ENTECH
ENGINEERING, INC.
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February 3, 2023
Revised November 30, 2023

The Renehan's
604 Southpointe Drive, Suite 150
Colorado Springs, CO 80906

Re: Soil and Geology Study
5740 Burgess Road
Tax Schedule No. 62130-00-050
El Paso County, Colorado

Dear Renehan's:

The project consists of subdividing 34.28-acres; three rural residential lots are proposed for the subdivision. The site is located northwest of the intersection of Burgess Road and South Holmes Road in the northern portion of El Paso County, Colorado.

GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site is located in a portion of the SE¼ of Section 13 Township 12 South, Range 66 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located to the northwest of the intersection of Burgess Road and South Holmes Road in the northern portion of El Paso County, Colorado. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site is generally gradually to moderately sloping to the northwest, with steeper slopes along the head of a drainage located in the northwestern portion of the site. Kettle Creek is located west of the site and Burgess Creek to the north. The head of a drainage was observed in the northwestern portion of the site. The drainage on the site flows in a westerly direction and was dry at the time of our site investigation. The site boundaries are indicated on the USGS Map, Figure 2. The site is currently undeveloped with La Foret located to the north, and rural residential development to the east, south, and west. The site contains field grasses, weeds, kinnikinic, and Ponderosa Pines. Site photographs were taken and site mapping was completed on November 8, 2022. Photographs are included in appendix A. Test Borings were drilled on November 9, 2022, and the Test Pits were excavated on November 10, 2022.

Total acreage of the site is 34.28-acres. Three rural residential lots are proposed as part of the replat which vary in size from 8.62 to 17.06 acres. The new lots will be serviced by an individual wells and on-site wastewater treatment systems. The Site Plan with the proposed replat is presented in Figure 3.

The report has been revised to address Colorado Geological Survey (CGS) review comments dated October 9, 2023.

LAND USE AND ENGINEERING GEOLOGY

The site was found to be suitable for the proposed development. Areas were encountered where the geologic conditions will impose some minor constraints/hazards on development and land use. These include areas of potentially expansive soils, seasonally and potentially seasonally wet areas, shallow bedrock, and potentially unstable slopes. Based on the proposed

development plan, it appears that these areas will have some 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: 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 November 8, 2022.

Five test borings were drilled and four test pits were excavated on the site to evaluate general suitability of the soil characteristics for residential construction. The test borings were placed in the proposed building footprints, and one located in the proposed private driveway. The locations of the test borings and test pits are indicated on the Site Plan/Test Boring 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 description of the soil types is presented in Appendix D. In general, the soils consist of gravelly loamy sand. The soils are described as follows:

Type	Description
40	Kettle gravelly loamy sand, 3 – 8% Slopes
41	Kettle gravelly loamy sand, 8 – 40% 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).

Soils

The soils encountered in the Test Borings and Test Pits can be grouped into two general soil types: Type 1: silty to slightly silty sand, clean sand, clayey sand (SM-SW, SM, SW, SC), and Type 2: silty sandstone (SM). Bedrock was encountered at depths ranging from 2 to 12 feet in the Test Borings and Test Pits, bedrock was not encountered in Test Pit Nos. 1 – 3. The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1 is a silty to slightly silty sand (SM, SM-SW). Soil type one was encountered at the existing surface grade in all of the test borings and test pits extending to depths ranging from 1 to 12 feet. These soils were encountered at loose to medium dense states and dry to moist conditions. Samples tested had approximately 5 to 14 percent of the soil sized particles passing the No. 200 Sieve. Atterberg Limits Testing resulted in non-plastic results. Sulfate testing resulted in less than 0.01 percent sulfate by weight indicating the sand exhibits negligible potential for below grade concrete degradation.

Soil Type 2 is a silty sandstone (SM). Soil type two was encountered in all of the test borings, at depths ranging from 2 to 12 feet bgs and extended to the termination of the test borings (15 to 20 feet). These soils were encountered at dense to very dense states and moist conditions. Samples tested had approximately 16 to 31 percent of the soil sized particles passing the No. 200 Sieve. Atterberg Limits Testing resulted in non-plastic results. Sulfate testing resulted in less than 0.01 percent sulfate by weight indicating the sand exhibits negligible potential for below grade concrete degradation.

The Test Boring and Test Pit Logs are presented in Appendix B, and the Laboratory test results from the test pits are presented in Appendix C. A Summary of Laboratory Test Results is presented in Table 1.

Groundwater

Groundwater was not encountered in any of the test borings which were drilled to depths of 15 to 20 feet. Signs of seasonally occurring groundwater were observed in three of the test pits at depths ranging from 4.5 to 5 feet. Groundwater is not anticipated to affect shallow foundations on the majority of the site. Water was not observed in the head of the drainage in the northwestern portion of the site or in any of the minor drainage swales. 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 10 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 expansive claystone and siltstone.

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

Qal **Recent Alluvium of Holocene Age:** These are recent stream deposits in the head of the drainage located in the northwest portion of site. Some areas have recent sand deposition, while others have highly organic soils.

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 Black Forest Quadrangle* distributed by the Colorado Geologic Survey in 2003, and the *Geologic Map of the Falcon NW Quadrangle,* by Madole in 2003, (References 4 and 5, Figure 5), the *Geologic Map of the Colorado Springs-Castle Rock Area,* distributed by the US Geological Survey in 1979 (Reference 6), and the *Geologic Map of the Denver 1° x 2° Quadrangle,* distributed by the US Geological Survey in 1981 (Reference 7). 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 constraints/hazards identified on this site include potentially expansive soils, seasonally and potentially seasonally wet areas, shallow bedrock, and areas of potentially unstable slopes. These constraints/hazards and recommended mitigation techniques are discussed as follows:

Expansive Soils – Constraint

Expansive soils were not encountered in the test borings, however, highly expansive claystone and siltstone are commonly interbedded in the sandstone of the Dawson Formation. Expansive clays, claystone, or siltstone, 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 and Floodplain Areas

The site is not mapped within any floodplains according to the FEMA Map Nos. 08041CO315G, and 08041CO526G dated December 7, 2018 (Figure 8, Reference 8). The head of a drainage is located in the northwestern portion of the site on Lot 3 that has been identified as a seasonally wet area, and a low lying area above the drainage has been identified as a potentially seasonally wet area. These areas indicated on Geology/Engineering Geology Map (Figure 6). In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and frost heave potential. Water was not observed these areas at time of our site investigation. The seasonally wet area is located within a no-build area, and the potentially seasonal shallow groundwater area will be avoided by the proposed structure on Lot 3. In these areas the potential exists for high groundwater levels during high moisture periods and should structures encroach on these areas the following precautions should be followed. Exact locations of floodplain and specific drainage studies are beyond the scope of this report.

Seasonally Wet Area – Constraint

The seasonally wet area has been mapped in the head of the drainage located in the northwestern portion of Lot 3. Construction is not recommended in this area and is located within a no-build area. Mitigation for seasonally wet areas is discussed in the following section.

Potentially Seasonally Wet Areas – Constraint

A low lying area above the head of the drainage located in the northwestern portion of Lot 3 was identified as a potentially seasonally wet area. Water was not observed in this area; however, this area has the potential for seasonal shallow groundwater, and is indicated on the Geology/Engineering Geology Map (Figure 6). Due to the size of the proposed lots these areas can either be avoided by the proposed structures or proposed soil treatment areas. Signs of seasonally occurring groundwater were encountered in three of test pits at depths ranging from 4.5 to 5 feet. The pits were placed in anticipated OWTS soil treatment field areas. The test borings were drilled on Lots 2 and 3 in anticipated building locations. These test borings were dry to depths of 15 to 20 feet. The potential for seasonally perched groundwater on the shallow bedrock exist on the site. A minimum separation of 3 feet between foundation components and potential groundwater levels is recommended. Should groundwater or signs of groundwater be encountered in building excavations additional drains consisting of interceptor installed on the uphill side of the excavation or underslab drains may be needed.

Mitigation: In these locations, foundations are 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 2.5 feet 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. Typical drain details are presented in Figures 8 through 10. Additionally, swales should be created to intercept surface runoff and carry it safely around and away from structures. It is anticipated that the site grading may mitigate the drainages in some areas. The water table may be of sufficient depth to minimize the effects on buildings in some areas.

Shallow Bedrock – Constraint
Bedrock was encountered in both the test borings at depths of 2 to 12 feet, and was encountered at very dense states. A Summary of the Depth to Bedrock is included in Table 1. Where shallow bedrock is encountered, excavation/grading may be difficult requiring track-mounted excavators. Bedrock may be encountered cuts for the private driveway and utility excavations

Slope Stability and Landslide Hazards
The majority of the slopes in the building areas on site are generally gradually to moderately sloping and do not exhibit any past or potential unstable slopes or landslides. However, areas of downslope creep have been mapped in the northwestern portion of the site along the head of a drainage. These slopes are located within a no-build area and will be avoided by the proposed development. This area is identified on the Geology/Engineering Geology Map, Figure 6. The recommendations for these areas are as follows:

- Potentially Unstable Slopes - Constraint
  The areas identified with this hazard includes the steeper slopes along the drainage in the northwestern portion of Lot 3. In these areas we would anticipate lateral and vertical movement of the near surface soils in the downslope direction. These areas are located within a no-build area and will be avoided by the proposed development.

RELEVANCE OF GEOLOGIC CONDITIONS TO LAND USE PLANNING

Total acreage of the site is 34.28-acres. Three rural residential lots which vary in size from 8.62 to 17.06 acres are proposed as part of the replat. The new lots will be serviced by an individual wells and on-site wastewater treatment systems. The existing geologic and engineering geologic conditions will impose constraints on development and construction. The geologic constraints/hazards identified on this site include potentially expansive soils, seasonally and potentially seasonally wet areas, shallow bedrock, and areas of potentially unstable slopes, which can be satisfactorily mitigated through avoidance or proper engineering design and construction practices.

The upper sand in the test borings were encountered at loose to medium dense states, and the sandstone bedrock was encountered in the test borings on the site was encountered at very dense states and hard consistencies. Bedrock was encountered 2 to 12 feet in the test borings.

High allowable bearing capacities should be expected in areas of shallow bedrock. Difficult excavation of the very dense bedrock should be expected.

The sand and sandstone encountered in the test borings is considered to have low expansion potential. Highly expansive clays and claystone are commonly interbedded in the Dawson Formation in the area. Loose sands, if encountered, will require removal and recompaction typically to a depth of 2 to 3 feet. Expansive soils if encountered at or near foundation grade may require 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.

The foundations should be supported by soils with a similar bearing capacity (i.e., entirely on structural fill, or entirely on sandstone bedrock). If the majority of the foundation is supported by sandstone and a relatively small portion supported by sand, the sand may be overexcavated down to sandstone and replaced with structural fill compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557. If the majority of the foundation is supported by sand, the sandstone should be overexcavated a minimum of 2 feet and replaced with sand compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557.

The head of a drainage is located in the northwestern portion of the site on Lot 3 that has been identified as a seasonally wet area, and a low lying area above the drainage has been identified as a potentially seasonally wet area. These areas indicated on Geology/Engineering Geology Map (Figure 6). In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and frost heave potential. Water was not observed these areas at time of our site investigation. The seasonally wet area is located within a no-build area, and the potentially seasonal shallow groundwater area will be avoided by the proposed structure on Lot 3. Due to the size of the lots these areas can either be avoided, or regraded and redirected around proposed structures or proposed soil treatment area.

Signs of seasonally occurring groundwater were encountered in three of test pits at depths ranging from 4.5 to 5 feet. The pits were placed in anticipated OWTS soil treatment field areas. The test borings were drilled on Lots 2 and 3 in anticipated building locations. These test borings were dry to depths of 15 to 20 feet. The potential for seasonally perched groundwater on the shallow bedrock exist on the site. A minimum separation of 3 feet between foundation components and potential groundwater levels is recommended. Should groundwater or signs of groundwater be encountered in building excavations additional drains consisting of interceptor installed on the uphill side of the excavation or underslab drains may be needed. Typical drain details are presented in Figures 8 through 10.

The majority of the slopes in the building areas on site are generally gradually to moderately sloping and do not exhibit any past or potential unstable slopes or landslides. However, areas of downslope creep have been mapped in the northwestern portion of the site on Lot 3 along the head of a drainage. These slopes are located within a no-build area and will be avoided by the

proposed development. This area is identified on the Geology/Engineering Geology Map, Figure 6.

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 building sites and septic systems other than those tested for this report 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 The Renehan's, 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.
Sr. Geologist

Reviewed by:

COLORADO REGISTERED JOSEPH COLLIN GOODE JR. 23725 PROFESSIONAL ENGINEER

Joseph C Goode Jr.

Digitally signed by Joseph C Goode Jr.
Date: 2023.11.30 16:20:50 -07'00'

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

LLL
Encl.

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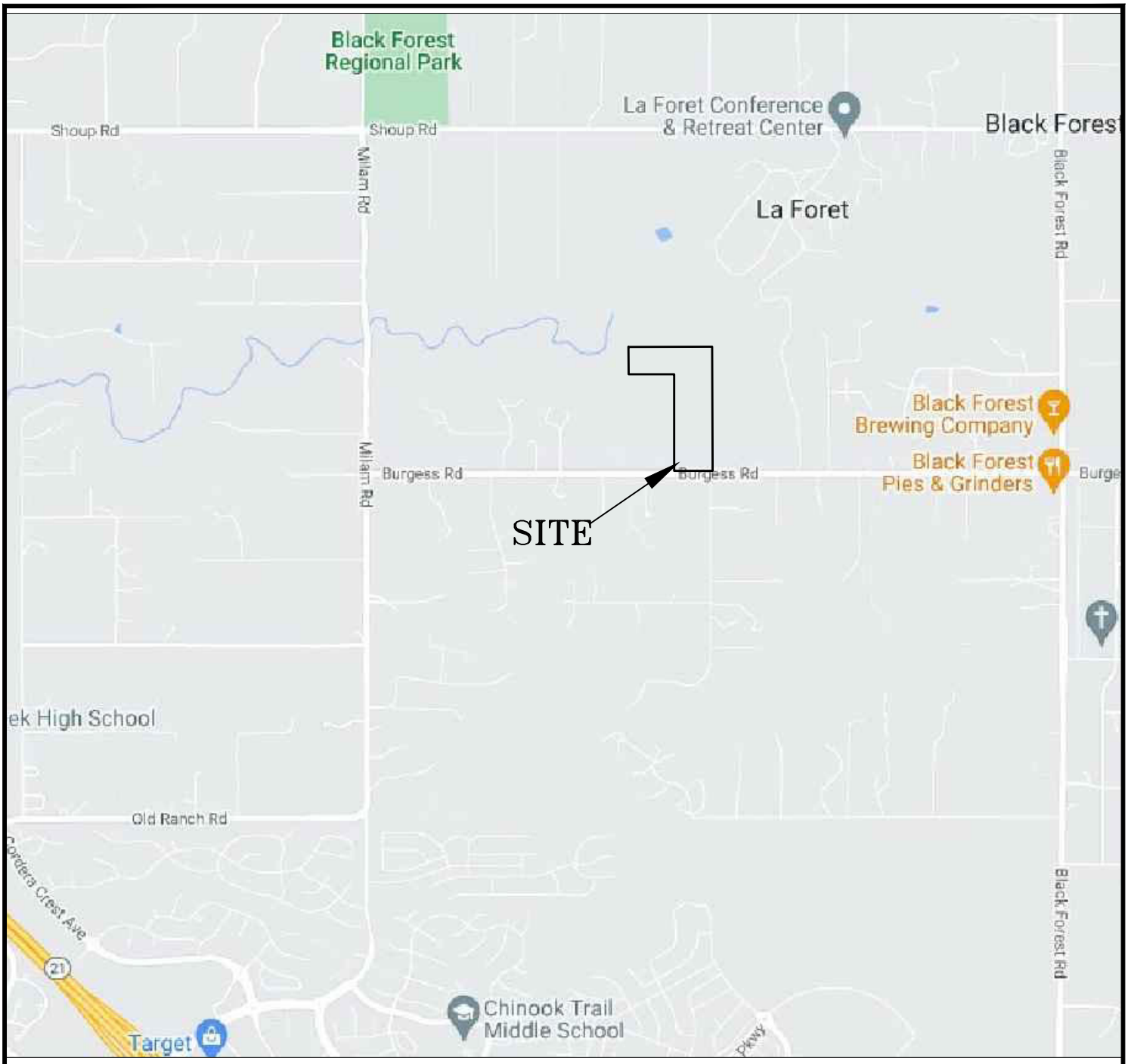
FIGURES



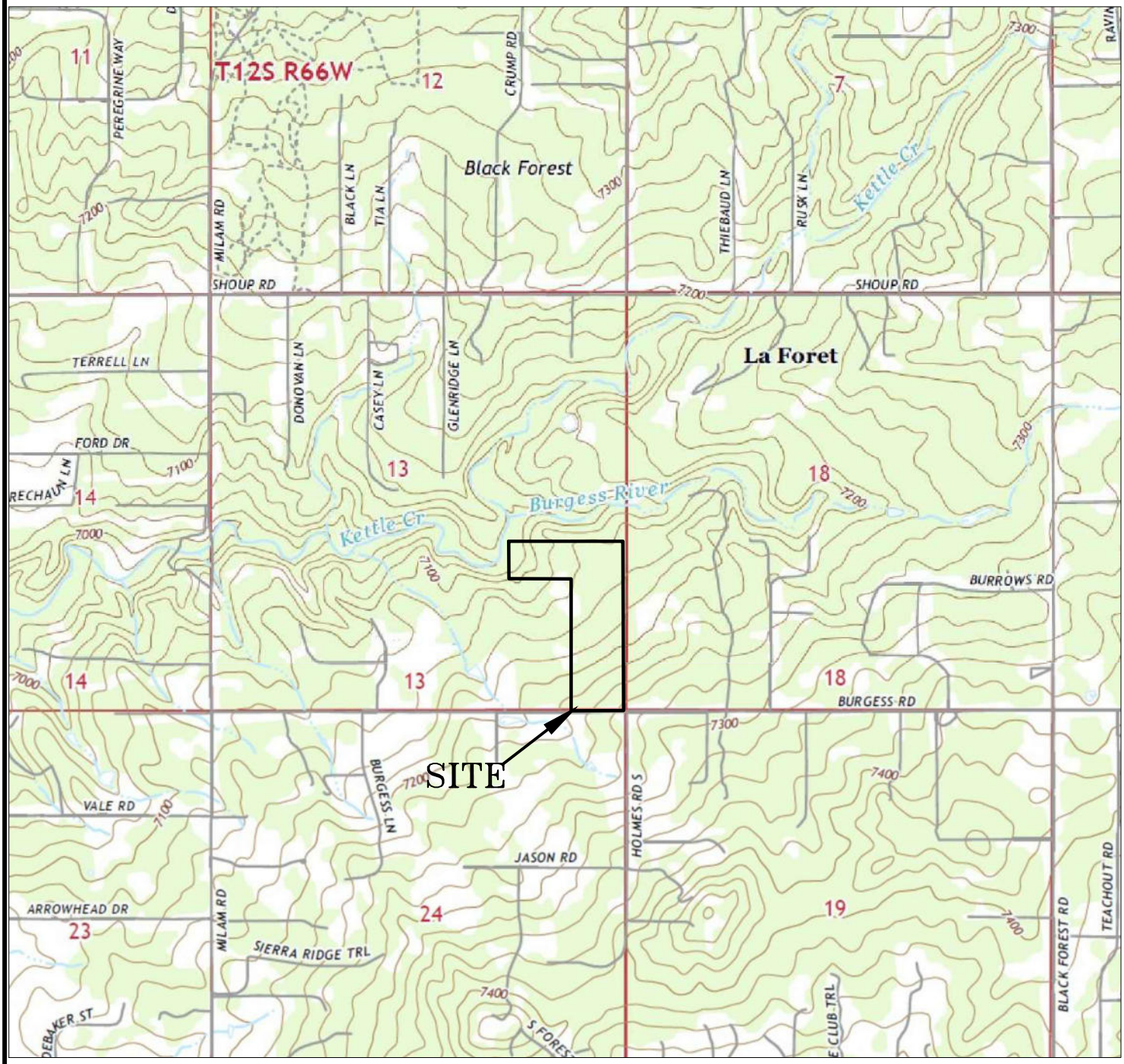
ENTECH ENGINEERING, INC.

VICINITY MAP

5740 BURGESS ROAD
EL PASO COUNTY, CO
FOR: THE RENEHAN'S

JOB NO.
222084

FIG. 1



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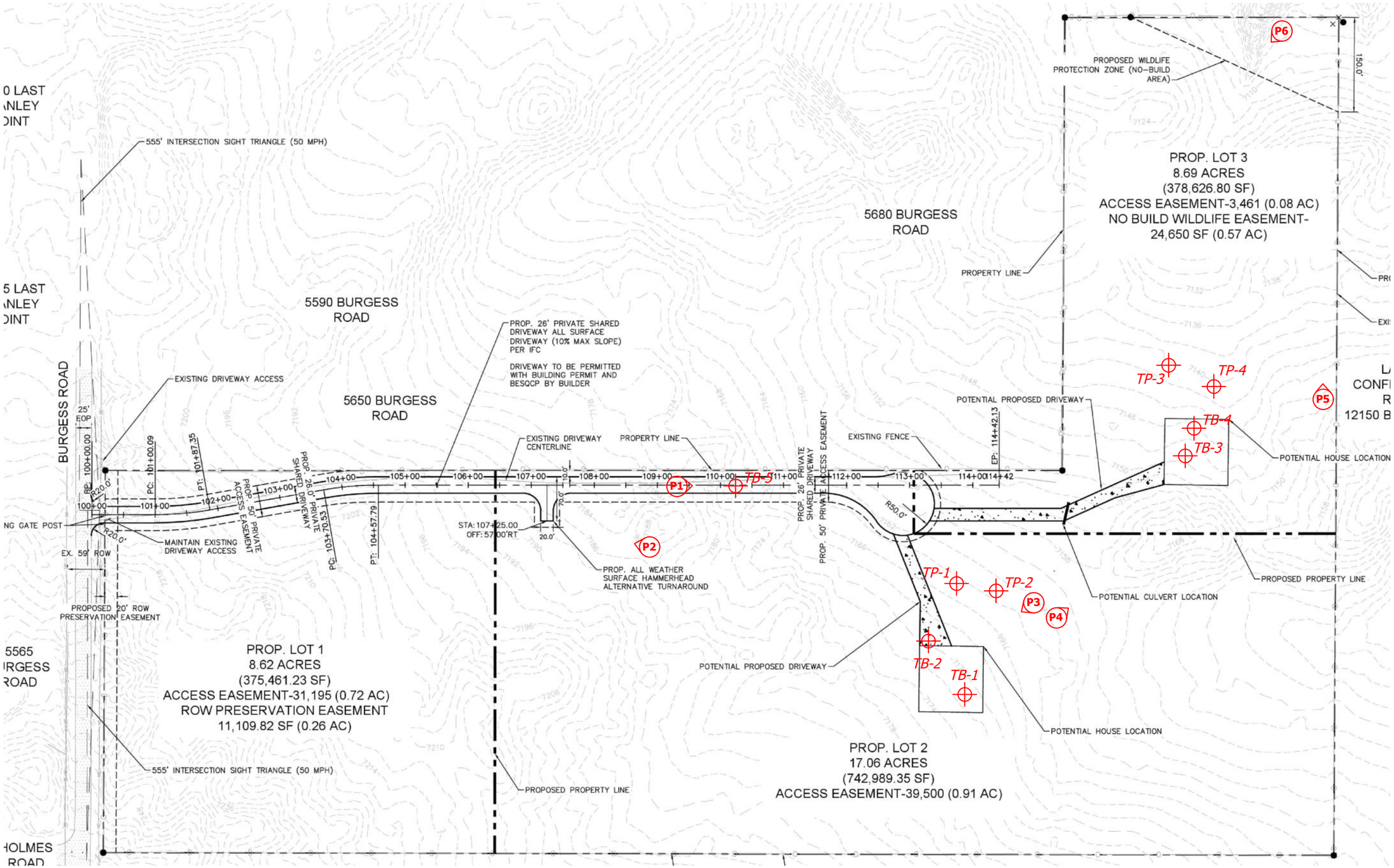
ENTECH ENGINEERING, INC.

USGS MAP

5740 BURGESS ROAD
EL PASO COUNTY, CO
FOR: THE RENEHAN'S

JOB NO.
222084

FIG. 2



Legend:

- TB - Approximate Test Boring Location and Number
- TP - Approximate Test Pit Location and Number
- P1 - Approximate Photograph Direction and Location

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ENTECH ENGINEERING, INC.

SITE MAP/ TESTING LOCATION MAP

5740 BURGESS ROAD
EL PASO COUNTY, CO
FOR: THE RENEHAN'S

JOB NO.
222084

FIG. 3

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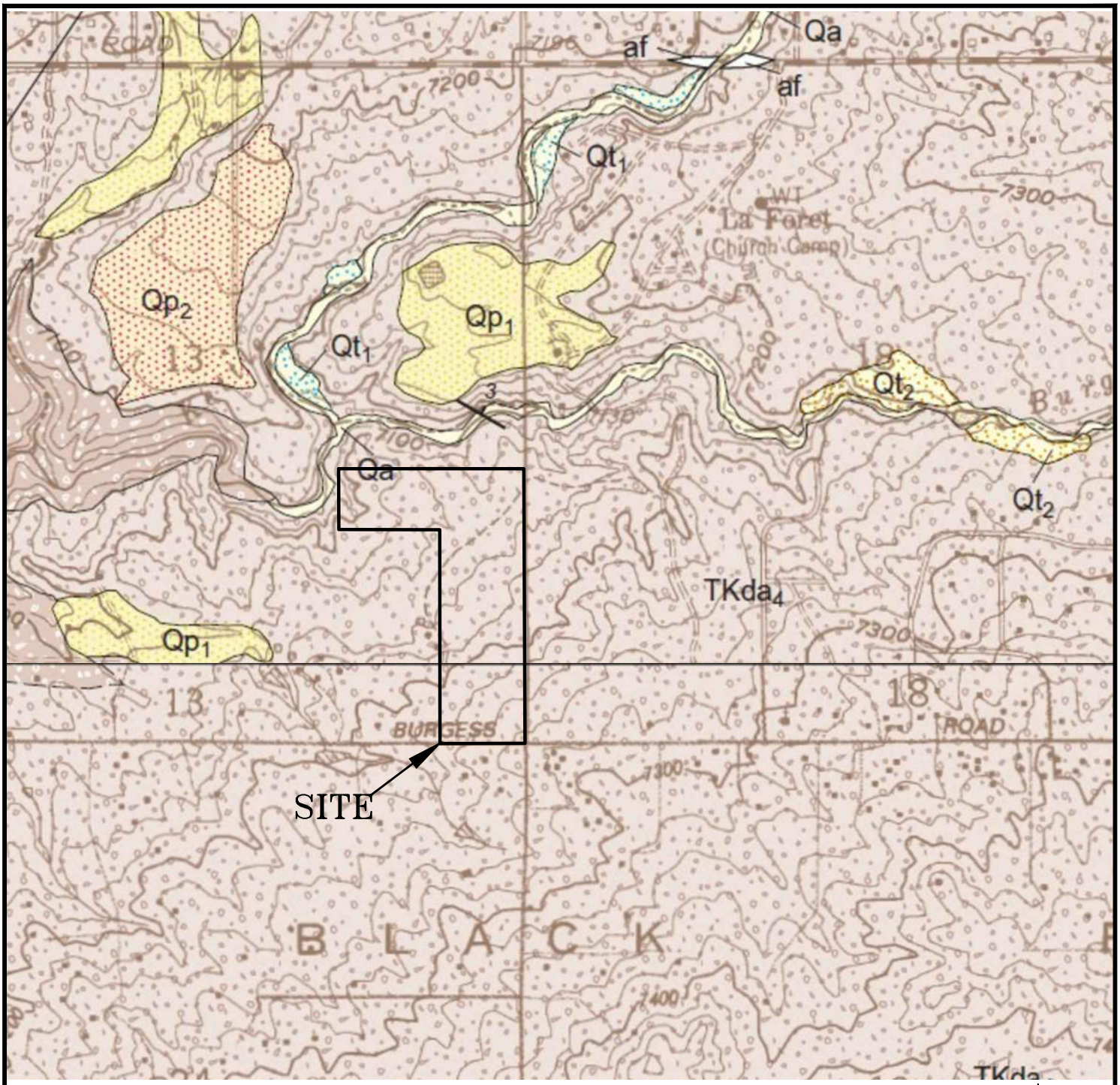
ENTECH ENGINEERING, INC.

SOILS SURVEY MAP

5740 BURGESS ROAD
EL PASO COUNTY, CO
FOR: THE RENEHAN'S

JOB NO.
222084

FIG. 4



ENTECH ENGINEERING, INC.

BLACK FOREST/ FALCON NW QUADRANGLES GEOLOGIC MAP

5740 BURGESS ROAD
EL PASO COUNTY, CO
FOR: THE RENEHAN'S

JOB NO.
222084

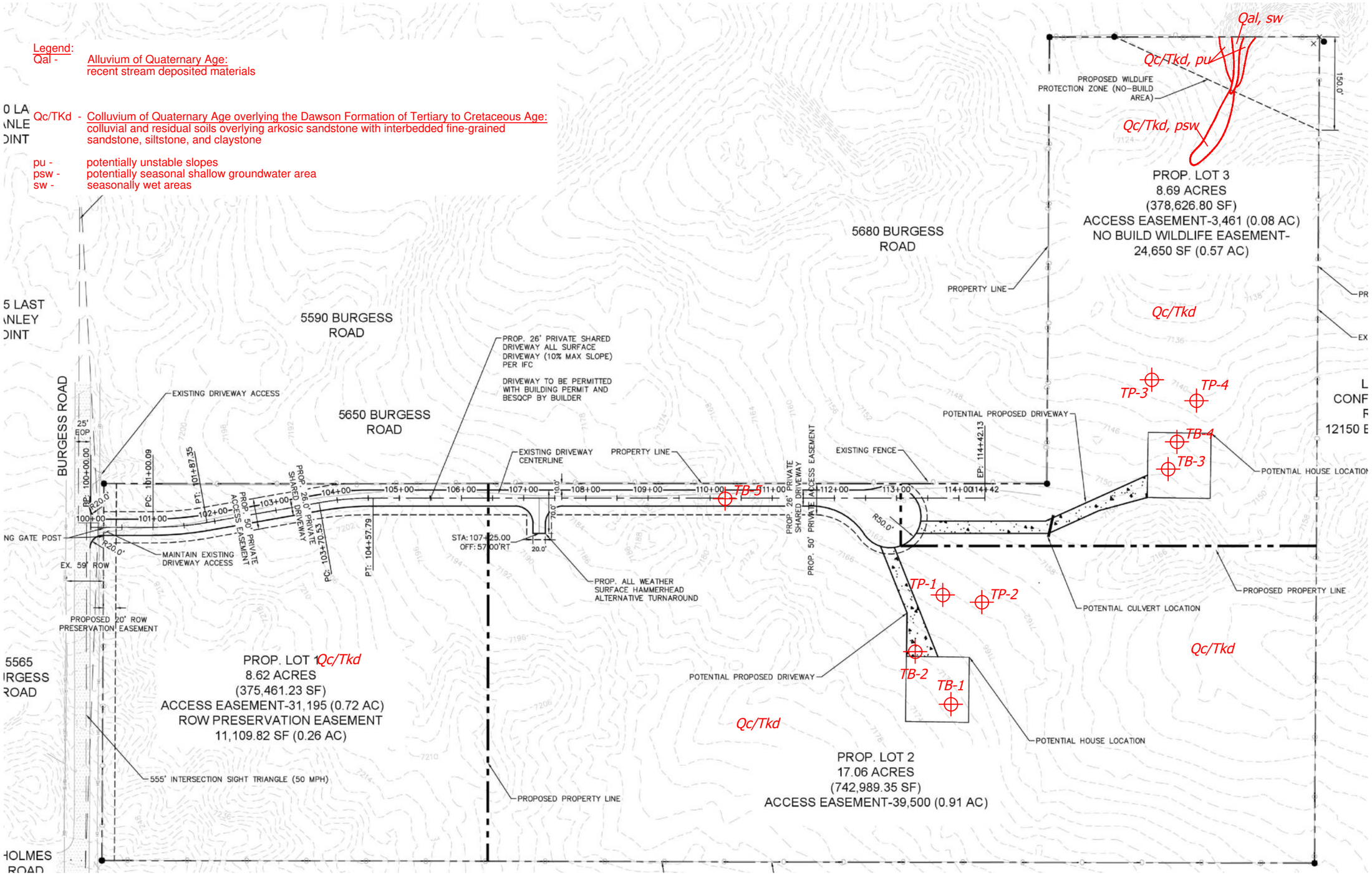
FIG. 5

Legend:

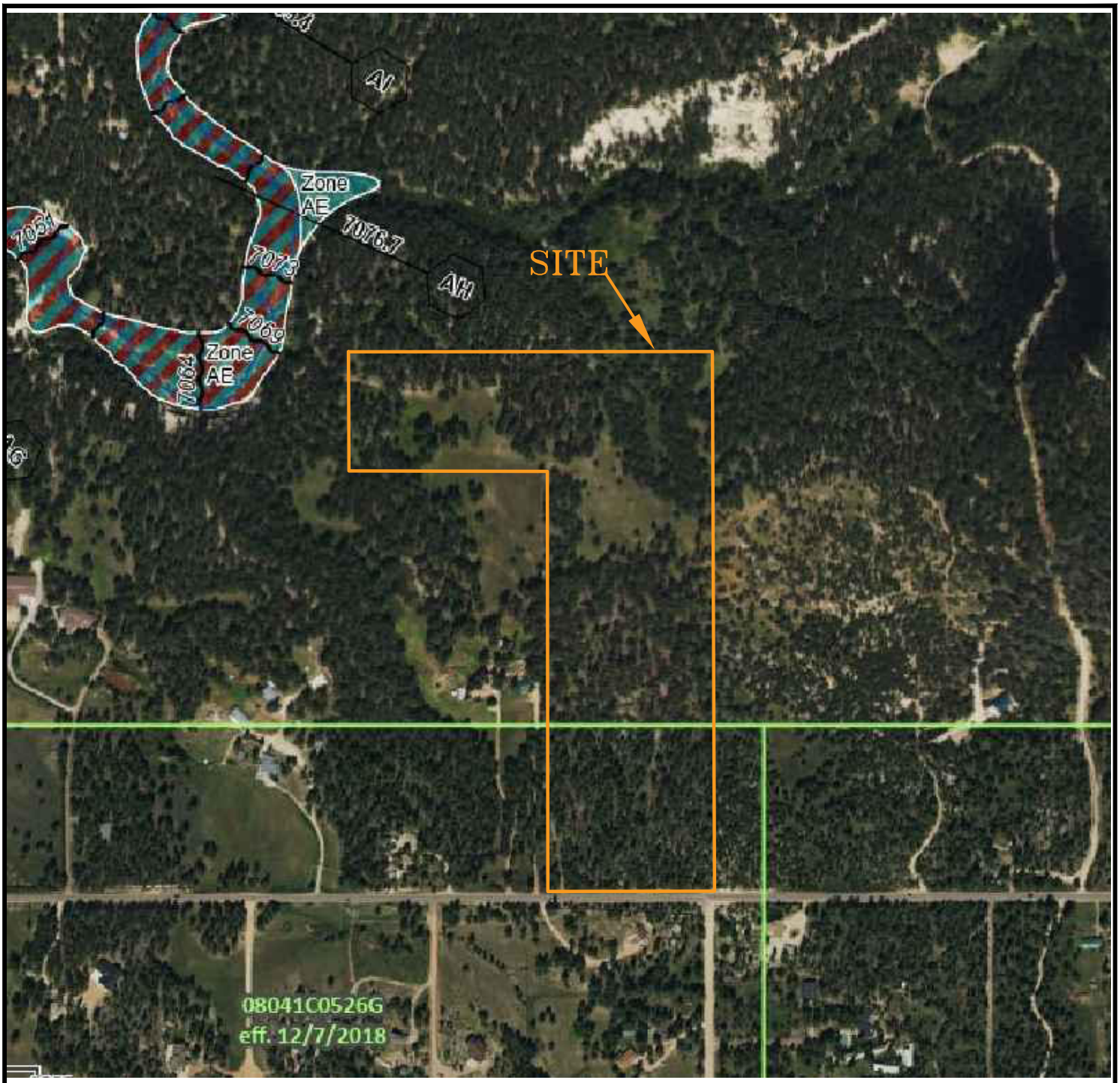
Qal - Alluvium of Quaternary Age:
recent stream deposited materials

Qc/TKd - Colluvium of Quaternary Age overlying the Dawson Formation of Tertiary to Cretaceous Age:
colluvial and residual soils overlying arkosic sandstone with interbedded fine-grained sandstone, siltstone, and claystone

pu - potentially unstable slopes
psw - potentially seasonal shallow groundwater area
sw - seasonally wet areas



ENTECH ENGINEERING, INC.	**GEOLOGY/ ENGINEERING GEOLOGY MAP** 5740 BURGESS ROAD EL PASO COUNTY, CO FOR: THE RENEHAN'S	JOB NO. 222084 **FIG. 6**



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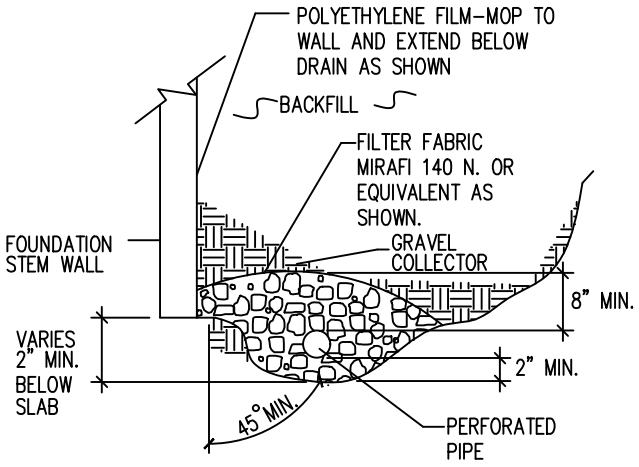
ENTECH ENGINEERING, INC.

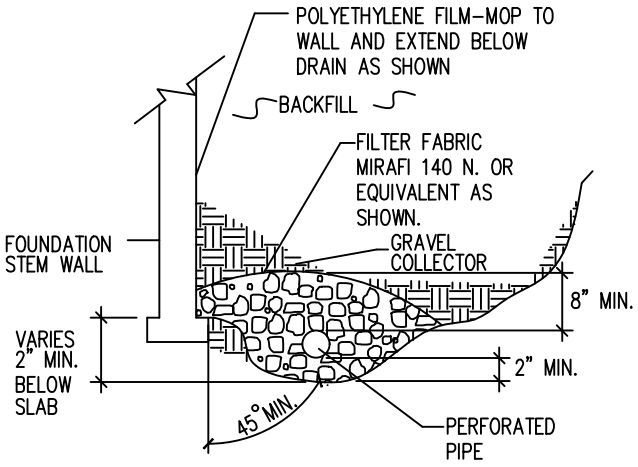
FEMA FLOODPLAIN MAP

5740 BURGESS ROAD
EL PASO COUNTY, CO
FOR: THE RENEHAN'S

JOB NO.
222084

FIG. 7





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.

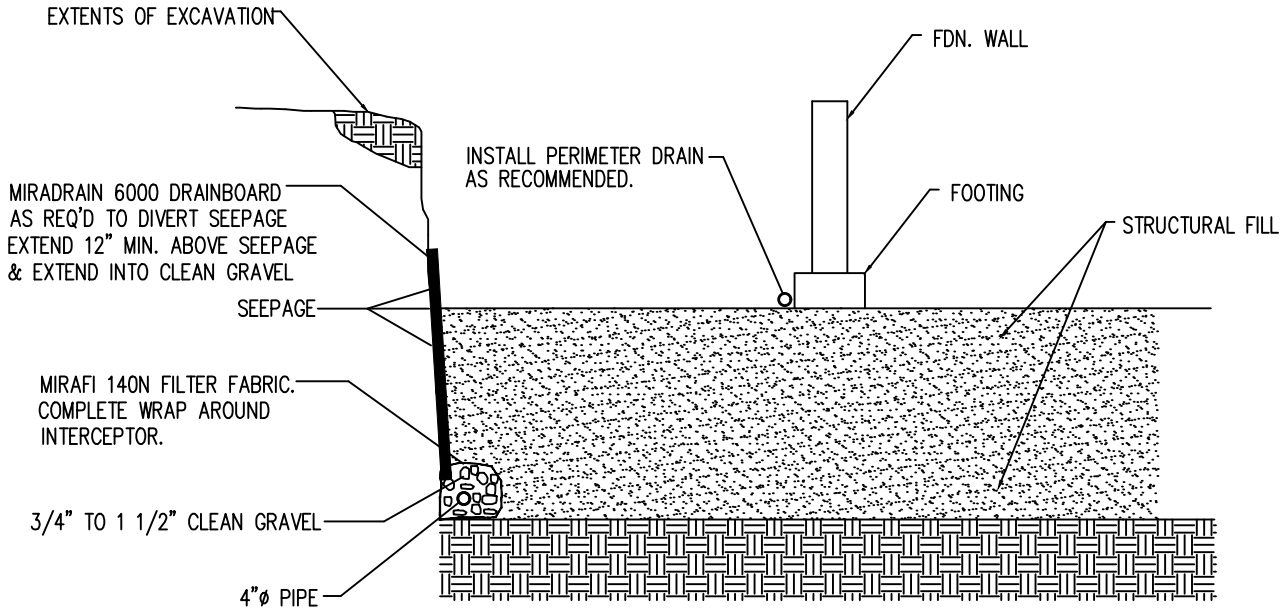
ENTECH ENGINEERING, INC.

PERIMETER DRAIN DETAIL

5740 BURGESS ROAD
EL PASO COUNTY, CO
FOR: THE RENEHAN'S

JOB NO.
222084

FIG. 8



NOTE:
EXTEND INTERCEPTOR DRAIN TO UNDERDRAIN OR TO SUMP.
BENCH DRAIN INTO NATIVE SOILS 12 INCHES MINIMUM.

INTERCEPTOR DRAIN DETAIL

N.T.S.

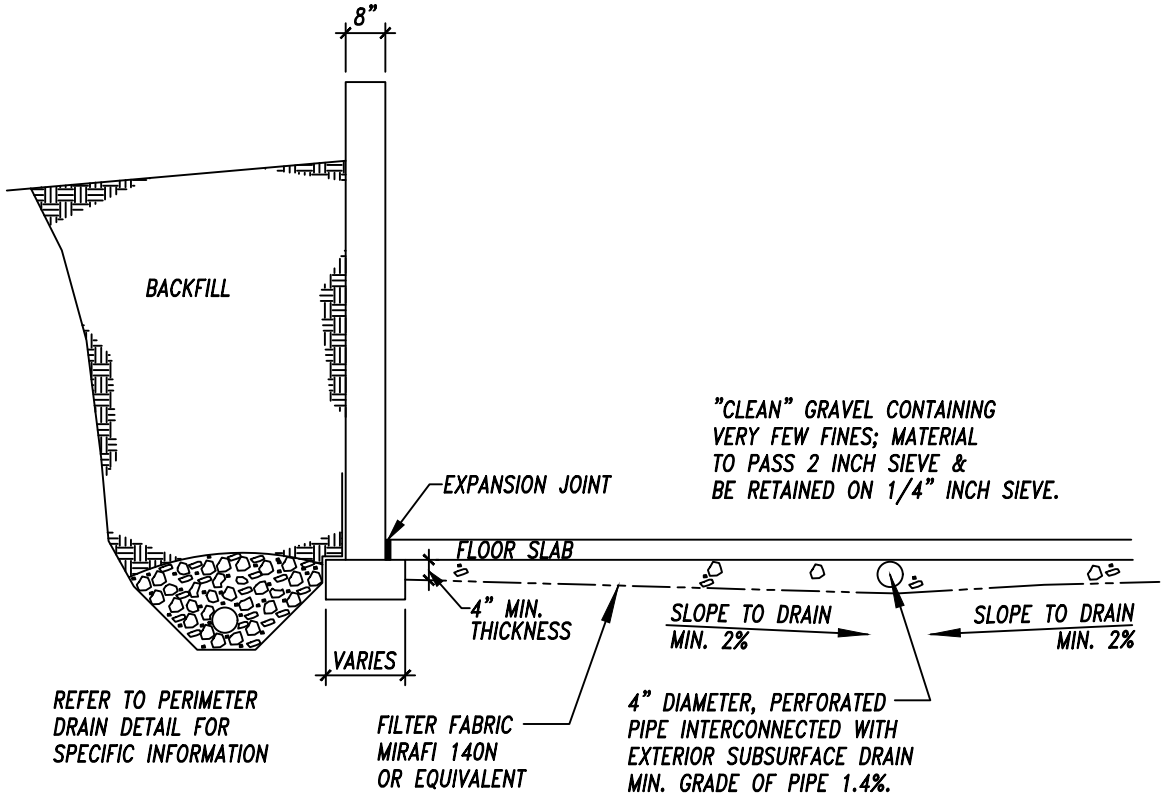
ENTECH ENGINEERING, INC.

INTERCEPTOR DRAIN DETAIL

5740 BURGESS ROAD
EL PASO COUNTY, CO
FOR: THE RENEHAN'S

JOB NO.
222084

FIG. 9



ENTECH ENGINEERING, INC.

TYP. UNDERSLAB DRAIN DETAIL (CAPILLARY BREAK)

5740 BURGESS ROAD
EL PASO COUNTY, CO
FOR: THE RENEHAN'S

JOB NO.
222084

FIG. 10

APPENDIX A: Site Photographs

1

Looking north along the proposed driveway in the western side of the site.

November 8, 2022

2

Looking south from the southern portion of the site.

November 8, 2022

Job No. 222084

3

Looking southeast from the northeastern portion of the site.

November 8, 2022

4

Looking northwest from the northeastern portion of the site.

November 8, 2022

Job No. 222084

5

Looking west along the northern side of the site.

November 8, 2022

6

Looking east along the head of the drainage in the northwestern portion of Lot 3.

November 8, 2022

Job No. 222084

APPENDIX B: Test Boring and Test Pit Logs

ENTECH ENGINEERING, INC.

Table B-1: Summary Test Boring Results

Test Boring No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
1	12	>20
2	7	>20
3	2	>15
4	3	>20
5	9	>20

ENTECH ENGINEERING, INC.

Table B-2: Summary Tactile Test Pit Results

Test Pit No.	USDA Soil Type	LTAR Value	Depth to Bedrock (ft.)	Depth to Groundwater or Seasonally Occurring Groundwater (ft.)
1	4A*	0.15	>8	4.5*
2	4A*	0.15	>8	5*
3	R-1*	0.5	>8	>8
4	4A*	0.15	3.5*	>4.5

*- Conditions that will require an engineered OWTS

TEST BORING 1
DATE DRILLED 11/9/2022

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 11/10/22						
SAND, WITH SILT to SILTY, TAN, LOOSE to DENSE, DRY to MOIST				8	1.8	1
	5			7	3.9	1
	10			32	6.7	1
SANDSTONE, WEAK, GRAY, WEATHERED (SAND, SILTY, VERY DENSE, MOIST)	15			50/8"	####	2
	20			50/8"	8.4	2

TEST BORING 2
DATE DRILLED 11/9/2022

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 11/10/22						
SAND, SLIGHTLY SILTY to SILTY, TAN, MEDIUM DENSE, MOIST				17	4.2	1
	5			13	4.4	1
SANDSTONE, WEAK, GRAY, WEATHERED (SAND, SILTY, VERY DENSE, MOIST)	10			50/8"	11.8	2
	15			50/7"	10.4	2
	20			50/8"	11.4	2

ENTECH ENGINEERING, INC.

TEST BORING LOGS

5740 BURGESS ROAD
THE RENEHAN'S

JOB NO. 222084

FIG. B-1

TEST BORING 3
DATE DRILLED 11/9/2022

REMARKS

DRY TO 15', 11/10/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					1
			50/11"	####	2
5			50/7"	####	2
10			50	####	2
15			50/5"	6.0	2
20					

SAND, SILTY, BROWN

SANDSTONE, WEAK, TAN, WEATHERED (SAND, SILTY, VERY DENSE, MOIST)

TEST BORING 4
DATE DRILLED 11/9/2022

REMARKS

DRY TO 20', 11/10/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			30	2.2	1
5			50/7"	7.1	2
10			50/7"	13.4	2
15			50/7"	10.5	2
20			50/7"	15.9	2

SAND, SILTY, TAN, DENSE, DRY

SANDSTONE, WEAK, TAN, WEATHERED (SAND, SILTY, VERY DENSE, MOIST)

ENTECH ENGINEERING, INC.

TEST BORING LOGS

5740 BURGESS ROAD
THE RENEHAN'S

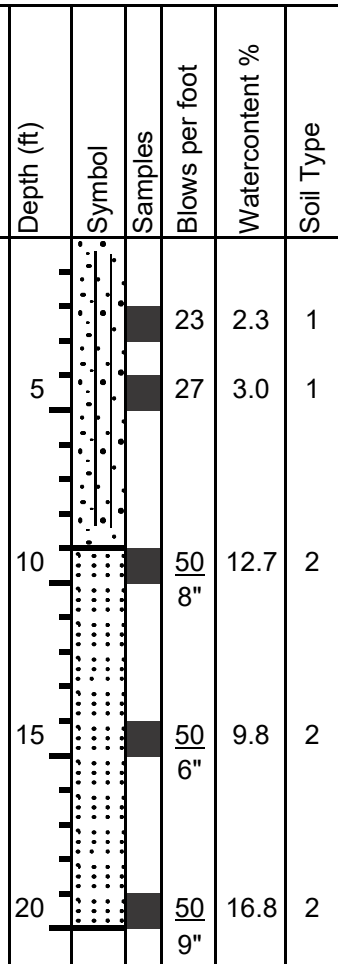
JOB NO. 222084

FIG. B-2

TEST BORING 5
DATE DRILLED 11/9/2022

REMARKS

DRY TO 20', 11/10/22



ENTECH ENGINEERING, INC.

TEST BORING LOGS

5740 BURGESS ROAD
THE RENEHAN'S

JOB NO. 222084

FIG. B-3

TEST PIT 1
DATE EXCAVATED 9/20/2023
REMARKS

Redoximorphic Features
@ 4-feet 6-inches

Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type	
1						topsoil, sandy clay loam, brown, moist
2			ma		R-1	sandy clay, fine to medium grained, grayish brown, moist
3			gr	m		sandy loam, fine to coarse grained, brown, moist
4					R-1	
5			gr	m		sandy loam, fine to coarse grained, brown, moist
6					R-1	
7			ma			sandy clay, fine to medium grained, grayish brown, moist
8						
9						
10						

TEST PIT 2
DATE DRILLED 9/20/2023
REMARKS

Redoximorphic Features
@ 5-feet 0-inches

Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type	
1						topsoil, sandy clay loam, brown, moist
2						
3			ma		4A	sandy clay, fine to medium grained, grayish brown, moist
4						
5			gr	m	2	sandy loam, fine to coarse grained, brown, moist
6						
7			ma		4A	sandy clay, fine to medium grained, grayish brown, moist
8						
9						
##						

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.

TEST PIT LOGS

5740 BURGESS ROAD
THE RENEHAN'S

JOB NO.
222084

FIG. B-4

TEST PIT 3
DATE EXCAVATED 9/20/2023
REMARKS

Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type	
1						topsoil, sandy clay loam, brown, moist
2			gr	s	R-1	gravelly sandy clay loam, fine to very coarse grained, brown to grayish brown, moist
3						
4			gr	s	R-1	
5						
6						
7			gr	m	R-1	gravelly sandy loam, fine to very coarse grained, brown, moist
8						
9						
10						

TEST PIT 4
DATE EXCAVATED 9/20/2023
REMARKS

Bedrock @ 3-feet 6-inches,
Refusal @ 4-feet 6-inches,
Redoximorphic Features
@ 4-feet 6-inches

Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type	
1						topsoil, sandy clay loam, brown, moist
2			bl	s	2	sandy loam, fine to coarse grained, pale brown, moist
3						
4			ma		4A	clayey sandstone, fine to medium grained, brown, moist
5						
6						
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.

TEST PIT LOGS

5740 BURGESS ROAD
THE RENEHAN'S

JOB NO.
222084

FIG. B-5

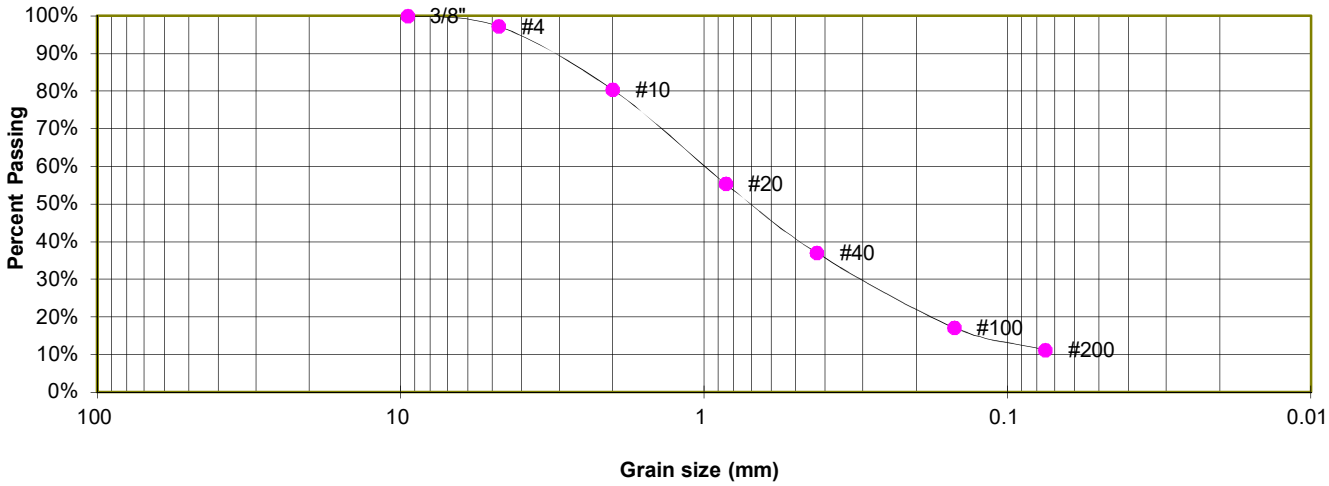
APPENDIX C: Laboratory Test Results

TABLE C-1
SUMMARY OF LABORATORY TEST RESULTS

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	SULFATE (WT %)	USCS	SOIL DESCRIPTION
1	1	2-3	11.3	NV	NP	NP	<0.01	SW-SM	SAND, WITH SILT
1	2	5	4.8					SW	SAND, SLIGHTLY SILTY
1	4	2-3	13.5					SM	SAND, SILTY
2	3	5	31.3	NV	NP	NP	<0.01	SM	SANDSTONE (SAND, SILTY)
2	5	15	16.2					SM	SANDSTONE (SAND, SILTY)

Project: 5740 Burgess Road
Client: The Renehan's
Job No: 222084

TEST BORING	1	SOIL DESCRIPTION	SAND, WITH SILT
DEPTH (FT)	2-3	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.2%
10	80.4%
20	55.4%
40	37.0%
100	17.1%
200	11.3%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW-SM

ENTECH ENGINEERING, INC.

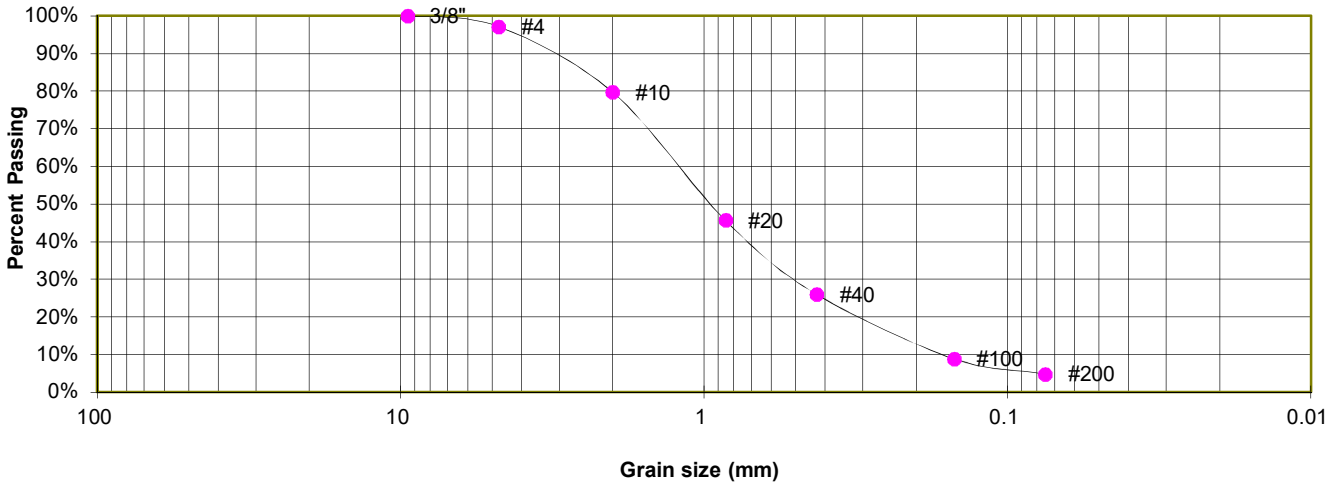
LABORATORY TEST RESULTS

5740 BURGESS ROAD
THE RENEHAN'S

JOB NO. 222084

FIG. C-1

TEST BORING	2	SOIL DESCRIPTION	SAND, SLIGHTLY SILTY
DEPTH (FT)	5	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.2%
10	79.7%
20	45.7%
40	26.0%
100	8.9%
200	4.8%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW

ENTECH ENGINEERING, INC.

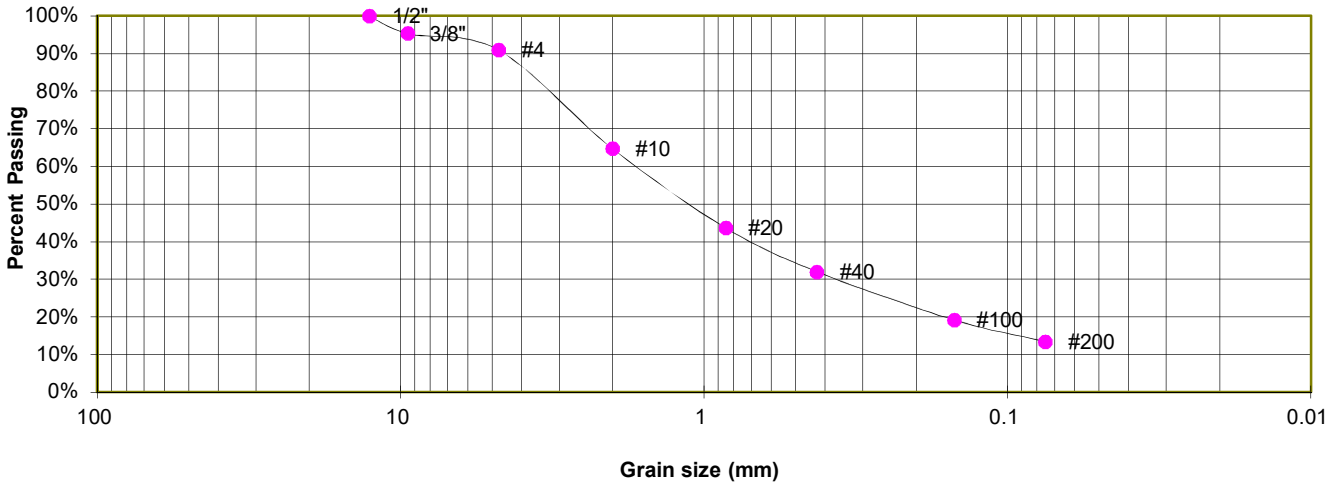
LABORATORY TEST RESULTS

5740 BURGESS ROAD
THE RENEHAN'S

JOB NO.
222084

FIG. C-2

TEST BORING	4	SOIL DESCRIPTION	SAND, SILTY
DEPTH (FT)	2-3	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	95.3%
4	90.9%
10	64.7%
20	43.7%
40	32.0%
100	19.2%
200	13.5%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

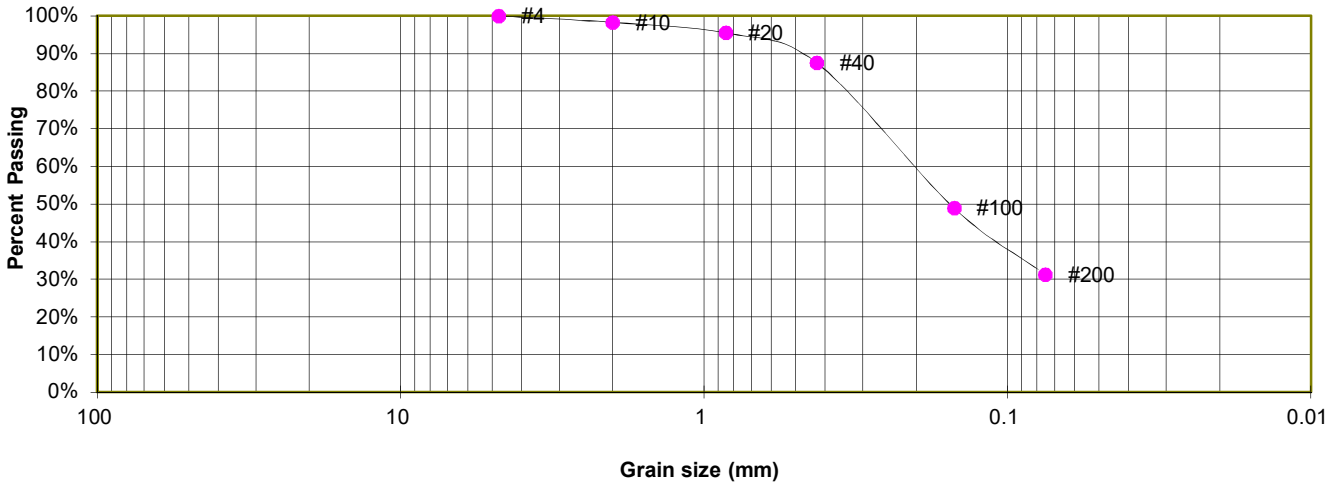
LABORATORY TEST RESULTS

5740 BURGESS ROAD
THE RENEHAN'S

JOB NO.
222084

FIG. C-3

TEST BORING	3	SOIL DESCRIPTION	SANDSTONE (SAND, SILTY)
DEPTH (FT)	5	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.3%
20	95.5%
40	87.5%
100	48.9%
200	31.3%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

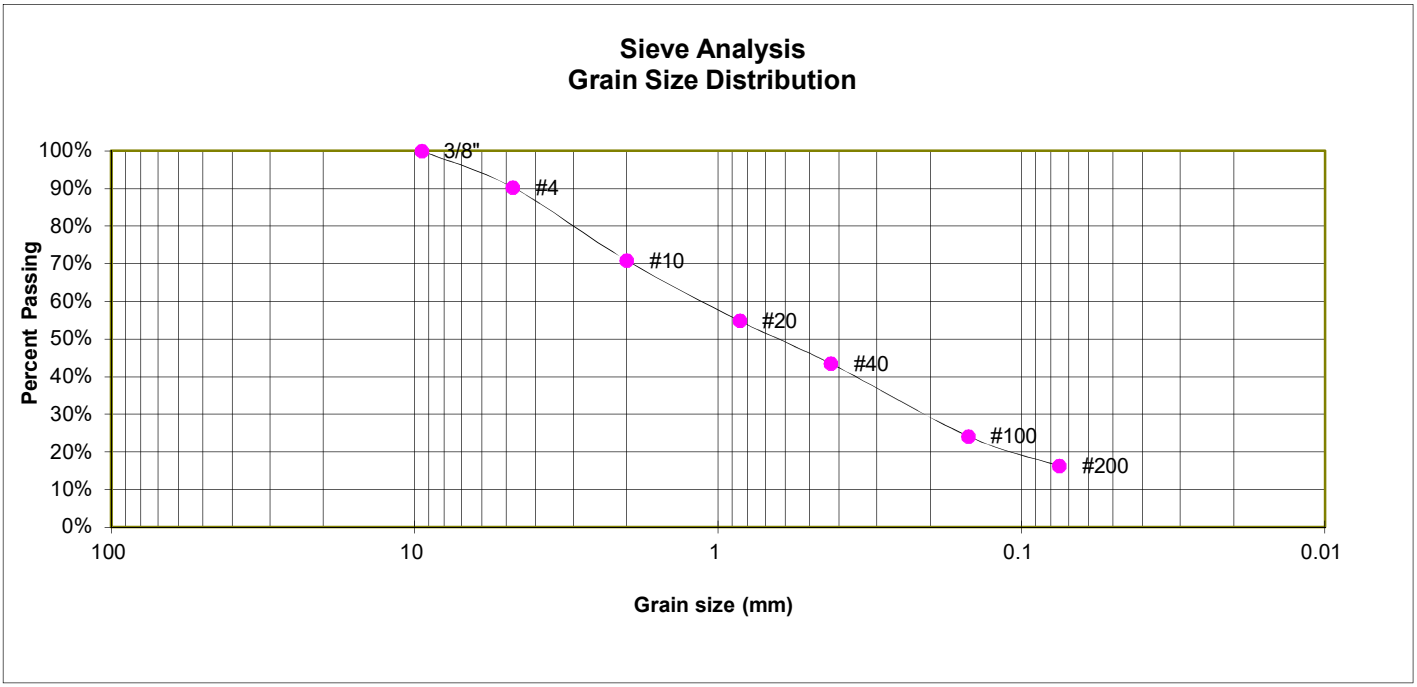
LABORATORY TEST RESULTS

5740 BURGESS ROAD
THE RENEHAN'S

JOB NO.
222084

FIG. C-4

TEST BORING	5	SOIL DESCRIPTION	SANDSTONE (SAND, SILTY)
DEPTH (FT)	15	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	90.3%
10	70.9%
20	54.9%
40	43.5%
100	24.2%
200	16.2%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

LABORATORY TEST RESULTS

5740 BURGESS ROAD
THE RENEHAN'S

JOB NO.
222084

FIG. C-5

APPENDIX D: Soil Survey Descriptions

El Paso County Area, Colorado

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

Map Unit Setting

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

Map Unit Composition

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

Description of Kettle

Setting

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

Typical profile

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

Properties and qualities

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

Interpretive groups

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

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

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 supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

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

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022