

Architecture
Structural
Geotechnical



Materials Testing
Forensic
Civil/Planning

ROCKY MOUNTAIN GROUP

Job No. 159927

February 15, 2018

Wayne Connell
PO Box 2434
Parker, CO 80134

Re: Onsite Wastewater Treatment System Evaluation
37300 Stillwater St
Elizabeth, Colorado

Dear Wayne Connell:

As requested, personnel of RMG – Rocky Mountain Group have performed a preliminary investigation, reconnaissance, and site evaluation at the above referenced address. The purpose of this preliminary investigation and the site evaluation is to provide recommendations for an Onsite Wastewater Treatment System (OWTS). During the inspection, a total of three 8-foot deep test pits (TP) were excavated in the vicinity of the proposed treatment area and as indicated on the site plan of the OWTS design.

PRELIMINARY INVESTIGATION:

The purpose of our preliminary investigation was to review publically available and documented information related to the site. RMG has reviewed the provided site plan, identified the soil conditions anticipated to be encountered during construction of the proposed OWTS, and included a review of documented NRCS data provided by websoilsurvey.nrcs.usda.gov.

It is our understanding that a 4 bedroom single family residence is proposed at this site.

Based on the information provided by the client, the proposed treatment area is to be located to the east-southeast of the house. The proposed area is indicated on the Site Plan by of the OWTS Design document.

The soil conditions as indicated by the NRCS data referenced above are anticipated to consist of Weld loam and Bresser-Stapleton sandy loams. The Weld loam designation has a typical profile of loam from 0 to 5 inches, clay, silty clay, silty clay loam from 5 to 45 inches, silty clay loam, loam, silt loam from 5 to 45 inches, and sandy loam, loam silt loam from 5 to 45 inches below the existing ground surface. The Bresser designation has a typical profile of sandy loam from 0 to 7 inches, clay loam, sandy clay loam from 7 to 20 inches, sandy loam from 7 to 20 inches, and very gravelly loamy sand, gravelly loamy sand, loamy coarse sand from 20 to 29 inches below the existing ground surface. The Stapleton designation has a typical profile of sandy loam from 0 to 37 inches and gravelly loamy sand, loamy sand, loamy coarse sand from 37 to 60 inches below the existing ground surface.

Southern Office:
Colorado Springs, CO 80918
719.548.0600

Central Office:
Englewood, CO 80112
303.688.9475

Northern Office:
Evans, CO 80620
970.330.1071

Fort Collins: 970.616.4364
Monument: 719.488.2145
Woodland Park: 719.687.6077

www.rmg-engineers.com

A review of FEMA Map No. 08039C0250C indicates that the proposed treatment area is not located within an identified flood plain.

Based on the preliminary information available for review, an estimated treatment size of 657 square feet is anticipated. This estimate was used in locating the field and profile pit excavations only and should not be considered part of the final design. Refer to the OWTS Design document for treatment area, size, and location.

Site conditions exposed during the Reconnaissance Visit and Detailed Soil Evaluation may vary from the preliminary investigation.

RECONNAISSANCE VISIT:

Personnel of RMG performed a reconnaissance visit on January 31, 2018. The purpose of this reconnaissance visit was to evaluate the site surface characteristics including landscape position, topography, vegetation, natural and cultural features, and current and historic land uses.

The site surface characteristics were observed to consist of low lying grasses and weeds across the entire site. The site slopes down to the south and east at approximately 5 to 15 percent across the lot. The central portion of the lot, southeast of the proposed house location, slopes down to the east at approximately 5 to 10 percent. The proposed treatment area is to be located approximately 200 feet to the east-southeast of the proposed house.

No significant drainage swales, man-made cuts, or streams or waterways that would impact the treatment area were observed in the immediate vicinity of the treatment area.

The proposed well was not staked at the time of our reconnaissance visit. Based on conversations with the client, it is our understanding the proposed well is to be located approximately 20 feet to the northeast of the staked house location. The treatment area is to be located a minimum distance of 100 feet from the well location. If this distance cannot be maintained, contact RMG prior to proceeding. No existing wells were observed within 100 feet of the proposed treatment area.

DETAILED SOIL EVALUATION:

Personnel of RMG performed a detailed soil evaluation of three 8-foot deep test pit excavations on January 31, 2018 (Test Pits TP-1, TP-2, and TP-3), utilizing the visual and tactile method for the evaluation of the site soils. Each profile pit excavation is represented in the tables below. The locations of the profile pit excavations are shown on the site plan of the OWTS design document.

Test Pit 1 (TP-1)

Depth	Soil Type	USDA Soil Texture	Soil Shape	Soil Grade
0-6 ft	3A	Sandy Clay Loam	Granular	Weak
6-8 ft	2A	Sandy Loam	Granular	Weak

Test Pit 2 (TP-2)

Depth	Soil Type	USDA Soil Texture	Soil Shape	Soil Grade
0-6 ft	3A	Sandy Clay Loam	Granular	Weak
6-8 ft	2A	Sandy Loam	Granular	Weak

Neither groundwater nor bedrock were encountered in the test pits. A minimum separation of 4 feet shall be maintained from groundwater and bedrock, if encountered, to the infiltrative surface. If groundwater and/or bedrock are encountered at shallower depths during construction of the OWTS, RMG should be contacted prior to proceeding. Redoximorphic features indicating the fluctuation of groundwater or higher ground water levels were not observed in the test pits.

The depth of the infiltrative surface is provided in the recommendations section of this report.

There are no foreseeable or stated construction related issues or land use changes at this time. No difficulties were encountered during the site visit.

RECOMMENDATIONS:

It is recommended that the treatment area be located in the vicinity of the test pits. Based on our observations, a long-term acceptance rate (LTAR) of 0.30 shall be used for the design of a Treatment Level 1 OWTS. The infiltrative surface shall be placed no deeper than 4 feet below the existing grade. There shall be a minimum cover of 1 foot (12 inches) over all OWTS components. If the minimum or maximum depth to infiltrative surface cannot be maintained, the contractor/owner shall contact this office for revised recommendations prior to proceeding with the construction of the OWTS. Reference manufacturer's installation instructions for all components specified in the engineer designed OWTS Design document.

LIMITATIONS:

This report is only valid in conjunction with the OWTS Design document engineered by RMG. The recommendations provided in this report are based upon the subsurface conditions observed in the profile pit excavations and accepted engineering procedures. The subsurface conditions encountered in the excavation for the treatment area may vary from those encountered in the profile pit excavations. Therefore, depth to limiting or restrictive conditions, bedrock, and groundwater may be different from the results reported in this letter. If subsurface conditions encountered in the OWTS treatment area differ from those indicated in this report, or problems arise, RMG should be retained to review the subsurface conditions prior to any work being performed or completed.

Should you have questions or require additional information, please do not hesitate to call.

Cordially,

RMG – Rocky Mountain Group

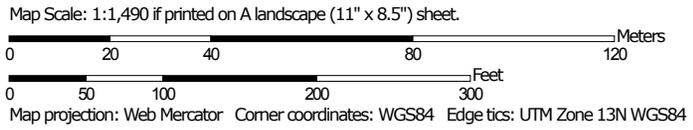
A handwritten signature in blue ink that reads "Matthew A. Meier". The signature is fluid and cursive, with the first name being the most prominent.

Matthew Meier E.I.T.
Geotechnical Staff Engineer
CPOW Visual and Tactile Evaluation of
Soils Training Certified
October 22-23, 2015
Greeley, Colorado

Soil Map—Elbert County, Colorado, Western Part
(37300 Stillwater St)



Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Elbert County, Colorado, Western Part
Survey Area Data: Version 13, Oct 10, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 17, 2015—Mar 9, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Bresser-Stapleton sandy loams, 8 to 25 percent slopes	3.7	41.0%
44	Weld loam, 4 to 8 percent slopes	5.3	59.0%
Totals for Area of Interest		9.1	100.0%

Elbert County, Colorado, Western Part

8—Bresser-Stapleton sandy loams, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: jnl7
Elevation: 5,300 to 6,400 feet
Mean annual precipitation: 14 to 17 inches
Frost-free period: 120 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Bresser and similar soils: 50 percent
Stapleton and similar soils: 25 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bresser

Setting

Landform: Ridges, valley sides, hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium and/or arkosic residuum weathered from sedimentary rock

Typical profile

H1 - 0 to 7 inches: sandy loam
H2 - 7 to 20 inches: clay loam, sandy clay loam
H2 - 7 to 20 inches: sandy loam
H3 - 20 to 29 inches: very gravelly loamy sand, gravelly loamy sand, loamy coarse sand
H4 - 29 to 60 inches:
H4 - 29 to 60 inches:
H4 - 29 to 60 inches:

Properties and qualities

Slope: 8 to 20 percent
Depth to restrictive feature: More than 80 inches
Natural 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
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

Description of Stapleton

Setting

Landform: Valley sides, hills, ridges
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium and/or arkosic residuum weathered from
sedimentary rock

Typical profile

H1 - 0 to 37 inches: sandy loam
H2 - 37 to 60 inches: gravelly loamy sand, loamy sand, loamy
coarse sand
H2 - 37 to 60 inches:
H2 - 37 to 60 inches:

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to
very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 10 percent
Hydric soil rating: No

Cushman

Percent of map unit: 7 percent
Hydric soil rating: No

Weld

Percent of map unit: 6 percent

Hydric soil rating: No

Aquic haplustoll

Percent of map unit: 2 percent

Landform: Swales

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Elbert County, Colorado, Western Part

Survey Area Data: Version 13, Oct 10, 2017

Elbert County, Colorado, Western Part

44—Weld loam, 4 to 8 percent slopes

Map Unit Setting

National map unit symbol: jnl2

Elevation: 5,300 to 6,400 feet

Mean annual precipitation: 14 to 17 inches

Farmland classification: Not prime farmland

Map Unit Composition

Weld and similar soils: 80 percent

Minor components: 20 percent

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

Description of Weld

Setting

Landform: Hills

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Silty eolian deposits

Typical profile

H1 - 0 to 5 inches: loam

H2 - 5 to 45 inches: clay, silty clay, silty clay loam

H2 - 5 to 45 inches: silty clay loam, loam, silt loam

H2 - 5 to 45 inches: sandy loam, loam, silt loam

H3 - 45 to 60 inches:

H3 - 45 to 60 inches:

H3 - 45 to 60 inches:

H4 - 60 to 64 inches:

H4 - 60 to 64 inches:

H4 - 60 to 64 inches:

Properties and qualities

Slope: 4 to 8 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat):

Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 6 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Very high (about 31.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: Loamy Foothill 14-19 P.Z. (R049XC202CO)

Hydric soil rating: No

Minor Components

Baca

Percent of map unit: 10 percent

Hydric soil rating: No

Wiley

Percent of map unit: 6 percent

Hydric soil rating: No

Bresser

Percent of map unit: 3 percent

Hydric soil rating: No

Aquic haplustoll

Percent of map unit: 1 percent

Landform: Swales

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Elbert County, Colorado, Western Part

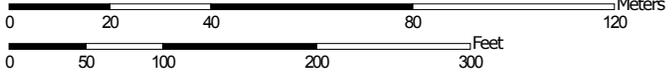
Survey Area Data: Version 13, Oct 10, 2017

Septic Tank Absorption Fields—Elbert County, Colorado, Western Part
(37300 Stillwater St)



Soil Map may not be valid at this scale.

Map Scale: 1:1,490 if printed on A landscape (11" x 8.5") sheet.

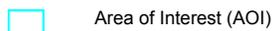


Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84



MAP LEGEND

Area of Interest (AOI)



Area of Interest (AOI)

Background



Aerial Photography

Soils

Soil Rating Polygons



Very limited



Somewhat limited



Not limited



Not rated or not available

Soil Rating Lines



Very limited



Somewhat limited



Not limited



Not rated or not available

Soil Rating Points



Very limited



Somewhat limited



Not limited



Not rated or not available

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: Elbert County, Colorado, Western Part
Survey Area Data: Version 13, Oct 10, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 17, 2015—Mar 9, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Septic Tank Absorption Fields

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
8	Bresser-Stapleton sandy loams, 8 to 25 percent slopes	Somewhat limited	Bresser (50%)	Slope (0.96)	3.7	41.0%
44	Weld loam, 4 to 8 percent slopes	Very limited	Weld (80%)	Slow water movement (1.00)	5.3	59.0%
Totals for Area of Interest					9.1	100.0%

Rating	Acres in AOI	Percent of AOI
Very limited	5.3	59.0%
Somewhat limited	3.7	41.0%
Totals for Area of Interest	9.1	100.0%

Description

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Saturated hydraulic conductivity (Ksat), depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher