3/21/2023

Geology and Soils Evaluation Report

Proposed Mariah Trail Subdivision, Filing No. 1

El Paso County, Colorado

VIVID Project No.: D23-2-587

March 21, 2023

Report prepared for:

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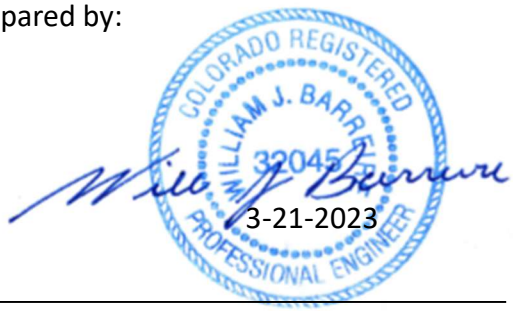
GEOLOGY AND SOILS EVALUATION REPORT
Proposed Mariah Trail Subdivision, Filing No. 1
El Paso County, Colorado
VIVID Project No. D23-2-587

Prepared by:



3-21-2023

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Senior Geotechnical Engineer

Reviewed by:

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Table of Contents

1.0 INTRODUCTION

1.1 GENERAL

This report presents the results of a geology and soils evaluation performed for the proposed Mariah Trail Subdivision, Filing No. 1, to be constructed south of the current terminus of Mariah Trail in El Paso County, Colorado. An attached Vicinity Map (Figure 1) shows the general location of the project. Our evaluation was performed for Wayne Anthony Custom Homes along with Atwell, LLC, and was authorized by Daryn Strop.

1.2 PROJECT DESCRIPTION

The proposed project includes the re-platting and development of a 35-acre parcel into a residential subdivision. Six lots are planned that will vary from approximately 5 to 7 acres in size. The property has no current improvements and is in a generally native condition. The development will include the extension of Mariah Trail (approximately 1000 feet) into the subdivision. A preliminary site layout is shown on Figure 2, attached to this report.

1.3 PURPOSE AND SCOPE

The purpose of this evaluation was to investigate the site geology and potential geologic hazards for the proposed development. This report is part of the submittal of the Preliminary Development Plan for this proposed subdivision to El Paso County.

Our scope of services included the following:

- ✓ Review of available mapping to evaluate the local geology, topography, flood risk potential, and other geologic features and hazards.
- ✓ Obtain permission to enter the private property for fieldwork activities.
- ✓ Perform a visual site reconnaissance to observe existing site conditions, field locate soil borings, and establish safety procedures as applicable.
- ✓ Notify the Colorado One-call Center (Colorado 811) to locate utilities.
- ✓ The drilling of three exploratory borings along the proposed Mariah Trail extension and one boring at the location of a possible drainage feature.
- ✓ Laboratory testing of selected samples obtained during the field exploration to evaluate relevant physical, geologic, and engineering properties of the soil.
- ✓ Preparation of this report, which includes a description of the proposed project, a description of the surface and subsurface site conditions found during our investigation, geologic and geotechnical research and mapping for evaluation of challenges or hazards that may impact the development.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 FIELD EXPLORATION

A field exploration performed on March 3, 2023 included the drilling of three exploratory borings along the approximate alignment of the proposed Mariah Trail extension and one boring at the approximate location of a potential site drainage feature. The locations of the borings are presented on Figure 2 – Field Exploration Plan. A summary of the subsurface exploration is presented in Table 1, below.

Table 1
Summary of Subsurface Exploration

Boring Designation	Approximate Boring Depth [feet, below ground surface]	Approximate Depth to Groundwater [feet, below ground surface]	Approximate Depth to Weathered Bedrock [feet, below ground surface]
B-1	10	None Encountered	4
B-2	10	None Encountered	None Encountered
B-3	10	None Encountered	2.5
B-4	10	None Encountered	7.5

Borings were performed with a truck-mounted CME-45 drill rig equipped with 4-inch outside diameter, continuous-flight, solid-stem auger. Samples were taken with a 2.5-inch O.D./2.0-inch I.D., California-type sampler, and by bulk methods. Penetration tests were obtained at the various sample depths as well.

Appendix A to this report includes logs of the borings describing the subsurface conditions. The lines defining boundaries between soil and rock types on the logs are based upon drill behavior and interpolation between samples and are therefore approximate. Transition between soil and rock types may be abrupt or may be gradual.

2.2 LABORATORY TESTING

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

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

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

3.0 GEOLOGY AND SOILS

3.1 SITE DESCRIPTION

The site is a vacant 35 acres and is currently covered with native grasses and shrubs. The parcel is a generally mild south and east sloping parcel with one shallow alluvial valley. Sparse residential properties surround the parcel.

3.2 GEOLOGIC RECONNAISSANCE

A visual geologic reconnaissance of the site was performed by Mr. William Barreire, Professional Engineer (Geotechnical), with VIVID Engineering Group, Inc. This reconnaissance was supported by the field drilling and laboratory testing, as well as geologic mapping and information from the following sources:

- CGS Geologic Map of the Black Forest Quadrangle, El Paso County, Colorado, by Jon P. Thorson, 2003
- Soil Survey of El Paso County Area, Colorado Soil Conservation Service, USDA, 1979
- El Paso County, Colorado: Potential Geologic Hazards and Surficial Deposits, Environmental and Engineering Maps and Tables for Land Use (Colorado Springs Quadrangle 1961), Charles S. Robinson and Associates, Inc. Cochran, D.M. (1977)

Portions of geologic mapping are presented as Figure 3a-Regional Geology Map and Figure 3b-Site Specific Geology Map, attached to this report. An NRCS Soil Survey Map and associated Soil Descriptions are presented as Figures 4a, 4b, 4c, and 4d. A USGS Topographic Map is attached as Figure 5.

3.3 SITE STRATIGRAPHY (FIGURES 3A AND 3B)

Based on information available, two geologic units are identified on the site which may be described as follows:

QTa
Alluvium of Palmer Divide:

The alluvial sheet washed deposits encountered on and adjacent to the site are generally associated with the early Pleistocene or Pliocene Ages. The material is typically pale brown. This unit consists of poorly sorted sand, medium to thin bedded, laminated, and composed largely of quartz grains. Sand and pebble gravel are interbedded with cobble and boulder gravel which consist of Pikes Peak Granite.

TKd5
Dawson Formation (Facies #5):

The Upper Dawson Formation (TKd5) is associated with the early to middle Eocene Age, and is one of five facies of this unit in this area of El Paso County. This unit is typically made up of very thick to massive, cross-bedded, light gray colored arkoses. These sandstones are generally pink to light gray in color, with high clay contents.

3.4 ENGINEERING GEOLOGY AND MITIGATION OF GEOLOGIC HAZARDS

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

Expansive/Settlement Prone Soil

Expansive soil was encountered on this site based on Denver Swell testing under light loads (for pavement design purposes) when subject to wetting. The underlying Dawson Formation bedrock can also possess zones of expansive material. Expansive soils can be mitigated through typical engineering approaches including removal

of expansive layers, over-excavation and treatment or replacement, or use of deep foundations. Expansion potential and proper mitigation must be evaluated during final geotechnical investigations for specific structures.

Settlement prone soils and bedrock were not encountered during this investigation and are not anticipated to be a significant or widespread hazard for this development.

Erodible Soils

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

Corrosive Soils

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

Mine Subsidence

This project is outside of areas of known mining and mine subsidence.

Slope Stability

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

Flooding Potential

As shown on Figure 6, the project site is outside of mapped flood plain areas. Based on the mapping and our site observations flooding is not considered to be a hazard for this development.

Seismicity

The major structural feature of this region is the Rampart Range Fault System which is located approximately 11 miles west of the site along the Front Range. There is evidence of movement during the past 2 million years along this fault zone. The Rampart Range Fault is considered to be active by the Colorado Geologic Survey. This area, as is the case with most of central Colorado, is subject to a degree of risk due to seismic activity. The Colorado Geologic Survey considers the El Paso County area to be in Seismic Risk Zone 2A. Pikes Peak Regional Building Department has adopted the International Building Code. Refer to the currently approved building codes for current design and construction practices.

Radiation

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

Groundwater

Groundwater was not encountered in our soil borings; however, our borings were terminated at a depth of 10 feet below the existing ground surface due to their planned use for pavement design and general drainage/permeability information.

Although groundwater was not encountered during this investigation, groundwater and smaller seeps are not uncommon as perched water above the bedrock, or in more permeable lenses within the Dawson Formation. If this condition is encountered during site-specific geotechnical investigations for individual lots, it should be mitigated with cut-off or foundation drains that are common local design and construction techniques.

Preliminary Residence Foundation Concepts

As indicated above, expansive soil was encountered on this site based on swell-settlement (aka Denver Swell) testing under light loads (for pavement design purposes) when subject to wetting. The underlying Dawson Formation bedrock can also possess zones of expansive material. Expansive soils and bedrock can be mitigated through typical engineering approaches including removal of expansive layers, over-excavation and treatment or replacement, or use of deep foundations. Expansion potential and proper mitigation must be evaluated during final geotechnical investigations for specific structures.

Typically, shallow foundations and slab-on-grade floors can be utilized on similar soil and bedrock conditions with proper mitigation and acceptance of some risk of movement structure and slab movement. Where expansive soils or bedrock is encountered, over-excavation of the expansive materials followed by moisture treatment and reuse/re-compaction of this material or replacement of the over-excavated material with non-expansive soils can be performed. The depth of over-excavation is dependent on the magnitude of the expansion but is generally anticipated to be between approximately 3 and 6 feet in this type of geology, with some potential variation. Maximum allowable bearing capacity for the on-site soils or moisture treated materials will likely be on the order of 2,000 to 3,000 pounds per square foot. Maximum allowable bearing capacity for footing bearing in the Dawson Formation material can range from 3,000 to 5,000 psf. Voided footings to concentrate structure deadload can also be utilized to resist heave of expansive soils.

If expansion characteristics are more severe, or to further reduce risk of foundation and floor movement, deep drilled shaft foundations extending into bedrock and structural floor systems (with a crawl space) can be used to effectively isolate the foundation and slabs from the effects of the underlying expansive materials.

Conclusion

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

3.5 ECONOMIC MINERAL RESOURCES

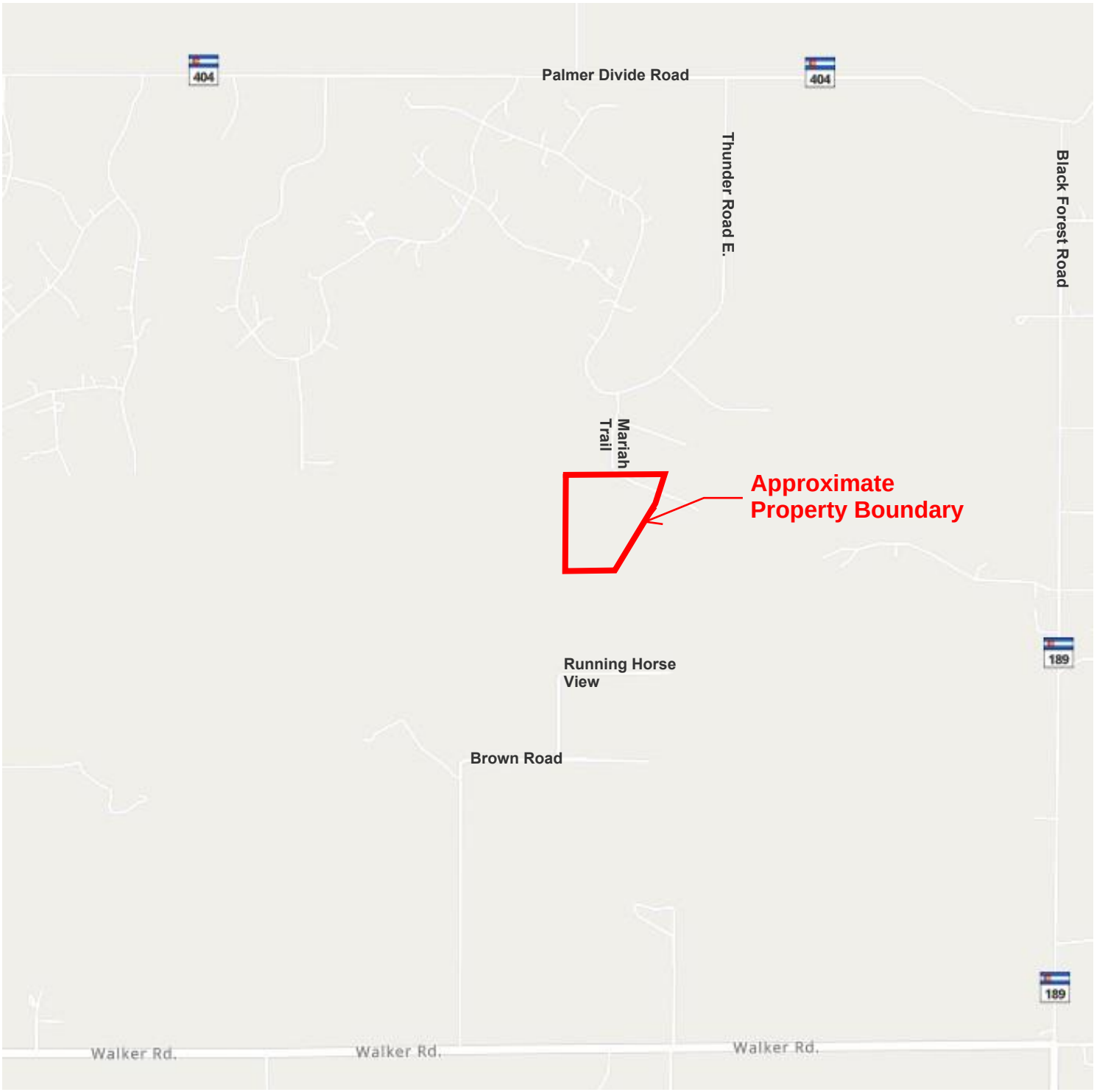
According to the *El Paso County Aggregate Resource Evaluation Map*, the project site is not mapped with any viable aggregate deposits. The site is mapped as “poor” for coal resources and “fair” for oil, according to the *Evaluation of Mineral and Mineral Fuel Potential of El Paso, State Mineral Lands.*

4.0 LIMITATIONS

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

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

Figures



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Not to Scale. Base image obtained from www.mapquest.com, 2023

VIVID Engineering Group	Project No: D23-2-587 Date: 1/31/23 Drawn by: JA Reviewed by: WJB	**VICINITY MAP** Mariah Trail Subdivision, Filing No. 1 El Paso County, Colorado	Figure **1**

Not to Scale

REFERENCE:

Base image obtained from Polaris Surveying, dated 2/21/23.

LEGEND

B-1 Approximate Boring Location

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Colorado Springs, CO 80907
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Project No. D23-2-587

Date: March 21, 2023

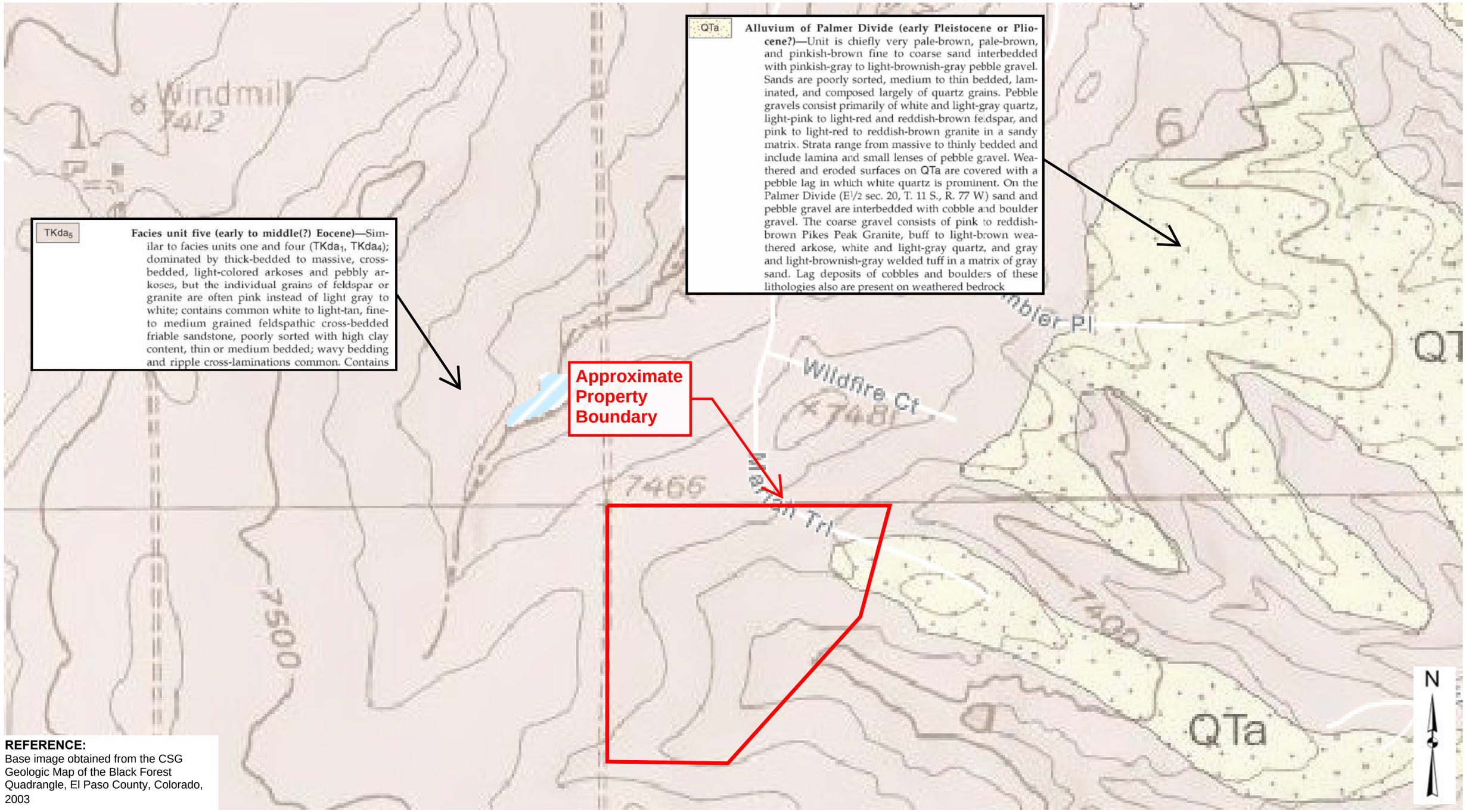
Drawn by: BTM

Reviewed by: WJB

FIELD EXPLORATION PLAN

Mariah Trail Subdivision, Filing No. 1
El Paso County, Colorado

Figure 2



REFERENCE:
Base image obtained from the CSG Geologic Map of the Black Forest Quadrangle, El Paso County, Colorado, 2003

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Project No: D23-2-587
Date: 1/31/23
Drawn by: JA
Reviewed by: WJB

REGIONAL GEOLOGY MAP

Mariah Trail Subdivision, Filing No. 1
El Paso County, Colorado

Figure
3a

Not to Scale. Base image dated 10/6/2019 and obtained from Google Earth, 2023.

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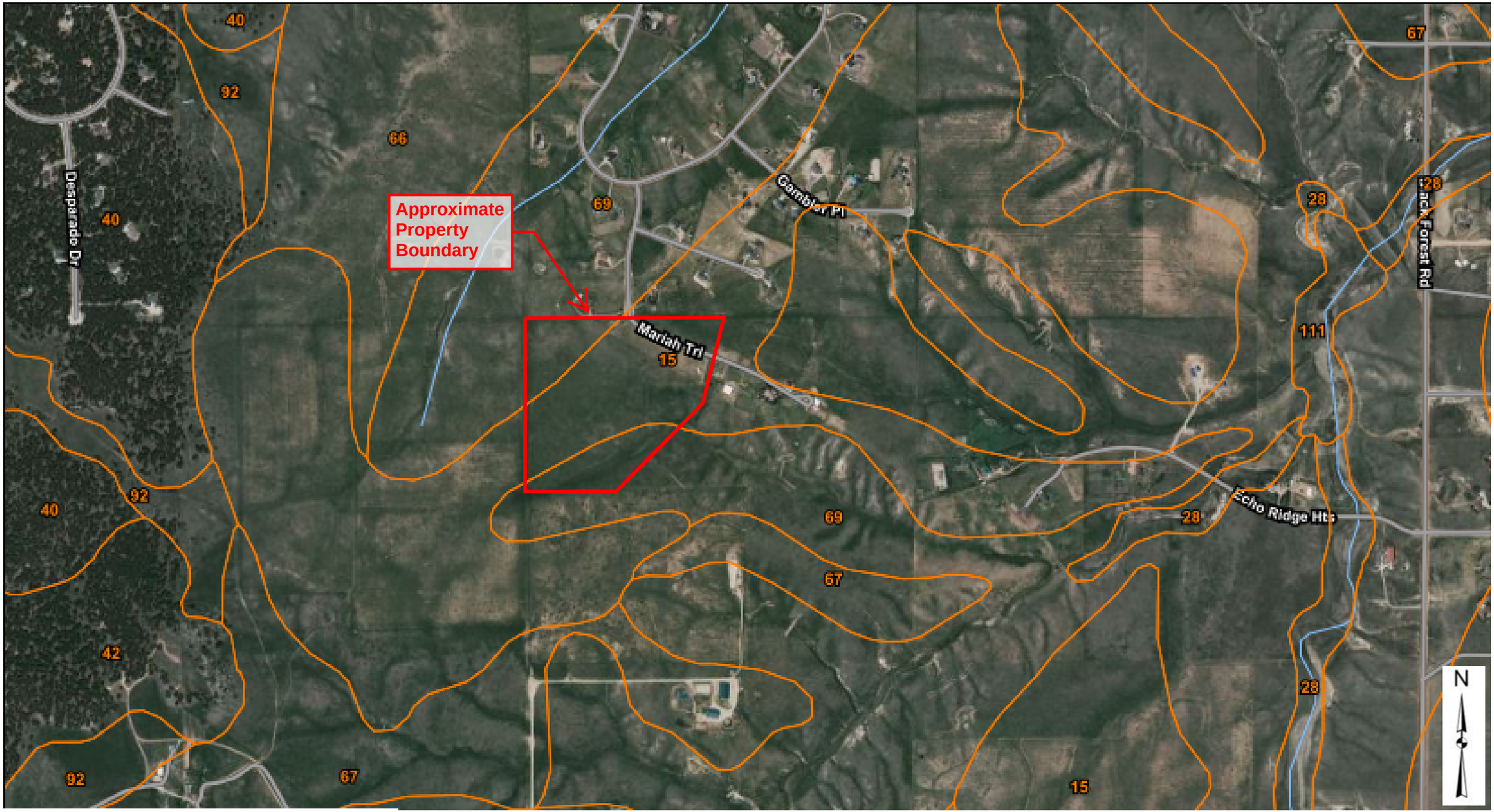
Date: 1/31/23
Drawn by: JA
Reviewed by: WJB

SITE-SPECIFIC GEOLOGY MAP

Mariah Trail Subdivision, Filing No. 1
El Paso County, Colorado

Figure
3b



Not to Scale. Base image from https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

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NRCS SOIL SURVEY MAP

Mariah Trail Subdivision, Filing No. 1
El Paso County, Colorado

Figure
4a

El Paso County Area, Colorado

15—Brussett loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 367k
Elevation: 7,200 to 7,500 feet
Frost-free period: 115 to 125 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Brussett and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brussett

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits

Typical profile

A - 0 to 8 inches: loam
BA - 8 to 12 inches: loam
Bt - 12 to 26 inches: clay loam
Bk - 26 to 60 inches: silt loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

El Paso County Area, Colorado

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

Map Unit Setting

National map unit symbol: 3680
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Ellicott and similar soils: 97 percent
Minor components: 3 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ellicott

Setting

Landform: Stream terraces, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Typical profile

A - 0 to 4 inches: loamy coarse sand
C - 4 to 60 inches: stratified coarse sand to sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None, Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R069XY031CO - Sandy Bottomland
Other vegetative classification: SANDY BOTTOMLAND (069AY031CO)
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquoll

Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

El Paso County Area, Colorado

40—Kettle gravelly loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 368g
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

El Paso County Area, Colorado

42—Kettle-Rock outcrop complex

Map Unit Setting

National map unit symbol: 368j
Elevation: 6,800 to 7,700 feet
Frost-free period: 110 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 60 percent
Rock outcrop: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 60 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Not to Scale. Base image from https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

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Reviewed by: WJB

NRCS SOIL SURVEY MAP (Soil Descriptions)

Mariah Trail Subdivision, Filing No. 1
El Paso County, Colorado

Figure
4b

El Paso County Area, Colorado

66—Peyton sandy loam, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 369c
Elevation: 6,800 to 7,600 feet
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Peyton and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Flats, hills
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions

El Paso County Area, Colorado

67—Peyton sandy loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369d
Elevation: 6,800 to 7,600 feet
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 115 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

El Paso County Area, Colorado

69—Peyton-Pring complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 369g
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 40 percent
Pring and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy clay loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 8 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Not to Scale. Base image from https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

VIVID Engineering Group, Inc.
1053 Elkton Drive
Colorado Springs, Colorado 80907
719.896.4356

Project No: D23-2-587
Date: 1/31/23
Drawn by: JA
Reviewed by: WJB

NRCS SOIL SURVEY MAP (Soil Descriptions)

Mariah Trail Subdivision, Filing No. 1
El Paso County, Colorado

Figure
4c

El Paso County Area, Colorado

92—Tomah-Crowfoot loamy sands, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 36b9
Elevation: 7,300 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Tomah and similar soils: 50 percent
Crowfoot and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tomah

Setting

Landform: Alluvial fans, hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from arkose and/or residuum weathered from arkose

Typical profile

A - 0 to 10 inches: loamy sand
E - 10 to 22 inches: coarse sand
Bt - 22 to 48 inches: stratified coarse sand to sandy clay loam
C - 48 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Description of Crowfoot

Setting

Landform: Hills, alluvial fans
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 12 inches: loamy sand
E - 12 to 23 inches: sand
Bt - 23 to 36 inches: sandy clay loam
C - 36 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

El Paso County Area, Colorado

111—Water

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Not to Scale. Base image from https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

VIVID Engineering Group, Inc.
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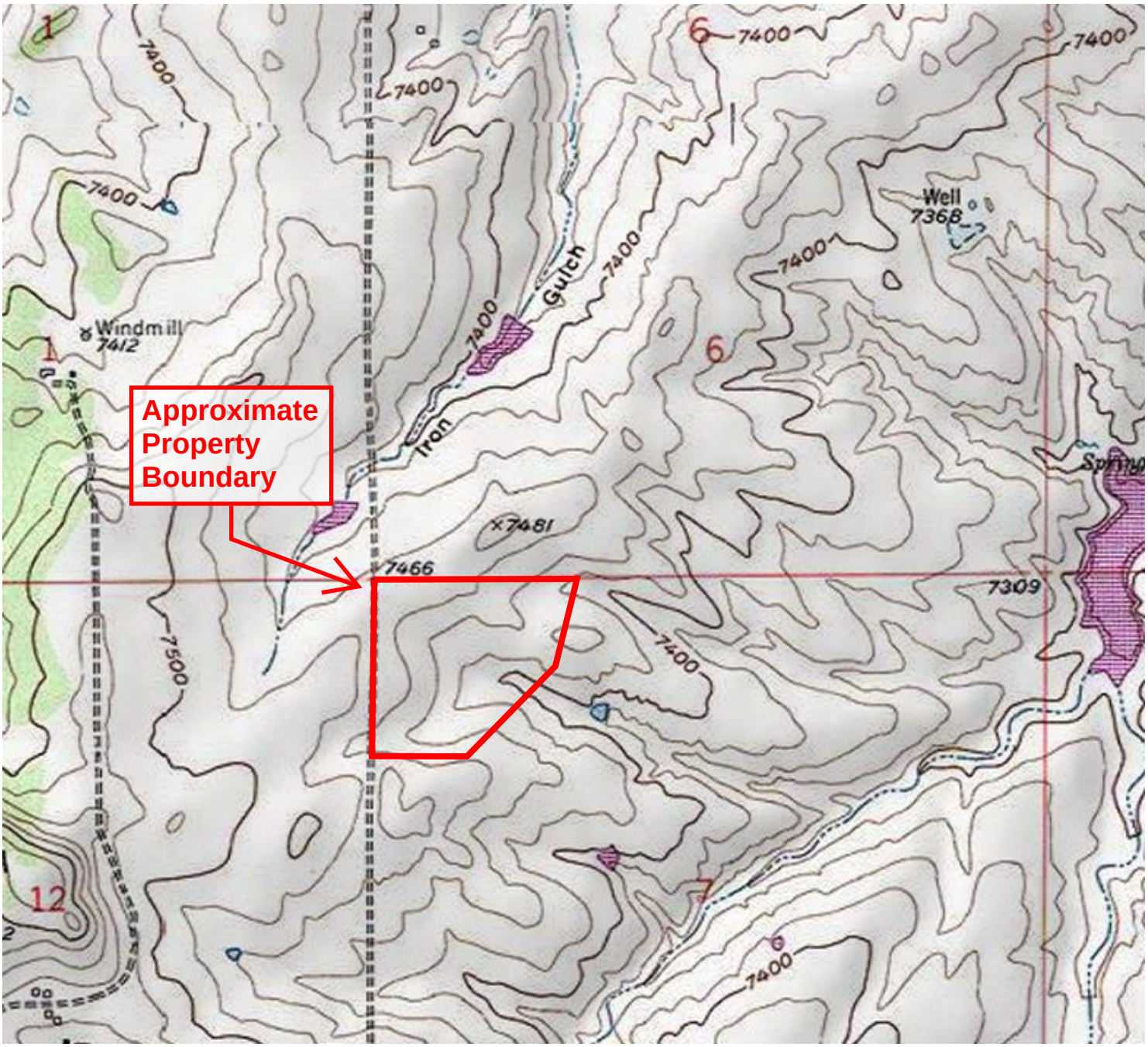
Project No: D23-2-587
Date: 1/31/23
Drawn by: JA
Reviewed by: WJB

NRCS SOIL SURVEY MAP (Soil Descriptions)

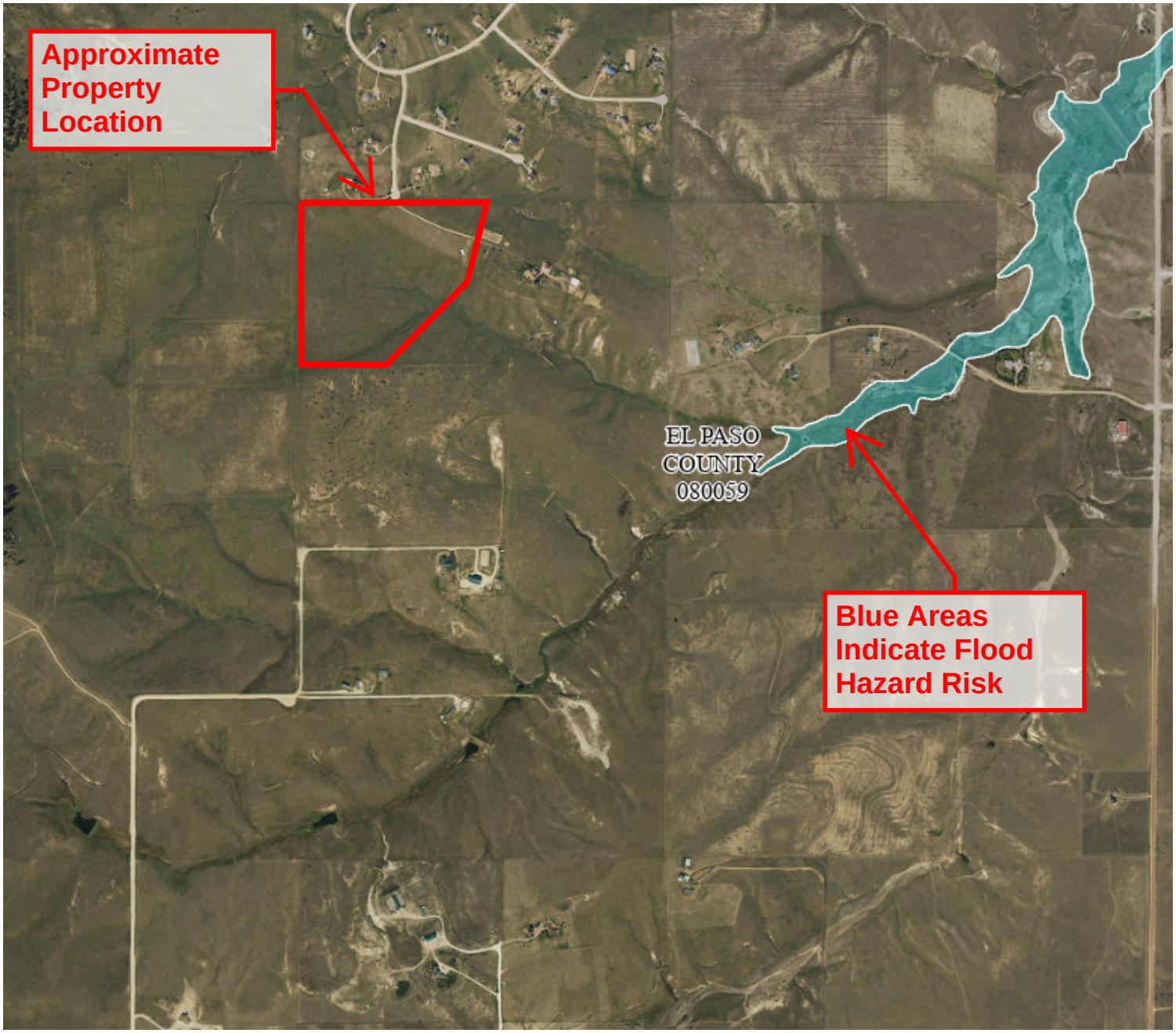
Mariah Trail Subdivision, Filing No. 1
El Paso County, Colorado

Figure
4d



Not to Scale. Base image obtained from USGS 7.5 Minute Quadrangle, 1961

VIVID Engineering Group	Project No: D23-2-587	**TOPOGRAPHIC MAP**	Figure 5
	Date: 1/31/23		
	Drawn by: JA	Mariah Trail Subdivision, Filing No. 1 El Paso County, Colorado	
	Reviewed by: WJB		



N

Notes:
- Blue shaded areas indicate flood hazard risk
- Site has no mapped flood hazards

Not to Scale. Base image obtained from https://dsat.services.femadata.com/arcgis/rest/services/FEMA_R8/RiskMAP_ElPasoCounty_Colorado/MapServer/legend, 2019

VIVID Engineering Group	Project No: D23-2-587	**FLOOD HAZARD MAP**	Figure 6
	Date: 1/31/23		
	Drawn by: JA	Mariah Trail Subdivision, Filing No. 1 El Paso County, Colorado	
	Reviewed by: WJB		

Appendix A

Logs of Exploratory Borings

Vivid Engineering Group, Inc.
1053 Elkton Drive
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KEY TO SYMBOLS

CLIENT Wayne Anthony Custom Homes

PROJECT NAME Mariah Trail Subdivision, Filing No. 1

PROJECT NUMBER D23-2-587

PROJECT LOCATION South Terminus of Mariah Trail

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)


CL-ML: USCS Low Plasticity Silty Clay


SC: USCS Clayey Sand


SC-SM: USCS Clayey Sand


SM: USCS Silty Sand


WEATHERED SANDSTONE

SAMPLER SYMBOLS


Grab Sample


2" I.D. Modified California Sampler (MC)

ABBREVIATIONS

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

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

BORING NUMBER B-1

CLIENT Wayne Anthony Custom Homes
PROJECT NAME Mariah Trail Subdivision, Filing No. 1
PROJECT NUMBER D23-2-587
PROJECT LOCATION South Terminus of Mariah Trail
DATE STARTED 3/3/23 **COMPLETED** 3/3/23
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Custom Auger Drilling (CME-45)
GROUND WATER LEVELS:
DRILLING METHOD 4" Solid Stem Auger
AT TIME OF DRILLING ---
LOGGED BY J. Adams **CHECKED BY** W. Barreire
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB				Clayey SAND, brown, slightly moist, medium dense to dense
2.5	MC	15-22	MC = 8.7% DD = 118.9 pcf Swell = 4.9% when wetted under 200 psf load		
	GB				
4.0					**Dawson Formation** Weathered SANDSTONE, poorly cemented, light brown, slightly moist, moderately hard
5.0	MC	17-32			
7.5					
10.0	MC	20-20			
					Bottom of borehole at 10.0 feet.

Vivid Engineering Group, Inc.
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BORING NUMBER B-2

CLIENT Wayne Anthony Custom Homes
PROJECT NAME Mariah Trail Subdivision, Filing No. 1
PROJECT NUMBER D23-2-587
PROJECT LOCATION South Terminus of Mariah Trail
DATE STARTED 3/3/23 **COMPLETED** 3/3/23
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Custom Auger Drilling (CME-45)
GROUND WATER LEVELS:
DRILLING METHOD 4" Solid Stem Auger
AT TIME OF DRILLING ---
LOGGED BY J. Adams **CHECKED BY** W. Barreire
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB				Silty to Clayey SAND, light brown, slightly moist, medium dense
2.5	MC	10-15	MC = 4.6% DD = 108.7 pcf Swell = 1.1% when wetted under 200 psf load		
	GB				
5.0	MC	10-16	MC = 3.5% DD = 106.5 pcf LL = NP PL = NP Fines = 32.0%		
7.5					
10.0	MC	16-20			10.0

Bottom of borehole at 10.0 feet.

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

BORING NUMBER B-3

CLIENT Wayne Anthony Custom Homes
PROJECT NAME Mariah Trail Subdivision, Filing No. 1
PROJECT NUMBER D23-2-587
PROJECT LOCATION South Terminus of Mariah Trail
DATE STARTED 3/3/23 **COMPLETED** 3/3/23
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Custom Auger Drilling (CME-45)
GROUND WATER LEVELS:
DRILLING METHOD 4" Solid Stem Auger
AT TIME OF DRILLING ---
LOGGED BY J. Adams **CHECKED BY** W. Barreire
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB				Silty, Clayey SAND, light brown, slightly moist, medium dense to dense
2.5	MC	32-40	MC = 2.9% DD = 131.9 pcf LL = 23 PL = 16 Fines = 23.0%	2.5	**Dawson Formation** Weathered SANDSTONE, poorly cemented, light brown, slightly moist, moderately hard
	GB				
5.0	MC	24-29			
7.5					
10.0	MC	15-24		10.0	

Bottom of borehole at 10.0 feet.

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

BORING NUMBER B-4

CLIENT Wayne Anthony Custom Homes
PROJECT NAME Mariah Trail Subdivision, Filing No. 1
PROJECT NUMBER D23-2-587
PROJECT LOCATION South Terminus of Mariah Trail
DATE STARTED 3/3/23 **COMPLETED** 3/3/23
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR Custom Auger Drilling (CME-45)
GROUND WATER LEVELS:
DRILLING METHOD 4" Solid Stem Auger
AT TIME OF DRILLING ---
LOGGED BY J. Adams **CHECKED BY** W. Barreire
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB				Silty SAND, light brown, slightly moist, medium dense
2.5	MC	7-7	MC = 4.7% DD = 98.7 pcf LL = 20 PL = 17 Fines = 40.0%		
	GB				
				4.0	
5.0	MC	9-12	MC = 5.6% DD = 106.3 pcf LL = 24 PL = 19 Fines = 50.0%		Sandy, Silty CLAY, light brown, moist, very stiff
7.5				7.5	**Dawson Formation** Weathered SANDSTONE, poorly cemented, light brown, slightly moist, medium hard to hard
10.0	MC	25-40		10.0	

Bottom of borehole at 10.0 feet.

Appendix B

Geotechnical Laboratory Test Results

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

SUMMARY OF LABORATORY RESULTS

CLIENT Wayne Anthony Custom Homes **PROJECT NAME** Mariah Trail Subdivision, Filing No. 1

PROJECT NUMBER D23-2-587 **PROJECT LOCATION** South Terminus of Mariah Trail

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)		
B-1	2.0							8.7	118.9		
B-2	2.0							4.6	108.7		
B-2	4.0	NP	NP	NP	2	32	SM	3.5	106.5		
B-3	2.0	23	16	7	9.5	23	SC-SM	2.9	131.9		
B-4	2.0	20	17	3	9.5	40	SM	4.7	98.7		
B-4	4.0	24	19	5	9.5	50	CL-ML	5.6	106.3		

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Colorado Springs, Colorado 80907
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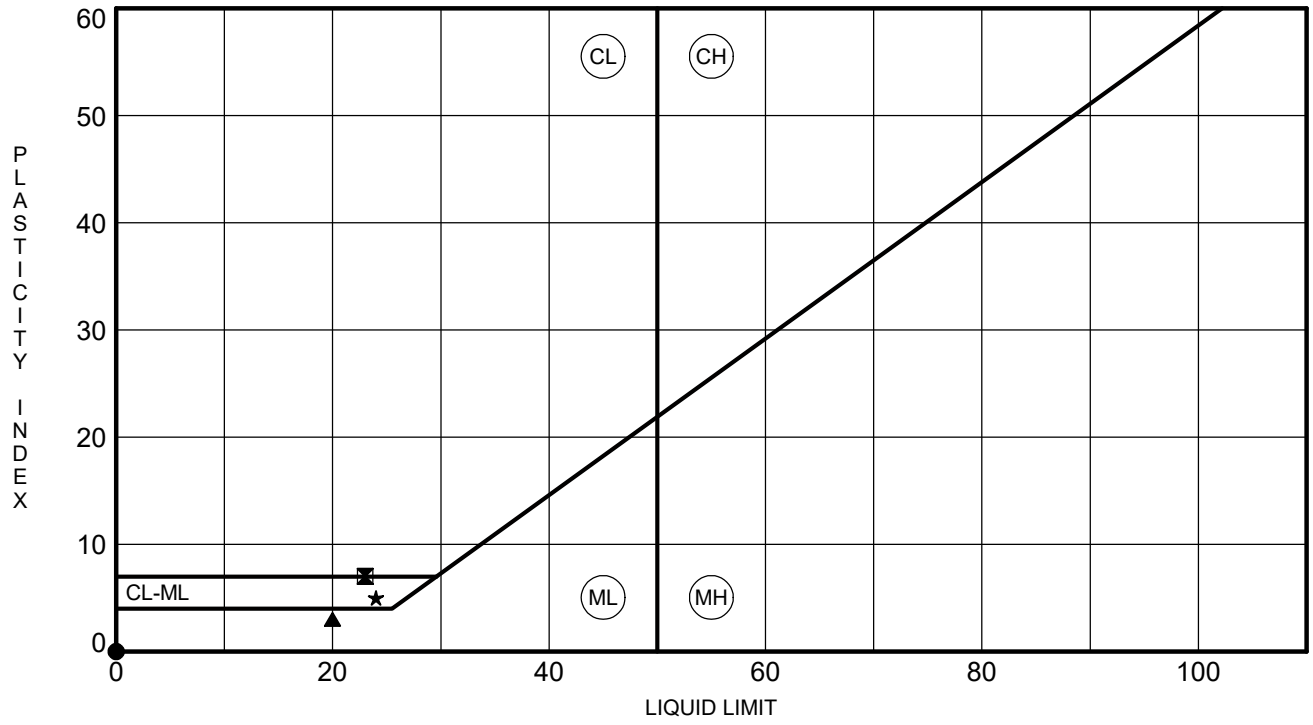
ATTERBERG LIMITS' RESULTS

CLIENT Wayne Anthony Custom Homes **PROJECT NAME** Mariah Trail Subdivision, Filing No. 1

PROJECT NUMBER D23-2-587 **PROJECT LOCATION** South Terminus of Mariah Trail



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-2**	**4.0**	**NP**	**NP**	**NP**	**32**	**SILTY SAND(SM)**
⊠	**B-3**	**2.0**	**23**	**16**	**7**	**23**	**SILTY, CLAYEY SAND(SC-SM)**
▲	**B-4**	**2.0**	**20**	**17**	**3**	**40**	**SILTY SAND(SM)**
★	**B-4**	**4.0**	**24**	**19**	**5**	**50**	**SANDY SILTY CLAY(CL-ML)**

Vivid Engineering Group, Inc.
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Colorado Springs, Colorado 80907
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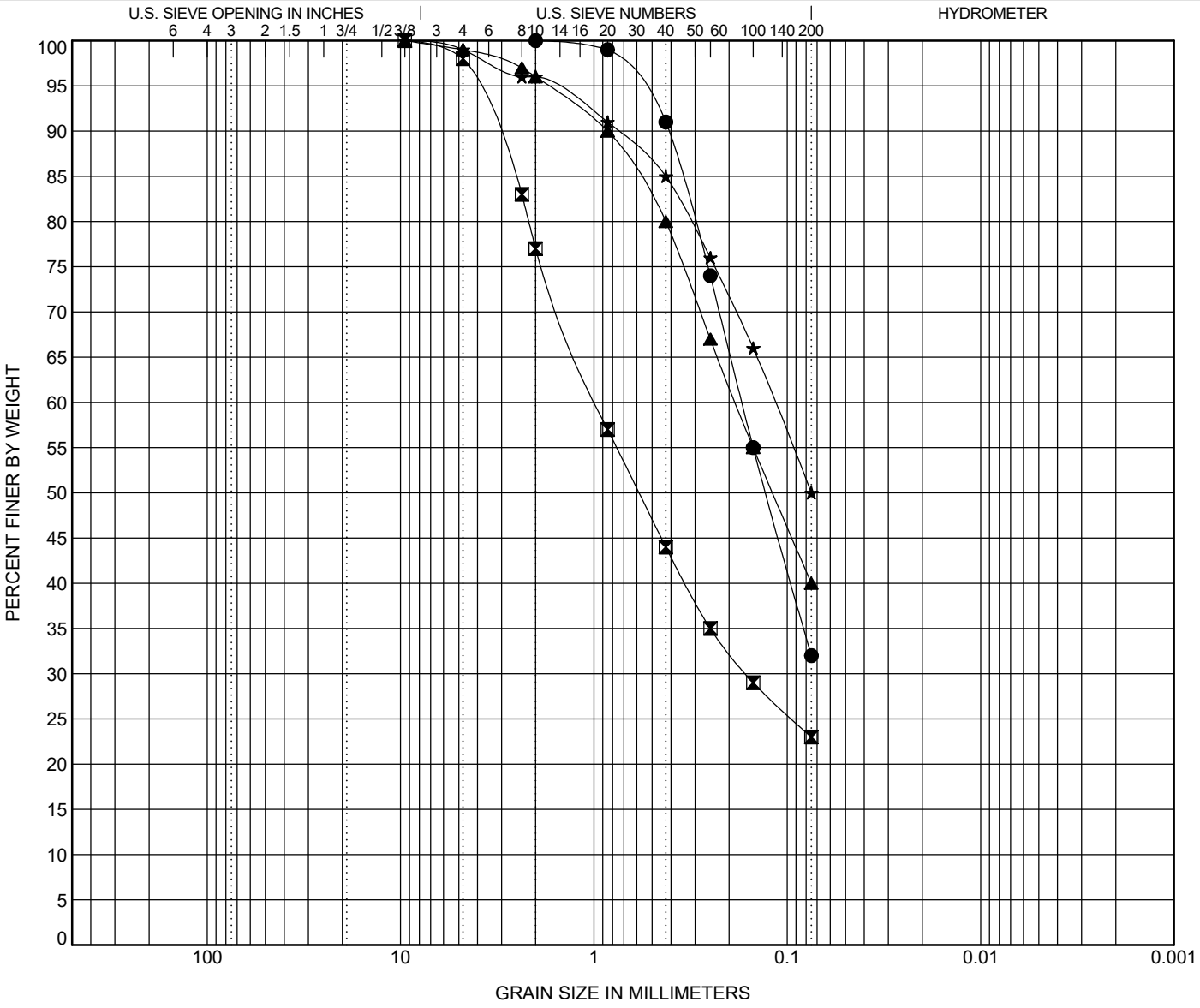
Fax: 719-896-4357

GRAIN SIZE DISTRIBUTION

CLIENT Wayne Anthony Custom Homes **PROJECT NAME** Mariah Trail Subdivision, Filing No. 1

PROJECT NUMBER D23-2-587 **PROJECT LOCATION** South Terminus of Mariah Trail



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

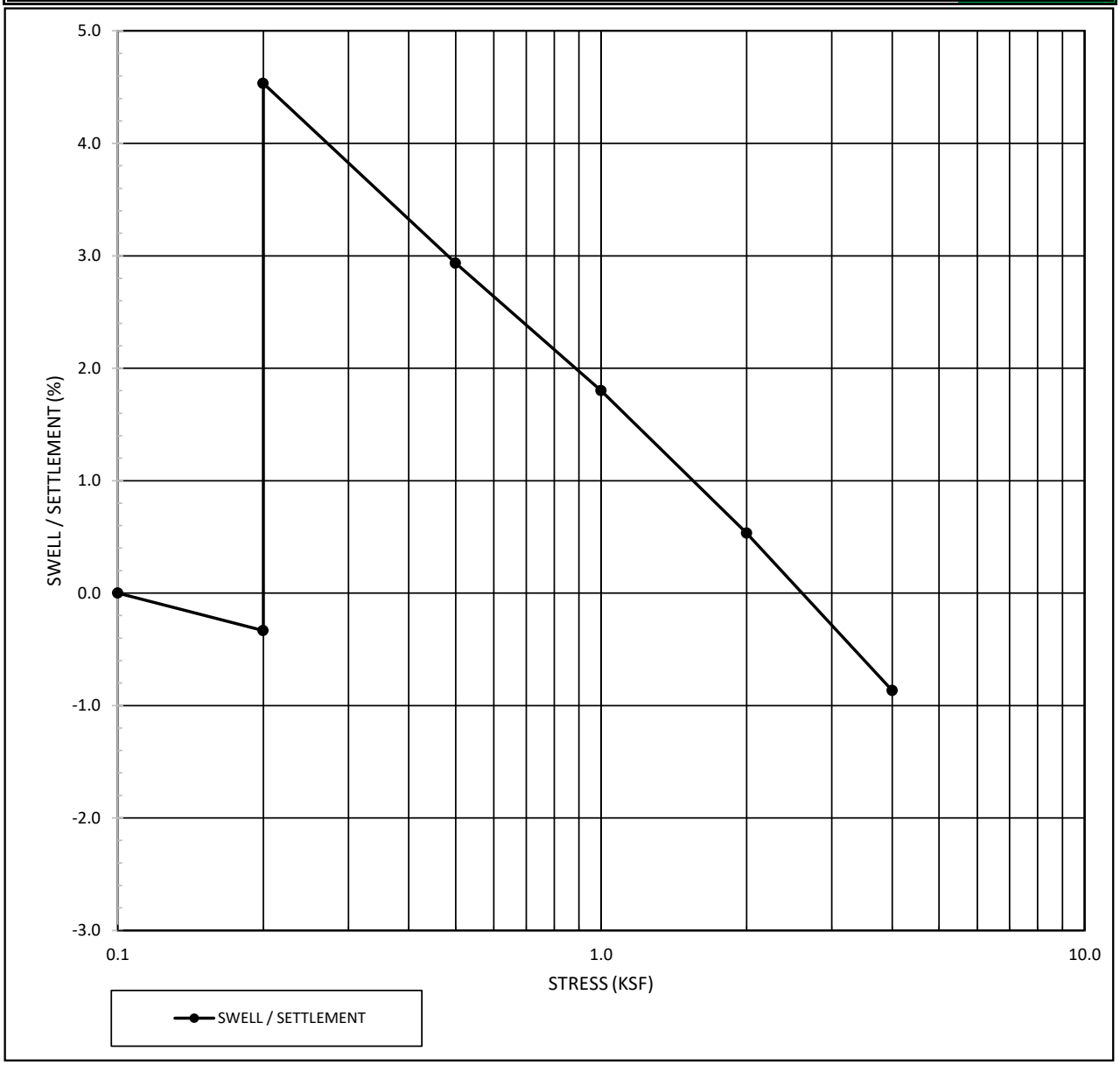
BOREHOLE		DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-2	4.0	SILTY SAND(SM)	NP	NP	NP		
⊠	B-3	2.0	SILTY, CLAYEY SAND(SC-SM)	23	16	7		
▲	B-4	2.0	SILTY SAND(SM)	20	17	3		
★	B-4	4.0	SANDY SILTY CLAY(CL-ML)	24	19	5		

BOREHOLE		DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-2	4.0	2	0.172			0.0	68.0	32.0	
⊠	B-3	2.0	9.5	0.966	0.163		2.0	75.0	23.0	
▲	B-4	2.0	9.5	0.186			1.0	59.0	40.0	
★	B-4	4.0	9.5	0.116			1.0	49.0	50.0	

VIVID Engineering Group, Inc.

Project Name:	Mariah Trail Subdivision, Filing No. 1	**Date**	3/3/2023
Project No.:	D23-2-587		
Boring ID.:	B-1	**Sample Depth (ft)**	2
Sample Description:	Clayey SAND, brown, slightly moist		

	%
Swell @ Wetting Weight:	**4.9**

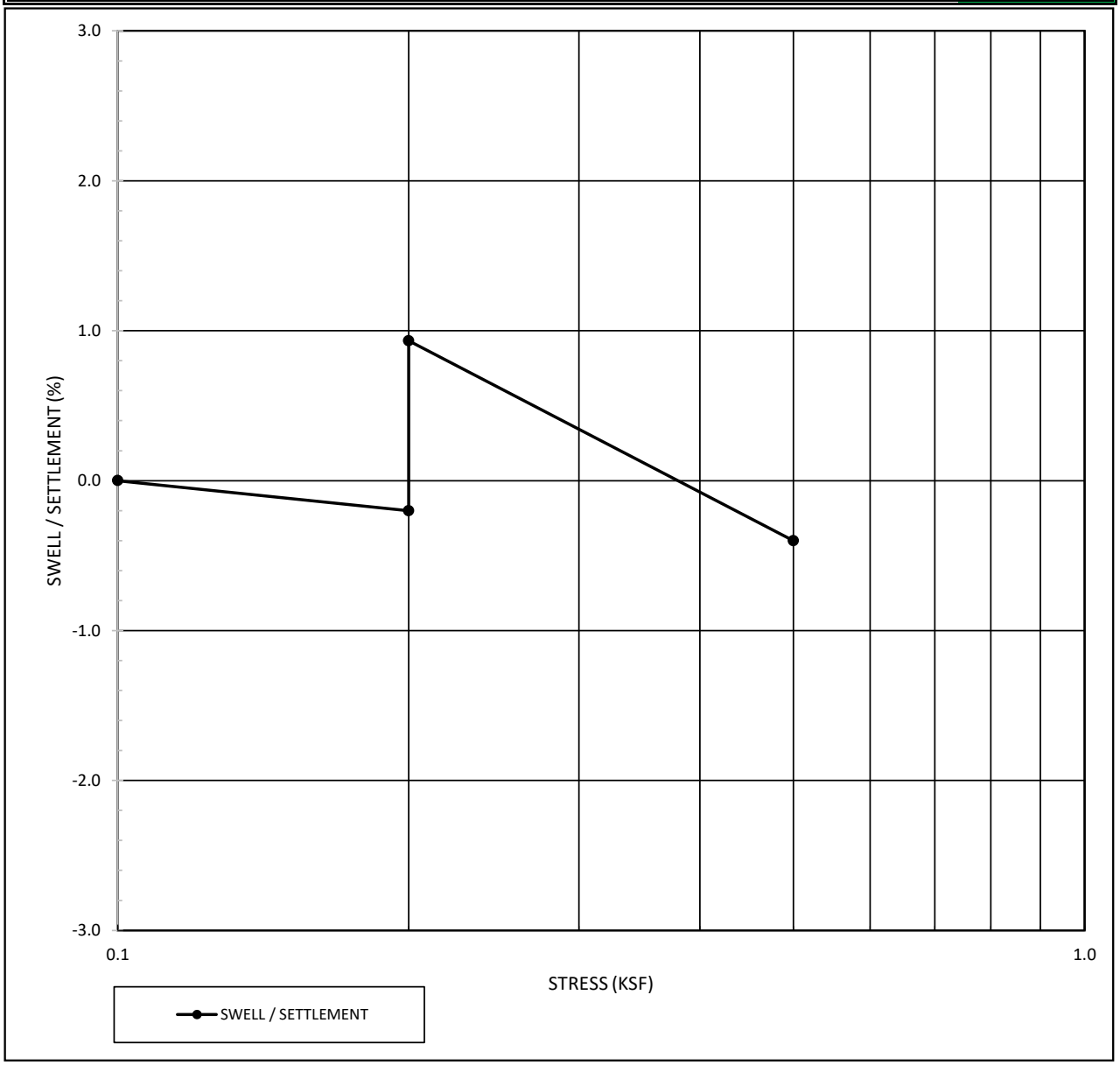


Initial Condition	
Moisture Content %	**8.7**
Dry Density (pcf)	**118.9**
Post-Swell Condition	
Moisture Content %	**17.7**

VIVID Engineering Group, Inc.

Project Name:	Mariah Trail Subdivision, Filing No. 1	**Date**	3/3/2023
Project No.:	D23-2-587		
Boring ID.:	B-2	**Sample Depth (ft)**	2
Sample Description:	Clayey SAND, light brown, slightly moist		

	%
Swell @ Wetting Weight:	**1.1**



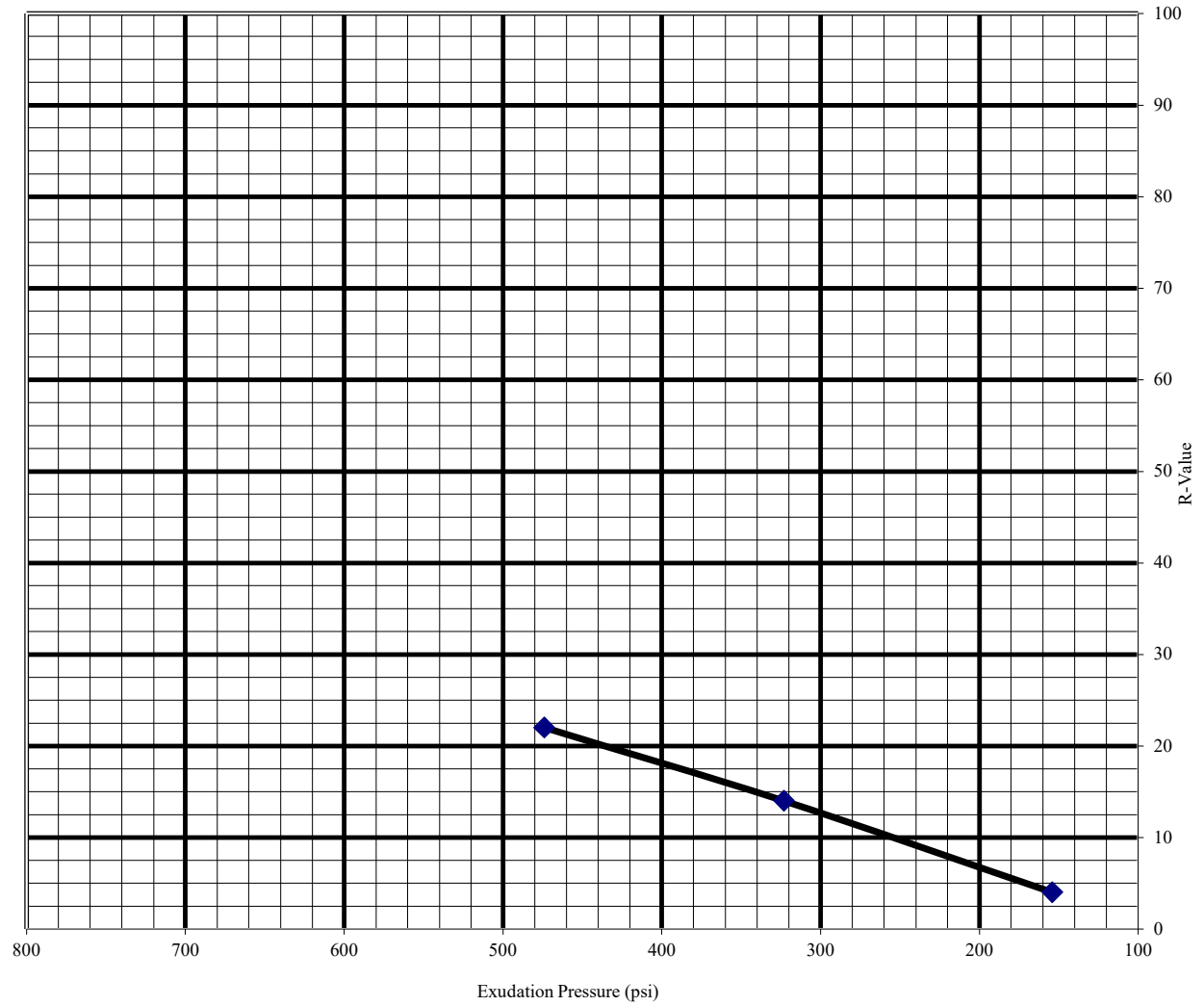
Initial Condition	
Moisture Content %	**4.6**
Dry Density (pcf)	**108.7**
Post-Swell Condition	
Moisture Content %	**18.1**

3885 Forest Street
Denver, CO 80207

Vivid Engineering Group
R-Value Test Report

Project Number:	D23-2-587	**Project Name:**	Mariah Trail Subdivision, Filing No. 1
Sample Id:	N/A	**Depth (ft):**	0-4'
Location:	B-1 to B-3 Combined	**Classification:**	N/A
Date Sampled:	3/3/2023	**Date Tested:**	3/9/2023

R-Value at 300 psi exudation pressure = **12**



Test No.	Compact. Press. (psi)	Density (pcf)	Moist. (%)	Horizont. Pressure (psi)'@ 160 psi	Sample Height (in).	Exud. Pressure (psi)	R Value	R Value Correct.
1	180	123.0	8.9	110	2.49	474	22	22
2	160	117.0	10.5	129	2.63	323	12	14
3	120	111.8	12.9	148	2.62	154	4	4

Sampled by: WJB **Tested by:** AX **Checked by:** CV

Rev. 12-13-2022