June 7, 2021

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

Mike and Ruth Crowe
15980 Roller Coaster Road
Colorado Springs, CO 80921

Re: Soil, Geology, and Geologic Hazard Study
Crowe Subdivision
Parcel No. 61280-00-001
15980 Roller Coaster Road
El Paso County, Colorado

Dear Mr. and Mrs. Crowe:

GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site is located in a portion of the NE ¼ of SW ¼ of Section 28 Township 11 South, Range 66 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 2-miles northeast of Colorado Springs city limits, southwest of Reveille Drive and Roller Coaster 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 to moderately sloping to the south-southeast, with steeper slopes along a ridges in the northeastern and western portions of the parcel. Two dry drainages were observed in the central and eastern portions of the property. 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 undeveloped and rural residential. The site contains field grasses, weeds, kinnikinnick, and ponderosa pines. An existing house with a cabin, sheds, water well and septic system are located on Lot 2, which will remain. Site photographs taken April 22, 2021, are included in Appendix A. Site mapping was completed on April 22, 2021, and test pits were excavated on April 29, 2021.

Total acreage involved in the proposed subdivision is 20-acres. Three rural residential lots are proposed as part of the replat. The proposed lot sizes range from 5-acres to 9.11-acres. Access to the lots will be along the southern side of the property. An existing house is located on Lot 2 which will remain. The new lots will be serviced by individual wells and on-site wastewater treatment systems. The Site Plan with the proposed replat is presented in Figure 3.

LAND USE AND ENGINEERING GEOLOGY

This site was found to be suitable for the proposed development. Areas were encountered where the geologic conditions will impose some constraints on development and land use. These include areas of downslope creep and potentially seasonal shallow groundwater areas. Based on the proposed development plan, it appears that these areas will have some minor impacts on the development. These conditions will be discussed in greater detail in the report.

In general, it is our opinion that the development can be achieved if the observed geologic conditions on site are either avoided or properly mitigated. All recommendations are subject to the limitations discussed in the report.

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.

FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of 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/Engineering Geology Map which identified pertinent geologic conditions affecting development. The field mapping was performed by personnel of Entech Engineering, Inc. on April 22, 2021.

Two test pits were excavated on the two new proposed lots to determine general suitability of the soil characteristics for residential construction and for onsite wastewater treatment. 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 some of 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 1, Figure 4), previously the Soil Conservation Service (Reference 2) has mapped two 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:

Type	Description
41	Kettle gravelly, loamy sand, 8 – 40% Slopes
71	Pring coarse sandy loam, 3 – 8% Slopes

The soils have been described to have 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).

Soils

The soils encountered in the test pits consisted of silty to clean sand and sand/clay. The test pits were excavated to depths of 6 and 8 feet. Bedrock was encountered at depth of 6 feet in Test Pit No. 1, and not encountered in Test Pit No. 2. The soils were encountered at medium dense states and moderate moisture conditions. The samples of sand tested had 3 to 9 percent of the soil size particles passing the No. 200 sieve. The sand/clay sample had 42 percent of the soil size particles passing the No. 200 sieve. Highly expansive claystone and siltstone lenses are commonly interbedded in the Dawson Formation in this area. The sand soils and sandstone typically have low expansion potential.

Groundwater

Groundwater was not encountered in the test pits which were excavated to depths of 6 and 8 feet. Groundwater is not anticipated to affect shallow foundations on the majority of the site. Areas of potentially seasonal shallow groundwater were observed along two minor dry drainages in the central and eastern portions of the site, and are further discussed below. 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 7 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 3). The bedrock underlying the site consists of the Dawson Formation of Tertiary to 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 Monument Quadrangle,* by Thorson and Madole in 2003, (Reference 4, Figure 5). The Geology Map for the site is presented in Figure 6. Two mappable units were identified on this site which is described as follows:

Qau **Alluvium Undivided of Holocene and Pleistocene Age:** The materials consist of pale brown to brown sand and gravel. The sands deposited by action of sheetwash and gravity, and stream deposited along minor drainages.

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 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 *Geologic Map of the Monument Quadrangle* distributed by the Colorado Geologic Survey in 2003 (Reference 4, Figure 5), The *Geologic Map of the Colorado Springs-Castle Rock Area,* distributed by the US Geological Survey in 1979 (Reference 5), and the *Geologic Map of the Denver 1° x 2° Quadrangle,* distributed by the US Geological Survey in 1981 (Reference 6). The test borings were used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 6.

ENGINEERING GEOLOGIC HAZARDS

Mapping has been performed on this site to identify areas where various geologic conditions exist of which developers should be cognizant during the planning, design and construction stages where new construction is proposed. The engineering geologic hazards identified on this site include downslope creep areas and potentially seasonal shallow groundwater areas. Potential Hazards including expansive soils have also been addressed. These hazards and recommended mitigation techniques are discussed as follows:

Expansive Soils - Constraint

Expansive soils were not encountered in the test pits. However, highly expansive claystone and siltstone are commonly interbedded in the sandstone of the Dawson Formation. Expansive clays, if encountered beneath foundations, can cause differential movement in the structure foundation.

Mitigation: Should expansive soils be encountered beneath the foundation; mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements.

Drainage Areas – Potentially Seasonal Shallow Groudwater - Constraint

Two minor dry drainages exist in the central and eastern portions of the site. No water was observed flowing in the drainages at the time of the investigation, however, these areas have the potential for seasonal shallow groundwater. These areas are indicated in the Geology/Engineering Geology Map (Figure 6). Due to the size of the proposed lots these areas can either be avoided or redirected around proposed structures or proposed soil treatment areas. The proposed building areas are not affected by these areas. The site does not lie within any floodplain zones according to the FEMA Map Nos. 08041CO285G and 08041CO295G dated December 7, 2018 (Figure 7, Reference 7). The two dry drainages mapped with these hazards have been identified in the National Wetland Inventory as a Freshwater Emergent Wetland habitat classified as Riverine habitat classified as R4SBC (Riverine – R, Intermittent – 4, Streambed – SB, Seasonally Flooded – C) (Figure 8, Reference 8). In this area we would anticipate the potential for surface and near surface groundwater conditions depending on seasonal changes in precipitation and runoff. Exact floodplain locations and drainage studies are beyond the scope of this report. Groundwater areas are discussed as follows:

Mitigation: In these locations, foundations in areas subject to severe frost heave potential should penetrate sufficient depth so as to discourage the formation of ice lenses beneath foundations. At this location and elevation, a foundation depth for frost protection of 30 inches is recommended. In areas where high subsurface moisture conditions are anticipated periodically, a subsurface perimeter drain will be necessary to help prevent the intrusion of water into areas located below grade. A typical perimeter drain detail is presented in Figure 9. Unstable conditions should be expected where excavations approach the groundwater level. The use of rock, shotcrete, or geo-grids may be necessary to stabilize excavations. Additionally, swales should be created to intercept surface runoff and carry it safely around and away from structures. The drainages can be filled during site grading mitigating the seasonal shallow and potentially seasonally shallow groundwater hazards. The water table may be a sufficient depth to minimize the effects on buildings; however, groundwater may be encountered during utility trenches during site development. All soft and organic soils should be removed prior to fill placement. Stabilization of the subgrade with rock and fabric prior to placing fill may be necessary if saturated unstable conditions are encountered.

Downslope Creep Areas - Constraint

The areas identified with this constraint includes the steeper slopes along the ridges in the western and northeastern portion of the site. In these areas we would anticipate lateral and vertical movement of the near surface soils in the downslope direction. These areas will be avoided by the proposed structures; however, they are acceptable for building sites with the following constraints on construction.

Mitigation: This type of movement will increase lateral pressures against foundation walls on the uphill side of structures. The design of foundations in these areas should account for this additional pressure. A lateral pressure detail is shown in Figure 10. Where possible in areas of downslope creep, structures should be designed to be as compact and rigid as possible. This will help them better tolerate the vertical and lateral movements to which the foundation system

may be subjected with minimal damage. Long, rambling, irregular structures should be avoided in these areas as they are associated with a much greater potential for damaging differential movement. Due to lot size, it is anticipated that the majority of the downslope creep areas can be avoided as building sites. Reinforcement or tie beams in the foundation may be necessary where the structures encroach on the downslope creep area. Any cuts steeper than 3:1 should be retained by walls designed for the sloping conditions.

RELEVANCE OF GEOLOGIC CONDITIONS TO LAND USE PLANNING

The proposed development will be rural-residential utilizing individual on-site wastewater treatment systems and water wells. Total acreage involved in the proposed subdivision is 20-acres. Four rural residential lots are proposed as part of the replat. The proposed lot sizes range from 5-acres to 9.11-acres. An existing house is located on Lot 2 which will remain. The new lots will be serviced by individual wells and on-site wastewater treatment systems. The existing geologic and engineering geologic conditions will impose minor constraints on development and construction. The geologic conditions on the site include downslope creep, and potentially seasonal shallow groundwater, which can be satisfactorily mitigated through avoidance or proper engineering design and construction practices.

The upper granular soils encountered in the test pits on the site were encountered at medium dense states, and the sandstone was encountered at very dense states. High allowable bearing capacities should be expected in areas of shallow bedrock. Difficult excavation of the very dense sandstone should be expected.

The sandstone encountered in the test pit is considered to have low expansion potential, however, highly expansive claystone and siltstone are commonly interbedded in the sandstone of the Dawson Formation. Mitigation of expansive soils if encountered will be required. Overexcavation and replacement with non-expansive soils at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. These soils will not prohibit development.

Minor drainages exist in the central and eastern portions of the site. No water was observed flowing in these drainages, however, the potential for seasonal shallow groundwater exists in these areas during periods of high runoff. Due to the sizes of the proposed lots these areas can likely be avoided by future structures. Structures should not block drainages. Grading should direct surface waters around structures and roadways to prevent areas of ponded water.

Areas of downslope creep were observed across the site, and are indicated on Figure 6. The areas identified with this hazard includes the steeper slopes along the ridges across the site. In these areas we would anticipate lateral and vertical movement of the near surface soils in the downslope direction. These areas will be avoided by the proposed structures; however, structures may encroach on these areas. In areas of downslope creep, structures should be

designed to be as compact and rigid as possible. Foundations may require tie-beams or additional foundation reinforcement in these areas. Foundations should be designed to step up the slopes to avoid deep cuts. Deep cuts should be avoided on all steeper sloping areas of the site. Any retaining walls should be designed for the global slope stability by a qualified professional engineer. This includes cuts made for terracing in backyards.

In summary, the granular soils will likely provide suitable support for shallow foundations. The geologic conditions encountered on site can be mitigated with avoidance or proper engineering and construction practices.

ECONOMIC MINERAL RESOURCES

Some of the sandy materials on-site could be considered a low-grade sand resource. According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 9), of the area of the site is not mapped with any potential aggregate resources. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 10), the site is not mapped with any resources. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 11), the area of the site has been mapped as "little or no potential" for industrial minerals.

According to *the Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 11), the site is mapped within the Denver Basin Coal Region. However, the area of the site has been mapped as "Poor" for coal resources. No active or inactive mines have been mapped in the area of the site. No metallic mineral resources have been mapped on the site (Reference 11).

The site has been mapped as "Fair" for oil and gas resources (Reference 11). No oil or gas fields have been discovered in the area of the site. The sedimentary rocks in the area may lack the geologic structure for trapping oil or gas; therefore, it may not be considered a significant resource. Hydraulic fracturing is a new method that is being used to extract oil and gas from rocks. It utilizes pressurized fluid to extract oil and gas from rocks that would not normally be productive. The area of the site has not been explored to determine if the rocks underlying the site would be commercially viable utilizing hydraulic fracturing. The practice of hydraulic fracturing has come under review due to concerns about environmental impacts, health and safety.

EROSION CONTROL

The soil types observed on the site are mildly to highly susceptible to wind erosion, and moderately to highly susceptible to water erosion. A minor wind erosion and dust problem may be created for a short time during and immediately after construction. Should the problem be considered severe enough during this time, watering of the cut areas or the use of chemical palliative may be required to control dust. However, once construction has been completed and vegetation re-established, the potential for wind erosion should be considerably reduced.

With regard to water erosion, loosely compacted soils will be the most susceptible to water erosion, residually weathered soils and weathered bedrock materials become increasingly less susceptible to water erosion. For the typical soils observed on site, allowable velocities or unvegetated and unlined earth channels would be on the order of 3 to 4 feet/second, depending upon the sediment load carried by the water. Permissible velocities may be increased through the use of vegetation to something on the order of 4 to 7 feet/second, depending upon the type of vegetation established. Should the anticipated velocities exceed these values, some form of channel lining material may be required to reduce erosion potential. These might consist of some of the synthetic channel lining materials on the market or conventional riprap. In cases where ditch-lining materials are still insufficient to control erosion, small check dams or sediment traps may be required. The check dams will serve to reduce flow velocities, as well as provide small traps for containing sediment. The determination of the amount, location and placement of ditch linings, check dams and of the special erosion control features should be performed by or in conjunction with the drainage engineer who is more familiar with the flow quantities and velocities.

Cut and fill slope areas will be subjected primarily to sheetwash and rill erosion. Unchecked rill erosion can eventually lead to concentrated flows of water and gully erosion. The best means to combat this type of erosion is, where possible, the adequate re-vegetation of cut and fill slopes. Cut and fill slopes having gradients more than three (3) horizontal to one (1) vertical become increasingly more difficult to revegetate successfully. Therefore, recommendations pertaining to the vegetation of the cut and fill slopes may require input from a qualified landscape architect and/or the Soil Conservation Service.

CLOSURE

It is our opinion that the existing geologic engineering and geologic conditions will impose some minor constraints on development and construction of the site. The majority of these conditions can be avoided by construction. Others can be mitigated through proper engineering design and construction practices. The proposed development and use are consistent with anticipated geologic and engineering geologic conditions.

It should be pointed out that because of the nature of data obtained by random sampling of such variable and non-homogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Individual investigations for new building sites and septic systems will be required prior to construction. Construction and design personnel should be made familiar with the contents of this report. Reporting such discrepancies to Entech Engineering, Inc. soon after they are discovered would be greatly appreciated and could possibly help avoid construction and development problems.

This report has been prepared for Mike and Ruth Crowe, for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty expressed or implied is made.

Mike and Ruth Crowe
Soils, Geology, and Geologic Hazard Study
Crowe Subdivision
Parcel No. 61280-00-001
15980 Roller Coaster Road
El Paso County, Colorado

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

Kristen A. Andrew-Hoser, P.G.
Senior Geologist

Reviewed by:

Joseph C. Goode, Jr., P.E.
President

COLORADO LICENSED
JOSEPH COLLIN GOODE JR.
23725
6/8/21
PROFESSIONAL ENGINEER

LLL/lll

Encl.

Entech Job No. 210825
AAprojects/2021/210825 sg&ghs

BIBLIOGRAPHY

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TABLE

Table 1: Summary Test Pit Results

Test Pit No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)	USDA Soil Type	LTAR Value
1	6	>6	4*	0.20*
2	>8	>8	R-1/R-2*	0.80*

*- Conditions that will require an engineered OWTS

FIGURES

N

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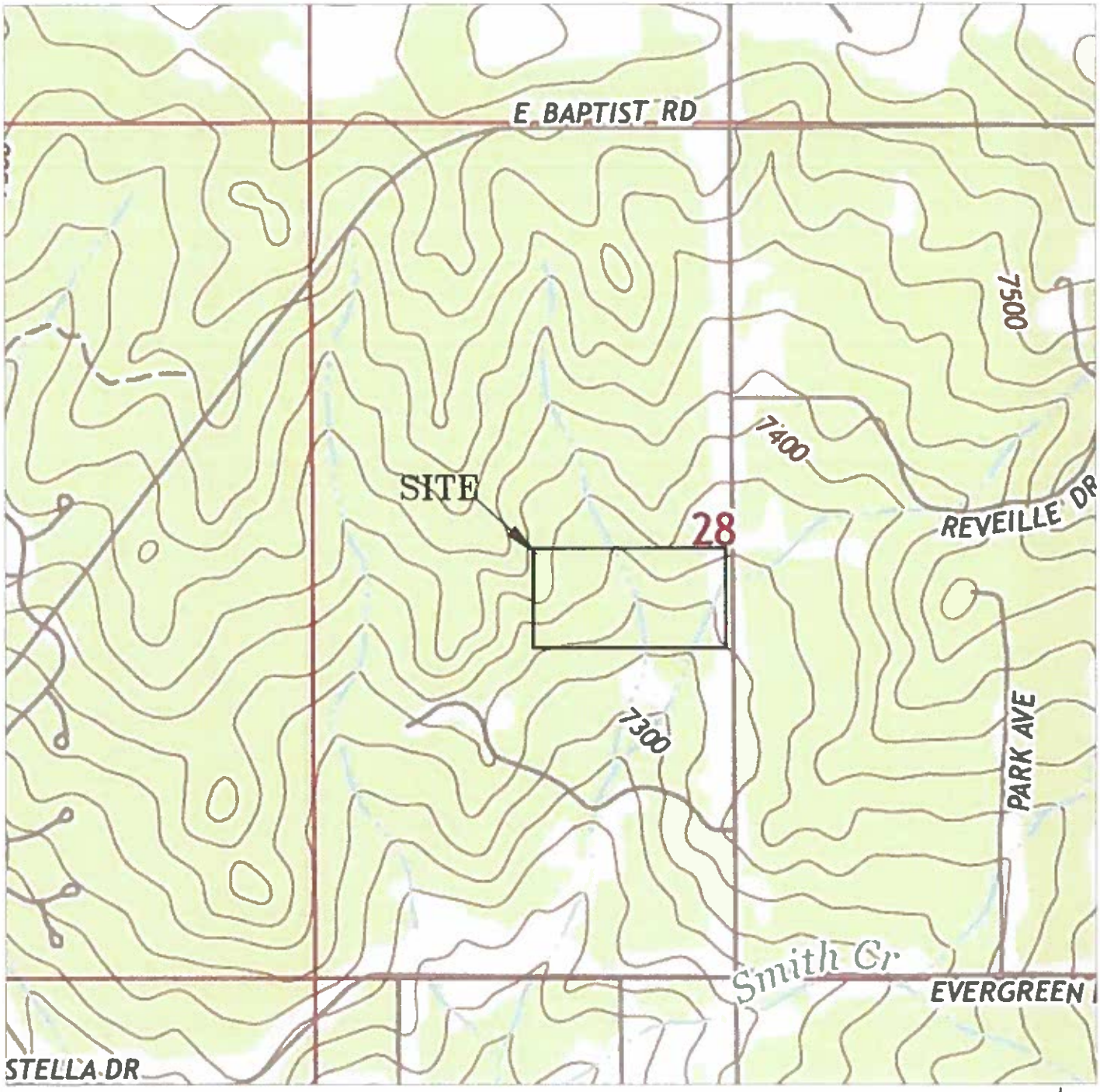
VICINITY MAP
CROWE SUBDIVISION
15980 ROLLER COASTER ROAD
EL PASO COUNTY, CO.
FOR: MIKE AND RUTH CROWE

DRAWN:	DATE:	CHECKED:	DATE:
LLL	5/22/21		

JOB NO.: 210825

FIG NO.: 1



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USGS TOPOGRAPHY MAP
CROWE SUBDIVISION
15980 ROLLER COASTER ROAD
EL PASO COUNTY, CO.
FOR: MIKE AND RUTH CROWE

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LLL	5/22/21		

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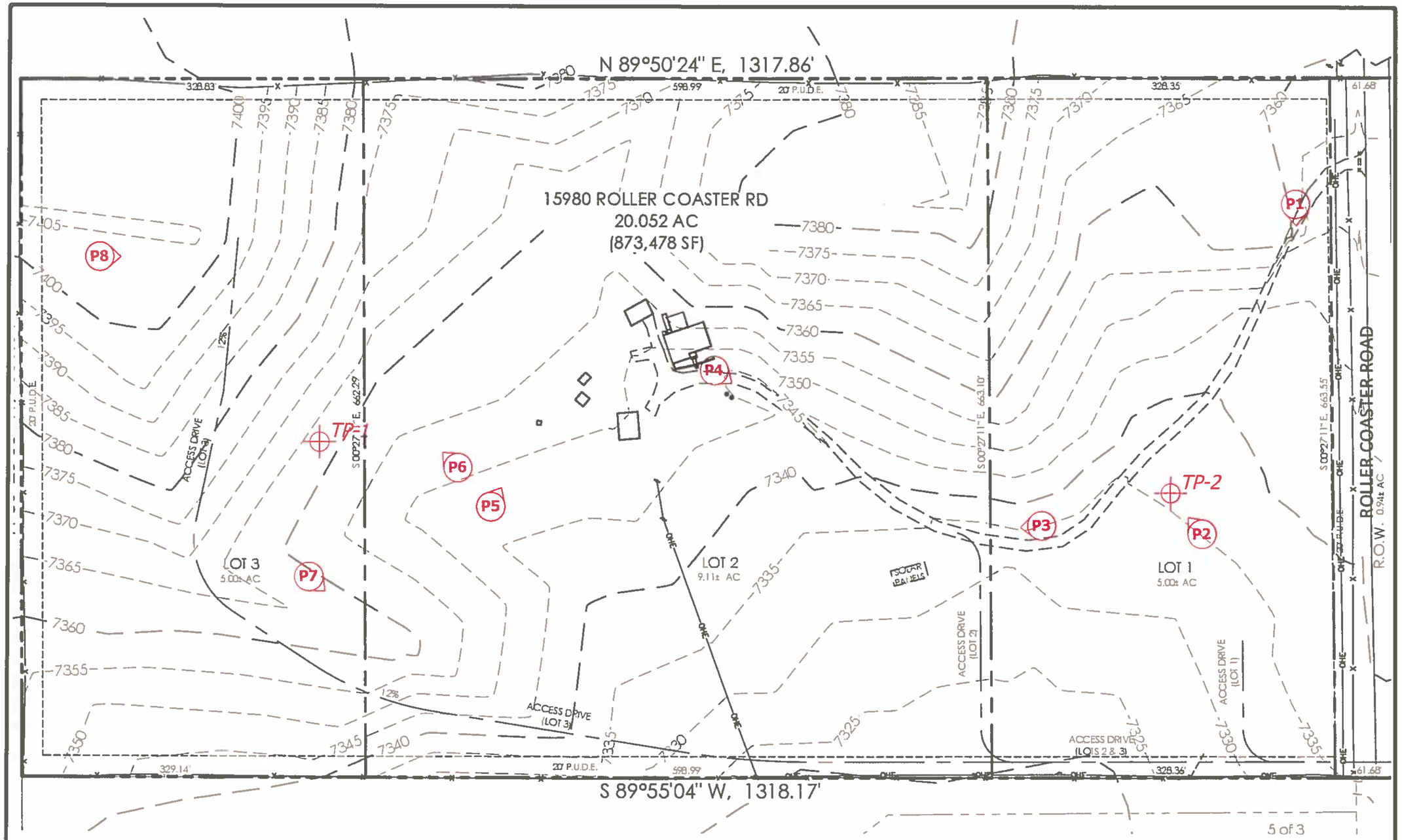
FIG NO.: 2



LEGEND:

TP- APPROXIMATE TEST PIT LOCATION AND NUMBER

P2 - APPROXIMATE PHOTOGRAPH LOCATION AND NUMBER

REVISION	BY

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SITE PLAN/TEST PIT LOCATION MAP
CROWE SUBDIVISION
15980 ROLLER COASTER ROAD
EL PASO COUNTY, CO.
FOR: MIKE AND RUTH CROWE

DRAWN: LLL
CHECKED:
DATE: 5/22/21
SCALE: AS SHOWN
JOB NO. 210825
FIGURE No. 3

N

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SOIL SURVEY MAP
CROWE SUBDIVISION
15980 ROLLER COASTER ROAD
EL PASO COUNTY, CO.
FOR: MIKE AND RUTH CROWE

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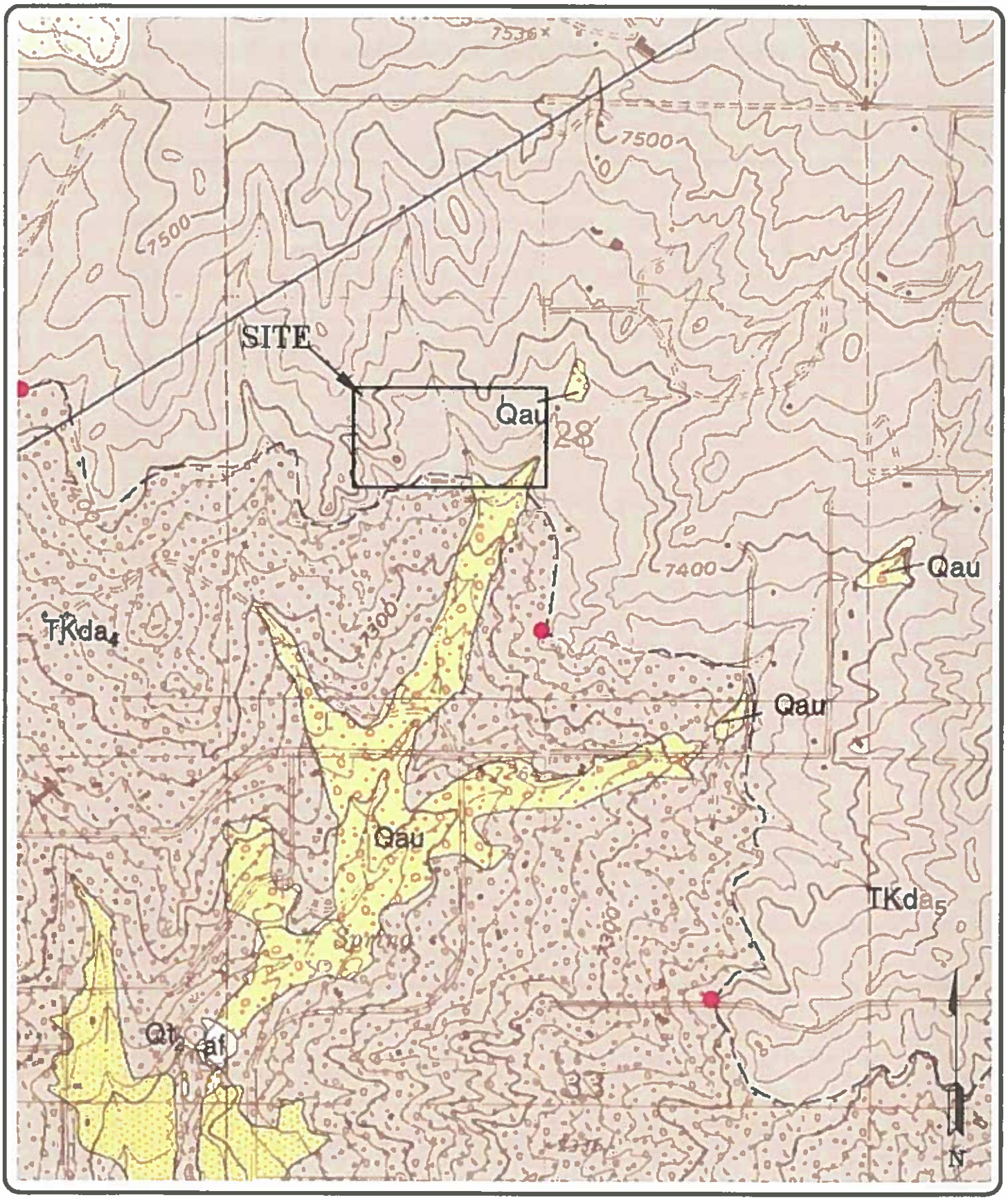
LLL	5/22/21		

JOB NO.: 210825

FIG NO.: 4



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MONUMENT QUADRANGLE GEOLOGIC MAP
CROWE SUBDIVISION
15980 ROLLER COASTER ROAD
EL PASO COUNTY, CO.
FOR: MIKE AND RUTH CROWE

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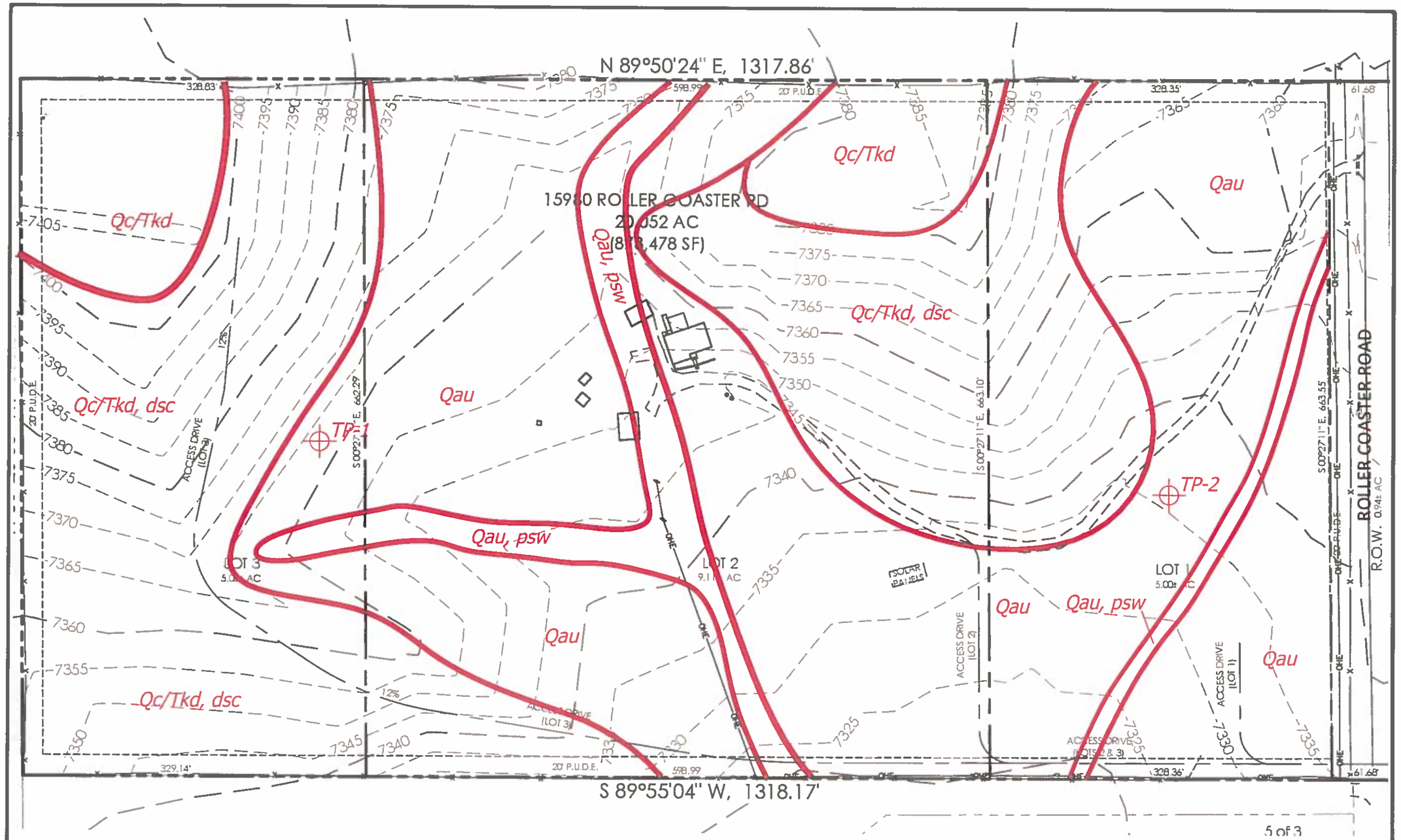
LLL	5/22/21		

JOB NO.: 210825

FIG NO.: 5



Legend:

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

dsc - downslope creep

psw - potentially seasonal shallow groundwater area

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GEOLOGY/ENGINEERING GEOLOGY MAP
CROWE SUBDIVISION
15980 ROLLER COASTER ROAD
EL PASO COUNTY, CO.
FOR: MIKE AND RUTH CROWE

DRAWN LLL
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DATE 5/22/21
SCALE AS SHOWN
JOB NO. 210825
FIGURE No. 6

N

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FEMA FLOODPLAIN MAP
CROWE SUBDIVISION
15980 ROLLER COASTER ROAD
EL PASO COUNTY, CO.
FOR: MIKE AND RUTH CROWE

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FIG NO.: 7

N

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NATIONAL WETLANDS INVENTORY MAP
CROWE SUBDIVISION
15980 ROLLER COASTER ROAD
EL PASO COUNTY, CO.
FOR: MIKE AND RUTH CROWE

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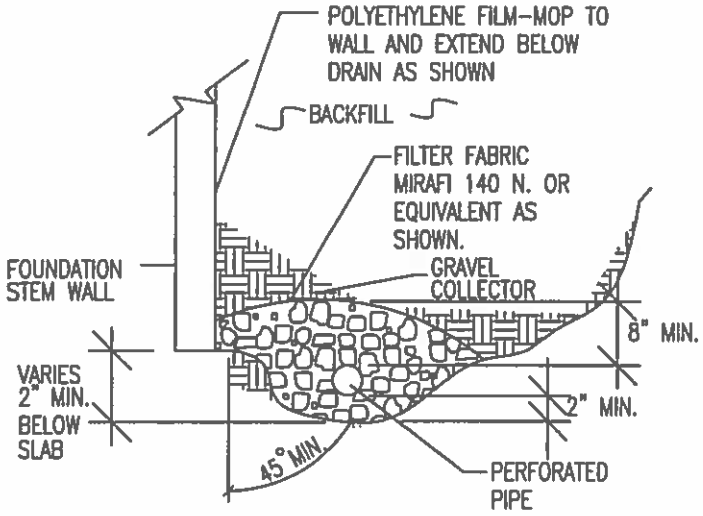
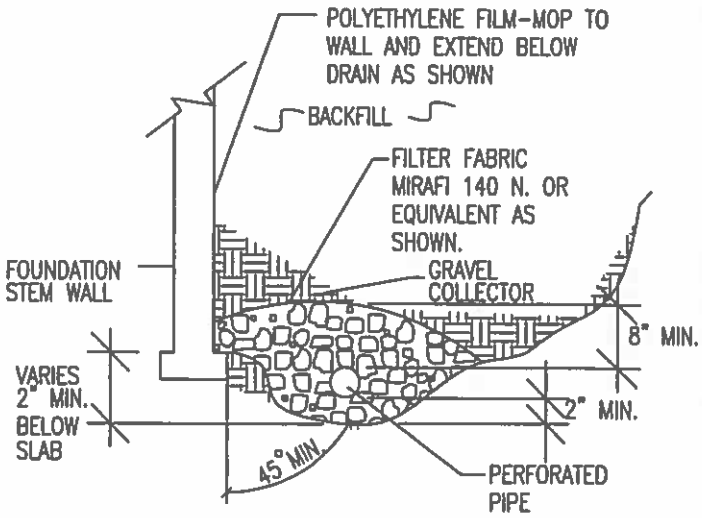
FIG NO.: 8





NOTES:

-GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS-85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

-PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4-INCH DIAMETER IS MOST OFTEN USED.

-ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON-PERFORATED PIPE.

-FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

-MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

-DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.

ENTECH ENGINEERING, INC.
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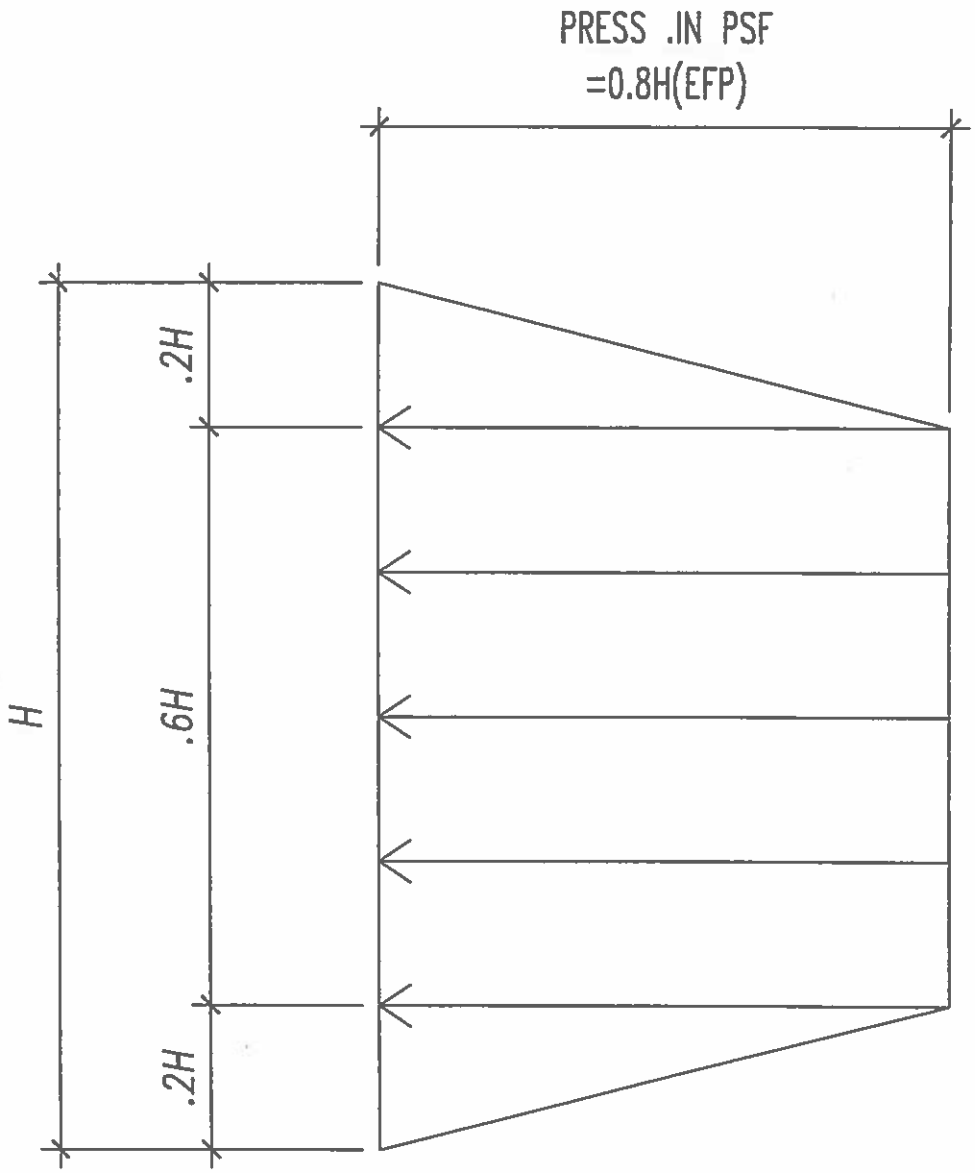
PERIMETER DRAIN DETAIL

DRAWN:	DATE:	DESIGNED:	CHECKED:

JOB NO.: 210825

FIG NO.: 9



PRESSURE DISTRIBUTION

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

LATERAL PRESSURE DISTRIBUTION
AREA WITH CREEP

DRAWN BY:	DATE DRAWN:		
R. MCBRIDE	03/13/13		

JOB NO.: 210825

FIG. NO.: 10

APPENDIX A: Photographs

1

Looking south from the northeastern portion of the site.

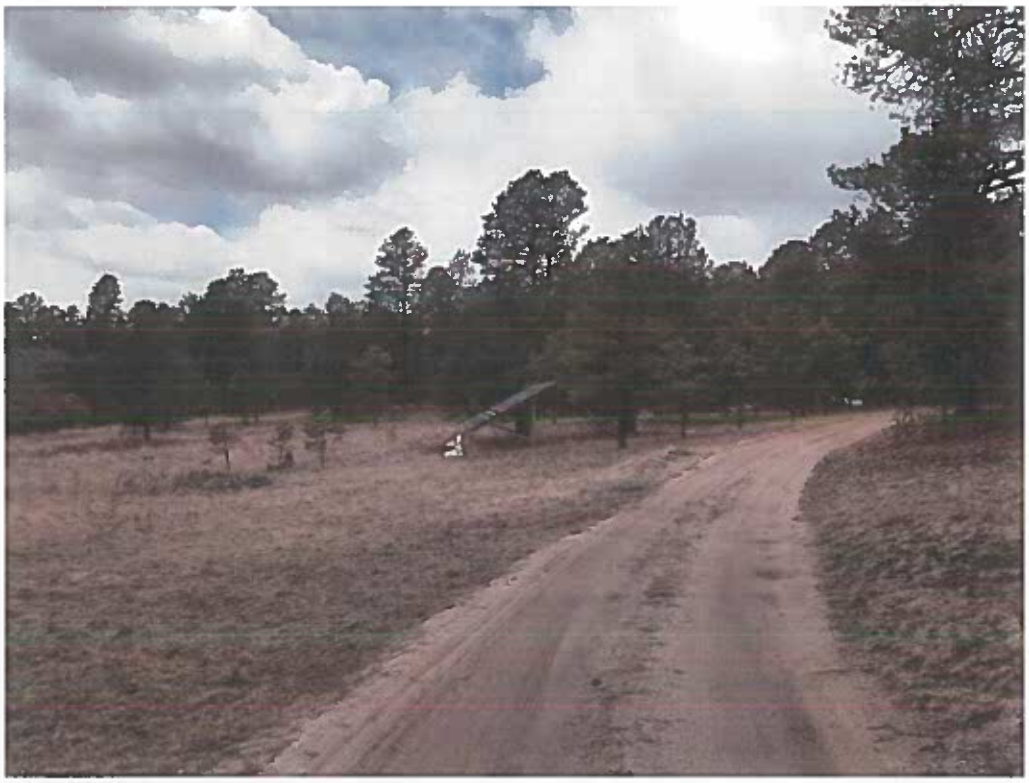
April 22, 2021

2

Looking northwest from the southeastern side of the site.

April 22, 2021

Job No. 210825



3

Looking west from the southeastern portion of the site.

April 22, 2021

4

Looking southeast along existing driveway from the central portion of the site.

April 22, 2021

Job No. 210825

5

Looking northeast from the south central portion of the site.

April 22, 2021

6

Looking northwest the central portion of the site.

April 22, 2021

Job No. 210825

7

Looking southeast along at moderate slope in the western portion of the site.

April 22, 2021

8

Looking east from the western side of the site.

April 22, 2021

Job No. 210825

APPENDIX B: Test Pit Logs

TEST PIT NO. 1
DATE EXCAVATED 4/29/2021
Job # 210825

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy clay loam, brown, moist	1					
sandy loam, Fine to coarse grained, grayish brown, moist	2		■	gr	w	2A
	3					
sandy loam with gravel, fine to very coarse grained, pale brown, moist	4		■	gr	w	R-2
	5					
sandy clay, fine to coarse grained, pale brown, moist	6		■	bl	s	4
	7					
Refusal @ 6' - due to sandstone bedrock	8					
	9					
	10					

TEST PIT NO. 2
DATE EXCAVATED 4/29/2021
CLIENT Mike and Ruth Crowe
LOCATION 15980 Roller Coaster Road

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy clay loam, brown, moist	1					
sandy loam, fine to coarse grained, grayish dark brown, moist	2		■	gr	w	2
	3					
sandy loam, fine to coarse grained, pale brown, moist	4		■	gr	w	R-1
	5					
sandy loam, fine to coarse grained, pale brown, moist	6		■	gr	w	R-2
	7					
	8					
	9					
	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

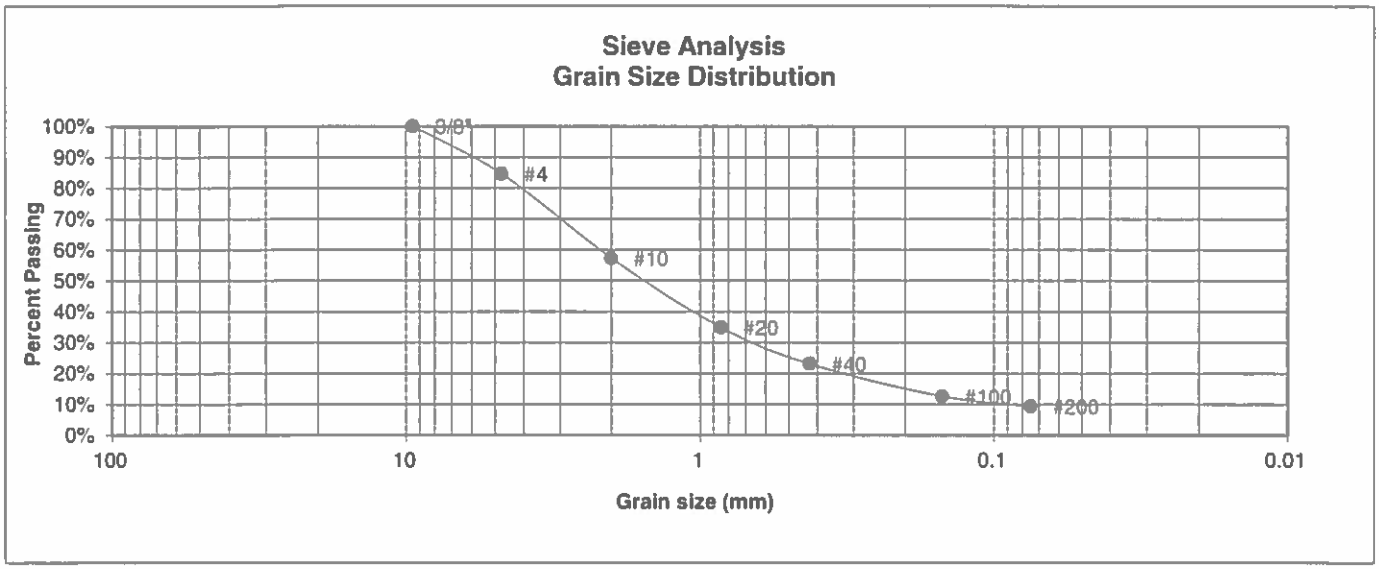
TEST PIT LOG

DRAWN:	DATE:	CHECKED	DATE:
jhr	5/14/21	LLL	5/22/21

JOB NO.: 210825
FIG NO.: B-1

APPENDIX C: Laboratory Test Results

BORING NO.	TP-1	UNIFIED CLASSIFICATION	SM-SW	TEST BY	BL
DEPTH(ft)	1	AASHTO CLASSIFICATION		JOB NO.	210825
CLIENT	MIKE AND RUTH CROWE				
PROJECT	15980 ROLLER COASTER RD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	84.6%
10	57.3%
20	34.9%
40	23.1%
100	12.6%
200	9.4%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

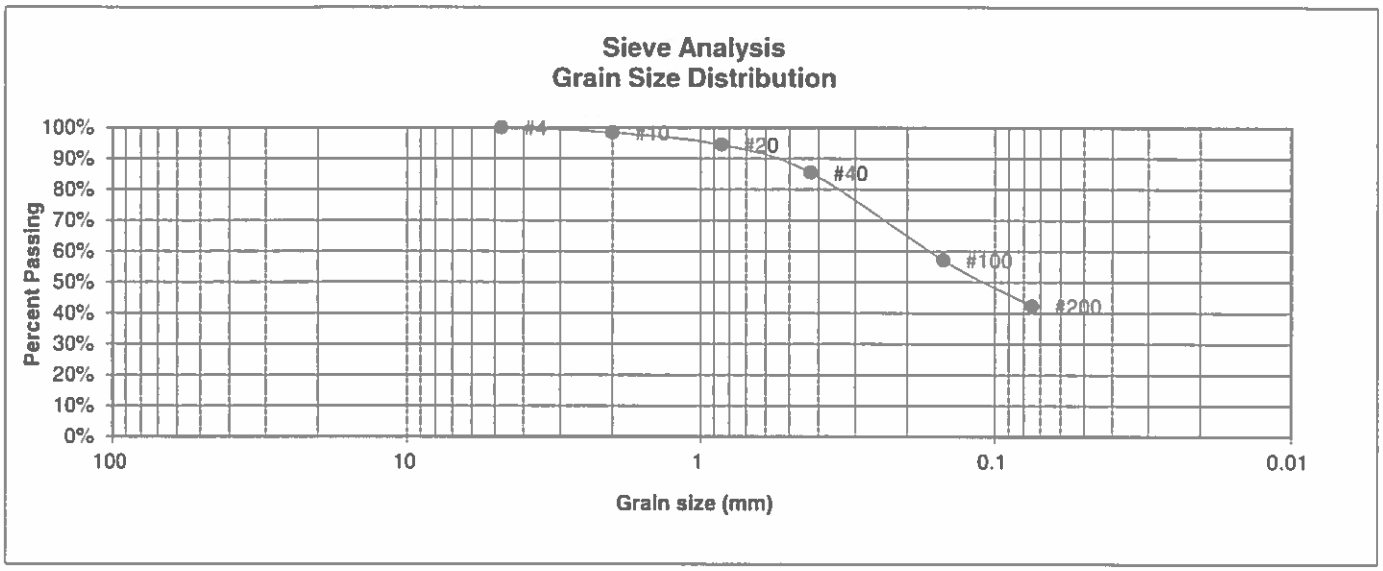
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		JHL	5-14-21

JOB NO: 210825

FIG NO: C-1

BORING NO.	TP-1	UNIFIED CLASSIFICATION	SC	TEST BY	BL
DEPTH(ft)	5	AASHTO CLASSIFICATION		JOB NO.	210825
CLIENT	MIKE AND RUTH CROWE				
PROJECT	15980 ROLLER COASTER RD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.4%
20	94.5%
40	85.4%
100	57.1%
200	42.3%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

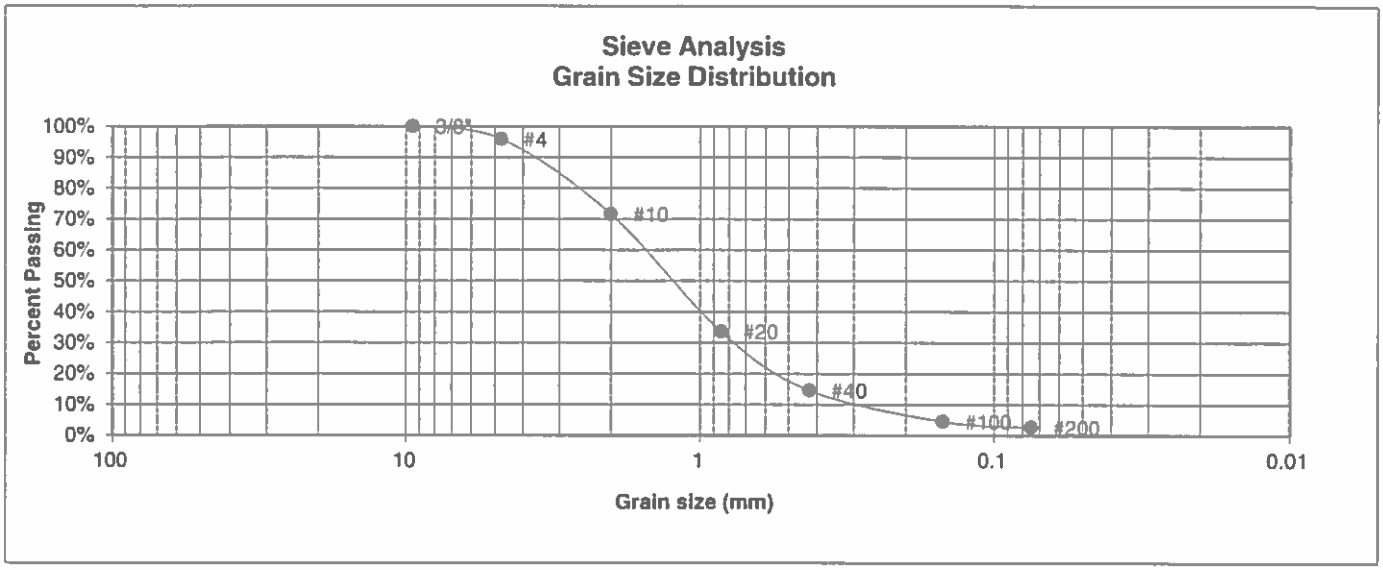
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		JHA	5-24-21

JOB NO: 210825

FIG NO: L-2

BORING NO.	TP-2	UNIFIED CLASSIFICATION	SW	TEST BY	BL
DEPTH(ft)	2-3	AASHTO CLASSIFICATION		JOB NO.	210825
CLIENT	MIKE AND RUTH CROWE				
PROJECT	15980 ROLLER COASTER RD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.9%
10	71.6%
20	33.6%
40	14.6%
100	4.5%
200	2.7%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: JHR	DATE: 5-19-21

JOB NO. 210825

FIG NO. C-3

APPENDIX D: Soil Survey Descriptions

El Paso County Area, Colorado

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

Map Unit Setting

National map unit symbol: 368h
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: 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 capacity: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

El Paso County Area, Colorado

71—Pring coarse sandy loam, 3 to 8 percent slopes

Map Unit Setting

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

Map Unit Composition

Pring and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

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: 3 to 8 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 capacity: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R048AY222CO
Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

APPENDIX E: El Paso County Health Department Septic Records

Blacktorest

P

EL PASO COUNTY HEALTH DEPARTMENT
COLORADO SPRINGS, COLORADO

5228

SEWAGE DISPOSAL INSPECTION FORM

#6128000001

File DATE 10/6/78

APPROVAL:
YES ✓ NO ____ ENVIRONMENTALIST Krueger

LOCATION (street number) 15980 Roller Coaster Rd Wilson

LEGAL DESCRIPTION ____

TYPE OF CONSTRUCTION ____ NO. OF BEDROOMS 3

SYSTEM INSTALLED BY Homeowner

COMMERCIAL MFG. yes SIZE 1000

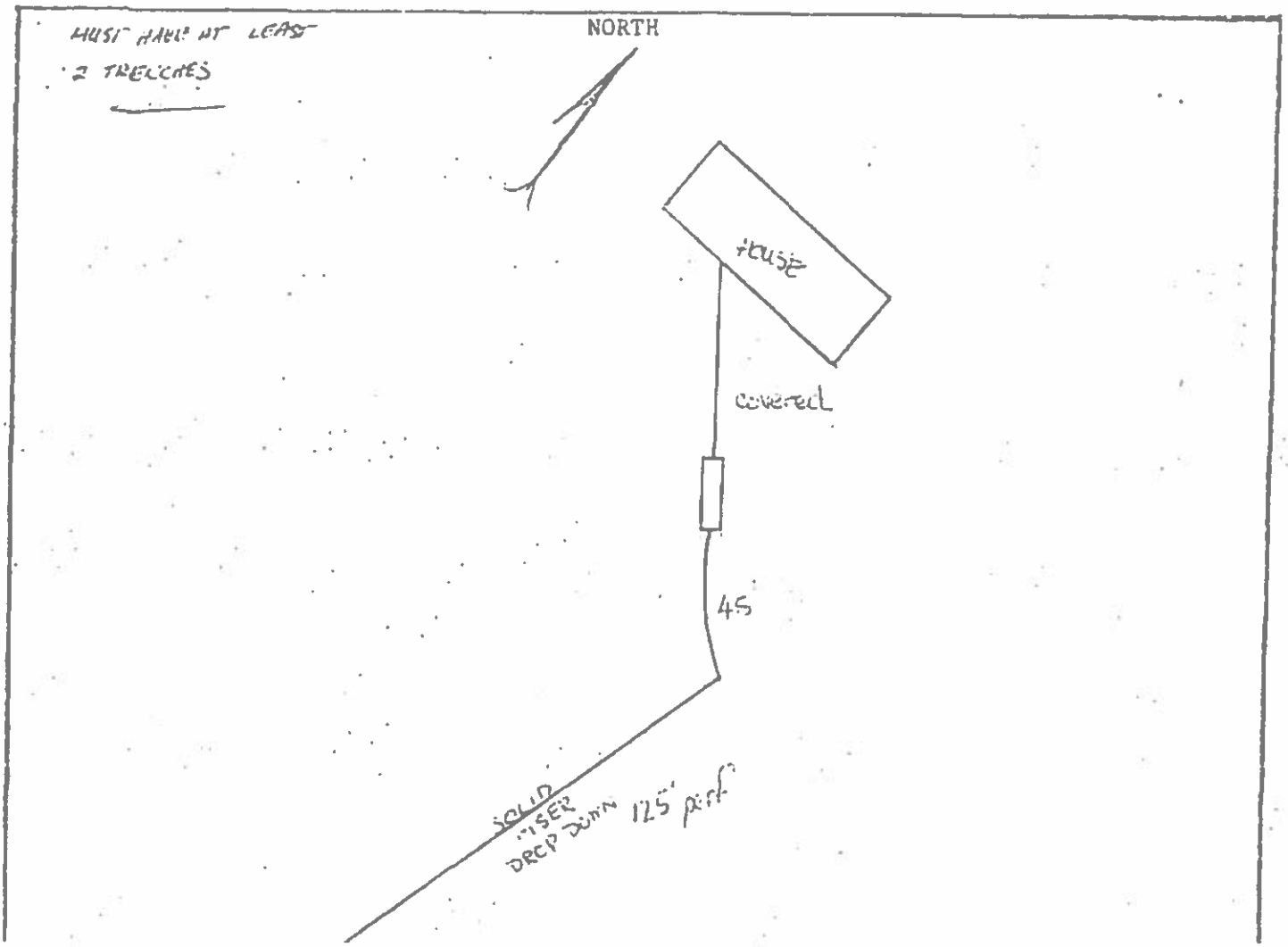
TYPE OF MATERIAL ____ NO. COMPARTMENTS 2

WIDTH ____ LENGTH ____ DEPTH (total) ____ LIQ. CAP ____

DISPOSAL FIELD: BED OR TRENCH DEPTH 12"-36" WIDTH 36" LENGTH 125' SQ. FT 375

DISTANCE BETWEEN LINES N/A ROCK river DEPTH 12" UNDER 6" OVER 2"

LEACHING PITS (NO.) ____ LINING MATERIAL ____ CAPACITY SQ. FT. ____



FRI 10/6

Acres _____ EL PASO COUNTY .. CITY-COUNTY HEALTH DEPARTMENT N 05228

501 North Foote Avenue . Colorado Springs, Colorado - 475-8240

Water Supply _____ Receipt No. 9552

PERMIT

TO CONSTRUCT, ALTER, REPAIR OR MODIFY AN INDIVIDUAL SEWAGE DISPOSAL SYSTEM

Issued To Don Wilson Date 4/20/78

Address of Property 15980 Roller Coaster Road, Black Forest

(Permit valid at this address only)

Builder - Contractor - Owner Address _____ Phone _____

Sewage-Disposal System work to be performed by Hamachor Phone _____

This Permit is issued in accordance with Regulation XII and Article 2 of Chapter 66, Colorado Revised Statutes 1963, as amended by the addition of a new Section 66-2-16. (H.B. 1205, 7-1-65). PERMIT EXPIRES upon completion installation of sewage-disposal system or at the end of six (6) months from date of issue - whichever occurs first - (unless work is in progress).

- This Permit does not denote approval of zoning and acreage requirements.-

Permit Fee $50.00 Charles H. Doudinn. Jr., M.D., M.P.H.
Director, City-County Health Department

October 28, 1978 Steven R. Rose
Date of Expiration Environmentalist

NOTE: LEAVE ENTIRE SEWAGE-DISPOSAL SYSTEM UNCOVERED FOR FINAL INSPECTION. 375 Sq. F.

24-HOUR ADVANCE NOTICE REQUIRED

Septic tank 1500 gals. Field 188 Feet of trench 24 inches wide

OR. Field 125 Feet of trench 36 inches wide

Seepage bed _____ ft. long _____ ft. wide. Seepage pit _____ sq. ft. _____ diam. _____ w/d

The Health Officer shall assume no responsibility in case of failure or inadequacy of a sewage-disposal system, beyond consulting in good faith with the property owner or representative. Free access to the property shall be authorized at reasonable times for the purpose of making such inspections as are necessary to determine compliance with requirements of this regulation.

fenced driveway

2 mi. N of Northgate.

E of N of cabin

EL PASO ~~CITY~~-COUNTY HEALTH DEPARTMENT
501 NORTH FOOTE AVENUE
COLORADO SPRINGS, COLORADO
475-8240 EXT. 220

Application for permit to construct, Remodel, or Install a Sewage Disposal System

Name of Owner Don Wilson Phone

Address of Property 15980 Roller Coaster Rd.

Legal Description of Property

Owner's Address (if different) Phone

Systems Contractor Address

Type of Construction Source and Type of Water Supply well

Size of Lot 20 Acres

The construction of the Sewage Disposal System will comply with all applicable Laws, Ordinances, Standards or Resolutions.

HEALTH DEPARTMENT USE ONLY

Permit Number Receipt Number

Number of Bedrooms 3 Tank Capacity 1000 gallons Absorption area 375 Sq. Ft.

REMARKS recommend keeping leach field from natural drainage area 188' of 2' trench

Trench System - 375 sq ft total - 125' of 3' trench.

APPLICATION IS (✓) APPROVED ( ) DENIED

ENVIRONMENTALIST [signature] DATE 4/17 1973

PLOT PLAN WILL INCLUDE THE FOLLOWING

Plot plan may be drawn on the back of this sheet or on a seperate sheet.

1. Streams, Lakes, Ponds, Irrigation Ditches and other Water Courses
2. North Direction
3. Location of Property Line
4. Buildings
5. Wells
6. Location of Proposed Septic System
7. Location of percolation test
8. Geographical features
9. Other Information as required

EHS - 6/9/76 - SEWAGE