

June 2, 2020

William Guman & Associates, Ltd  
731 North Weber Street  
Colorado Springs, CO 80903



**ENTECH**  
ENGINEERING, INC.

505 ELKTON DRIVE  
COLORADO SPRINGS, CO 80907  
PHONE (719) 531-5599  
FAX (719) 531-5238

Attn: Bill Guman

Re: Wastewater Study  
Mountain's Edge Subdivison  
McClelland Road & Farmhouse Court  
Parcel No. 32000-00-740  
El Paso County, Colorado

Please separate OWTS and  
Soils/Geology into two separate  
reports.

Dear Mr. Guman:

As requested, personnel of Entech Engineering, Inc. performed a wastewater study for the 30.6-acre parcel to be replatted into five (5) rural residential lots to evaluate the conditions with respect to on-site wastewater treatment suitability.

#### **GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION**

The site is located in a portion N½ of the N½ of the SW¼ of Section 13, Township 12 South, Range 63 West of the 6<sup>th</sup> Principal Meridian in El Paso County, Colorado. The site is located approximately 4¼ miles southeast of Peyton, Colorado, northwest of McClelland Road and Scott Road in El Paso County, Colorado. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site is gradually sloping generally to the southeast with gradual to moderate slopes along the small ridge that bisects the site in the eastern portion of the site. A drainage is located east of the proposed subdivision and flows in a southwesterly direction. A minor drainage is located in the central portion of the site located in portions of Lots 2 and 3. Water was not observed in the drainages at the time of this investigation. The site boundaries are indicated on the USGS Map, Figure 2. Previous land uses have included agricultural grazing and undeveloped land. The site contains primarily field grasses, weeds, cacti and yuccas. Site photographs, taken May 19, 2020, are included in Appendix A.

Total acreage involved in the proposed subdivision is 30.6-acres. Five rural residential lots are proposed as part of the replat. The proposed lot sizes range from approximately 5-acres to 6-acres. The lots will be serviced by individual water wells and on-site wastewater treatment systems. The Site Plan with the proposed replat is presented in Figure 3.

#### **SCOPE OF THE REPORT**

The scope of the report will include the following:

A general geologic analysis utilizing published geologic data. Detailed site-specific mapping will be conducted to obtain general information in respect to major geographic and geologic features, geologic descriptions and their effects on the development of the property with regards to on-site wastewater treatment systems.

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Wastewater Study  
Mountain's Edge Subdivision  
McClelland Road & Farmhouse Court  
Parcel No. 32000-00-740  
El Paso County, Colorado

## PREVIOUS INVESTIGATION

A Geology and Soils Study was previously prepared for this site by Kumar and Associates, Inc., November 14, 2008 (Reference 1). Information from this report was used in our investigation of the site.

## FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of any bedrock features and significant surficial deposits. The Natural Resource Conservation Service (NRCS), previously the Soil Conservation Service (SCS) survey was also reviewed to evaluate the site. The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved both field reconnaissance and measurements, and aerial photo reconnaissance and interpretation. The same mapping procedures have also been utilized to produce the Geology Map which identified pertinent geologic conditions affecting development. The field mapping was performed by personnel of Entech Engineering, Inc. on May 19, 2020.

Three test pits were excavated across the site on Lot Nos. 1, 2 and 4 to determine general suitability for the use of on-site wastewater treatment systems and general soil characteristics. The locations of the test pits are indicated on the Site Plan/Test Pit Location Map, Figure 3. The Test Pit Logs are presented in Appendix B. Results of this testing will be discussed later in this report.

Laboratory testing was also performed on the soils to classify and determine the soils engineering characteristics. Laboratory tests included grain-size analysis, ASTM D-422. Results of the laboratory testing are included in Appendix C.

## SOIL AND GEOLOGIC CONDITIONS

### Soil Survey

The Natural Resource Conservation Service (NRCS) (Reference 2, Figure 4), previously the Soil Conservation Service (Reference 2) has mapped four soil types on the site. Complete descriptions of the soil types are presented in Appendix D. In general, the soils consist of sandy loam to gravelly loamy sand. The soils are described as follows:

<u>Type</u>	<u>Description</u>
8	Blakeland Loamy Sand, 1 – 9% Slopes
10	Blendon Sandy Loam, 0 – 3% Slopes
96	Truckton Sandy Loam, 0 – 3% Slopes
97	Truckton Sandy Loam, 3 – 9% Slopes

The soils have been described to have moderate to rapid permeabilities. The soils are described as well suited for use as homesites. Possible hazards with soils erosion are present on the site. The erosion potential can be controlled with vegetation. The soils have been described to have moderate erosion hazards (Reference 2).

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### Soils

The soils encountered in the test pits consisted of silty to clayey sand overlying weathered silty to clayey sandstone. Bedrock was not encountered in Test Pit Nos 1 and 2. Weathered bedrock was encountered in Test Pit No. 3 at a depth of 3.5 feet. The upper sands were encountered at loose to medium dense states and moderate moisture conditions, and the sandstone was encountered at dense states and moderate moisture conditions.

### Groundwater

Groundwater was not encountered in the test pits, which were excavated to 7 to 8 feet. Signs of seasonally occurring groundwater were observed in Test Pit No. 2 (Lot 3) at 7.5 feet. Areas of potentially seasonal shallow and seasonal shallow groundwater have been mapped in drainages on the site that are discussed in the following sections. Fluctuations in groundwater conditions may occur due to variations in rainfall or other factors not readily apparent at this time. Isolated sand layers within the soil profile can carry water in the subsurface. Contractors should be cognizant of the potential for the occurrence of subsurface water features during construction.

### Geology

Approximately 27 miles west of the site is a major structural feature known as the Rampart Range Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within a large structural feature known as the Denver Basin. Bedrock in the area is typically gently dipping in a northerly direction (Reference 4). The bedrock underlying the site consists of the Dawson Formation of Cretaceous Age. The Dawson Formation typically consists of coarse-grained arkosic sandstone with interbedded layers of claystone or siltstone.

The geology of the site was evaluated using the *Geologic Map of the Black Forest*, by Thorson in 2003, (Reference 4, Figure 5). The Geology Map for the site is presented in Figure 6. Four mappable units were identified on this site which is described as follows:

- Qaf**      **Artificial Fill of Holocene Age:** These consist of man-made fill deposits associated with erosion berm on Lot 2.
- Qal**      **Alluvium of Quaternary Age:** These are recent deposits that have been deposited along the drainages and low-lying areas that exist on-site. These materials consist of silty to clayey sands. Some of these alluviums can contain highly organic soils.
- Qes**      **Eolian Sands of Quaternary Age:** These are wind-blown sands deposited by the action of prevailing winds. The materials typically consist of silty sands and may contain sandy silt layers.
- Qc/Tkd**      **Colluvium of Quaternary Age overlying Dawson Formation of Tertiary to Cretaceous Age:** The materials consist of colluvial or residual soils overlying the bedrock materials on-site. The colluvial soils were deposited by the action of sheetwash and gravity. The residual soils were derived from the in-situ weathering of the bedrock on site. These materials typically consist of silty to clayey sand with

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potential areas of sandy clays. The bedrock consists of the Dawson Formation. The Dawson Formation typically consists of coarse-grained, arkosic sandstone with interbedded lenses of fine-grained sandstone, siltstone and claystone.

The soils listed above were mapped from site-specific mapping, the *Bedrock Geologic Map of the Denver Basin* distributed by the Colorado Geologic Survey in 2011 (Reference 4, Figure 5), the *Surficial Geologic Map of the Denver 1° x 2° Quadrangle*, distributed by the US Geological Survey in 2001 (Reference 5), and the *Geologic Map of the Colorado Springs-Castle Rock Area*, distributed by the US Geological Survey in 1979 (Reference 6). The test pits were used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 6.

### Drainage Areas

Minor drainages exist on-site that flow in southwesterly directions. No water was observed flowing in these drainages at the time of the investigation. Areas of seasonal shallow groundwater have been mapped along the drainages on the site (Figure 6). These areas are indicated as no-build areas on Figure 3, and will be avoided.

In these areas, we would anticipate the potential for periodically high subsurface moisture conditions, frost heave potential and highly organic soils. These areas lie within minor drainage areas which can be avoided by the proposed development. Due to the potential for seasonal high groundwater conditions, on-site wastewater treatment systems are not recommended in these areas. The eastern side of the site lies within any floodplain zones according to the FEMA Map No. 08041CO375G dated December 7, 2018 (Figure 7, Reference 7). Exact locations of floodplain and specific drainage studies are beyond the scope of this report. Individual wastewater treatment systems must be located a minimum of 25 feet from dry gulches and 50 feet from water courses or floodplains.

### **ON-SITE WASTEWATER TREATMENT**

The Natural Resource Conservation Service (Reference 2), previously the Soil Conservation Service (Reference 3) has been mapped with two soil descriptions. The Soil Survey Map (Reference 1) is presented in Figure 4, and the Soil Survey Descriptions (Reference 3) are presented in Appendix D. The soils are described as having moderate to rapid percolation rates.

Soils encountered in the tactile test pits consisted of sandy loam, sandy clay loam and sand overlying weathered to formational silty sandstone. Weathered sandstone was only encountered in Test Pit No. 3. The limiting layers encountered in the test pits are the sandy loam, sandy clay loam and silty sandstone, which corresponds with USDA Soil Types 2A to 3A with LTAR values of 0.50 to 0.30 gallons per day per square foot. Weathered bedrock was encountered at approximately 3.5 feet in Test Pit No. 3. Signs of seasonally occurring groundwater were encountered in Test Pit No. 2 (Lot 3) at 7.5 feet. Absorption fields must be maintained a minimum of 4 feet above groundwater or bedrock, or confining layer. Should groundwater or bedrock be encountered within 6 feet of the surface, designed systems will be required. Designed systems are anticipated for Lot No. 1 (Test Pit No. 3), however, areas may be encountered on the lot where conventional systems would be suitable.

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In summary, it is our opinion the site is suitable for individual on-site wastewater treatment systems (OWTS) and that contamination of surface and subsurface water resources should not occur provided the OWTS sites are evaluated and installed according to El Paso County and State Guidelines and properly maintained. Based on the testing performed designed systems would likely be required for Lot 1, and the remaining lots would likely be suitable for conventional systems provided shallow bedrock, restrictive clay soils or groundwater are not encountered in the soil treatment areas. The Septic Suitability Map is presented in Figure 8. A possible house location, water well, and two septic sites for the lots are indicated on Figure 8. Areas that should be avoided by septic systems are indicated on the septic suitability map.

**Individual soil testing is required for proposed construction on each lot prior to construction.** Absorption fields must be located a minimum of 100 feet from any well, including those on adjacent properties. Absorption fields must also be located a minimum of 50 feet from any drainages, floodplains or ponded areas and 25 feet from dry gulches.

## CLOSURE

This report has been prepared for William Guman & Associates, Ltd., for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty expressed or implied is made.

We trust that this report has provided you with all the information that you required. Should you require additional information, please do not hesitate to contact Entech Engineering, Inc.

Respectfully Submitted,

ENTECH ENGINEERING, INC.



Logan L. Langford, P.G.  
Geologist

LLL/III

Encl.

Entech Job No. 200989  
AAprojects/2020/200989 wws

Reviewed by:



Joseph C. Goode, Jr.  
President



William Guman & Associates, Ltd  
Wastewater Study  
Mountain's Edge Subdivision  
McClelland Road & Farmhouse Court  
Parcel No. 32000-00-740  
El Paso County, Colorado

## BIBLIOGRAPHY

1. Kumar & Associates, Inc. November 14, 2008. *Geology and Soils Study, Mountain's Edge Development, El Paso County, Colorado*. Kumar Project No. 082-222.
2. Natural Resource Conservation Service, September 13, 2019. *Web Soil Survey*. United States Department Agriculture, <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>.
3. United States Department of Agriculture Soil Conservation Service. June 1981. *Soil Survey of El Paso County Area, Colorado*.
4. Dechesne, Marieke, Reynolds, R.G., Barkman, P.E., and Johnson, K.R., 2011. *Bedrock Geologic Map of the Denver Basin, Between Greeley and Colorado Springs, Colorado*. Plate 1 of 13.
5. Moore, D.W., Straub, A.W., Berry, M.E., Baker, M.L. and Brandt, T.R., 2001. *Surficial Geologic Map of the Denver 1-degree X 2-degree Quadrangle, Colorado*. USGS MF-2347.
6. Trimble, Donald E. and Machette, Michael N. 1979. *Geologic Map of the Colorado Springs-Castle Rock Area, Front Range Urban Corridor, Colorado*. USGS, Map I-857-F.
7. Federal Emergency Management Agency. December 7, 2018. *Flood Insurance Rate Maps for the City of Colorado Springs, Colorado*. Map Number 08041CO375G

## TABLE

**Table 1: Summary Tactile Test Pit Results**

<b>Test Pit No.</b>	<b>USDA Soil Type</b>	<b>LTAR Value</b>	<b>Depth to Bedrock (ft.)</b>	<b>Depth to Seasonally Occurring Groundwater (ft.)</b>
1	2A	0.50	N/A	N/A
2	3	0.35	N/A	7.5
3	3A*	0.30	3.5*	N/A

\*- Conditions that will require an engineered OWTS



## FIGURES



**ENTECH**  
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 COLORADO SPRINGS, CO. 80907 (719) 531-5399

VICINITY MAP  
 MOUNTAIN'S EDGE SUBDIVISION  
 McCLELLAND ROAD & FARMHOUSE COURT  
 EL PASO COUNTY, CO.  
 FOR: WILLIAM GUMAN & ASSC. LTD

DRAWN:  
 LLL

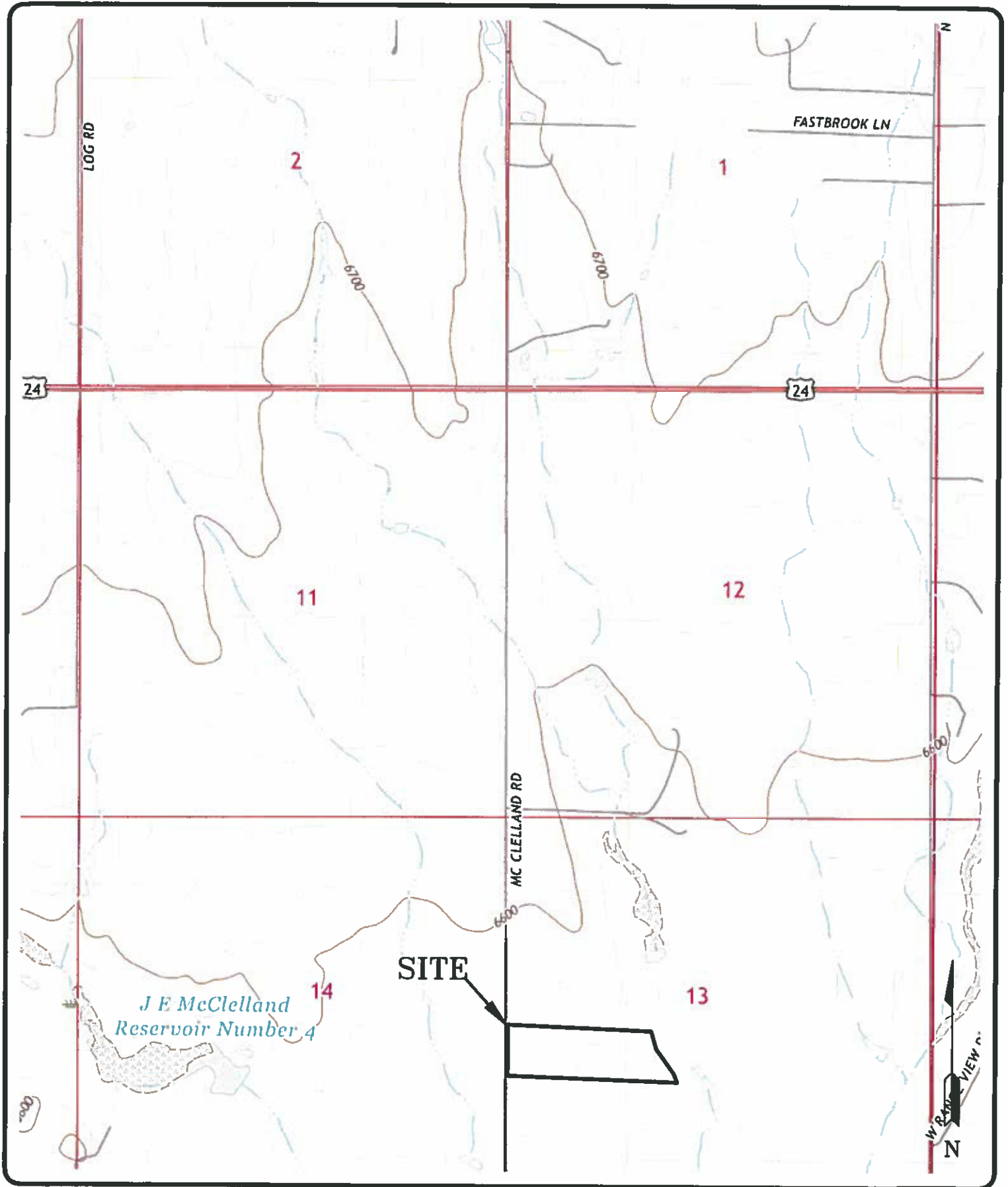
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 200989

FIG NO.:  
 1



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 305 ELKTON DRIVE  
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USGS MAP  
 MOUNTAIN'S EDGE SUBDIVISION  
 McCLELLAND ROAD & FARMHOUSE COURT  
 EL PASO COUNTY, CO.  
 FOR: WILLIAM GUMAN & ASSC. LTD

DRAWN:  
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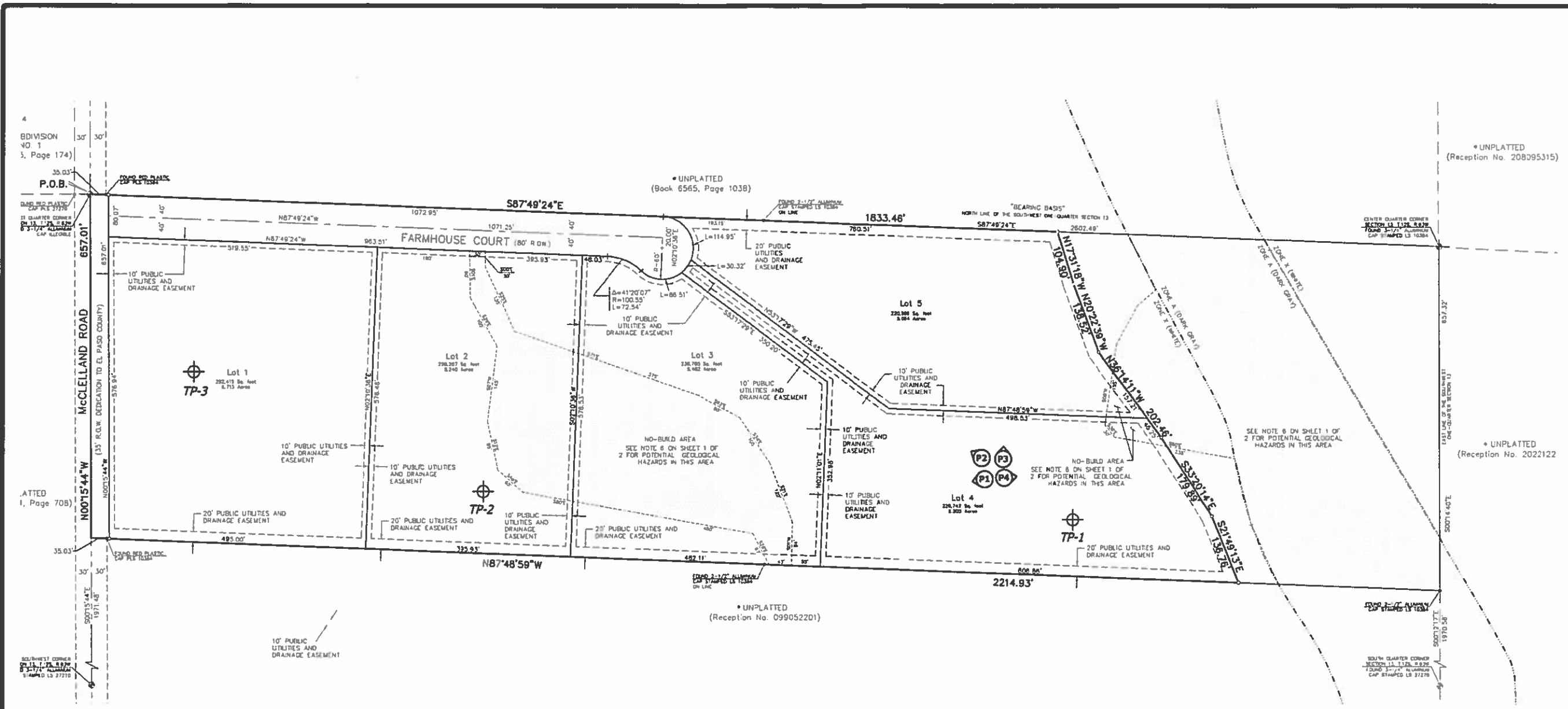
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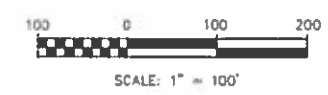
FIG NO.:  
 2



**LEGEND:**

- - Indicates survey monument set with a #4 rebar with Surveyor's Cap, PLS #20681.
- - Indicates recovered survey monument as noted.
- \* - Indicates not a part of this subdivision.
- - - - - Indicates FEMA flood hazard delineation line.
- - Indicates NO-BUILD area.

⊕ - approximate test pit location and number  
 P1 - approximate photograph location and number



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SITE PLAN/TESTING LOCATION MAP  
 MOUNTAIN'S EDGE SUBDIVISION  
 McCLELLAND ROAD & FARMHOUSE COURT  
 EL PASO COUNTY, CO.  
 FOR: WILLIAM GUMAN & ASSC. LTD

DATE	6/1/20
SCALE	AS SHOWN
JOB NO.	200989
PLANNING NO.	3



**ENTECH**  
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**SOIL SURVEY MAP**  
**DIDLEAU SUBDIVISION**  
**HERRING ROAD & FOREST HEIGHTS CIRCLE**  
**EL PASO COUNTY, CO.**  
**FOR: LDC, INC.**

DRAWN:  
 LLL

DATE:  
 2/28/20

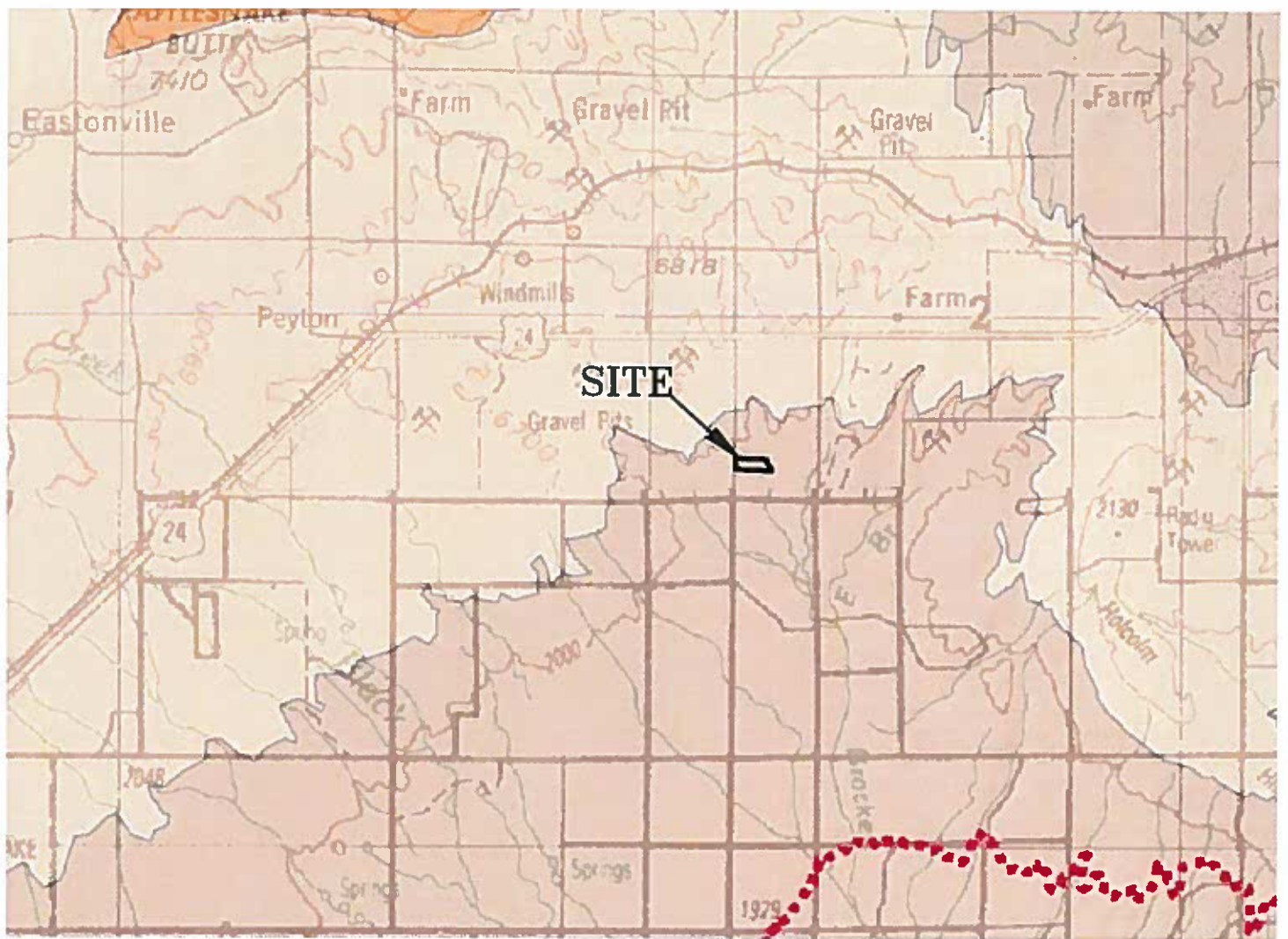
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 192115

FIG NO.:  
 4





**Explanation of Symbols**

**Geology**

- Core Hole
- ★ K-T Boundary Site
- K-T Boundary

The K-T Boundary was modeled based on field sites and cores discovered and described by various colleagues of the NSF funded-DMNS Denver Basin Project. It is not shown on the western margin where it has not been discovered and structure is more complex.

**Faults**

Faults near or in the mountains were omitted from this map. For the Boulder - Weld Fault Zone, Twiss (1979) 1:500,000 faults were used.

- Fault

**Geologic Units**

- Undifferentiated younger Tertiary rocks
- Denver Basin Group D2 Sequence (Eocene)  
*Also known as Dawson Arkose or Dawson Formation*
- Table Mountain Lava Flows (Paleocene)
- Denver Basin Group D1 Sequence (Cretaceous to Paleocene)  
*Also known as, or including, the Dawson Arkose, Dawson Fm., Denver Fm. or Arapahoe Fm.*
- Larame Formation (Cretaceous)
- Fox Hills Sandstone (Cretaceous)  
*Base is modeled at a depth of 200 ft below the top*
- Pierre Shale (Cretaceous)
- Undifferentiated Mesozoic and Paleozoic Rocks
- Undifferentiated Precambrian Crystalline Basement

Subdivisions mapped by J.P. Thorson (in press.)  
 Denver Formation (TKd), Pikeview Formation (Kpv), Jimmy Camp Formation (TKc), Black Squirrel Formation (TKbs), Dawson Arkose (Tda)



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**DENVER BASIN GEOLOGIC MAP**  
**MOUNTAIN'S EDGE SUBDIVISION**  
**MCCLELLAND ROAD & FARMHOUSE COURT**  
**EL PASO COUNTY, CO.**  
**WILLIAM GUMAN & ASSC. LTD**

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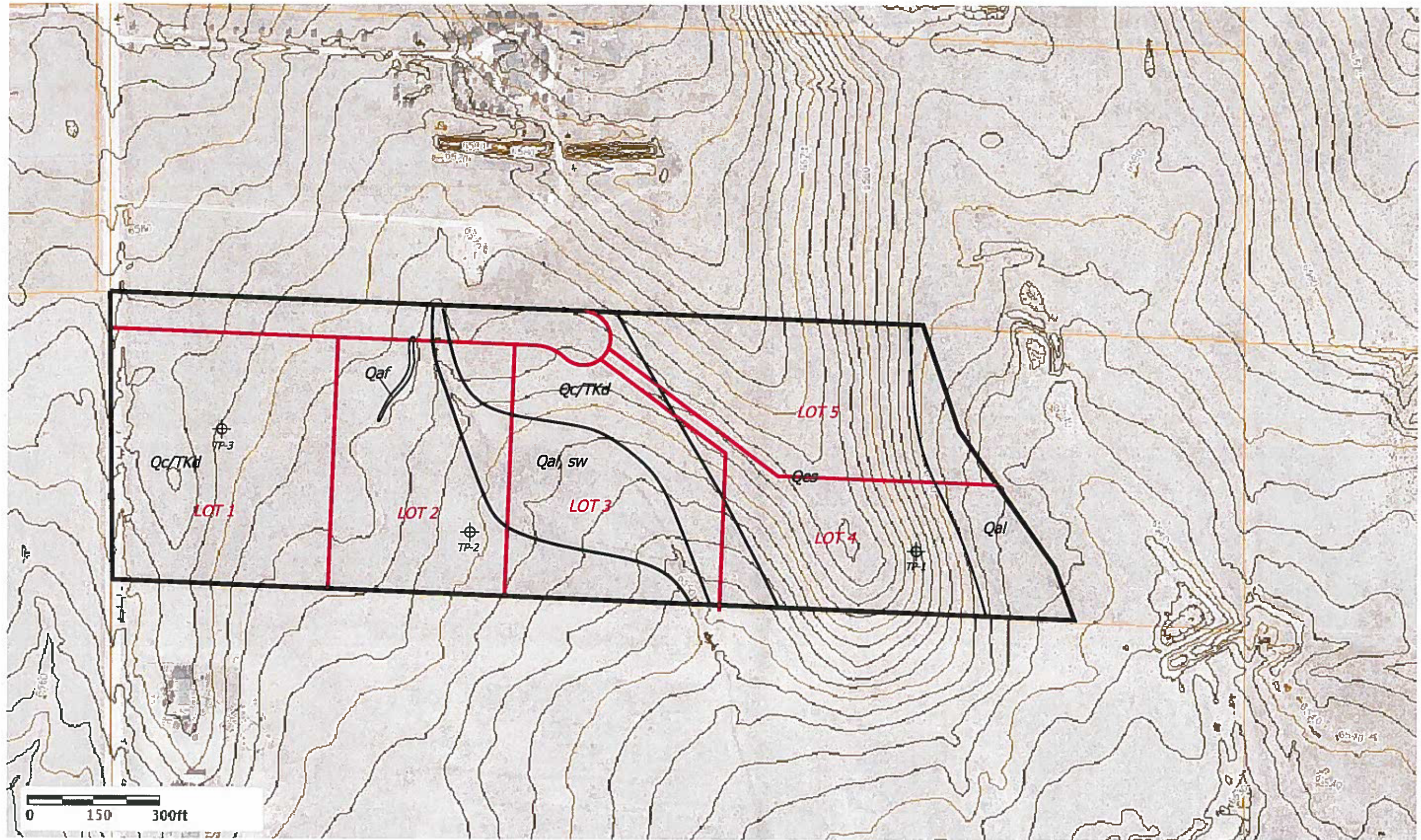
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FIG NO.:  
 5





- Legend:**
- Qaf - Artificial Fill of Holocene Age: man-made fill deposits
  - Qal - Alluvium of Quaternary Age: water deposited materials
  - Qes - Eolian Sands of Quaternary Age: wind blown sediments
  - QcTKd - Colluvium of Quaternary Age overlying Dawson Formation of Tertiary to Cretaceous Age: colluvial and residual soils overlying arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone
  - sw - shallow groundwater area

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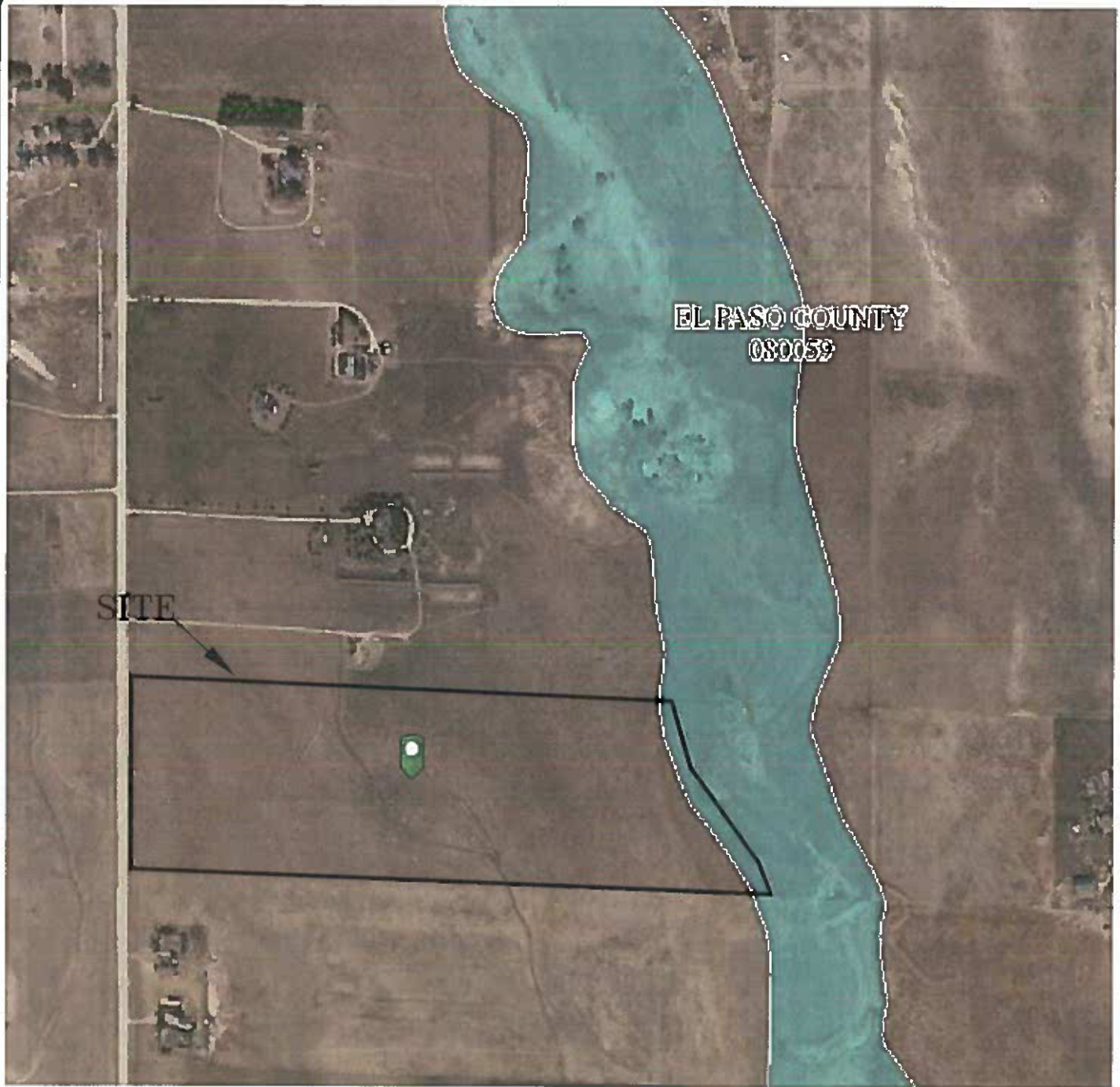
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 COLORADO SPRINGS, CO. 80907



GEOLOGY MAP  
 MOUNTAIN'S EDGE SUBDIVISION  
 McCLELLAND ROAD & FARMHOUSE COURT  
 EL PASO COUNTY, CO.  
 WILLIAM GUMAN & ASSC. LTD

DATE  
 8/1/20  
 AS SHOWN  
 JOB NO.  
 200000  
 SCALE NO.  
**6**





EL PASO COUNTY  
080059

SITE



**ENTECH**  
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399 ELIXON DRIVE  
COLORADO SPRINGS, CO. 80907 (719) 531-5399

FEMA FLOODPLAIN MAP  
MOUNTAIN'S EDGE SUBDIVISION  
McCLELLAND ROAD & FARMHOUSE COURT  
EL PASO COUNTY, CO.  
FOR: WILLIAM GUMAN & ASSC. LTD

DRAWN:  
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DATE:  
6/1/20

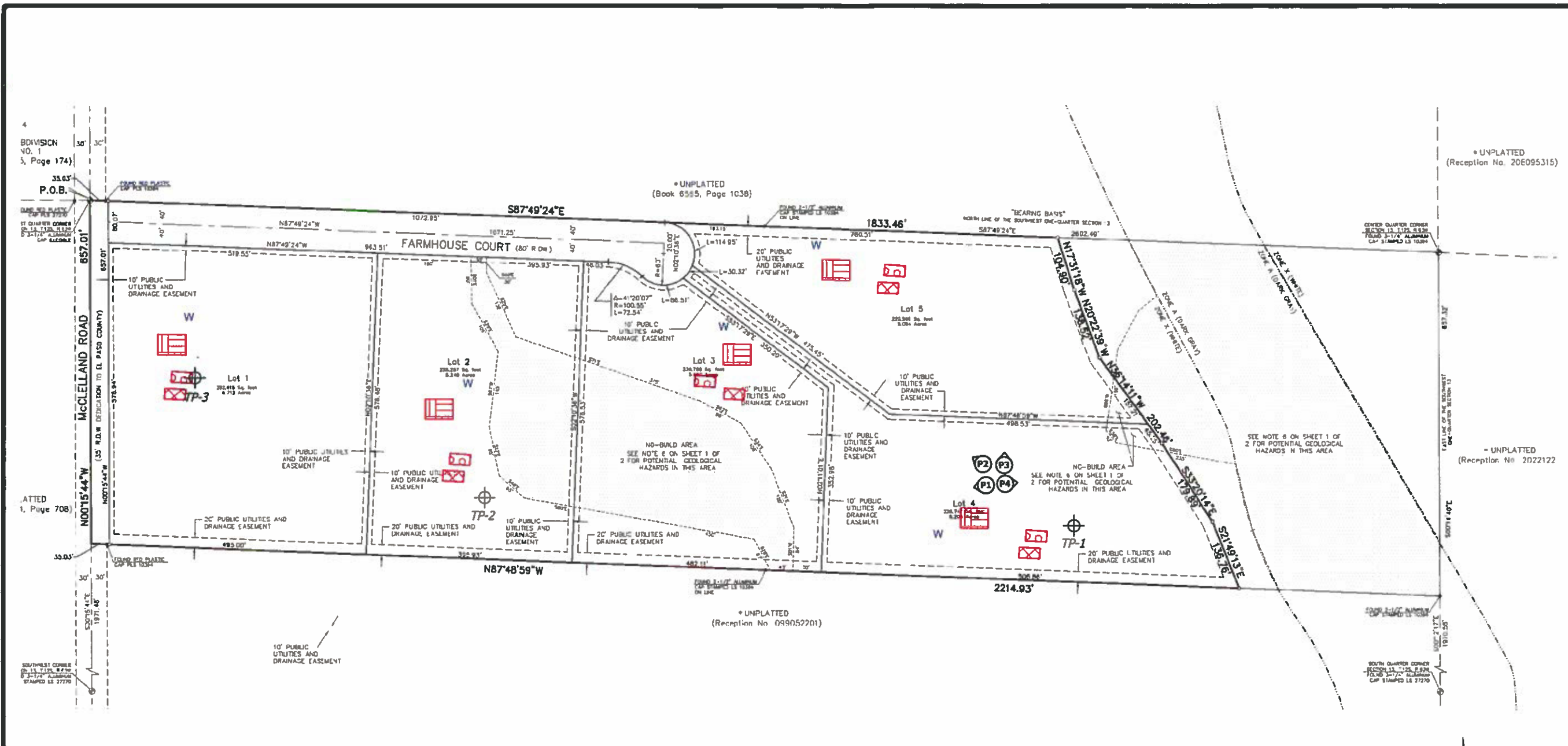
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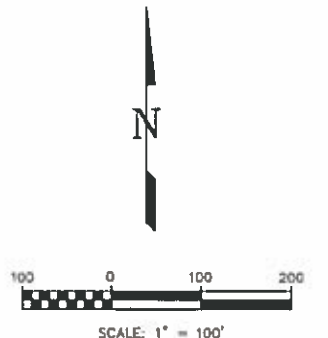
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FIG NO.:  
7





- LEGEND:**
- POSSIBLE OWTS LOCATIONS
  - POSSIBLE OWTS ALTERNATE LOCATIONS
  - POSSIBLE HOUSE LOCATIONS
  - AREAS WHERE OWTS ARE NOT RECOMMENDED
  - W** - WATER WELLS MUST BE A MINIMUM OF 100 FT FROM OWTS ABSORPTION FIELDS
  - SEASONAL GROUNDWATER AREAS ARE NOT SUITABLE FOR OWTS LOCATIONS



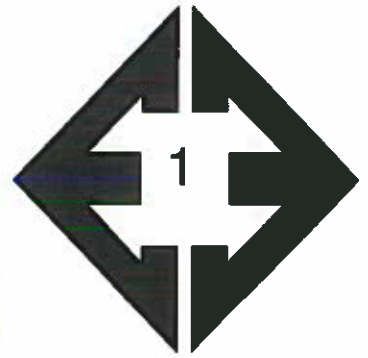
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OWTS SUTABILITY MAP  
MOUNTAIN'S EDGE SUBDIVISION  
MCCLELLAND ROAD & FARMHOUSE COURT  
EL PASO COUNTY, CO.  
WILLIAM GUMAN & ASSC. LTD

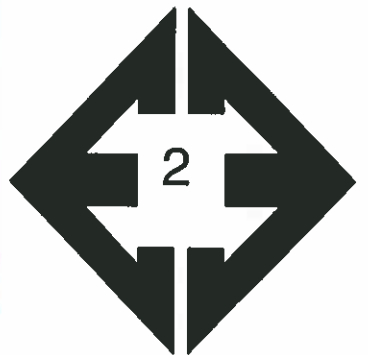
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8

## **APPENDIX A: Photographs**



**Looking west from the  
central portion of Lot  
4.**

May 19, 2020



**Looking northwest  
from the central  
portion of Lot 4.**

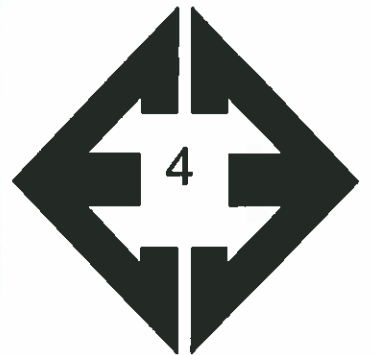
May 19, 2020





**Looking north from the  
central portion of Lot  
4.**

May 19, 2020



**Looking east towards  
drainage from the  
eastern portion of the  
site.**

May 19, 2020

## **APPENDIX B: Test Pit Logs**

TEST PIT NO. 1  
 DATE EXCAVATED 5/19/2020  
 Job # 200989

TEST PIT NO. 2  
 DATE EXCAVATED 5/19/2020  
 CLIENT WILLIAM GUMAN & ASSC. LTD  
 LOCATION McCLELLAND ROAD

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, brown	1	*		gr	l	2A	topsoil, sandy clay loam, brown	1	*		gr	m	3
sandy loam, fine to coarse grained, tan	2						gravelly, sandy clay loam, fine to coarse grained, light brown	2					
	3							3			gr	w	2A
sand, fine to coarse grained, tan	4			sg		1	gravelly sandy loam, fine to coarse grained, tan	4					
	5						*-signs of seasonally occurring groundwater at 7.5'	5					
	6							6					
	7							7					
	8							8					
	9							9					
	10							10					

Soil Structure Shape

granular - gr  
 platy - pl  
 blocky - bl  
 prismatic - pr  
 single grain - sg  
 massive - ma

Soil Structure Grade

weak - w  
 moderate - m  
 strong - s  
 loose - l



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505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST PIT LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	6/1/20

JOB NO.:

200989

FIG NO.:

B-1

TEST PIT NO. 3  
 DATE EXCAVATED 5/19/2020  
 Job # 200989

CLIENT LOCATION  
 WILLIAM GUMAN & ASSC. LTD  
 McCLELLAND ROAD

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy clay loam, brown	1	*						1					
gravelly, sandy loam, fine to coarse grained, light brown	2			gr	w	2A		2					
	3							3					
weathered to formational silty sandstone, fine to coarse grained, light brown	4			ma		3A		4					
	5							5					
	6							6					
	7							7					
	8							8					
	9							9					
	10							10					

Soil Structure Shape  
 granular - gr  
 platy - pl  
 blocky - bl  
 prismatic - pr  
 single grain - sg  
 massive - ma

Soil Structure Grade  
 weak - w  
 moderate - m  
 strong - s  
 loose - l



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**TEST PIT LOG**

DRAWN:

DATE:

CHECKED:  
 LLL

DATE:  
 6/1/20

JOB NO.:

200989

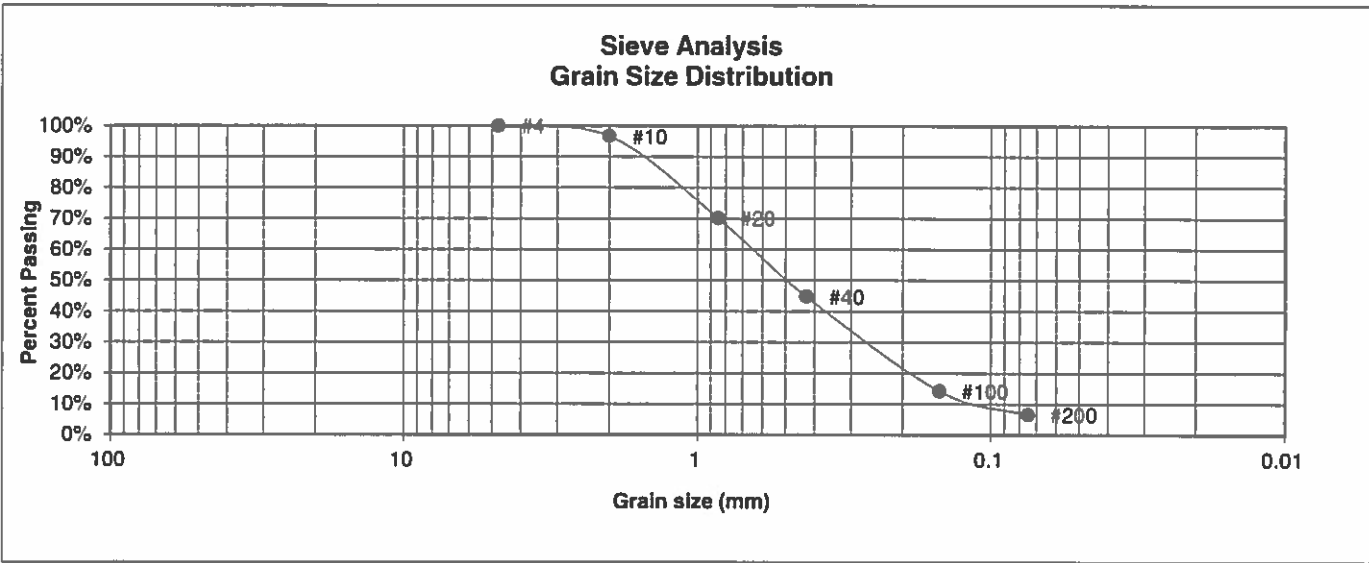
FIG NO.:

B-2

## **APPENDIX C: Laboratory Test Results**



BORING NO.	TP-1	<u>UNIFIED CLASSIFICATION</u>	SM-SP	<u>TEST BY</u>	BL
DEPTH(ft)	2-3	<u>AASHTO CLASSIFICATION</u>		<u>JOB NO.</u>	200989
CLIENT	WILLIAM GUMAN				
PROJECT	McCLELLAND ROAD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	96.7%
20	70.1%
40	44.8%
100	14.2%
200	6.6%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



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505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

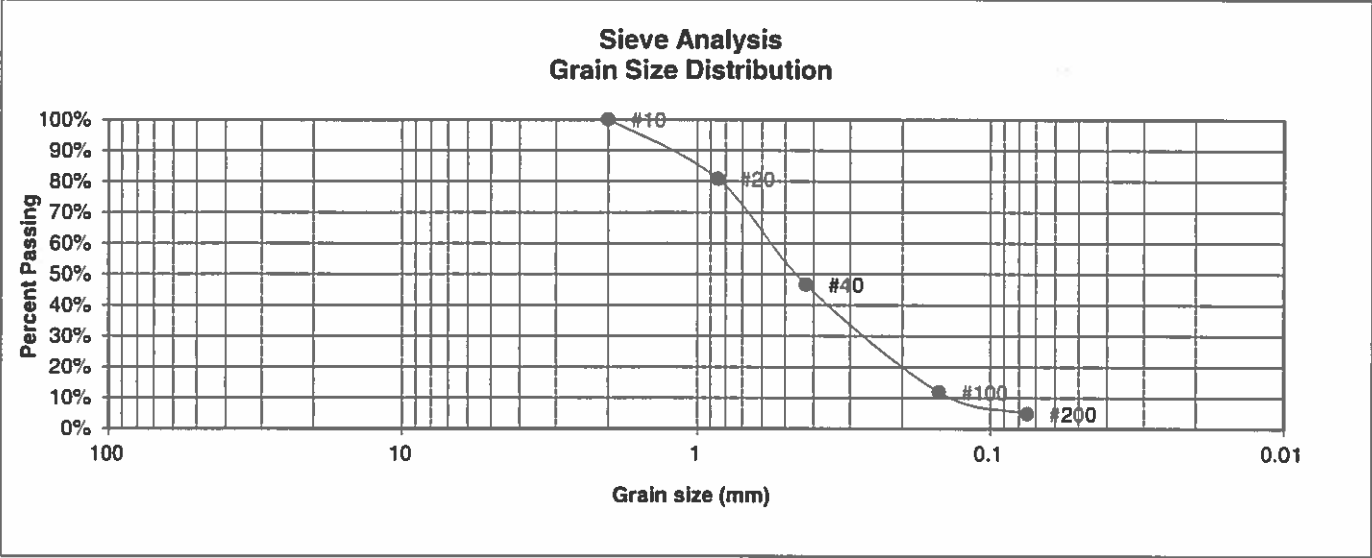
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>LL</i>	DATE: <i>6/1/20</i>
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JOB NO.:  
200989

FIG NO.:  
*C-1*

BORING NO.	TP-1	<u>UNIFIED CLASSIFICATION</u>	SP	<u>TEST BY</u>	BL
DEPTH(ft)	6-8	<u>AASHTO CLASSIFICATION</u>		<u>JOB NO.</u>	200989
CLIENT	WILLIAM GUMAN				
PROJECT	McCLELLAND ROAD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	80.8%
40	46.7%
100	11.9%
200	4.9%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



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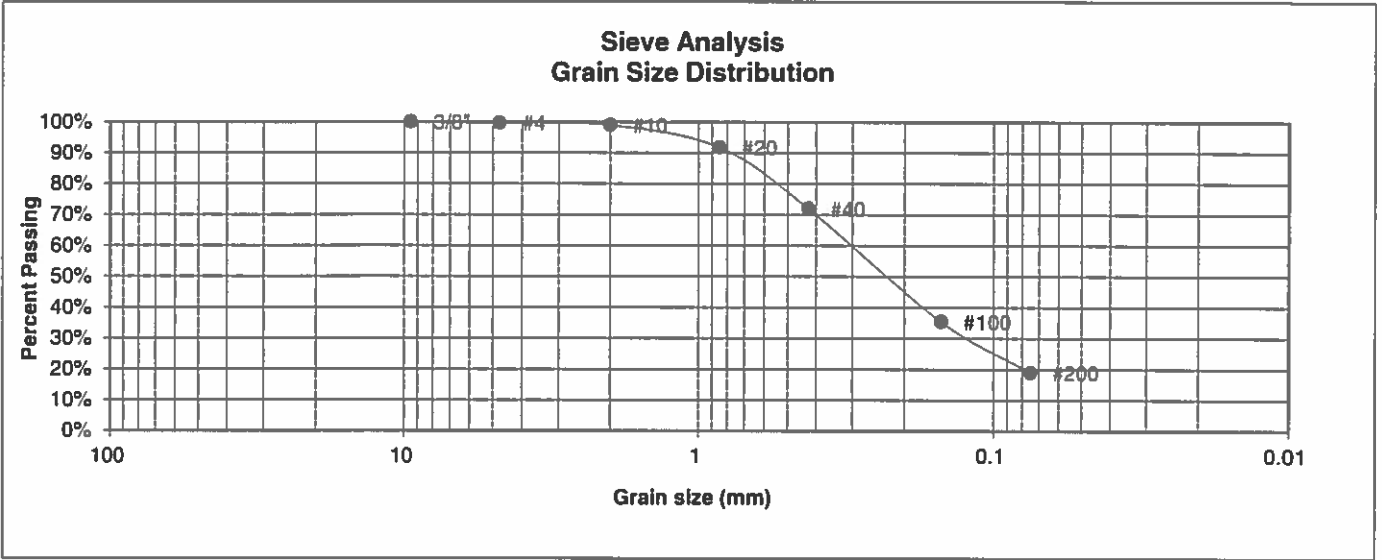
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE	CHECKED: L L L	DATE: 6/1/20
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JOB NO.:  
200989

FIG NO.:  
C-2

BORING NO.	TP-2	UNIFIED CLASSIFICATION	SC	TEST BY	BL
DEPTH(ft)	2-3	AASHTO CLASSIFICATION		JOB NO.	200989
CLIENT	WILLIAM GUMAN				
PROJECT	McCLELLAND ROAD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.7%
10	98.9%
20	91.8%
40	71.9%
100	35.4%
200	19.0%

**Atterberg Limits**  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

**Swell**  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



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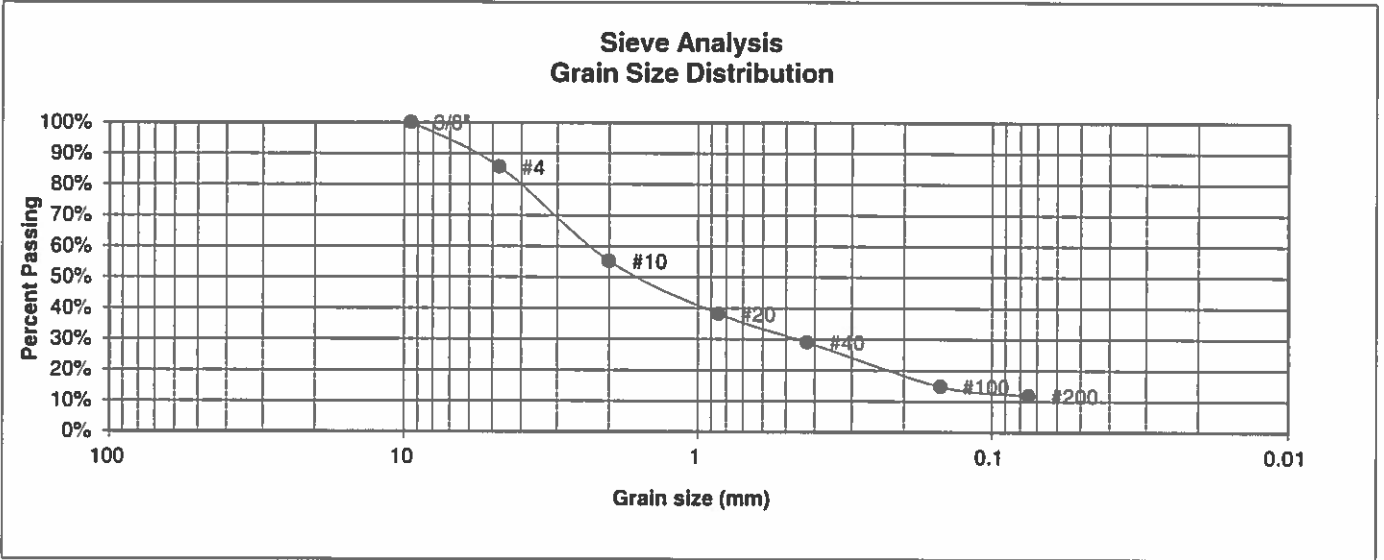
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	6/1/20

JOB NO.:  
200989

FIG NO.:  
C-3

BORING NO.	TP-2	<u>UNIFIED CLASSIFICATION</u>	SM-SW	<u>TEST BY</u>	BL
DEPTH(ft)	5-7	<u>AASHTO CLASSIFICATION</u>		<u>JOB NO.</u>	200989
CLIENT	WILLIAM GUMAN				
PROJECT	McCLELLAND ROAD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	85.6%
10	55.2%
20	38.2%
40	29.0%
100	14.8%
200	11.8%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



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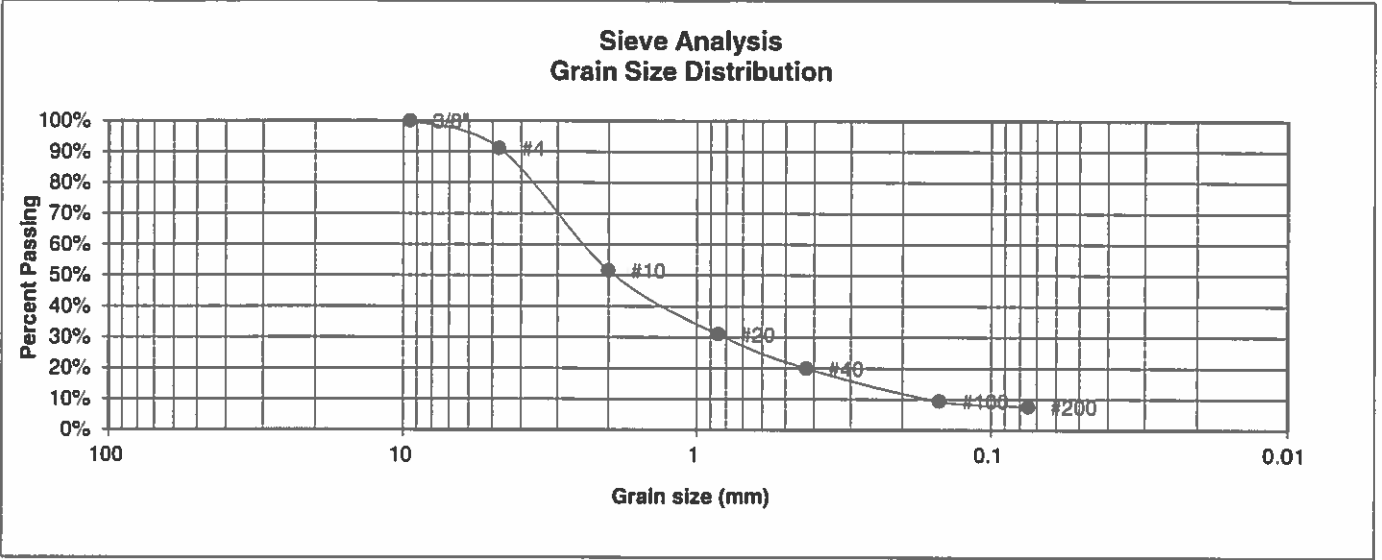
### LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	6/1/20

JOB NO.:  
200989

FIG NO.:  
C-4

BORING NO.	TP-3	UNIFIED CLASSIFICATION	SM-SW	TEST BY	BL
DEPTH(ft)	2-3	AASHTO CLASSIFICATION		JOB NO.	200989
CLIENT	WILLIAM GUMAN				
PROJECT	McCLELLAND ROAD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	91.1%
10	51.6%
20	31.0%
40	19.9%
100	9.4%
200	7.6%

**Atterberg Limits**  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

**Swell**  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



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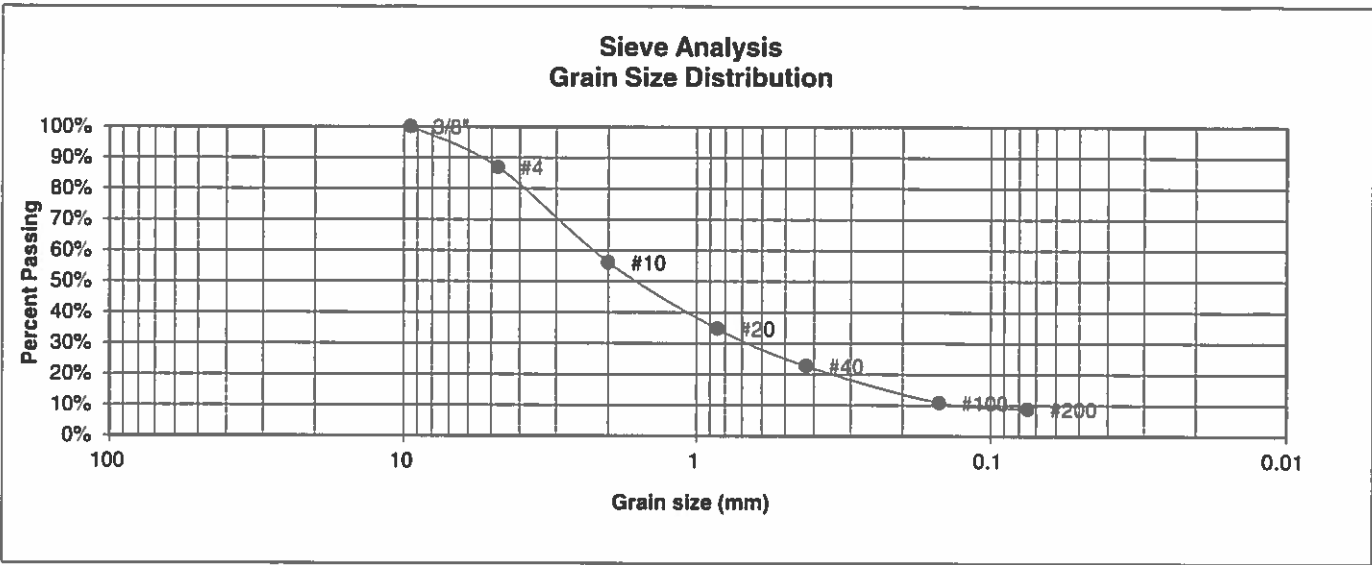
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: LLL	DATE: 6/1/20
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JOB NO.:  
200989

FIG NO.:  
C-5

BORING NO.	TP-3	<u>UNIFIED CLASSIFICATION</u>	SM-SW	<u>TEST BY</u>	BL
DEPTH(ft)	5-6	<u>AASHTO CLASSIFICATION</u>		<u>JOB NO.</u>	200989
CLIENT	WILLIAM GUMAN				
PROJECT	McCLELLAND ROAD				



U.S. Sieve #	Percent Finer	Atterberg Limits
3"		Plastic Limit
1 1/2"		Liquid Limit
3/4"		Plastic Index
1/2"		
3/8"	100.0%	
4	86.9%	<u>Swell</u>
10	56.1%	Moisture at start
20	34.7%	Moisture at finish
40	22.7%	Moisture increase
100	10.8%	Initial dry density (pcf)
200	8.8%	Swell (psf)



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**LABORATORY TEST RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	6/1/20

JOB NO.:  
200989

FIG NO.:  
C-6

## **APPENDIX D: Soil Survey Map & Descriptions**

## El Paso County Area, Colorado

### 8—Blakeland loamy sand, 1 to 9 percent slopes

#### Map Unit Setting

*National map unit symbol:* 369v  
*Elevation:* 4,600 to 5,800 feet  
*Mean annual precipitation:* 14 to 16 inches  
*Mean annual air temperature:* 46 to 48 degrees F  
*Frost-free period:* 125 to 145 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Blakeland and similar soils:* 98 percent  
*Minor components:* 2 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Blakeland

##### Setting

*Landform:* Hills, flats  
*Landform position (three-dimensional):* Side slope, talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

##### Typical profile

*A - 0 to 11 inches:* loamy sand  
*AC - 11 to 27 inches:* loamy sand  
*C - 27 to 60 inches:* sand

##### Properties and qualities

*Slope:* 1 to 9 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat excessively drained  
*Runoff class:* 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  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 5 percent  
*Available water storage in profile:* Low (about 4.5 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 3e  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* A  
*Ecological site:* Sandy Foothill (R049BY210CO)  
*Hydric soil rating:* No



### **Minor Components**

#### **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

### **Data Source Information**

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 17, Sep 13, 2019

## El Paso County Area, Colorado

### 10—Blendon sandy loam, 0 to 3 percent slopes

#### Map Unit Setting

*National map unit symbol:* 3671  
*Elevation:* 6,000 to 6,800 feet  
*Mean annual precipitation:* 14 to 16 inches  
*Mean annual air temperature:* 46 to 48 degrees F  
*Frost-free period:* 125 to 145 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Blendon and similar soils:* 98 percent  
*Minor components:* 2 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Blendon

##### Setting

*Landform:* Terraces, alluvial fans  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Sandy alluvium derived from arkose

##### Typical profile

*A - 0 to 10 inches:* sandy loam  
*Bw - 10 to 36 inches:* sandy loam  
*C - 36 to 60 inches:* gravelly sandy loam

##### Properties and qualities

*Slope:* 0 to 3 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):*  
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:* 2 percent  
*Available water storage in profile:* Moderate (about 6.2 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 3e  
*Hydrologic Soil Group:* B  
*Ecological site:* Sandy Foothill (R049BY210CO)  
*Hydric soil rating:* No

### **Minor Components**

#### **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

### **Data Source Information**

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 17, Sep 13, 2019

## El Paso County Area, Colorado

### 96—Truckton sandy loam, 0 to 3 percent slopes

#### Map Unit Setting

*National map unit symbol:* 36bf

*Elevation:* 6,000 to 7,000 feet

*Mean annual precipitation:* 14 to 15 inches

*Mean annual air temperature:* 46 to 50 degrees F

*Frost-free period:* 125 to 145 days

*Farmland classification:* Prime farmland if irrigated and the product of  
I (soil erodibility) x C (climate factor) does not exceed 60

#### Map Unit Composition

*Truckton and similar soils:* 95 percent

*Minor components:* 5 percent

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

#### Description of Truckton

##### Setting

*Landform:* Flats

*Landform position (three-dimensional):* 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 8 inches:* sandy loam

*Bt - 8 to 24 inches:* sandy loam

*C - 24 to 60 inches:* coarse sandy loam

##### Properties and qualities

*Slope:* 0 to 3 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Well drained

*Runoff class:* Very low

*Capacity of the most limiting layer to transmit water (Ksat):* High  
(1.98 to 6.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water storage in profile:* Low (about 5.7 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 2e

*Land capability classification (nonirrigated):* 3e

*Hydrologic Soil Group:* A

*Ecological site:* Sandy Foothill (R049BY210CO)

*Hydric soil rating:* No

### **Minor Components**

#### **Other soils**

*Percent of map unit: 4 percent*

*Hydric soil rating: No*

#### **Pleasant**

*Percent of map unit: 1 percent*

*Landform: Depressions*

*Hydric soil rating: Yes*

## **Data Source Information**

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 17, Sep 13, 2019

## El Paso County Area, Colorado

### 97—Truckton sandy loam, 3 to 9 percent slopes

#### Map Unit Setting

*National map unit symbol:* 2x0j2  
*Elevation:* 5,300 to 6,850 feet  
*Mean annual precipitation:* 14 to 19 inches  
*Mean annual air temperature:* 48 to 52 degrees F  
*Frost-free period:* 85 to 155 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Truckton and similar soils:* 85 percent  
*Minor components:* 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Truckton

##### Setting

*Landform:* Interfluves, hillslopes  
*Landform position (two-dimensional):* Backslope  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Re-worked alluvium derived from arkose

##### Typical profile

*A - 0 to 4 inches:* sandy loam  
*Bt1 - 4 to 12 inches:* sandy loam  
*Bt2 - 12 to 19 inches:* sandy loam  
*C - 19 to 80 inches:* sandy loam

##### Properties and qualities

*Slope:* 3 to 9 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  
(2.00 to 6.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 1 percent  
*Salinity, maximum in profile:* Nonsaline (0.1 to 1.9 mmhos/cm)  
*Available water storage in profile:* Moderate (about 6.6 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 6e  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* A

*Ecological site:* Sandy Foothill (R049BY210CO)  
*Hydric soil rating:* No

#### **Minor Components**

##### **Blakeland**

*Percent of map unit:* 8 percent  
*Landform:* Interfluves, hillslopes  
*Landform position (two-dimensional):* Shoulder, backslope, summit  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Linear, convex  
*Across-slope shape:* Linear, convex  
*Ecological site:* Sandy Foothill (R049BY210CO)  
*Hydric soil rating:* No

##### **Bresser**

*Percent of map unit:* 7 percent  
*Landform:* Interfluves, low hills  
*Landform position (two-dimensional):* Foothill, toeslope  
*Landform position (three-dimensional):* Base slope  
*Down-slope shape:* Linear, concave  
*Across-slope shape:* Linear, concave  
*Ecological site:* Sandy Foothill (R049BY210CO)  
*Hydric soil rating:* No

## **Data Source Information**

Soil Survey Area: El Paso County Area, Colorado  
Survey Area Data: Version 17, Sep 13, 2019