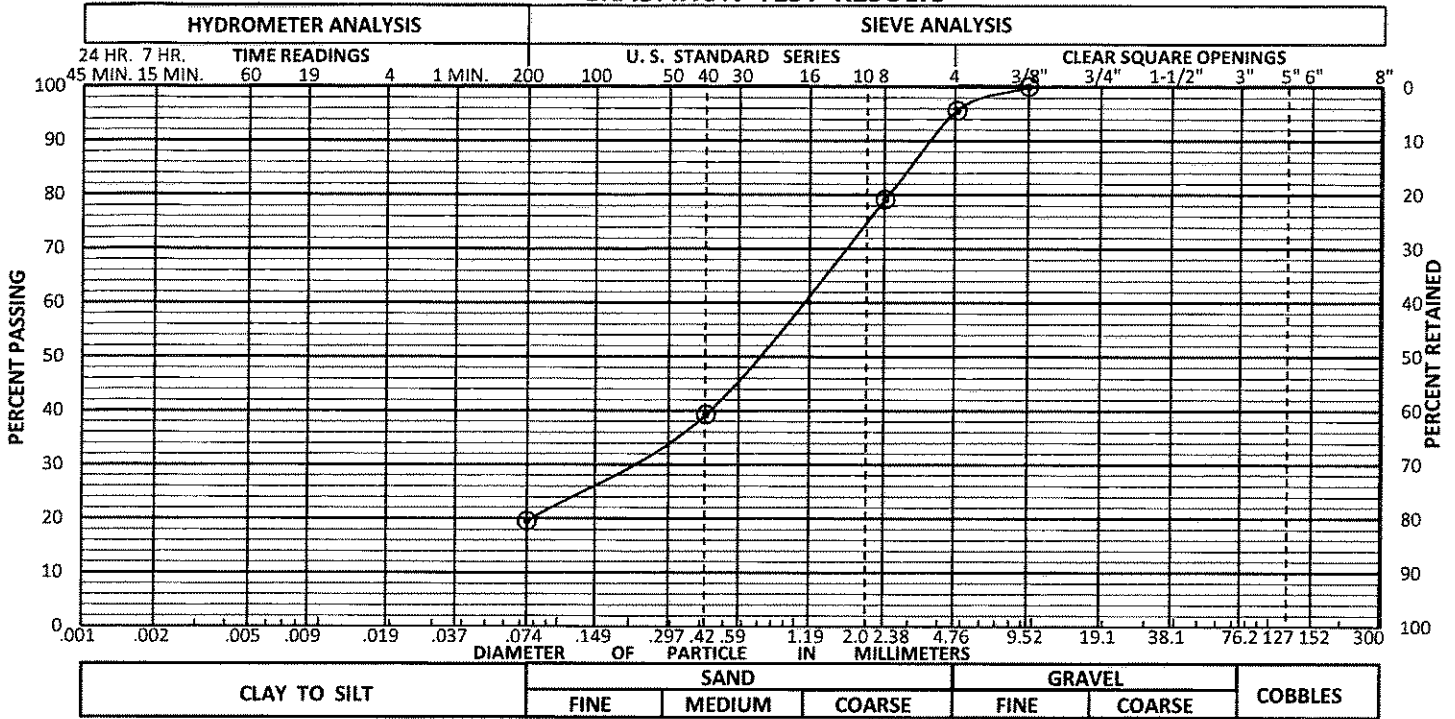
0 Halleluiah Trail
El Paso County
Colorado
Job #20-0429



0 50 100 150
GRAPHIC SCALE IN FEET
SCALE: 1" = 150'

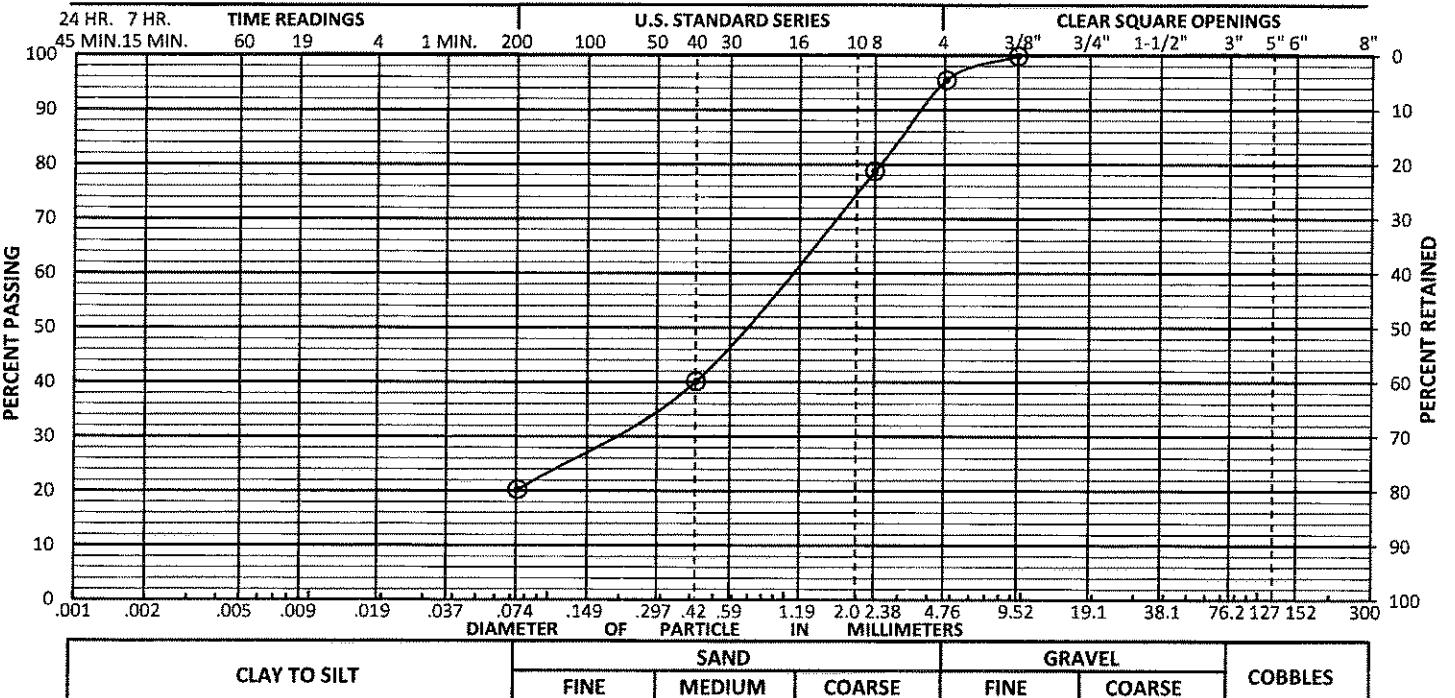
GEOQUEST LLC

GRADATION TEST RESULTS



CLASSIFICATION SM
 GRAVEL 4.4 %
 SAND 76.1 %
 FINES 19.5 %
SAMPLE # 1 **HOLE #** TH-1 **DEPTH** 12 FEET

NOTES: 18.8 % Moisture Content



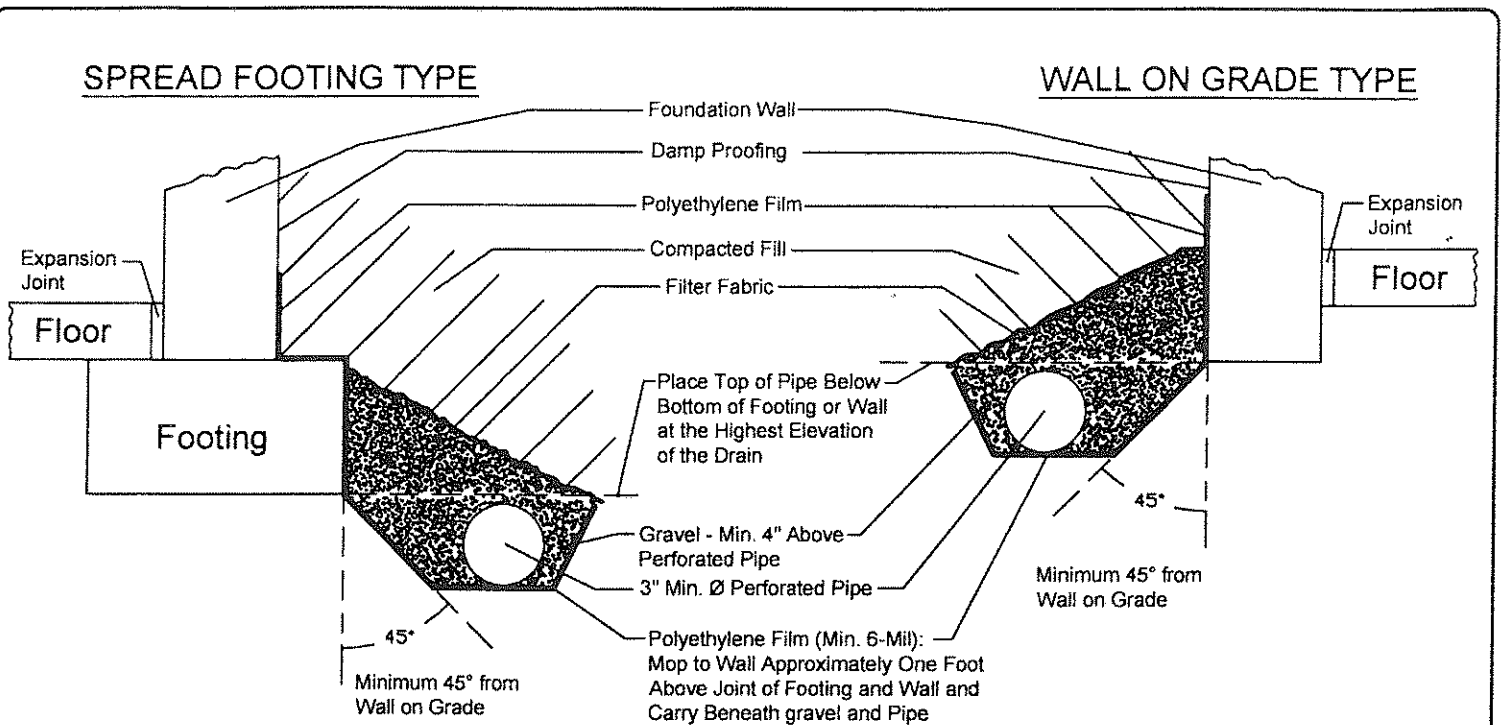
CLASSIFICATION SM
 GRAVEL 4.6 %
 SAND 75.2 %
 FINES 20.2 %
SAMPLE # 1 **HOLE #** TH-2 **DEPTH** 4 FEET

NOTES: 12.7 % Moisture Content

Job #: 20-0429 **By:** MJ **5/12/2020**



EXTERIOR DRAIN DETAIL



1. Gravel to be Not More Than 1-1/2" and Not Less Than 1/2" Diameter.
2. Perforated Pipe Diameter Varies With Expected Seepage. 3"Ø and 4"Ø are Most Common. ABS and PVC are Most Common Materials for Pipe. We approve the use of an "EZ Flow Drainage System" by Infiltrator. All specifications in this drain detail are still applicable.
3. Pipe to be Laid out in a Minimum Slope of 1" in 10'.
4. Gravity Outfall is Desired if Possible. Portion of Pipe in Area Not Drained Shall be Non-Perforated. Daylight Must be Maintained Clear of Debris in Order to Function Properly.
5. If Gravity Outfall is Not Possible, Provide a Sump With Operational Pump. Pump May Not Connect to Any Sanitary or Storm Sewer.
6. Soil Backfill Should be Compacted to at Least 80% of the Modified Proctor Denisty in the Upper Three Feet of Fill.
7. Filter Fabric to be Mirafi 140s or Approved Equivalent. Roofing Felt and Sheet Plastic are Not Acceptable.
8. Drain Pipe Shall be Laid Below Protected Area, as Shown in The Detail Above.
9. Mop Polyethylene Film to Wall Approximately One Foot Above Joint of Footing and Wall (Do Not Pull Plastic Tight) and Carry Beneath Gravel and Pipe.
10. The Polyethylene Film Shall be Continued to the Edge of the Excavation.

LIMITATIONS

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

This report was prepared in accordance with generally accepted professional geotechnical/engineering methods. However, Geoquest, LLC makes no other warranty, express or implied, as to the findings, data, specifications, or professional advice rendered hereunder.

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

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



6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

PROFILE PIT EVALUATION

FOR

PERRY MOSE

JOB #20-0429

O Halleluiah Trail,
El Paso County,
Colorado

Sincerely,


Charles E. Milligan, P.E.
Civil Engineer



PROFILE PIT FINDINGS

Enclosed are the results of the profile pit for the septic system to be installed at **0 Halleluiah Trail, El Paso County, Colorado**. The location of the test pit was determined by Perry Mose. The residence will not be on a public water system. The number of bedrooms in the design for the residence is unknown. Due to the natural slope of the property, the entire system will feed to the southeast at approximately 4% at least 20 feet. All applicable portions of the El Paso County Health Department Onsite Wastewater Treatment System Regulations (OWTS) must be complied with for the installation of the treatment system.

The inspection was performed on May 12, 2020, in accordance with Table 10-1 of the **E.P.C.P.H. OWTS Regulations**.

Soil Profile #1:

- 0 to 6"** - Topsoil - loam, organic composition.
- 6" to 34"** - USDA soil texture sandy loam, soil type 2A, structure shape granular, structure grade 1, non-cemented, LTAR 0.50, light brownish grey in color, 10 YR 6/2.
- 34" to 8'** - USDA soil texture sandy loam, soil type 2A, structure shape massive, structure grade 0, moderately cemented, LTAR 0.50, pale brown in color, 2.5 Y 7/4, sandstone.

Soil Profile #2:

- 0 to 6"** - Topsoil - loam, organic composition.
- 6" to 48"** - USDA soil texture sandy loam, soil type 2, structure shape granular, structure grade 2, non-cemented, LTAR 0.60, light brownish grey in color, 10 YR 6/2.
- 48" to 8'** - USDA soil texture sandy loam, soil type 2A, structure shape massive, structure grade 0, moderately cemented, LTAR 0.50, light yellowish brown in color, 2.5 Y 6/4, redoximorphic features and saturation at 85 inches, sandstone.

Groundwater was encountered at the depth of 85 inches in Profile Pit #2 during the inspection. Bedrock was encountered at the depth of 34 inches in Profile Pit #1 and 48 inches in Profile Pit #2 during the inspection. No known wells were observed within 100 feet of the proposed system. **All setbacks shall conform to county regulations.**

Due to encountering bedrock, the septic system to be installed on this site shall be designed by a Colorado Licensed Engineer. Based on the observed conditions, we feel a design based on an LTAR of 0.50 GPD/SF (USDA 2A, treatment soil, treatment level 1) is reasonable. An above grade uniformly pressure dosed soil treatment area is required.

If during construction of the field itself, subsurface conditions change considerably or if the location of the proposed field changes, this office shall be notified to determine whether the conditions are adequate for the system as designed or whether a new system needs to be designed.

Weather conditions at the time of the test consisted of partly cloudy skies with moderate temperatures.

PROFILE PIT LOG - Profile Pit #1

JOB#: 20-0429
 DATE EVALUATED: 12 May 2020
 EQUIPMENT USED: MINI-EXCAVATOR

0-6" TOPSOIL

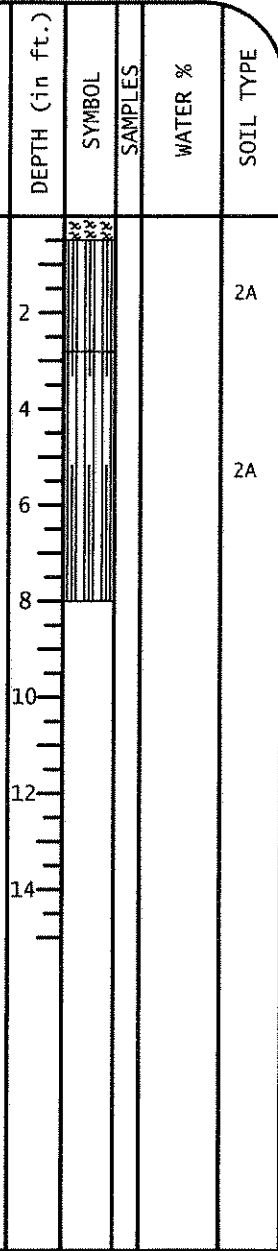
Loam
 Organic Composition

6"-34" Sand

Fine-coarse Grained	USDA Soil Texture: Sandy Loam
Moderate Density	USDA Soil Type: 2A
Moderate Moisture Content	USDA Structure Shape: Granular
Low-moderate Clay Content	USDA Structure Grade: 1
Low-moderate Cohesion	Cementation Class: Non-cemented
Low-moderate Plasticity	Long Term Acceptance Rate (LTAR, Treatment Level 1): 0.50
Light Brownish Grey Color	
10YR 6/2	

34"-8' Sandstone

Fine-coarse Grained	USDA Soil Texture: Sandy Loam
High Density	USDA Soil Type: 2A
High Moisture Content	USDA Structure Shape: Massive
Low-moderate Clay Content	USDA Structure Grade: 0
Low-moderate Cohesion	Cementation Class: Moderately
Low-moderate Plasticity	Long Term Acceptance Rate (LTAR, Treatment Level 1): 0.50
Pale Brown Color	
2.5Y 7/4	



LTAR to be Used for OWTS Sizing: 0.50GPD/SF (USDA Type 2A, Treatment soil, Treatment Level 1)
Depth to Groundwater (Permanent or Seasonal): Not Encountered; Seasonal & Saturated @ 85" in Profile Pit 2
Depth to Bedrock and Type: Sandstone @ 34"
Depth to Proposed Infiltrative Surface from Ground Surface: Above Grade (Uniformly pressure dosed STA)
Soil Treatment Area Slope and Direction: SE @ 4%

Note: See El Paso County Board of Health Regulation Chapter 8: On-Site Wastewater Treatments Systems (OWTS) Regulations for Additional Information. Refer to Table 10-1 for Corresponding LTAR if Treatment Level 2, 2N, 3, or 3N will be Implemented in the Design of the OWTS. System Sizing Depends on a Number of Factors (i.e. LTAR, # of Bedrooms, Type of Soil Treatment Area (STA), Method of Transfer to the STA (Gravity, Dosed, or Pressure Dosed), and Type of Storage / Distribution Media Used in the STA)

Project: 20-0429	Project Name and Address Perry Mose 0 Halleluiah Trail Sch. No. 4208000013 El Paso County, Colorado
Sheet: 1 of 2	
Date: 19 May 2020	
Scale: 1/4" = 1'	
Drawn by: mtj	
Checked by: cem	

GEOQUEST, LLC.	
6825 SILVER PONDS HEIGHTS SUITE 101 COLORADO SPRINGS, CO 80908	
OFFICE: (719) 481-4560 FAX: (719) 481-9204	

PROFILE PIT LOG - Profile Pit #2

JOB#: 20-0429
 DATE EVALUATED: 12 May 2020
 EQUIPMENT USED: MINI-EXCAVATOR

DEPTH (in ft.)	SYMBOL	SAMPLES	WATER %	SOIL TYPE
0-6"	TOPSOIL			
	Loam Organic Composition			2A
6"-48"	Sand			2A
	Fine-coarse Grained Moderate Density Moderate Moisture Content Low-moderate Clay Content Low Cohesion Low Plasticity Light Brownish Grey Color 10YR 6/2			
	USDA Soil Texture: Sandy Loam USDA Soil Type: 2 USDA Structure Shape: Granular USDA Structure Grade: 2 Cementation Class: Non-cemented Long Term Acceptance Rate (LTAR, Treatment Level 1): 0.60			
48"-8'	Sandstone			
	Fine-coarse Grained High Density High Moisture Content Low-moderate Clay Content Low-moderate Cohesion Low-moderate Plasticity Light Yellowish Brown Color 2.5Y 6/4			
	USDA Soil Texture: Sandy Loam USDA Soil Type: 2A USDA Structure Shape: Massive USDA Structure Grade: 0 Cementation Class: Moderately Long Term Acceptance Rate (LTAR, Treatment Level 1): 0.50 Redox & Saturated @ 85"			

LTAR to be Used for OWTS Sizing: 0.50GPD/SF (USDA Type 2A, Treatment soil, Treatment Level 1)
Depth to Groundwater (Permanent or Seasonal): Seasonal & Saturated @ 85"
Depth to Bedrock and Type: Sandstone @ 48"
Depth to Proposed Infiltrative Surface from Ground Surface: Above Grade (Uniformly pressure dosed STA)
Soil Treatment Area Slope and Direction: SE @ 4%

Note: See El Paso County Board of Health Regulation Chapter 8: On-Site Wastewater Treatments Systems (OWTS) Regulations for Additional Information. Refer to Table 10-1 for Corresponding LTAR if Treatment Level 2, 2N, 3, or 3N will be Implemented in the Design of the OWTS. System Sizing Depends on a Number of Factors (i.e. LTAR, # of Bedrooms, Type of Soil Treatment Area (STA), Method of Transfer to the STA (Gravity, Dosed, or Pressure Dosed), and Type of Storage / Distribution Media Used in the STA)

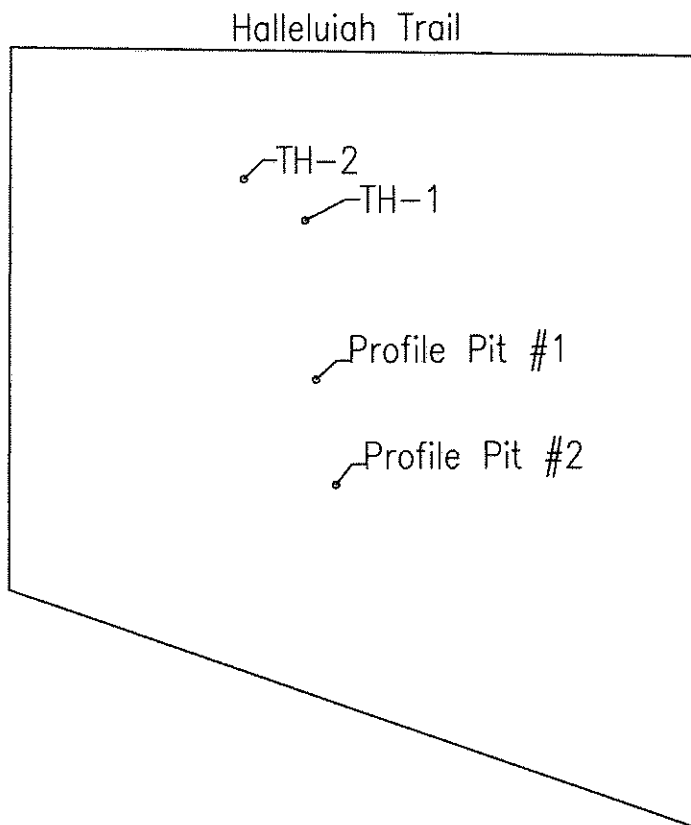
Project: 20-0429
 Sheet: 2 of 2
 Date: 19 May 2020
 Scale: 1/4" = 1'
 Drawn by: mtj
 Checked by: cem

Project Name and Address
Perry Mose
 0 Halleluiah Trail
 Sch. No. 4208000013
 El Paso County, Colorado

GEOQUEST, LLC.
 6825 SILVER PONDS HEIGHTS
 SUITE 101
 COLORADO SPRINGS, CO
 80908
 OFFICE: (719) 481-4560
 FAX: (719) 481-9204

GEOQUEST LLC
SITE MAP

0 Halleluiah Trail
El Paso County
Colorado
Job #20-0429



Location from Southeast Lot Corner to Profile Pit #1:

N. 40° W. - 451'

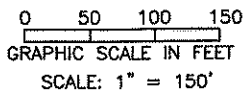
Location from Profile Pit #1 to Profile Pit #2:

S. 10° E. - 82'

GPS Coordinates:

Pit 1; N. 39° 01' 04.50" W. 104° 34' 41.20"

Pit 2; N. 39° 01' 03.70" W. 104° 34' 41.00"



Soils & Geology Report_v1.pdf Markup Summary

Cloud+ (2)



Subject: Cloud+
Page Label: 34
Author: John Green
Date: 12/16/2020 6:31:58 PM
Status:
Color: ■
Layer:
Space:

Mitigation should be added as a plat note



Subject: Cloud+
Page Label: 34
Author: John Green
Date: 12/16/2020 6:33:57 PM
Status:
Color: ■
Layer:
Space:

Hazard areas that cannot be mitigated must be shown on plat as no-build areas. Please provide graphic indicating hazard areas within site.