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SOILS AND GEOLOGY STUDY
SILVERADO RANCH FILING NO. 2
EL PASO COUNTY, COLORADO

Prepared for:

Silverado Ranch, Inc.
18911 Cherry Springs Ranch Drive
Monument, Colorado 80132

Attn: Stan Searle

September 27, 2024
Revised October 8, 2024

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Logan L. Langford, P.G.
Sr. Geologist

Reviewed by:

COLORADO LICENSED JOSEPH COLLIN GOODE 23725 PROFESSIONAL ENGINEER

Digitally signed by Joseph C. Goode Jr.
Date: 10/09/24

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

LLL

PCD No. SF246

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1 SUMMARY

Project Location

The project is located in portions of the NE¼ of Section 16, Township 15 South, Range 63 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 12 miles east of Colorado Springs, Colorado.

Project Description

Silverado Ranch Filing No. 2 Subdivision consists of 49.8 acres with fifteen (15) rural residential lots are proposed. The proposed lots range in size from 2.5 to 3.8-acre and will be serviced by individual water wells and on-site wastewater systems (OWTS).

Scope of Report

This report presents the results of our geologic evaluation and treatment of engineering geologic hazard study.

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 minor constraints on development and land use. These include areas of artificial fill, hydrocompaction, potentially expansive soils, potential seasonally shallow groundwater areas, and potential for elevated radon levels. Based on the proposed development plan, it appears that these areas will have some impact on the development. These conditions will be discussed in greater detail in the report.

Based on the results of our investigation 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.

2 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The project is located in portions of the NE¼ of Section 16, Township 15 South, Range 63 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 12 miles east of Colorado Springs, Colorado, at the southeast corner of South Peyton Highway and Drennan Road. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site varies from gradually sloping southeast with low lying pond areas in PLD-A and PLD-B. No drainages were observed within the subdivision, however, existing ponds and grass lined drainage channels are located on the site. Water was not observed in the ponds or grass lined drainage channels on the site at the time of this investigation. The site boundaries are indicated on the USGS Map, Figure 2. Previous land uses have included grazing and pasture land. The site contains primarily field grasses, weeds, cacti, and yuccas. Site photographs are included in Appendix A. The locations and directions of the photographs are indicated in Figure 3.

Silverado Ranch Filing No. 2 Subdivision consists of 49.8 acres with fifteen (15) rural residential lots proposed. The proposed lots range in size from 2.5 to 3.8-acre which will be serviced by individual water wells and on-site wastewater systems (OWTS). Grading for the roadways was completed at the time of our site observations, and drainage improvements adjacent to the Filing No. 2, and within Filing No. 2 were under construction. The Site and Exploration Plan is presented in Figure 3.

3 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.

4 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 air photo reconnaissance

and interpretation. The same mapping procedures have also been utilized to produce the Engineering Geology Map which identified pertinent geologic conditions affecting development. The field mapping was performed by personnel of Entech Engineering, Inc. on August 7, 2024. Site photographs are included in Appendix A.

Four (4) test borings were drilled and four (4) test pits excavated across the site as part of this study to determine the soils classification and engineering characteristics. The borings were drilled to depths of 20 feet using a truck-mounted, continuous flight auger drilling rig supplied and operated by Entech Engineering, Inc., and the test pits were excavated to depths of 8 feet.

Laboratory testing was performed on some of the soils to classify and determine the soils engineering characteristics. Laboratory tests included moisture content testing, ASTM D-2216, tests included grain-size analysis ASTM D-422, Atterberg Limits ASTM D-4318, volume change testing using Swell/Consolidation test. Sulfate testing was performed on select samples to evaluate potential for below grade concrete degradation due to sulfate attack. Results of the laboratory testing are included in Appendix C. A Summary of Laboratory Test Results is presented in Table C-1. Previous Laboratory Testing Summary and Test Boring Logs are included in Appendix D.

The subdivision was previously investigated by Front Range Geotechnical, *Preliminary Geology and Subsurface Soil Evaluation and Sewage Disposal Evaluation, Silverado Ranch Subdivision, El Paso County, Colorado*, dated October 5, 2006 (Reference 1). Information from this report was used in evaluating the site.

5 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

5.1 General Geology

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province. Approximately 21 miles to the west is a major structural feature known as the Ute Pass Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be very gently dipping in a northerly direction (Reference 2). The bedrock underlying the site consists of the Laramie Formation of Cretaceous Age. The Laramie Formation primarily consists of fine grained sandstone with interbedded shale and coal. Overlying this formation are unconsolidated deposits of artificial fill and eolian sediments. The eolian sediments were deposited by prevailing winds from the west

and northwest. Man-made soils exist as fill stockpiles located across the filing. The site's stratigraphy will be discussed in more detail in Section 5.3.

5.2 Soil Conservation Survey

The Natural Resource Conservation Service (Reference 3), previously the Soil Conservation Service (Reference 4) has mapped three soil types on the site (Figure 4). In general, the soils classify as loamy sand, and sandy loam. The soils are described as follows:

Type	Description
5	Bijou loamy sand, 1 – 8% slopes
6	Bijou sandy loam, 0 – 3% slopes
106	Wigton loamy sand, 1 – 8% slopes

Complete descriptions of each soil type are presented in Appendix D. The soils have generally been described to have moderate to rapid permeabilities. Limitations on development include, limited ability to support a load, shrink swell potential, slopes and frost action potential. Possible hazards with soil erosion are present on the site. The erosion potential can be controlled with vegetation. The majority of the soils have been described to have moderate erosion hazards.

5.3 Site Stratigraphy

The Geologic Map of the Pueblo 1ºx2º Quadrangle showing the site is presented in Figure 5 (Reference 5). The Geology Map prepared for the site is presented in Figure 6. Two mappable units were identified on this site which are described as follows:

Qaf **Artificial Fill of Holocene Age:** These are man placed fill deposits associated with temporary stockpiles were observed on the site.

Qes **Eolian Sands of Quaternary Age:** These deposits are fine to medium grained soil deposited on the site by the action of the prevailing winds from the west and northwest. They typically occur as large dune deposits or narrow ridges. These soil types are typically tan to brown in color and tend to have very uniform or well-sorted gradation. These materials tend to have a relatively high permeability and low density. Two blowouts within the eolian sand area located in the northwest and eastern portions of the subdivisions, these areas are the porous landscape detention (PLD) PLD-A and PLD-B.

The soils listed above were mapped from site-specific mapping, the *Geologic Map of the Pueblo 1º x 2º Quadrangle* distributed by the United States Geological Survey in 1978 (References 5), and the *Geologic Map of the Colorado Springs-Castle Rock Area*, distributed by the US Geological Survey in 1979 (Reference 6). The Test Borings and Test Pit Logs used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 6.

5.4 Soil Conditions

The soils encountered in the Test Borings can be grouped into two general soil types. The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1 classified as sand with silt to silty sand (SW-SM, SM). The sand was encountered in all of the test borings at the ground surface extending to depths ranging from 19 feet bgs in TB-1 and to the termination of TB-2 – TB-4 (20 feet). The sand was encountered at loose to medium dense states. The majority of the samples indicated medium dense states. One dimensional swell or collapse testing resulted in a consolidation of 0.5 percent, indicate a low consolidation potential.

Soil Type 2 classified as sandy clay (CL). The clay was encountered in TB-1 at 19 feet bgs and extended to the termination of the boring (20 feet). The clay was encountered at stiff consistencies.

The Test Boring Logs are presented in Appendix B, and the depth to bedrock and groundwater are presented on Table B-1. Laboratory Test Results are presented in Appendix C, and a Summary of Laboratory Test Results is presented in Table C-1.

5.5 Groundwater

Groundwater was not encountered in any of the test borings which were drilled to 20 feet. Areas of potential seasonally shallow groundwater have been mapped in the low-lying pond areas on the site. These areas are discussed in the following section. Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time. It should be noted that in the sandy materials on-site, some groundwater conditions might be encountered due to the variability in the soil profile. Isolated sand and gravel layers within the soils, sometimes only a few feet in thickness and width, can carry water in the subsurface. Builders and planners should be cognizant of the potential for the occurrence of such subsurface water features during construction on-site and deal with each individual problem as necessary at the time of construction.

6 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

Detailed mapping has been performed on this site to produce an Engineering Geology Map Figure 6. This map shows the location of various geologic conditions of which the developers should be cognizant during the planning, design and construction stages of the project. These hazards and the recommended mitigation techniques are as follows:

Artificial Fill – Constraint

These are areas of man-made fill associated with existing fill stockpiles located across the filing. The stockpiles are associated with ongoing drainage improvements currently under construction at the site. These stockpiles will be removed during the completion of the drainage improvements. Mitigation: Any uncontrolled fill encountered beneath foundations will require removal and recompaction at a minimum of 95% of its maximum Modified Procter Dry Density, ASTM D-1557.

Hydrocompaction – Constraint

The majority of the soils encountered on-site do not exhibit collapsible characteristics, however, minor areas of loose soils were encountered in the test borings drilled on site. In areas identified for this hazard classification, we anticipate a potential for settlement movements upon saturation of these surficial soils. The low density, uniform grain sized, windblown sand deposits are particularly susceptible to this type of phenomenon and have been identified on Figure 6. Mitigation: Should loose or collapsible soils be encountered beneath foundations, recompaction and moisture conditioning of the upper 2 feet of soil at 95% of its maximum Modified Proctor Dry Density ASTM D-1557 will be required. Roadway areas may also experience movement. Proofrolling and recompaction of soft areas should be performed during site work.

Expansive Soils – Constraint

Potentially expansive soils were encountered in the one of test borings drilled on site. These occurrences are typically sporadic; therefore, none have been indicated on the maps. The clays, if encountered at foundation grade, can cause differential movement in structures. These occurrences should be identified and dealt with on an individual basis.

Mitigation Should expansive soils be encountered beneath foundations; mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation 3 to 4 feet 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. The use of structural floors should be considered for basement construction on highly expansive clays. Final recommendations should be determined after additional investigation of each building site.

Groundwater and Floodplain Areas – Constraint

The site is not mapped within floodplain zones according to the FEMA Map Nos. 08041C0815G and 08041C1025G, Figure 7 (Reference 8). The topography of the site is gradually sloping to the southeast with two existing ponds located in the northwest corner of the subdivision and the eastern portion of the subdivision. These ponds area associated with blowout within the eolian sand deposits on the site and typically consist of poorly drained soils. The ponds were dry at the time of our site observation, and no areas of flowing or ponded water were observed within subdivision. The ponds have been identified as a potentially seasonal shallow groundwater area and is shown on the Geology/Engineering Geology Map, Figure 6.

The areas that have been mapped as potential seasonally shallow groundwater has been identified in the National Wetland Inventory as Freshwater Emergent Wetland habitats classified as PEM1A (Palustrine – P, Emergent – EM, Persistent – 1, Temporary Flooded – A) (Figure 8, Reference 9). This area is discussed as follows:

Potential Seasonal Shallow Groundwater Area – Constraint

In these areas, we would anticipate the potential for periodically high subsurface moisture conditions, frost heave potential and highly organic soils. This area is associated with ponds located in the northwest and eastern portions of the subdivision. These are located within no-build areas and will be avoided by future development.

Mitigation: Foundations must have a minimum 30-inch depth for frost protection. In areas where high subsurface moisture conditions are anticipated periodically, subsurface drains are recommended to help prevent the intrusion of water into areas below grade. Subsurface perimeter drains are recommended for portions of structures which will have useable space located below the finished ground surface, typical perimeter drain details are shown in Figure 9. Shallow groundwater conditions are not anticipated for majority of the filing, however, if areas of shallow groundwater are encountered, underslab drains or interceptor drains may be necessary. Typical drain details are shown in Figures 10 and 11. Specific recommendations should be made after additional investigation and site grading has been completed.

Radon – Hazard

Radon is a colorless, tasteless radioactive gas with a United States Environmental Protection Agency (EPA) specified action level of 4.0 picocuries per liter (pCi/L) of air. Radon gas has a very short half-life of 3.8 days. Radon levels for the area have been reported by the Colorado Geologic Survey in the open-file, Report No. 91-4 (Reference 10). Radon levels were not listed for the 80928, however, radon levels for the nearby 80808 zip code with an average of 14.6 pCi/L have been measured in the 80906-area code. The following is a table of radon levels in this area:

Average Radon Levels for the 80808 Zip Code	
0 < 4 pCi/L	50.00%
4 < 10 pCi/L	0.00%
10 < 20 pCi/L	0.00%
> 20 pCi/L	50.00%

Mitigation:

The potential for high radon levels is present for the site. Build-up of radon gas can usually be mitigated by providing increased ventilation of basement and crawlspace and sealing joints. Specific requirements for mitigation should be based on site specific testing.

6.1 Relevance of Geologic Conditions to Land Use Planning

As mentioned, we understand that the development will be single-family rural residential utilizing individual water wells and OWTS. It is our opinion that the existing geologic and engineering geologic conditions will impose some constraints on the proposed development and construction. The most significant problems affecting development will be those associated with artificial fill, hydrocompaction, potentially expansive soils, potential seasonally shallow groundwater areas, and potential for elevated radon levels. The potential seasonally shallow groundwater areas on the site are within no-build areas and will be avoided. Other constraints/hazards on site may be satisfactorily mitigated through proper engineering design and construction practices.

The upper residual soils are typically at loose to medium dense states. The granular soils encountered in the upper soil profiles of the test borings should provide good support for foundations. Loose soils if encountered at foundation depth will require mitigation. Foundations anticipated for the site are standard spread footings. Overexcavation in areas of expansive soils or recompaction in areas of loose soils will be required where encountered. Excavation is anticipated to be moderate with rubber-tired equipment for the site sand materials.

Expansive layers may be encountered in the soil and bedrock on this site. Areas of expansive soils encountered on site are sporadic; therefore, none have been indicated on the maps. Expansive soils, if encountered, will require special foundation design and/or overexcavation. These soils will not prohibit development.

The site is not mapped within floodplain zones according to the FEMA Map Nos. 08041C0815G and 08041C1025G, Figure 7 (Reference 8). The topography of the site is gradually sloping to the southeast with two existing ponds located in the northwest corner of the subdivision and the eastern portion of the subdivision. These ponds area associated with blowout within the eolian sand deposits on the site and typically consist of poorly drained soils. The ponds were dry at the time of our site observation, and no areas of flowing or ponded water were observed within subdivision. The ponds have been identified as a potentially seasonal shallow groundwater area and is shown on the Geology/Engineering Geology Map, Figure 6.

The areas that have been mapped as potential seasonally shallow groundwater has been identified in the National Wetland Inventory as Freshwater Emergent Wetland habitats classified as PEM1A (Palustrine – P, Emergent – EM, Persistent – 1, Temporary Flooded – A) (Figure 8, Reference 9).

Areas of erosion and gullying may require the construction of check dams and revegetation if construction encroaches on these areas. General recommendations for erosion control are discussed under Section 8 "Erosion Control".

In summary, development of the site can be achieved if the items mentioned above are mitigated. These items can be mitigated through proper design and construction or through avoidance. Investigation on each lot is also recommended prior to construction.

7 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 11), portions of the area are mapped as stream terrace and floodplain deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 12), areas of the site are not mapped with any resources. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 13), the area of the site has been mapped as “Little or No Potential” for industrial minerals. It is possible sand materials on site could be an aggregate resource. However, considering the silty to clayey nature

of much of these materials and abundance of similar materials through the region and the close proximity to developed land, they would be considered to have little significance as an economic resource.

According to *the Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 13), 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 13).

The site has been mapped as "Fair" for oil and gas resources (Reference 13). 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.

8 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.

9 ROADWAY AND EMBANKMENT CONSTRUCTION RECOMMENDATIONS

The site soils are suitable for the proposed roadways and embankments. If road or embankment excavations encroach on the groundwater level unstable soil conditions may be encountered. Excavation of saturated soils will be difficult with rubber-tired equipment. Stabilization using shot rock or geogrids may be necessary.

Any areas to receive fill should have all topsoil, organic material or debris removed. Prior to fill placement Entech should observe the subgrade. Fill must be properly benched and compacted to minimize potentially unstable conditions in slope areas. Fill slopes should be 3:1. The subgrade should be scarified and moisture conditioned to within 2% of optimum moisture content and compacted to a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557, prior to placing new fill. Areas receiving fill may require stabilization with rock or fabric if shallow groundwater conditions are encountered.

New fill should be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 95% of its maximum Modified Proctor Dry Density, ASTM D-1557. These materials should be placed at a moisture content conducive to compaction, usually 0 to ±2% of Proctor optimum moisture content. The placement and compaction of fill should be observed and tested by Entech during construction. Entech should approve any import materials prior to placing or hauling them

to the site. Additional investigation will be required for pavement designs once roadway grading is completed and utilities are installed.

10 CLOSURE

It is our opinion that the existing geologic engineering and geologic conditions will impose some constraints on development and construction of the site. The majority of these conditions 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 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 Silverado Ranch, Inc. 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.

11 REFERENCES

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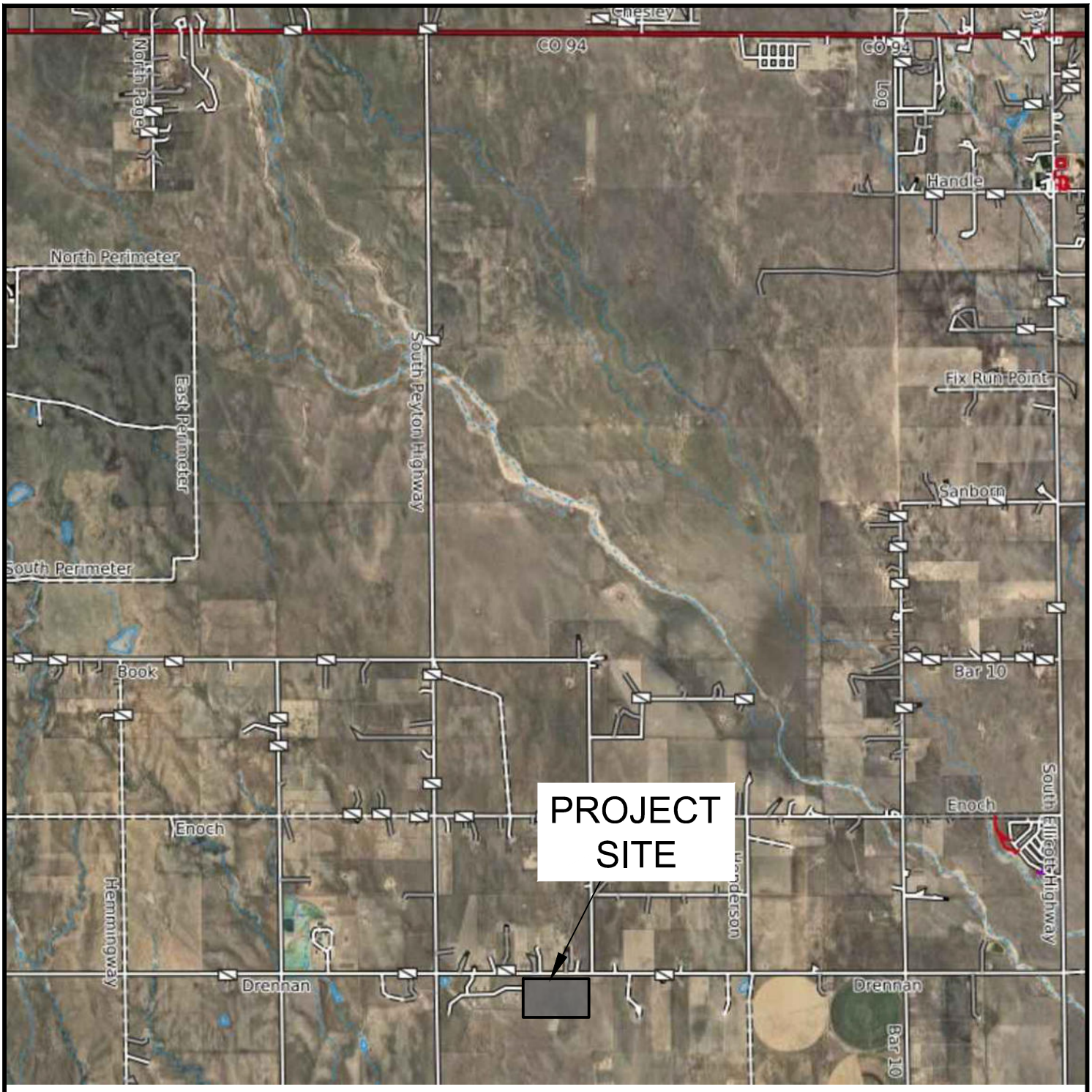
FIGURES



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VICINITY MAP

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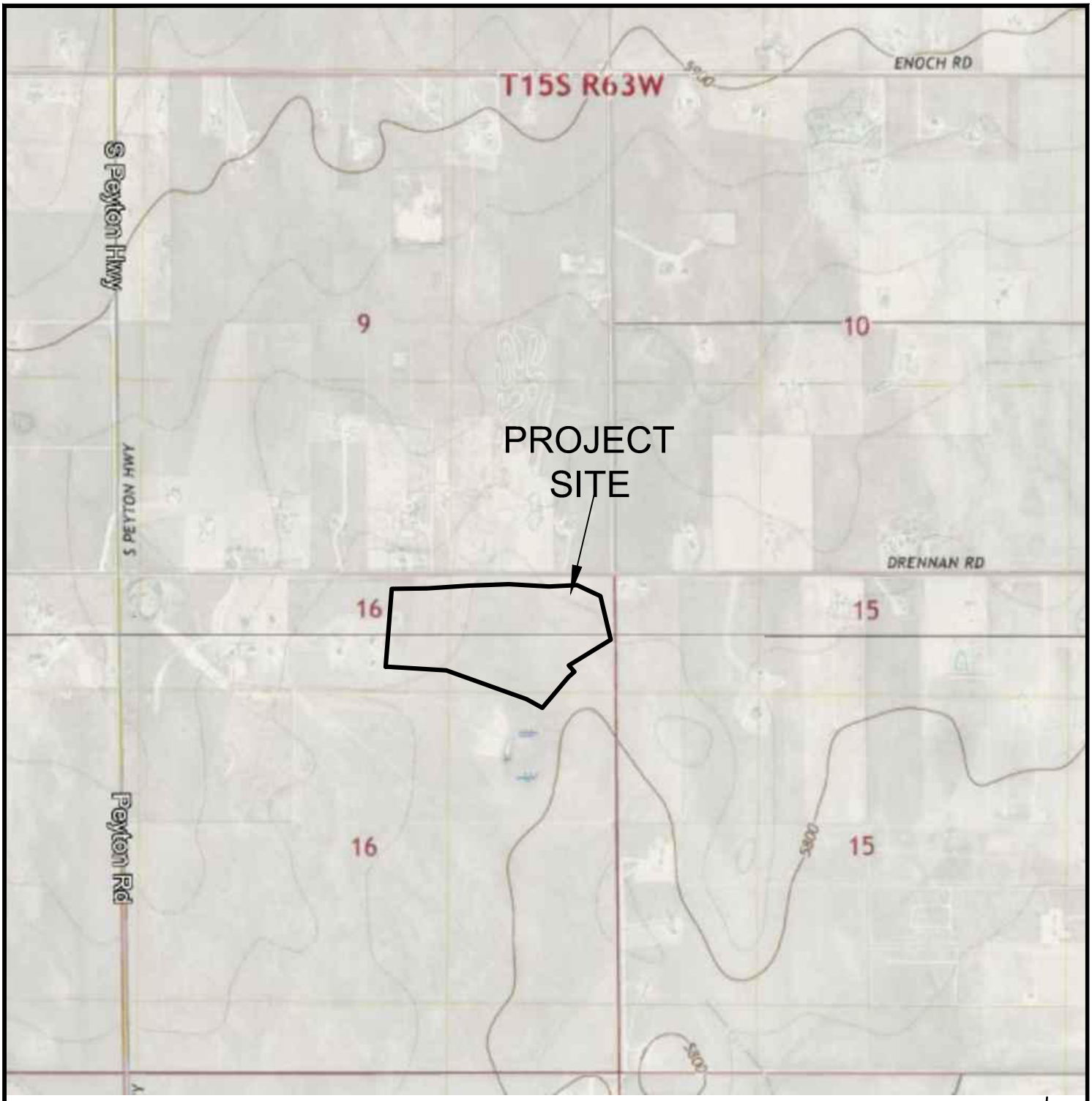
FIG. 1



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USGS TOPOGRAPHY MAP

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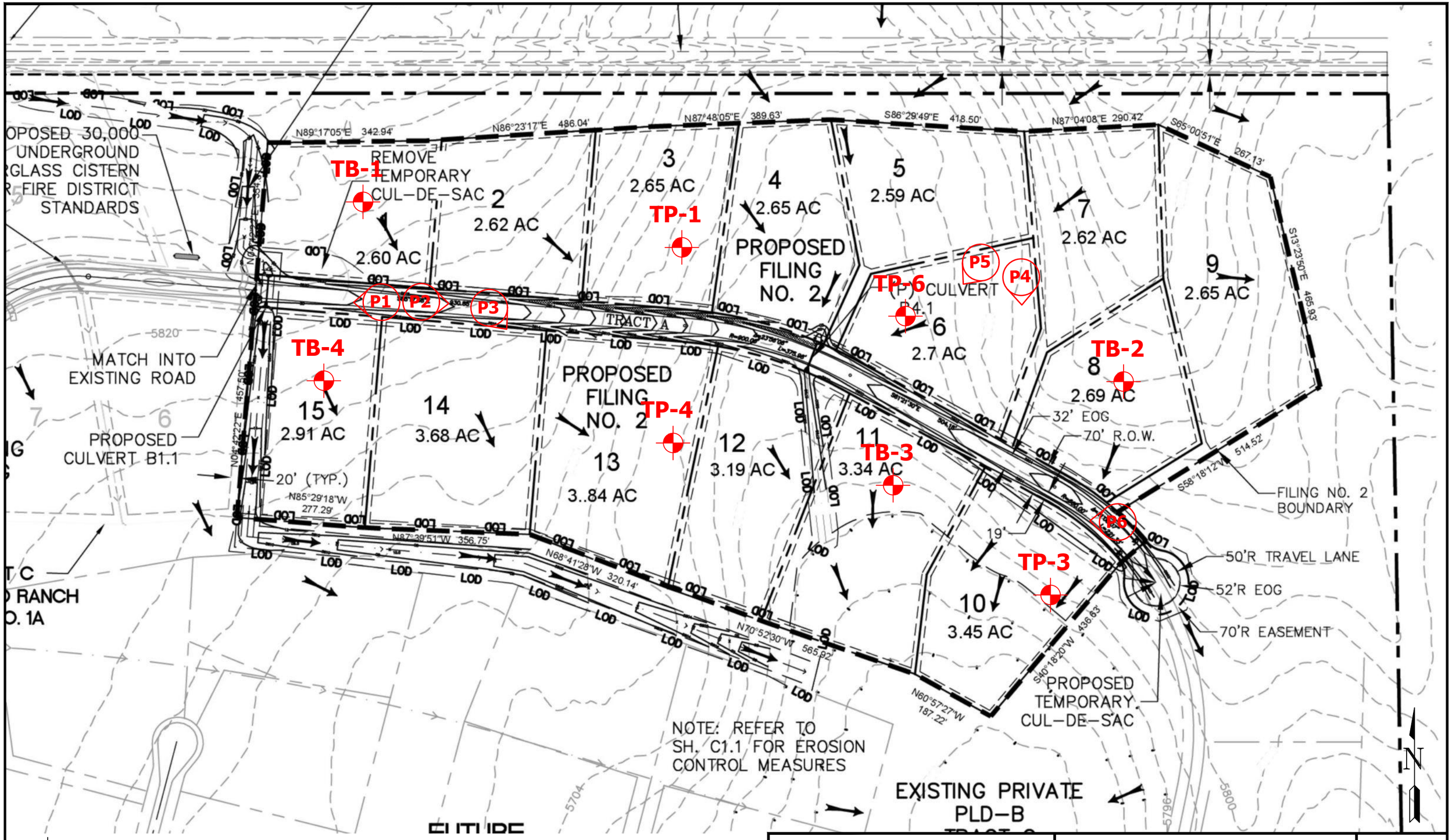
FIG. 2



TB- APPROXIMATE TEST BORING LOCATION AND NUMBER

TP- APPROXIMATE TEST PIT LOCATION AND NUMBER

(P2) - APPROXIMATE PHOTOGRAPH LOCATION AND NUMBER

ENTECH ENGINEERING, INC.

SITE AND EXPLORATION PLAN

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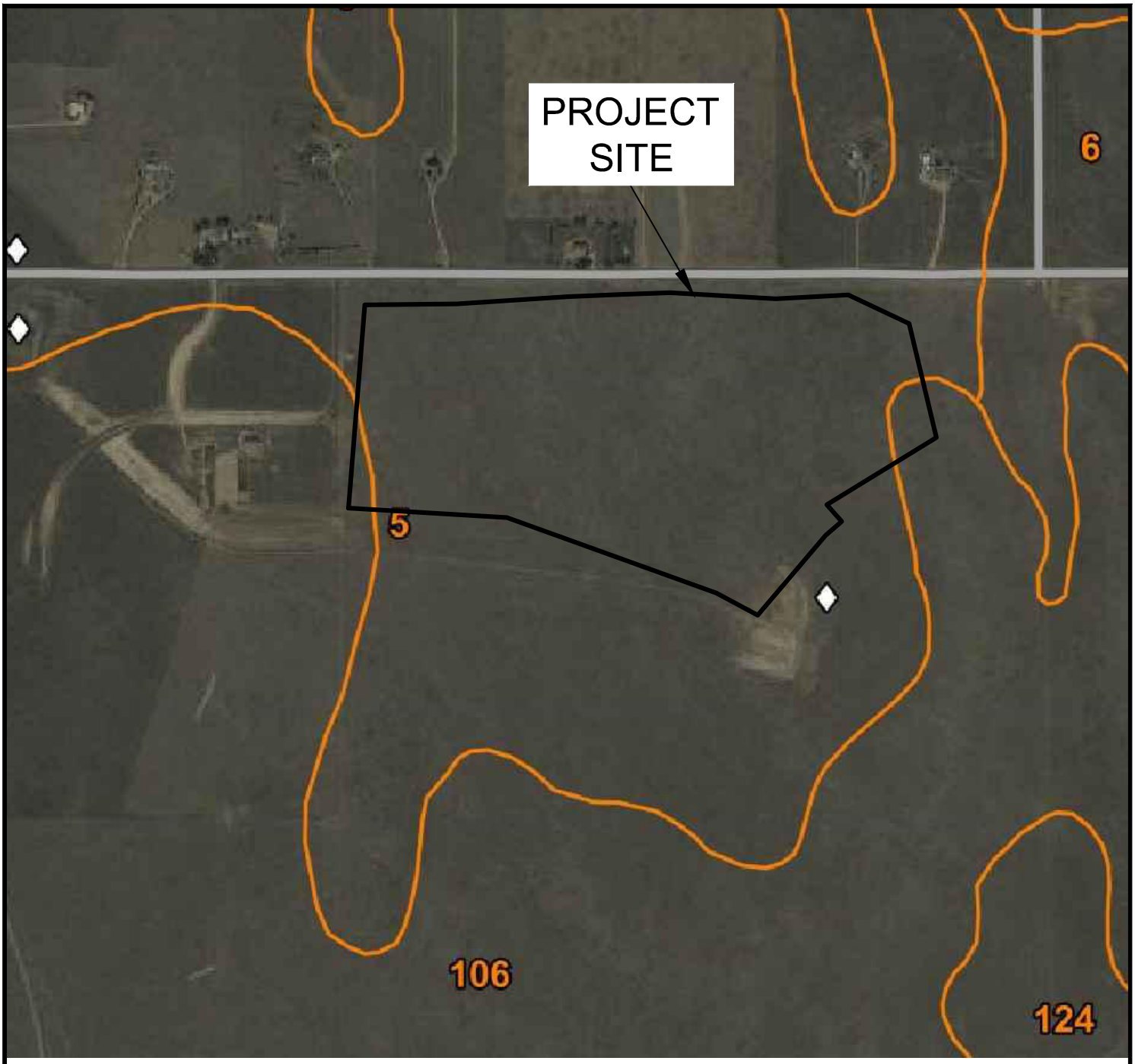
FIG. 3



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USDA SOIL MAP

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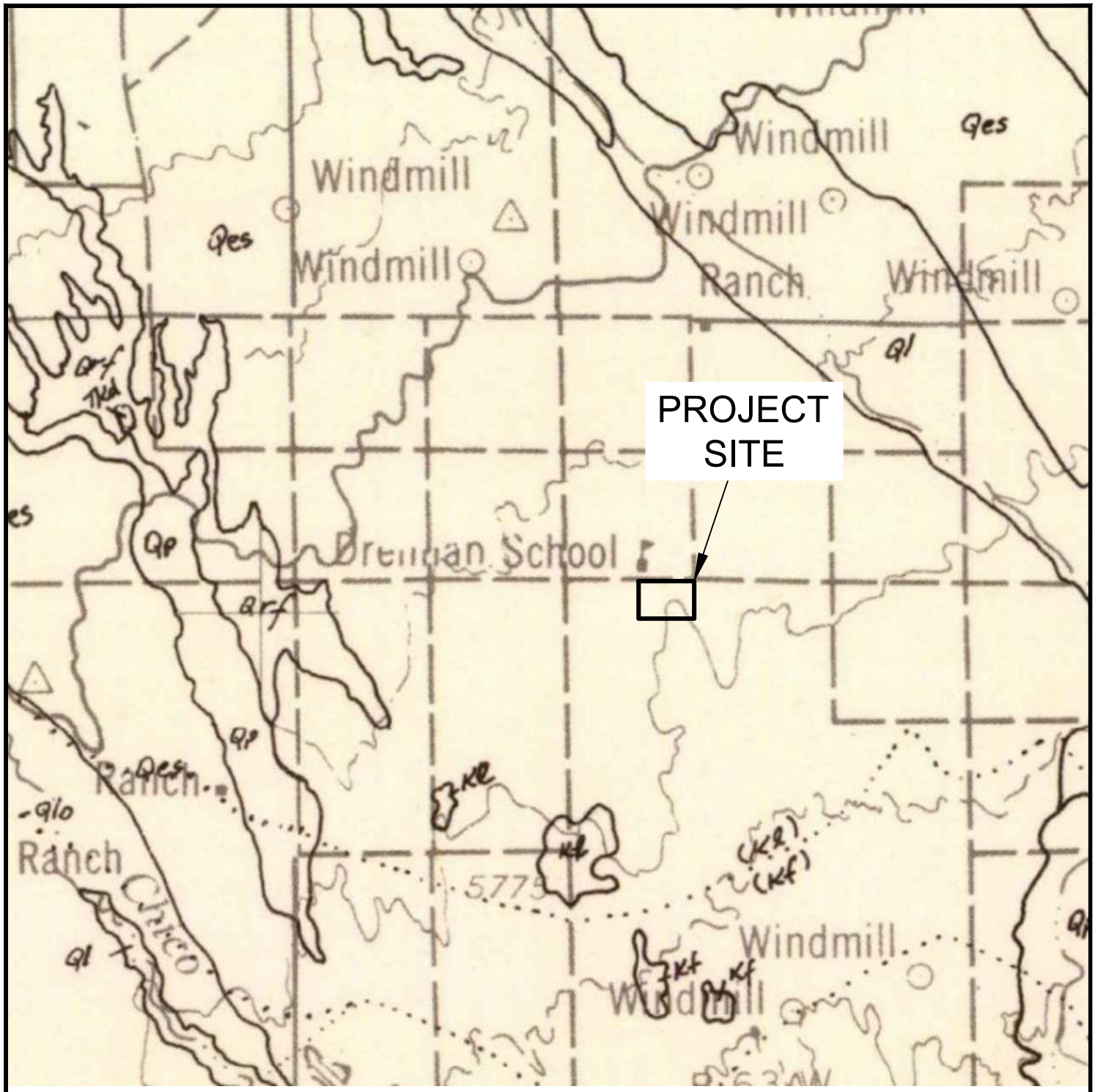
FIG. 4



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GEOLOGIC MAP OF THE PUEBLO 1° X 2° QUADRANGLE

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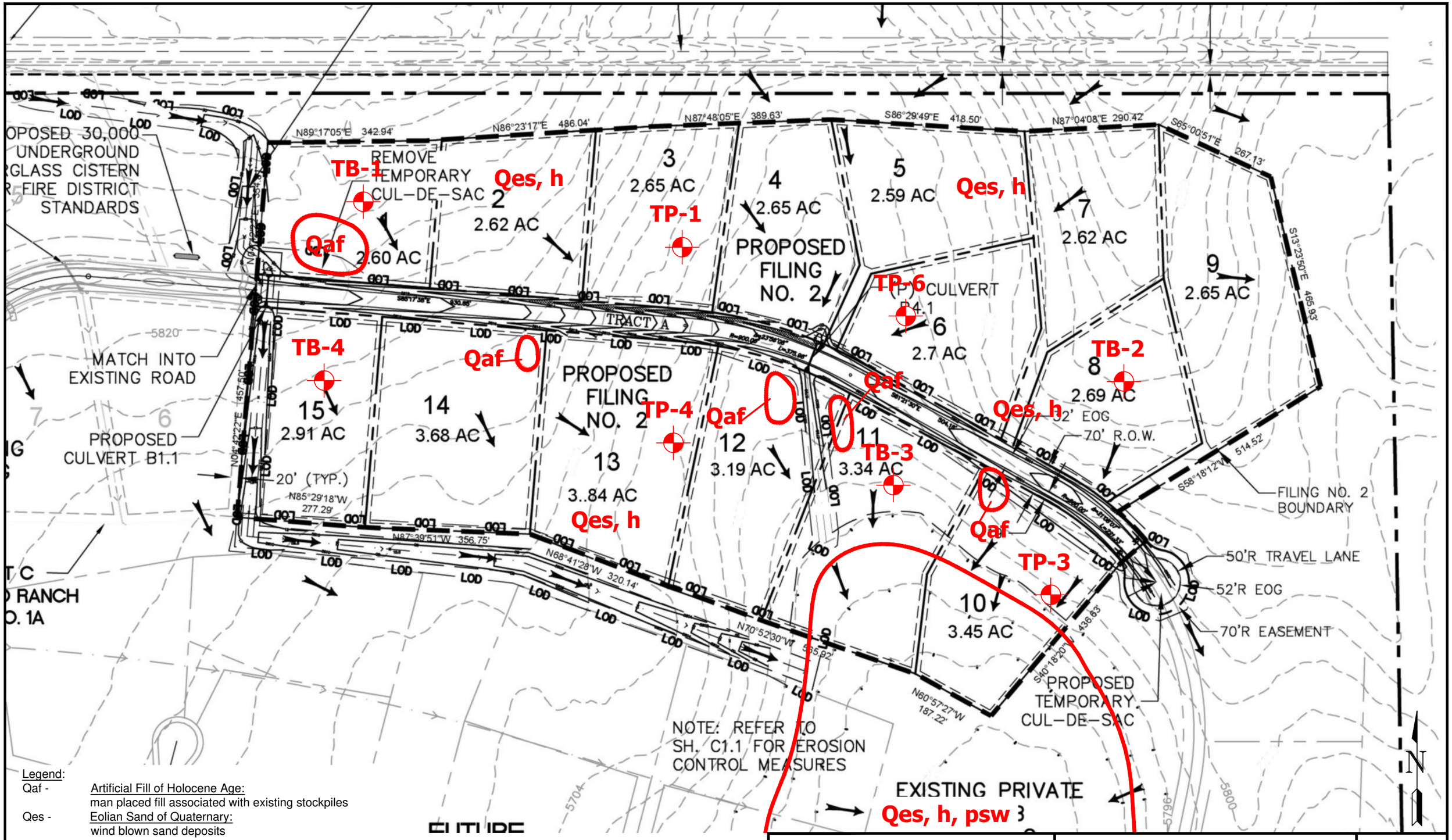
FIG. 5



Legend:

Qaf - Artificial Fill of Holocene Age:
man placed fill associated with existing stockpiles

Qes - Eolian Sand of Quaternary:
wind blown sand deposits

h - hydrocompaction

psw - potential seasonally shallow groundwater area

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GEOLOGY / ENGINEERING MAP

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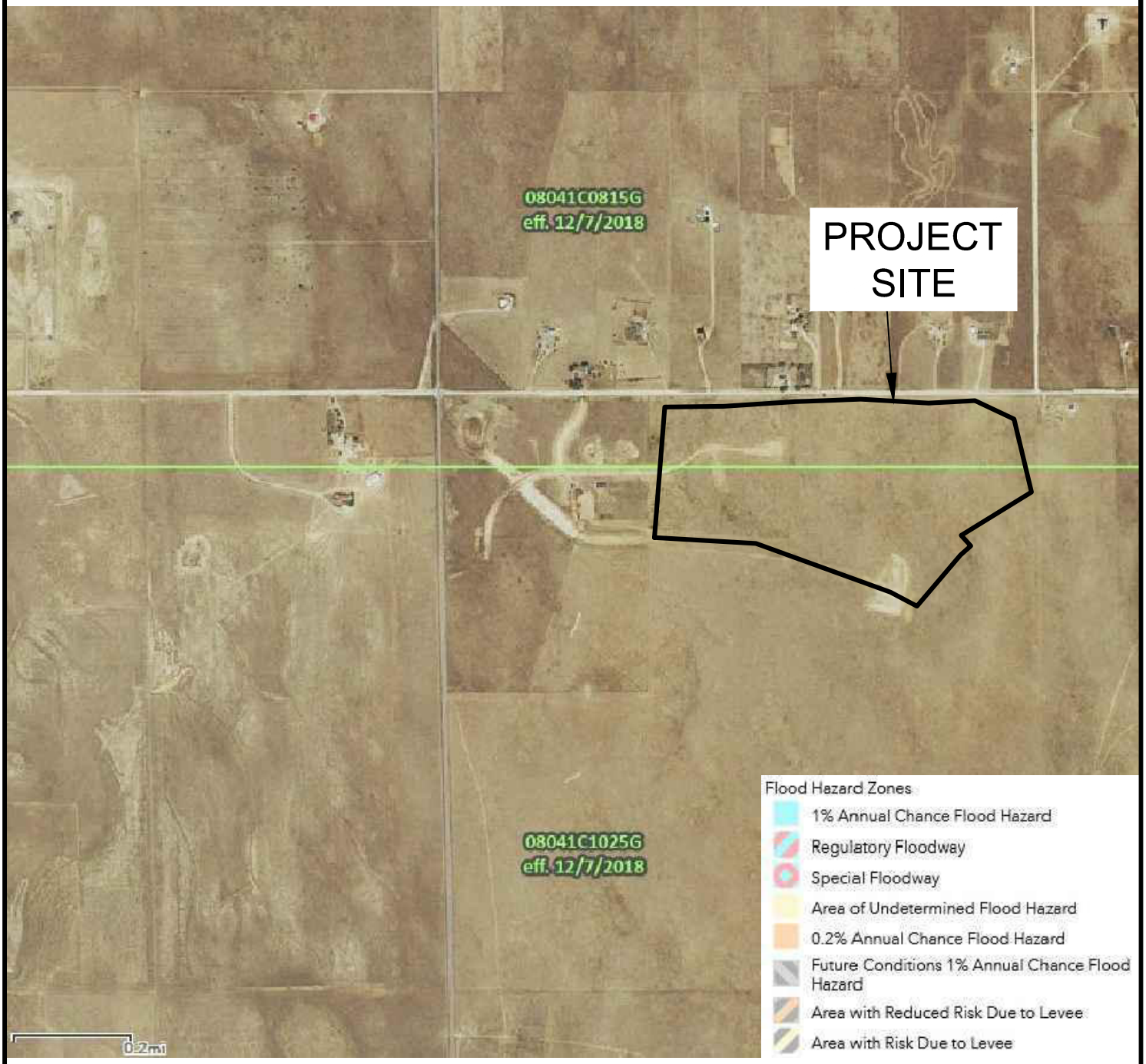
FIG. 6



N

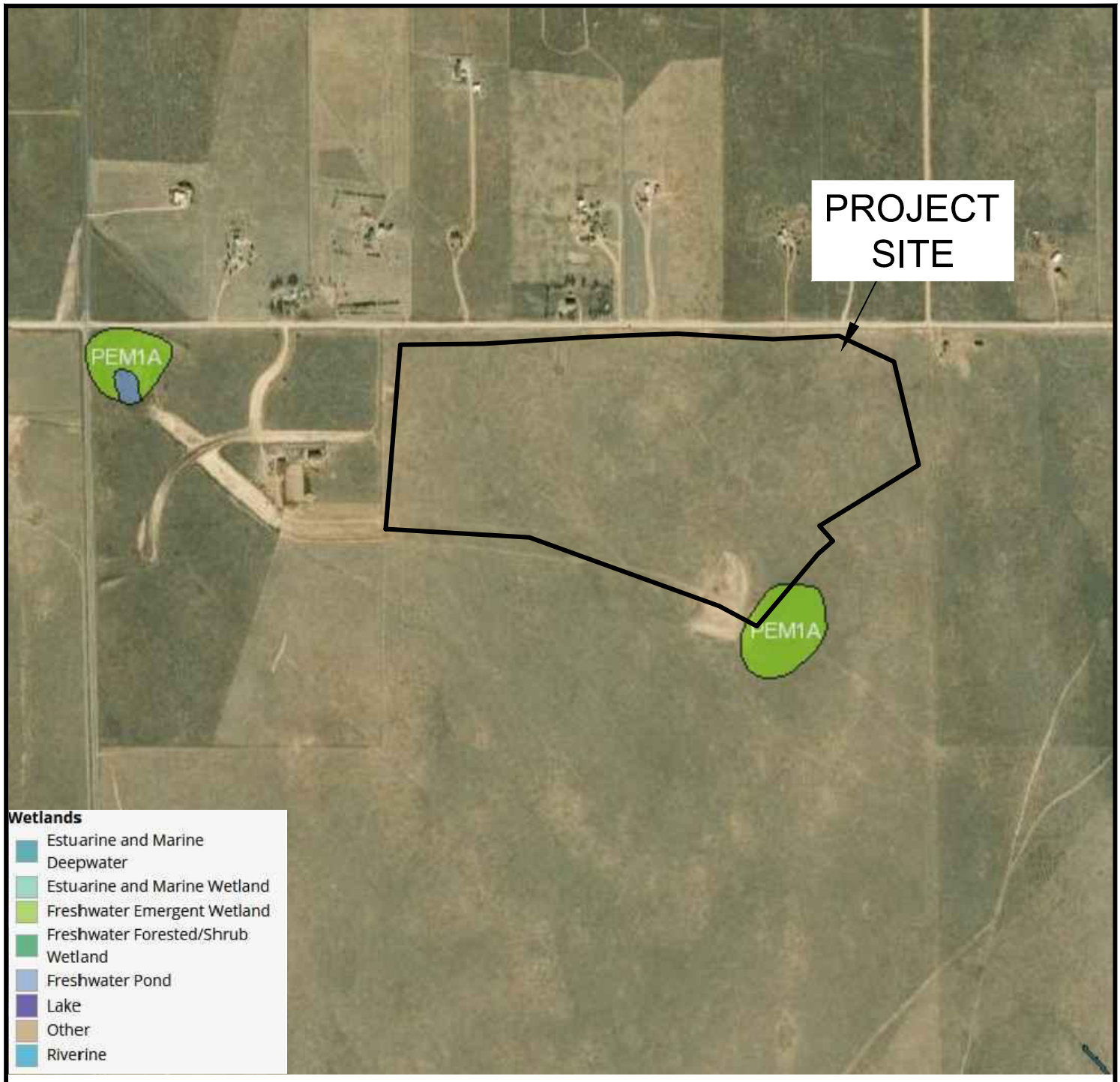
ENTECH ENGINEERING, INC.

FEMA FLOODPLAIN MAP

SILVERADO RANCH FILING NO. 2
SILVERADO RANCH INC.

JOB NO. 241337

FIG. 7



N

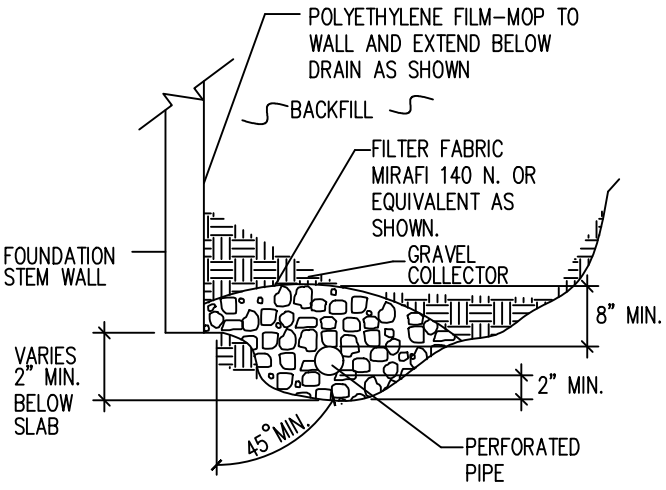
ENTECH ENGINEERING, INC.

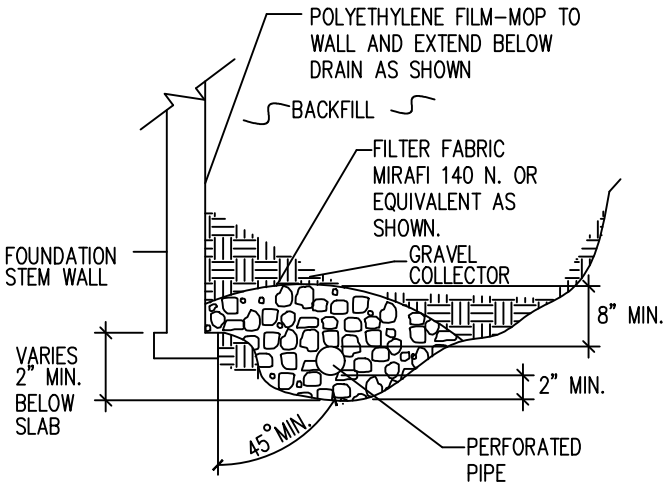
USFWS WETLANDS MAP

SILVERADO RANCH FILING NO. 2
SILVERADO RANCH INC.

JOB NO. 241337

FIG. 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.

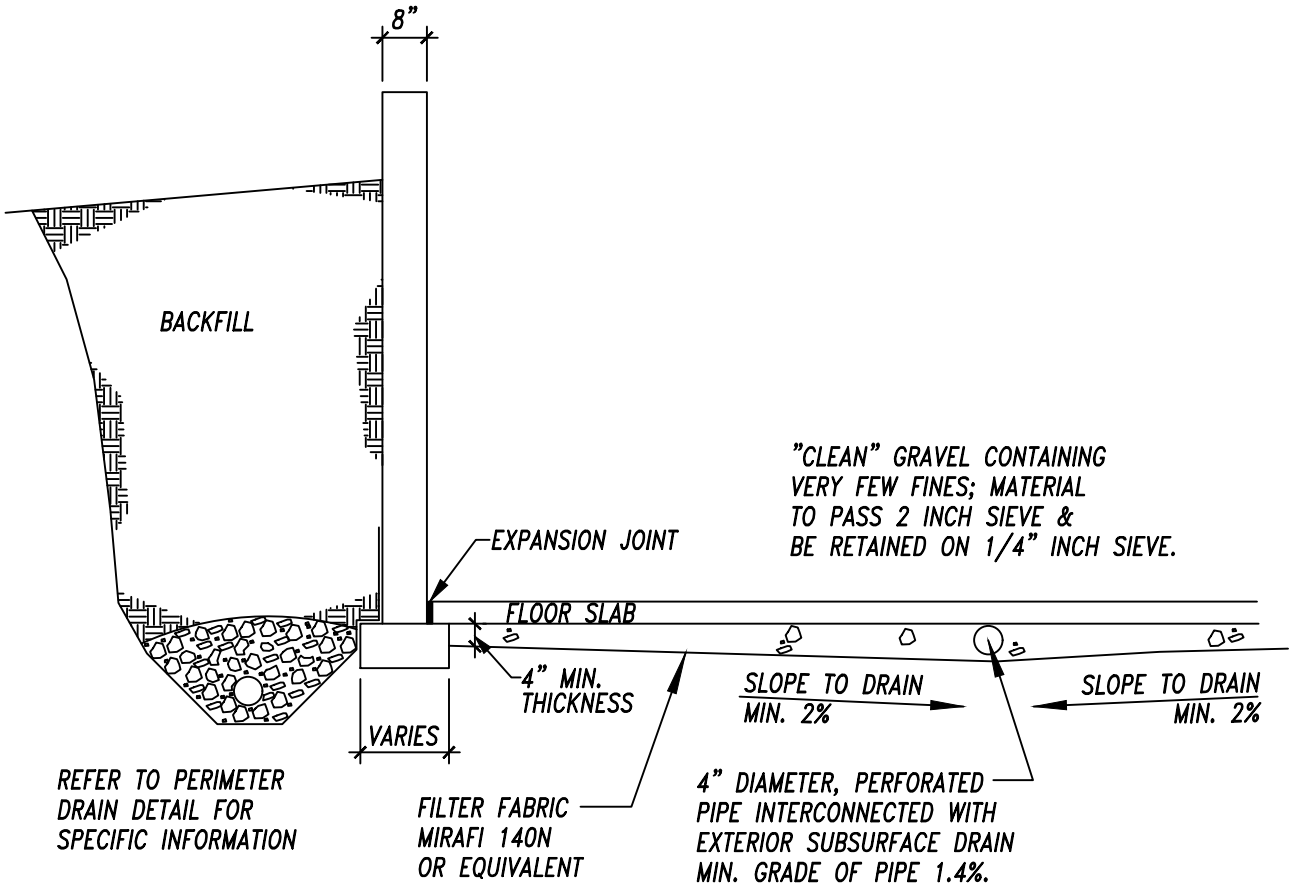
ENTECH ENGINEERING, INC.

PERIMETER DRAIN DETAIL

SILVERADO RANCH FILING NO. 2
SILVERADO RANCH INC.

JOB NO. 241337

FIG. 9



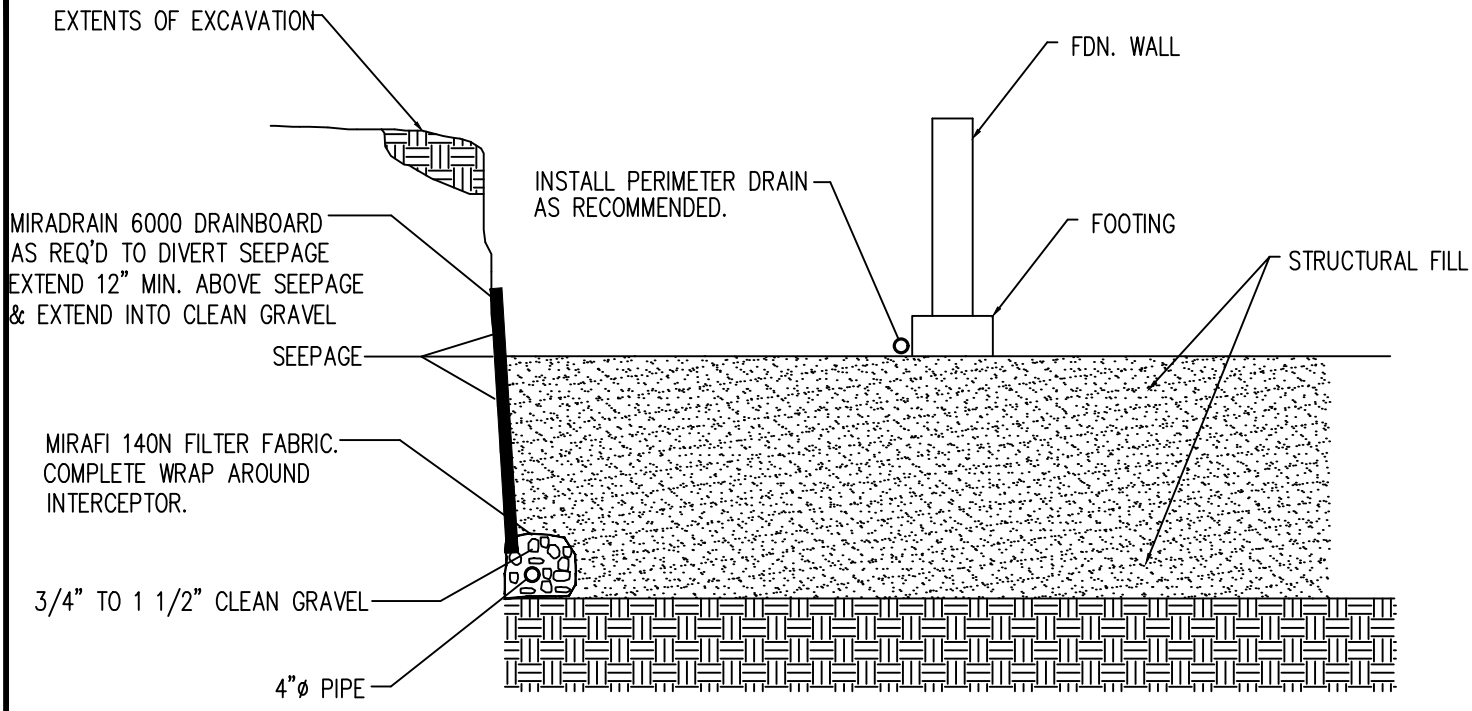
ENTECH ENGINEERING, INC.

TYP. UNDERSLAB DRAINAGE LAYER (CAPILLARY BREAK)

SILVERADO RANCH FILING NO. 2
SILVERADO RANCH INC.

JOB NO.
241337

FIG. 10



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

SILVERADO RANCH FILING NO. 2
SILVERADO RANCH INC.

JOB NO.
241337

FIG. 11

APPENDIX A: Site Photographs

1

Looking west from the southeastern portion of the site.

August 7, 2024

2

Looking north from the southeastern portion of the site.

August 7, 2024

Job No. 241337

3

Looking south from eastern portion of the site.

August 7, 2024

4

Looking northeast from the western portion of the site.

August 7, 2024

Job No. 241337

APPENDIX B: Test Boring and Test Pit Logs

TEST BORING 1
DATE DRILLED 8/8/2024

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 8/13/24						
SAND, WITH SILT, TAN, MEDIUM DENSE, MOIST to DRY				15	3.9	1
	5			10	2.7	1
	10			12	2.8	1
	15			11	2.5	1
CLAY, WITH SAND, TAN, STIFF, MOIST	20			14	15.2	2

TEST BORING 2
DATE DRILLED 8/8/2024

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 8/13/24						
SAND, WITH SILT, TAN, MEDIUM DENSE, DRY to MOIST				16	1.6	1
	5			14	1.5	1
	10			12	2.2	1
	15			14	3.0	1
	20			22	7.2	1

ENTECH ENGINEERING, INC.

TEST BORING LOGS

SILVERADO RANCH, FILING NO. 2
SILVERADO RANCH, INC.

JOB NO. 241337

FIG. B-1

TEST BORING 3
DATE DRILLED 8/8/2024

REMARKS

DRY TO 20', 8/13/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			12	3.1	1	SAND, WITH SILT, LIGHT BROWN to TAN, MEDIUM DENSE to LOOSE, MOIST
5			6	4.1	1	
10			13	7.9	1	SAND, CLAYEY, TAN to OLIVE, MEDIUM DENSE, MOIST
15			18	9.3	1	
20			15	3.2	1	SAND, WITH SILT, TAN, MEDIUM DENSE, MOIST

TEST BORING 4
DATE DRILLED 8/8/2024

REMARKS

DRY TO 20', 8/13/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			13	2.9	1	SAND, SILTY to WITH SILT, TAN, MEDIUM DENSE, DRY to MOIST
5			11	2.7	1	
10			15	3.7	1	
15			28	2.3	1	
20			22	2.8	1	

ENTECH ENGINEERING, INC.

TEST BORING LOGS

SILVERADO RANCH, FILING NO. 2
SILVERADO RANCH, INC.

JOB NO. 241337

FIG. B-2

TEST PIT 1
DATE EXCAVATED 8/7/2024

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type
topsoil, sandy clay loam, brown, moist	1					
	2					
sandy clay loam, fine to medium grained, dark brown, moist	3			g	s	3
	4					
	5					
sandy clay loam, fine to medium grained, light brown, moist	6			gr	s	3
	7					
	8					
	9					
	10					

TEST PIT 2
DATE EXCAVATED 8/7/2024

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type
topsoil, sandy clay loam, light brown, moist	1					
	2					
sandy clay loam, fine to medium grained, light brown, moist	3			gr	s	3
	4					
	5			gr	s	3
	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
structureless - sl

ENTECH ENGINEERING, INC.

TEST PIT LOGS

12260 SMITH ROAD
EL PASO COUNTY, COLORADO
DANIEL BYRNE

JOB NO.
241337

FIG. B-3

TEST PIT 3
DATE EXCAVATED 8/7/2024

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type
topsoil, sandy clay loam, light brown, moist	1					
	2					
sandy clay loam, fine to medium grained, dark brown, moist	3			bl	m	3
	4					
	5					
sandy clay loam, fine to medium grained, grey, moist	6			bl	m	3
	7					
	8					
	9					
	10					

TEST PIT 4
DATE EXCAVATED 8/7/2024

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type
topsoil, sandy clay loam, light brown, moist	1					
	2					
sandy clay loam, fine to medium grained, dark brown, moist	3			bl	m	3
	4					
	5					
	6			bl	m	3
	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

12260 SMITH ROAD
EL PASO COUNTY, COLORADO
DANIEL BYRNE

JOB NO.
241337

FIG. B-4

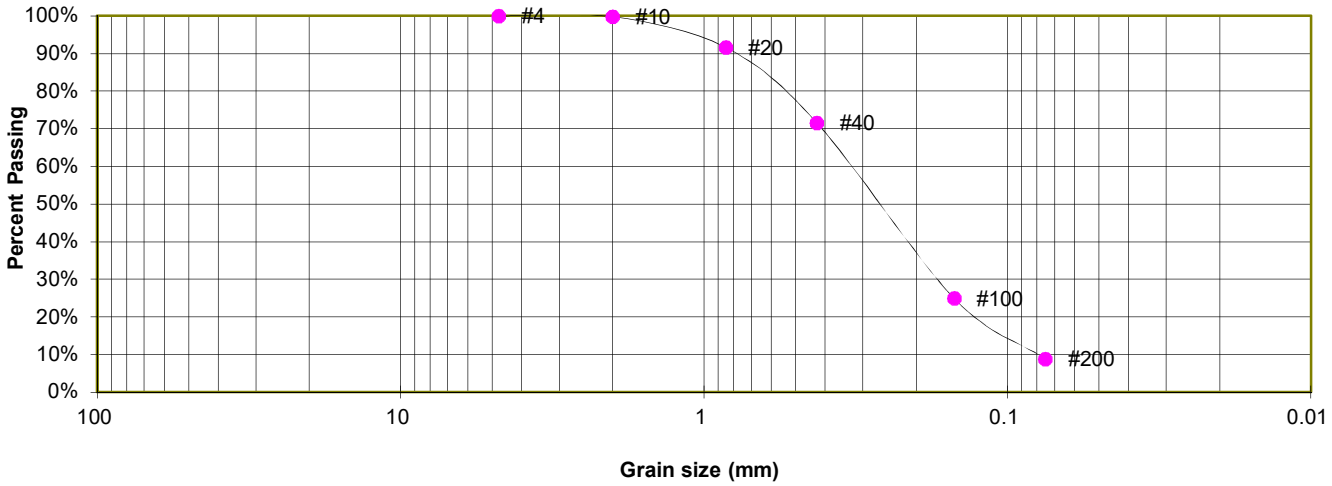
APPENDIX C: Laboratory Testing Results

TABLE C-1
SUMMARY OF LABORATORY TEST RESULTS

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	SWELL/ CONSOL (%)	USCS	SOIL DESCRIPTION
1	2	2-3			8.8					SW-SM	SAND, WITH SILT
1	3	10	11.5	111.8	45.0				-0.5	SC	SAND, CLAYEY
1	4	5			23.1					SM	SAND, SILTY
2	1	20			77.5	49	26	23		CL	CLAY, WITH SAND

Project: Silverado Ranch, Filing No. 2
Client: Silverado Ranch, Inc.
Job No: 241337

TEST BORING	2	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"	
4	100.0%
10	99.8%
20	91.6%
40	71.6%
100	25.0%
200	8.8%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW-SM

ENTECH ENGINEERING, INC.

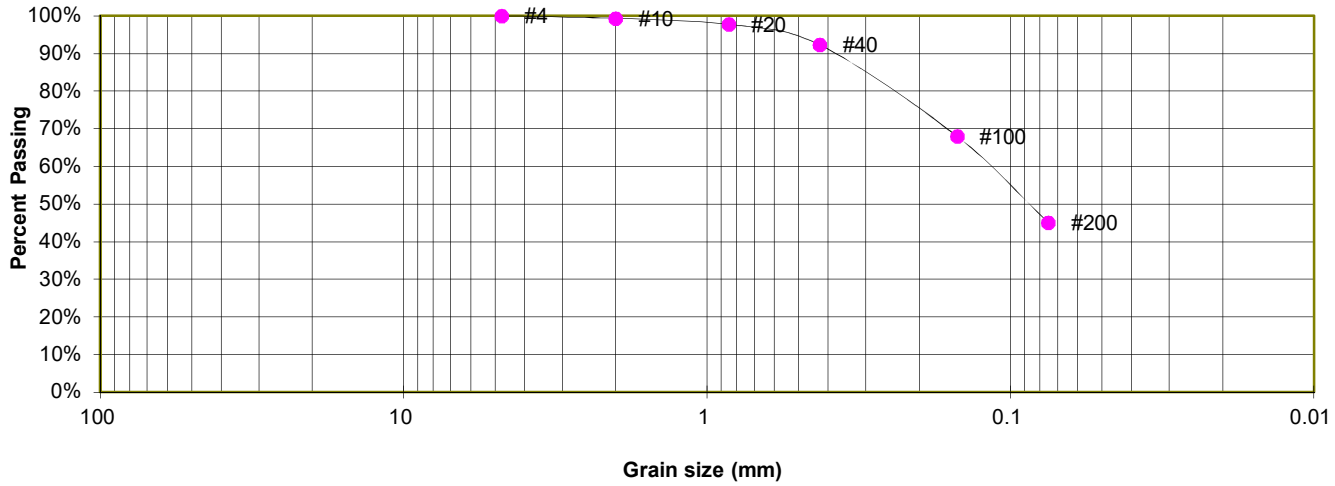
LABORATORY TEST RESULTS

SILVERADO RANCH, FILING NO. 2
SILVERADO RANCH, INC.

JOB NO. 241337

FIG. C-1

TEST BORING	3	SOIL DESCRIPTION	SAND, CLAYEY
DEPTH (FT)	10	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.4%
20	97.7%
40	92.2%
100	68.0%
200	45.0%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SC

ENTECH ENGINEERING, INC.

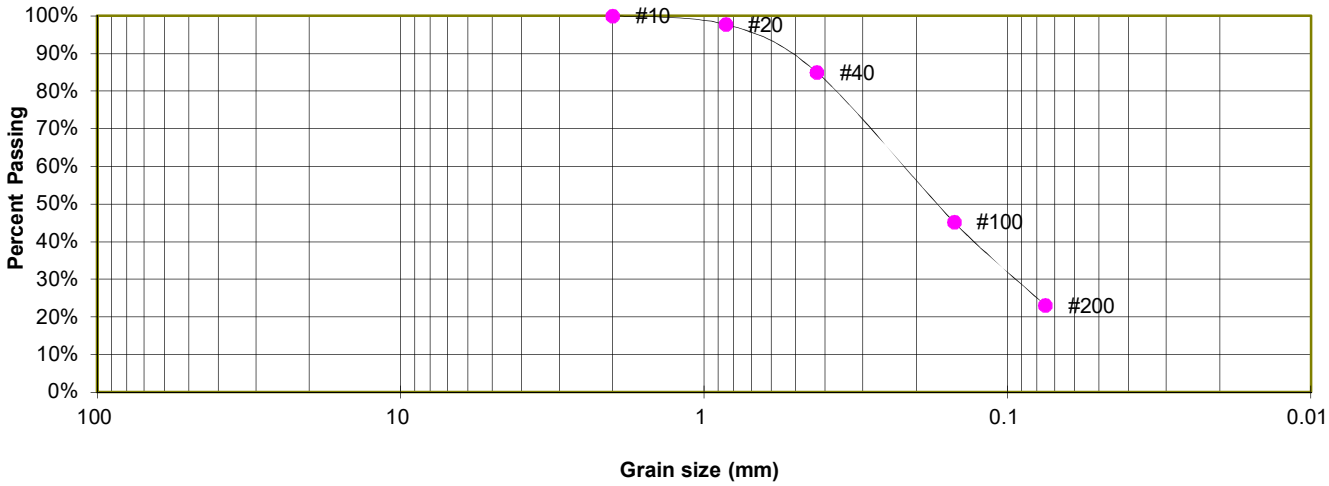
LABORATORY TEST RESULTS

SILVERADO RANCH, FILING NO. 2
SILVERADO RANCH, INC.

JOB NO. 241337

FIG. C-2

TEST BORING	4	SOIL DESCRIPTION	SAND, 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"	
4	
10	100.0%
20	97.7%
40	85.0%
100	45.2%
200	23.1%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

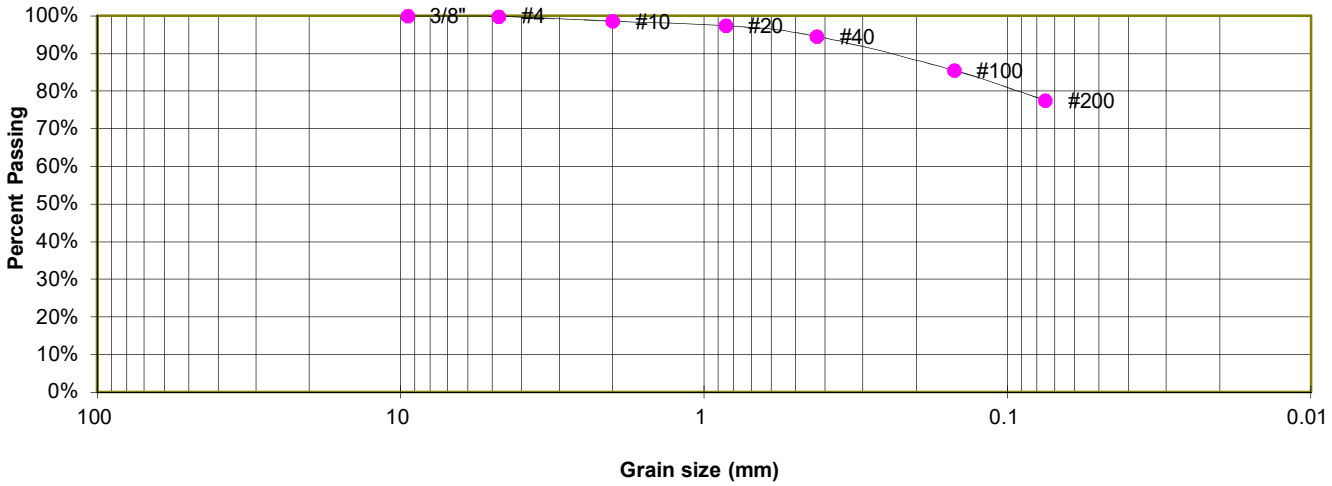
LABORATORY TEST RESULTS

SILVERADO RANCH, FILING NO. 2
SILVERADO RANCH, INC.

JOB NO. 241337

FIG. C-3

TEST BORING	1	SOIL DESCRIPTION	CLAY, WITH SAND
DEPTH (FT)	20	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.9%
10	98.6%
20	97.4%
40	94.6%
100	85.5%
200	77.5%

ATTERBERG LIMITS

Plastic Limit	26
Liquid Limit	49
Plastic Index	23

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL

ENTECH ENGINEERING, INC.

LABORATORY TEST RESULTS

SILVERADO RANCH, FILING NO. 2
SILVERADO RANCH, INC.

JOB NO. 241337

FIG. C-4

TEST BORING	3	SOIL DESCRIPTION	SAND, CLAYEY
DEPTH (FT)	10	SOIL TYPE	1

SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 112
NATURAL MOISTURE CONTENT: 11.5%
SWELL/COLLAPSE (%): -0.5%

ENTECH ENGINEERING, INC.

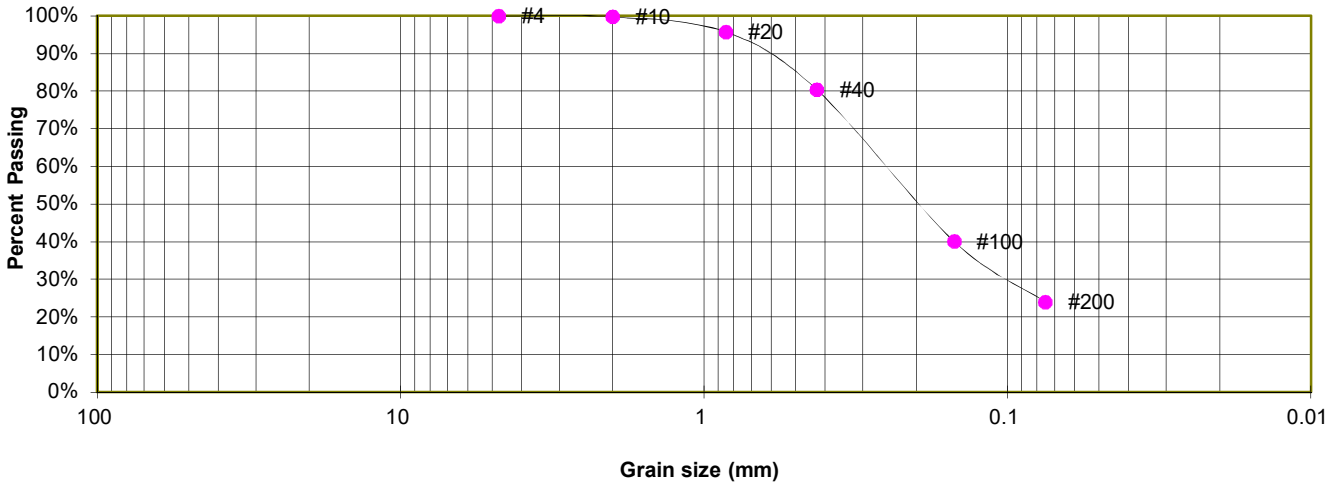
SWELL TEST RESULTS

SILVERADO RANCH, FILING NO. 2
SILVERADO RANCH, INC.

JOB NO. 241337

FIG. C-5

TEST PIT	TP-1	SOIL DESCRIPTION	SAND, SILTY
DEPTH (FT)	5.5		



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.8%
20	95.8%
40	80.4%
100	40.1%
200	23.9%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

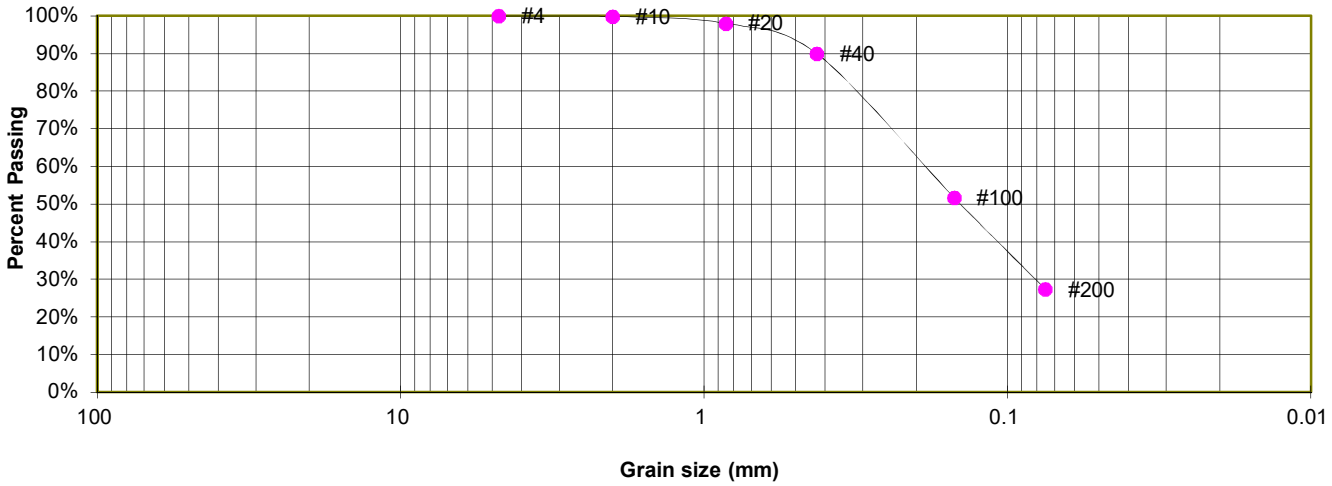
LABORATORY TEST RESULTS

SILVERADO RANCH, FILING NO. 2
SILVERADO RANCH, INC.

JOB NO. 241337

FIG. C-6

TEST PIT	TP-2	SOIL DESCRIPTION	SAND, WITH SILT
DEPTH (FT)	3		



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.8%
20	98.0%
40	89.9%
100	51.7%
200	27.4%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

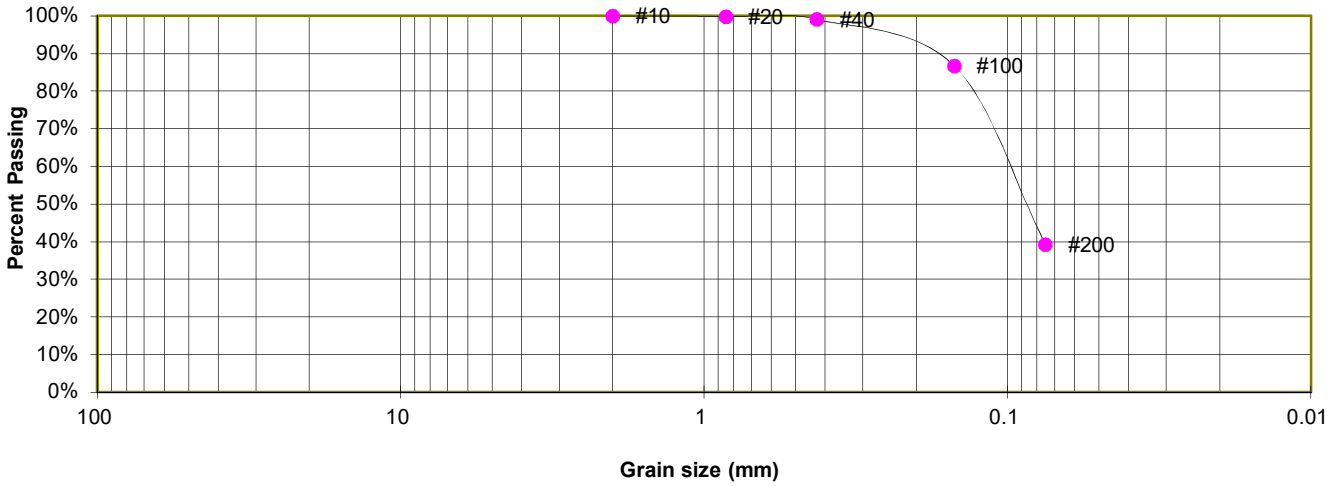
LABORATORY TEST RESULTS

SILVERADO RANCH, FILING NO. 2
SILVERADO RANCH, INC.

JOB NO. 241337

FIG. C-7

TEST PIT	TP-3	SOIL DESCRIPTION	SAND, SILTY
DEPTH (FT)	5.5		



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.8%
40	99.1%
100	86.8%
200	39.3%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

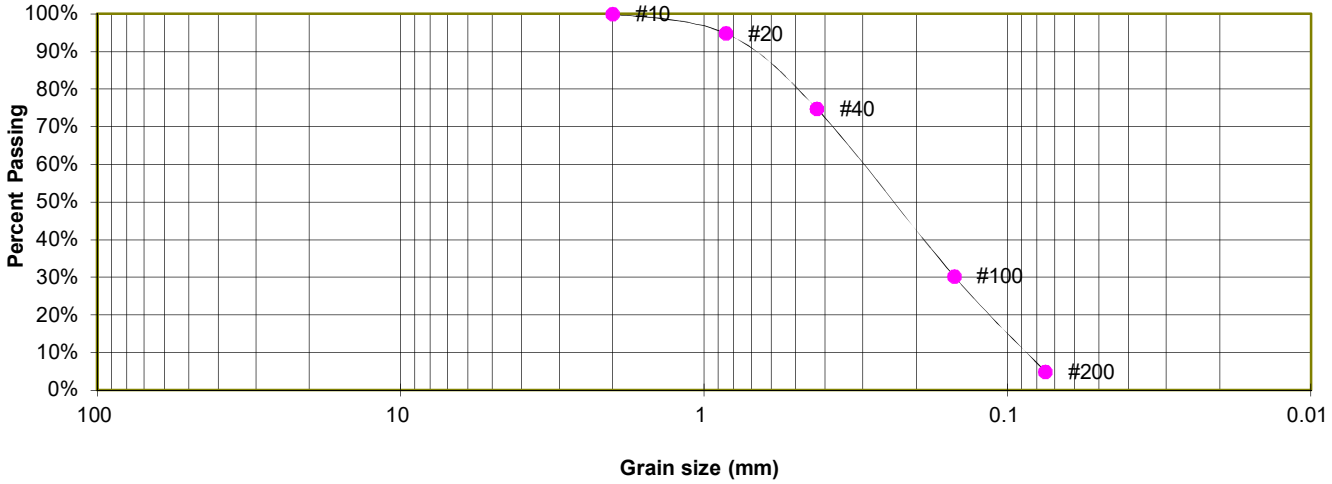
LABORATORY TEST RESULTS

SILVERADO RANCH, FILING NO. 2
SILVERADO RANCH, INC.

JOB NO. 241337

FIG. C-8

TEST PIT	TP-5	SOIL DESCRIPTION	SAND, SLIGHTLY SILTY
DEPTH (FT)	2.5		



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	94.9%
40	74.8%
100	30.3%
200	4.9%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW

ENTECH ENGINEERING, INC.

LABORATORY TEST RESULTS

SILVERADO RANCH, FILING NO. 2
SILVERADO RANCH, INC.

JOB NO. 241337

FIG. C-9

APPENDIX D: Soil Survey Descriptions

El Paso County Area, Colorado

5—Bijou loamy sand, 1 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tqxq
Elevation: 4,000 to 5,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Bijou

Setting

Landform: Sand sheets
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sands

Typical profile

A - 0 to 4 inches: loamy sand
AB - 4 to 9 inches: loamy sand
Bt - 9 to 36 inches: sandy loam
BC - 36 to 50 inches: loamy sand
C - 50 to 79 inches: loamy sand

Properties and qualities

Slope: 1 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
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
Maximum salinity: Nonsaline (0.1 to 0.2 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R067BY024CO - Sandy Plains

Hydric soil rating: No

Minor Components

Valent

Percent of map unit: 10 percent
Landform: Sand sheets
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Olnest

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

El Paso County Area, Colorado

6—Bijou sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tqxr
Elevation: 5,700 to 6,200 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 130 to 170 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

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

Description of Bijou

Setting

Landform: Swales, sand sheets
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Concave, linear
Parent material: Eolian sands

Typical profile

A - 0 to 4 inches: sandy loam
Bt1 - 4 to 8 inches: sandy loam
Bt2 - 8 to 21 inches: sandy loam
Bw - 21 to 28 inches: sandy loam
C - 28 to 79 inches: loamy coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
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
Maximum salinity: Nonsaline (0.1 to 0.2 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: A

Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Valent

Percent of map unit: 10 percent
Landform: Sand sheets
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Olnest

Percent of map unit: 5 percent
Landform: Swales
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

El Paso County Area, Colorado

106—Wigton loamy sand, 1 to 8 percent slopes

Map Unit Setting

National map unit symbol: 3678
Elevation: 5,300 to 6,000 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Wigton and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wigton

Setting

Landform: Dunes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Noncalcareous, dune-like sandy eolian deposits

Typical profile

A - 0 to 8 inches: loamy sand
AC - 8 to 19 inches: loamy sand
C - 19 to 60 inches: sand

Properties and qualities

Slope: 1 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: 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
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R067BY015CO - Deep Sand
Other vegetative classification: DEEP SANDS (069BY019CO)
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 21, Aug 24, 2023