



**ENTECH**  
ENGINEERING, INC.

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

June 28, 2023

Hodgen Settlers Ranch, LLC  
P.O. Box 1488  
Monument, CO 80132

Attn: Mark Davis

Re: Soils and Geology Study  
Settlers Ranch Filing No. 3  
Parcel Nos. 61230-04-048, 61240-05-001, 61240-05-003, & 61230-07-024  
El Paso County, Colorado  
Entech Job No. 230662

Dear Mr. Davis:

The project consists of subdividing approximately 75-acres; twenty-four (24) residential lots are proposed as part of the subdivision lot sizes range from 2.5 to 4.5 acres. The site is located northeast of the intersection of Timber Meadow Drive and Hodgen Road within the Settlers Ranch Subdivision, in the northern portion of El Paso County, Colorado.

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

The site is located within portions of the NE $\frac{1}{4}$  and SE $\frac{1}{4}$  of Section 23, and a portion of the NW $\frac{1}{4}$  of Section 24, Township 11 South, Range 66 West of the 6<sup>th</sup> Principal Meridian in the northern portion of El Paso County, Colorado. The site is located approximately 4 miles east of Monument, northeast of Timber Meadow Drive and Hodgen Road in El Paso County, Colorado. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site is gradually to moderately sloping to the northwest in the southern portion of the filing, and to the north and east in the northern portion of the filing. Several minor drainage swales are located across the filing. Areas of ponded or flowing water were not observed in the drainage swales at the time of this investigation. The site boundaries are indicated on the USGS Map, Figure 2. The site is currently undeveloped, Settlers Ranch Road is paved in the southern portion of the filing, and is partially graded with gravel road base in the northern portion of the filing. Adjacent properties consist of existing rural residential and agricultural. The site contains primarily field grasses and weeds with scattered areas of pine trees. Site photographs, taken May 1 and 18, 2023, are included in Appendix A.

Total acreage involved in the proposed subdivision is approximately 75-acres. Twenty-four rural residential lots are proposed with lot sizes ranging from 2.5 to 4.5-acres. The lots will be serviced by individual water wells and on-site wastewater treatment systems. The Site Plan with the proposed replat is presented in Figures 3 and 3A.

## **LAND USE AND ENGINEERING GEOLOGY**

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

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

## **SCOPE OF THE REPORT**

The scope of the report includes a general geologic analysis utilizing published geologic data, and soils and bedrock information obtained from the field investigation performed on the site. Detailed site-specific mapping was 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 any bedrock features and significant surficial deposits. The Natural Resource Conservation Service (NRCS), previously the Soil Conservation Service (SCS) survey was also reviewed to evaluate the site. The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved both field reconnaissance and measurements, and aerial photo reconnaissance and interpretation. The same mapping procedures have also been utilized to produce the Geology/Engineering Geology Map which identified pertinent geologic conditions affecting development. The field mapping was performed by personnel of Entech Engineering, Inc. on May 1 and 18, 2023.

Eight test borings were drilled on the site to determine general suitability for development and general soil characteristics. The locations of the test borings are indicated on the Site Plan/Test Boring Location Map, Figures 3 and 3A. The Test Boring Logs are presented in Appendix B. A Summary of Depth of Bedrock and Groundwater is presented in Table 1B.

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, and Atterberg Limits, ASTM D-4318. Results of the laboratory testing are included in Appendix C. A Summary of Laboratory Test Results is presented in Table 1C. Results of this testing will be discussed later in this report.

## **SOIL AND GEOLOGIC CONDITIONS**

### Soil Survey

The Natural Resource Conservation Service (NRCS) (Reference 1, Figure 4), previously the Soil Conservation Service (Reference 2) has mapped two soil types on the site. Complete descriptions of the soil types are presented in Appendix D. In general, the soil consists of sandy loam to gravelly loamy sand. The soils are described as follows:

<u>Type</u>	<u>Description</u>
67	Peyton sandy loam, 5 – 9% Slopes
92	Tomah-Crowfoot loamy sands, 3 – 8% 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 generally consisted of sand with silt, clayey sand, and sandy clay and clay with sand overlying silty sandstone and sandstone with silt. Bedrock was encountered in the test borings at depths ranging from the existing surface grade to 19 feet. The upper sands were encountered at medium dense to dense states and moderate moisture conditions, the clays were encountered at very stiff to hard consistencies and dry to moderate moisture conditions, and the sandstone was encountered at very dense states and moderate moisture conditions. The clays soils encountered in the borings exhibited low expansion potentials, however, moderate to highly expansive clays, claystone, and siltstone lenses are common in the area.

### Groundwater

Groundwater was not encountered in the test borings, which were drilled to 20 feet. It is anticipated groundwater will not affect shallow foundations on the majority of the site. Areas of potential seasonally shallow and seasonally shallow groundwater have been mapped in minor drainage swales of the site that are discussed in the following sections. Fluctuations in groundwater conditions may occur due to variations in rainfall or other factors not readily apparent at this time. Isolated sand layers within the soil profile can carry water in the subsurface. Contractors should be cognizant of the potential for the occurrence of subsurface water features during construction.

### Geology

Approximately 12 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

Cretaceous Age. The Dawson Formation typically consists of coarse-grained arkosic sandstone with interbedded layers claystone or siltstone.

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

**Qaf Artificial Fill of Holocene Age:** These are man-made fill deposits associated with erosion berms located across the site.

**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 (Reference 4, Figure 5), The *Geologic Map of the Colorado Springs-Castle Rock Area*, distributed by the US Geological Survey in 1979 (Reference 5), and the *Geologic Map of the Denver 1° x 2° Quadrangle*, distributed by the US Geological Survey in 1981 (Reference 6). The test borings and test pits were used in evaluating the site and is 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 artificial fill, potentially expansive soils, potential seasonally shallow and seasonally shallow groundwater areas, and shallow bedrock. These constraints/hazards and recommended mitigation techniques are discussed as follows:

### Artificial Fill - Constraint

These are areas of man-made fill associated with erosion berms and existing embankment located in the northeastern portion of the site. Areas of fill other than those mapped may exist on the site.

Mitigation: It is anticipated these areas would be avoided by development or regraded. Should any uncontrolled fill be encountered beneath foundations, removal and recompaction at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 will be required.



### Expansive Soils – Constraint

Highly expansive soils were not encountered in the test borings, however, moderate to highly expansive clays, claystone, and siltstone are commonly interbedded in the sandstone of the Dawson Formation. These clays or claystone, if encountered beneath foundations, can cause differential movement in the structure foundation.

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

### Drainage Areas

Several minor drainage swales are located in the northwestern, northeastern, and southern portions of the site that have been mapped as potentially seasonal shallow groundwater and seasonal shallow groundwater. Water was not observed in the drainages at the time of this investigation. This area is indicated in the Geology/Engineering Geology Map (Figure 6) and are discussed below. Due to the size of the proposed lots these areas can be avoided. The site does not lie within any floodplain zones according to the FEMA Map No. 08041CO305G dated December 7, 2018 (Figure 7, Reference 8). Exact locations of floodplain and specific drainage studies are beyond the scope of this report.

- Potentially Seasonal Shallow Groundwater Area - Constraint

Portions of the minor drainage swales on the site have been identified as a potentially seasonal shallow groundwater area. In these areas we would anticipate the potential for periodically high subsurface moisture conditions, frost heave potential and highly organic soils. The upslope sides of the erosion berms also have the potential to become saturated after periods of increased precipitation. These area lies within defined minor drainages or and will be avoided by the proposed development. Construction in any portions of these areas, if required, or immediately adjacent to these areas should follow these precautions.

Mitigation: Foundations must have a minimum 30-inch depth for frost protection. In areas where high subsurface moisture conditions are anticipated periodically, subsurface perimeter drains are recommended to help prevent the intrusion of water into areas below grade. Typical drain details are presented in Figure 8. Any grading in these areas should be done to direct surface flow around structures to avoid areas of ponded water. All organic material would be completely removed prior to any fill placement. **Specific drainage studies are beyond the scope of this report.**

- Seasonal Shallow Water - Constraint

These are areas located within the heads of drainage in the northern portions of the site within drainage easements, which be avoided by development. Water was not observed in the drainages at the time of this investigation. The same mitigation techniques for seasonally high groundwater areas are recommended for these seasonally ponded areas as well.

#### Shallow Bedrock – Constraint

Bedrock was encountered in all the test borings at depths ranging from 1 to 19 feet. A Summary of the Depth to Bedrock is included in Table 1B. Shallow bedrock will be encountered in some areas of this site. Where claystone or sandstone are encountered, excavation/grading may be difficult requiring track-mounted equipment with ripper attachments may be needed.

### **RELEVANCE OF GEOLOGIC CONDITIONS TO LAND USE PLANNING**

The proposed development will be rural-residential utilizing individual on-site wastewater treatment systems and water wells. Total acreage involved in the proposed subdivision is approximately 75-acres. Twenty-four rural residential lots are proposed with lot sizes ranging from approximately 2.5 to 4.5-acres. The existing geologic and engineering geologic conditions will impose minor constraints on development and construction. The geologic conditions on the site include artificial fill, potentially expansive soils, potential seasonally shallow and seasonally shallow groundwater areas, and shallow bedrock, which can be satisfactorily mitigated through avoidance or proper engineering design and construction practices.

The upper granular soils encountered in the test borings and test pits on the site were encountered at medium dense to dense states, the sandstone was encountered at dense to very dense states. Expansive soils were encountered in some of the test borings, however, highly expansive claystone and siltstone are commonly interbedded in the sandstone of the Dawson Formation. 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. These soils will not prohibit development.

Bedrock was encountered in all the test borings at depths ranging from 1 to 19 feet. A Summary of the Depth to Bedrock is included in Table 1B. Shallow bedrock will be encountered in some areas of this site. Where claystone or sandstone are encountered, excavation/grading may be difficult requiring track-mounted equipment with ripper attachments may be needed.

Areas of potential seasonally shallow groundwater were observed on the site (Figures 6 and 6A). In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and frost heave potential. In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and frost heave potential. These areas lie along minor drainage swales across the site. Water was not observed in any of the drainages at the time of our site investigation. Subsurface perimeter drains are recommended should structures encroach on this area. Typical drain details are presented in Figure 8. Septic systems are not recommended in in these areas due to the potential for shallow groundwater. Any grading in theses areas should be done to direct surface flow around construction to avoid areas of ponded water. All organic material should be completely removed prior to any fill placement. Specific drainage studies are beyond the scope of this report. The site is not mapped within any floodplains according to the FEMA Map No. 08041C0305G (Figure 7, Reference 7).



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

## **ROADWAY AND EMBANKMENT CONSTRUCTION RECOMMENDATIONS**

The soils encountered on this site are generally suitable for the proposed roadways and embankments. Groundwater should be expected to be encountered in deeper cuts and along or adjacent to drainage areas. If 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 percent of optimum moisture content and compacted to a minimum of 95 percent of its maximum Standard Proctor Dry Density ASTM D-698 (cohesive soils) or 95 percent of its Modified Proctor Dry Density ASTM D-1557 (granular soils). prior to placing new fill. Areas receiving fill may require stabilization with rock or fabric if soft soils or 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 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 for sandy soils, and a minimum of 95 percent of its maximum Standard Proctor Dry Density, ASTM D-698 for clay soils. These materials should be placed at a moisture content conducive to compaction, usually 0 to  $\pm 2\%$  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.

## **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 8), 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 9), the site is not mapped with any resources. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 10), 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 10), 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 10).



The site has been mapped as "Fair" for oil and gas resources (Reference 10). No oil or gas fields have been discovered in the area of the site. The sedimentary rocks in the area may lack the geologic structure for trapping oil or gas; therefore, it may not be considered a significant resource. Hydraulic fracturing is a new method that is being used to extract oil and gas from rocks. It utilizes pressurized fluid to extract oil and gas from rocks that would not normally be productive. The area of the site has not been explored to determine if the rocks underlying the site would be commercially viable utilizing hydraulic fracturing. The practice of hydraulic fracturing has come under review due to concerns about environmental impacts, health and safety.

## **EROSION CONTROL**

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

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

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



## CLOSURE

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

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

This report has been prepared for Hodgen Settlers Ranch, LLC, 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.

Reviewed by:

A blue ink signature of Logan L. Langford, P.G. Geologist.

Logan L. Langford, P.G.  
Geologist



A blue ink signature of Joseph C. Goode, Jr., P.E. President.

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

LLL

Encl.

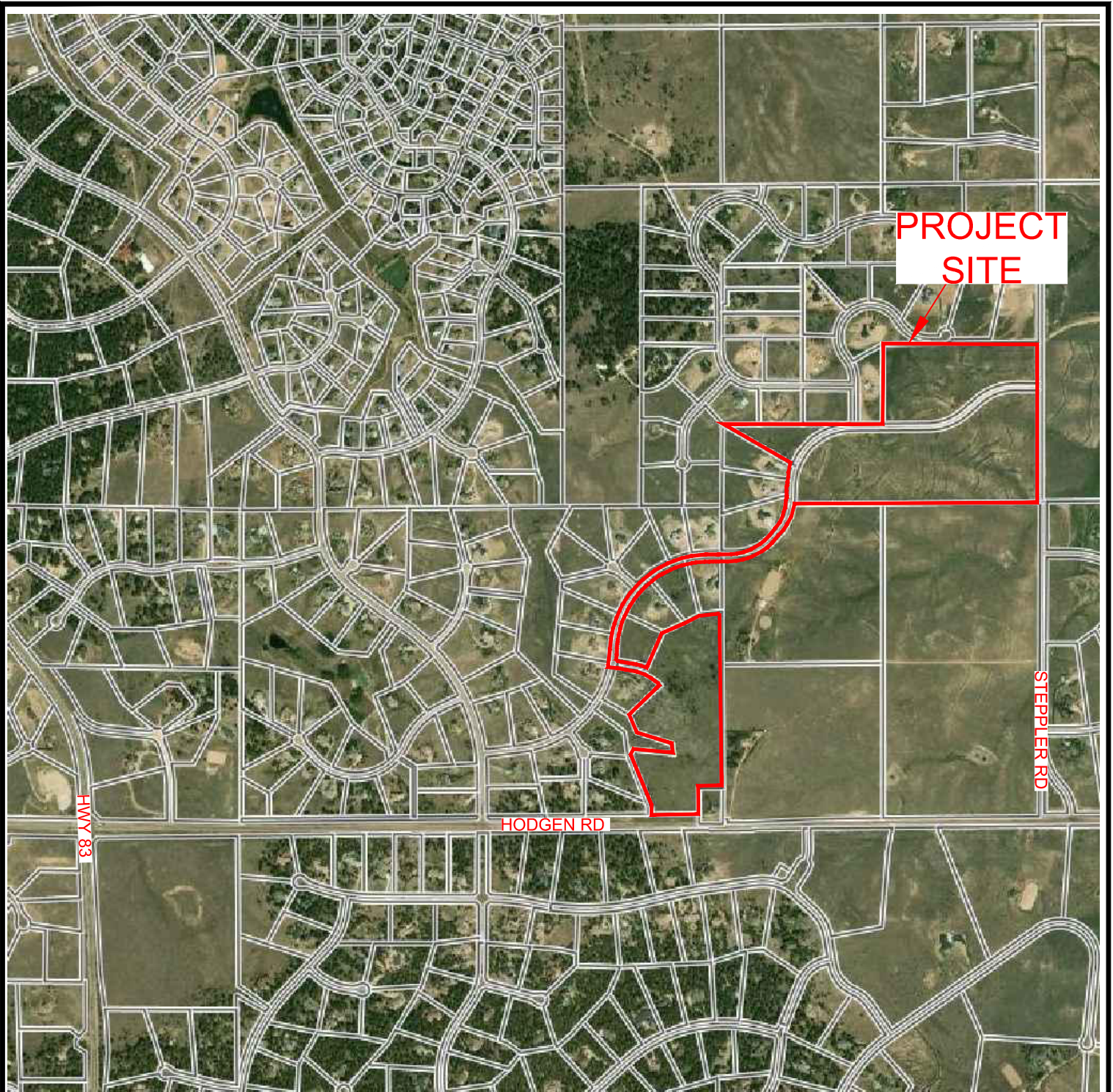
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## BIBLIOGRAPHY

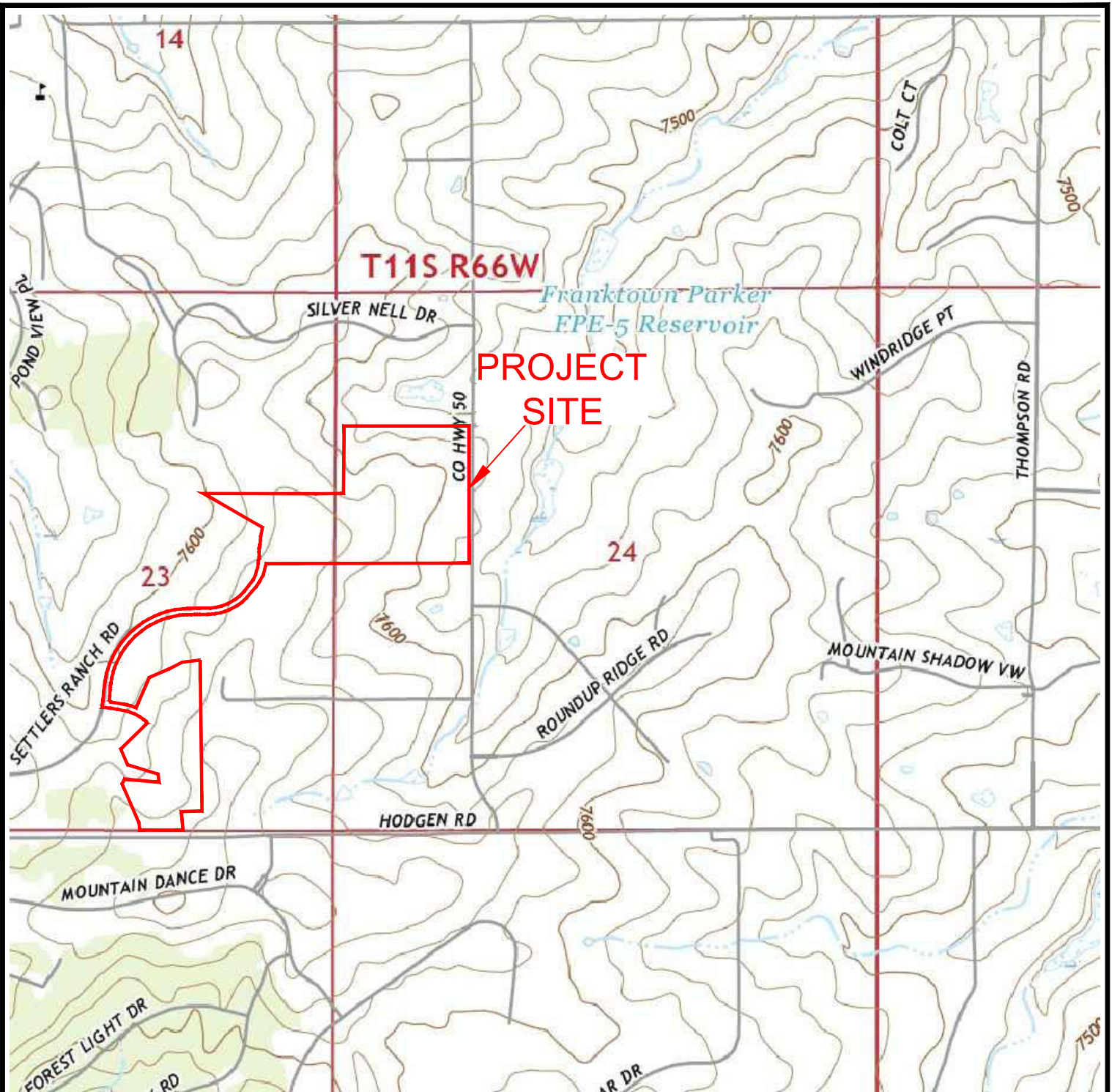
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## FIGURES







**USGS TOPOGRAPHY MAP**  
SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

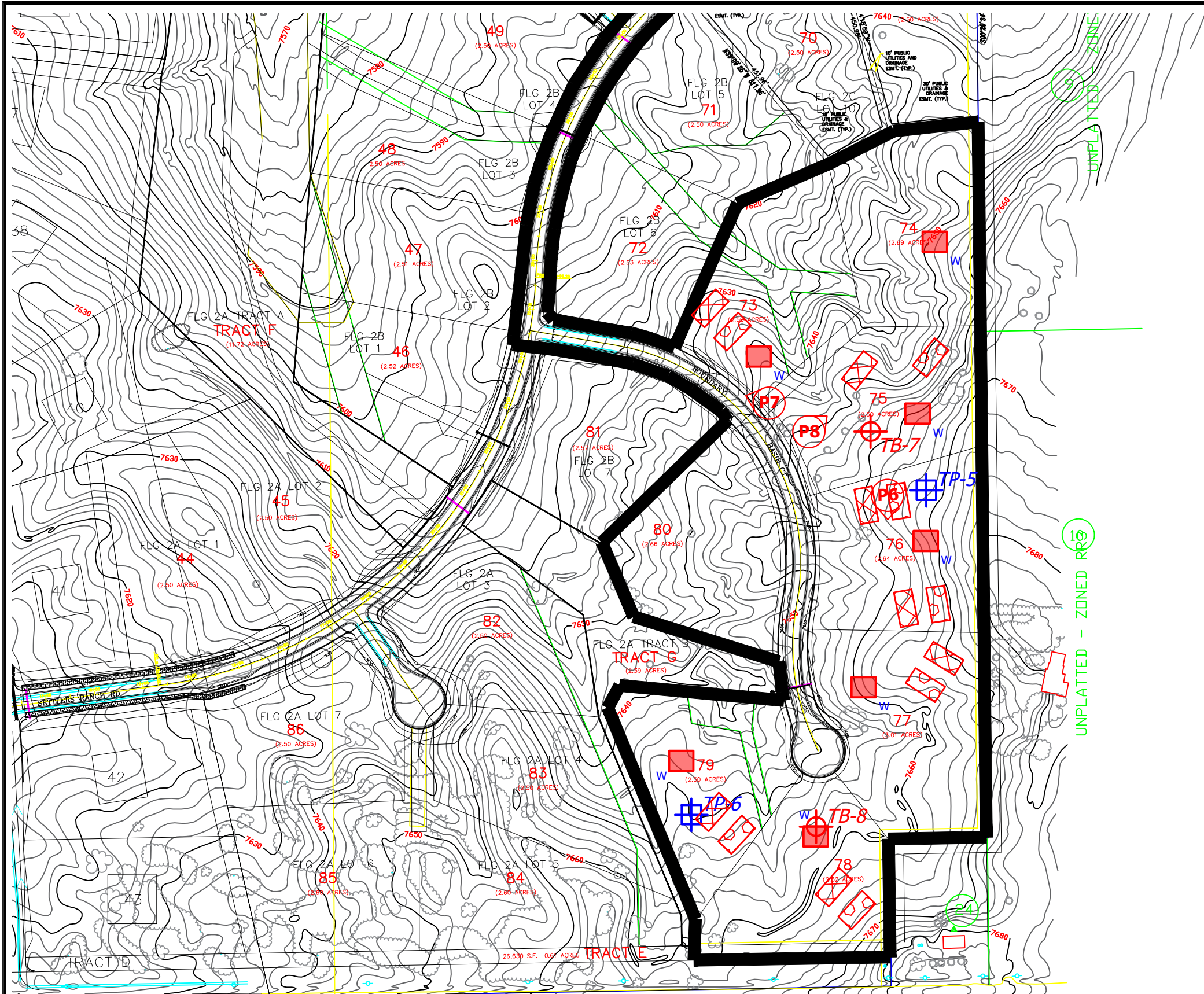
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**FIG. 2**









- ⊕ - APPROXIMATE TEST BORING LOCATION AND NUMBER
- ⊞ - APPROXIMATE TEST PIT LOCATION AND NUMBER
- Ⓟ - APPROXIMATE PHOTOGRAPH LOCATION AND NUMBER



REVISION	BY



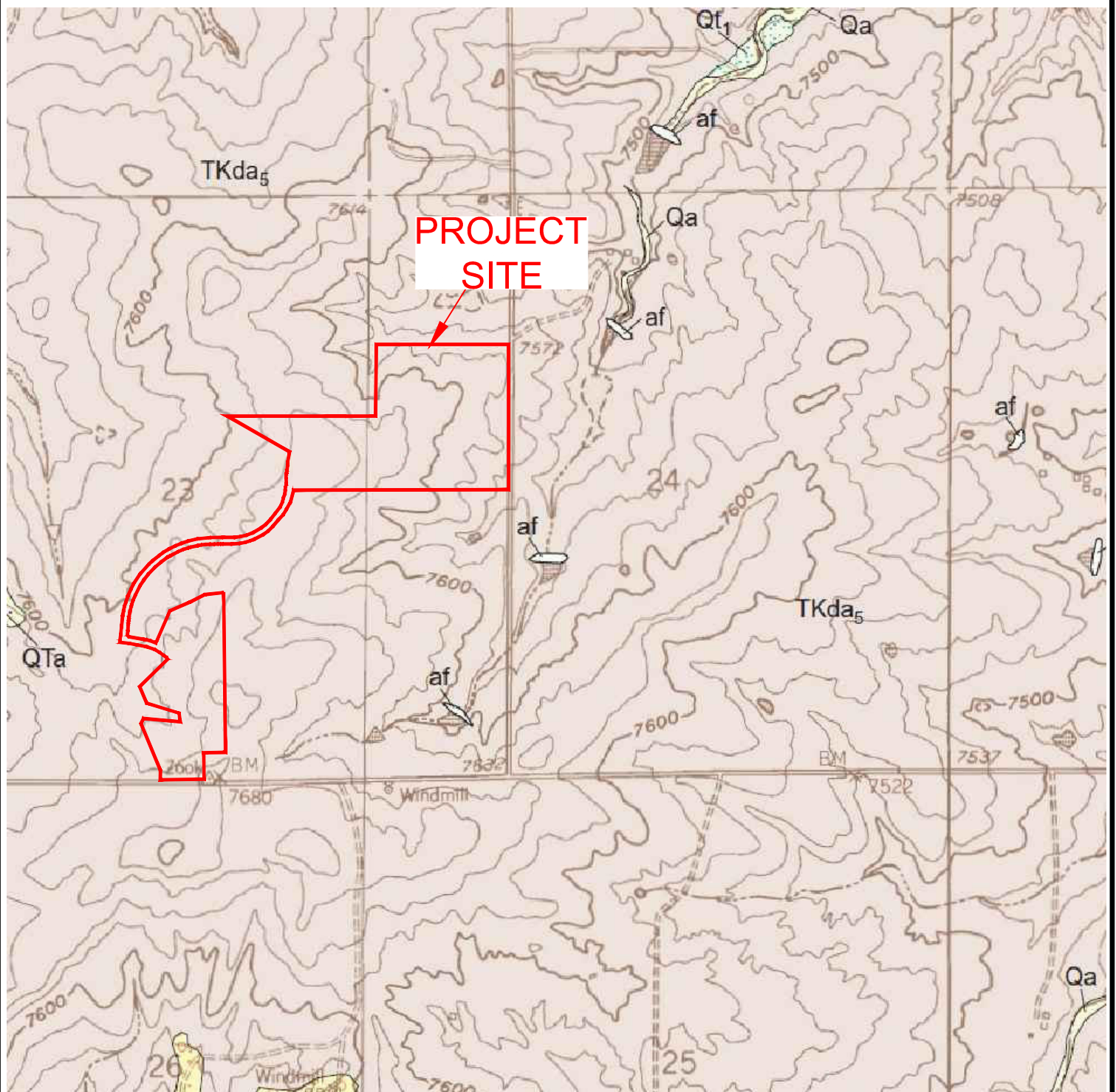
**SITE PLAN/TESTING LOCATION MAP**  
SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

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FIG. 3A







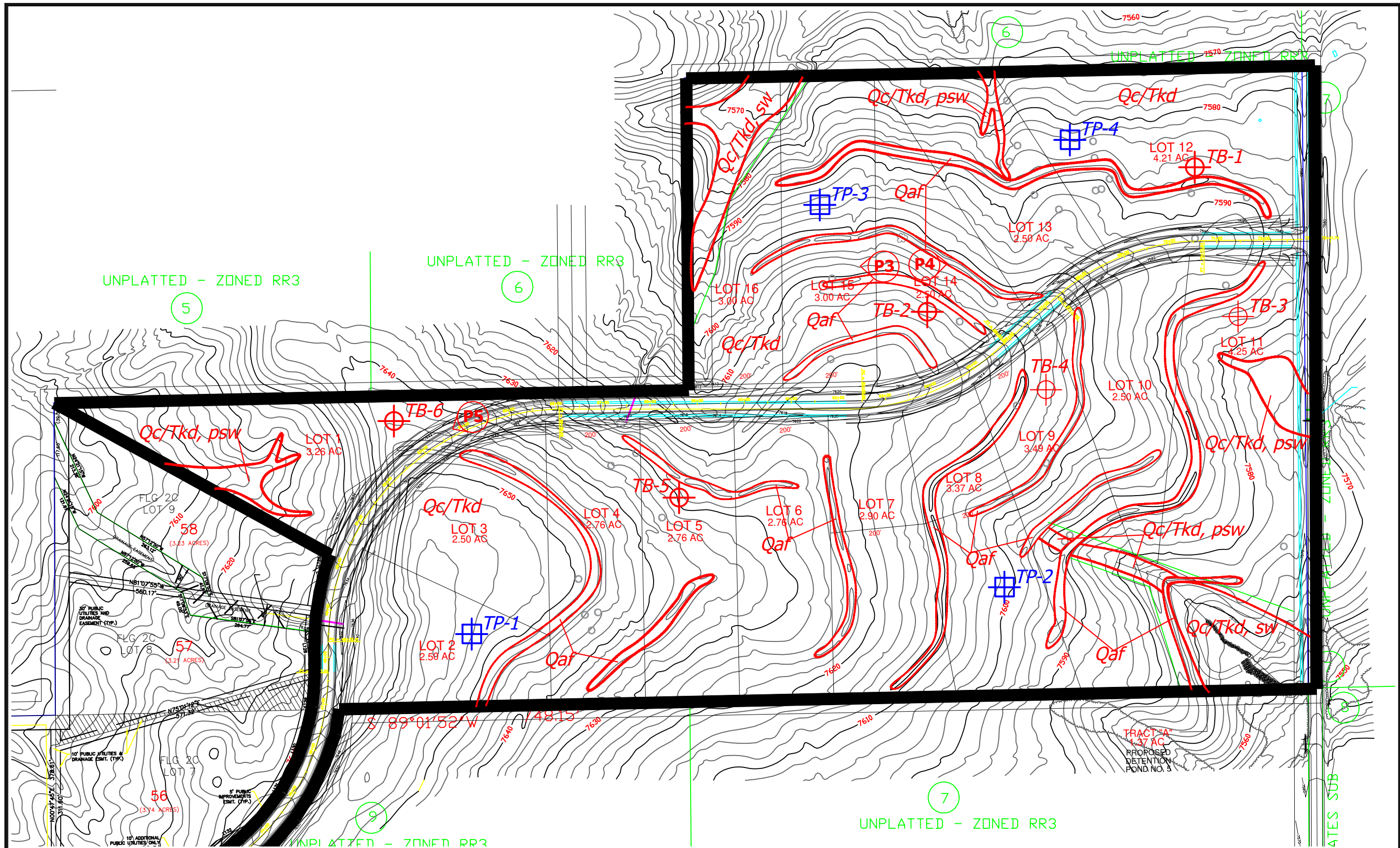


**BLACK FOREST QUADRANGLE  
GEOLOGIC MAP**  
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HODGEN SETTLERS RANCH, LLC

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230662

**FIG. 5**





**Legend:**  
Qaf - Artificial Fill of Holocene Age:  
man-made fill deposits associated with existing erosion berms  
QcTKd - Colluvium of Quaternary Age overlying Dawson Formation of Tertiary to Cretaceous Age:  
colluvial and residual soils overlying arkosic sandstone with interbedded fine-grained  
sandstone, siltstone and claystone  
psw - potentially seasonally shallow groundwater area  
sw - seasonally shallow groundwater area

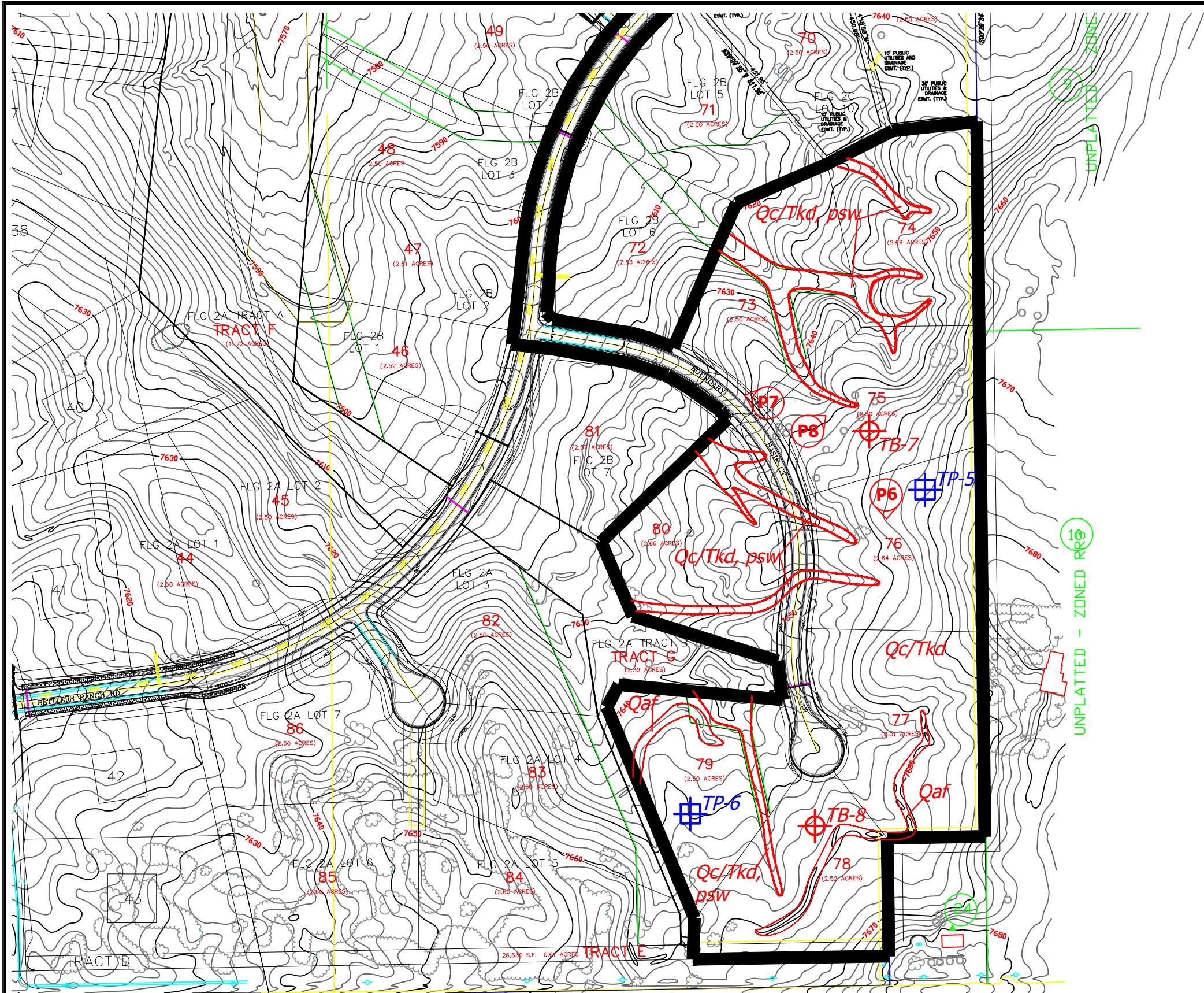
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**GEOLOGY/ENGINEERING MAP**  
SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

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**FIG. 6**





**Legend:**  
Qaf - Artificial Fill of Holocene Age: man-made fill deposits associated with existing erosion berms  
QcTKd - Colluvium of Quaternary Age overlying Dawson Formation of Tertiary to Cretaceous Age: colluvial and residual soils overlying arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone  
psw - potentially seasonally shallow groundwater area  
sw - seasonally shallow groundwater area



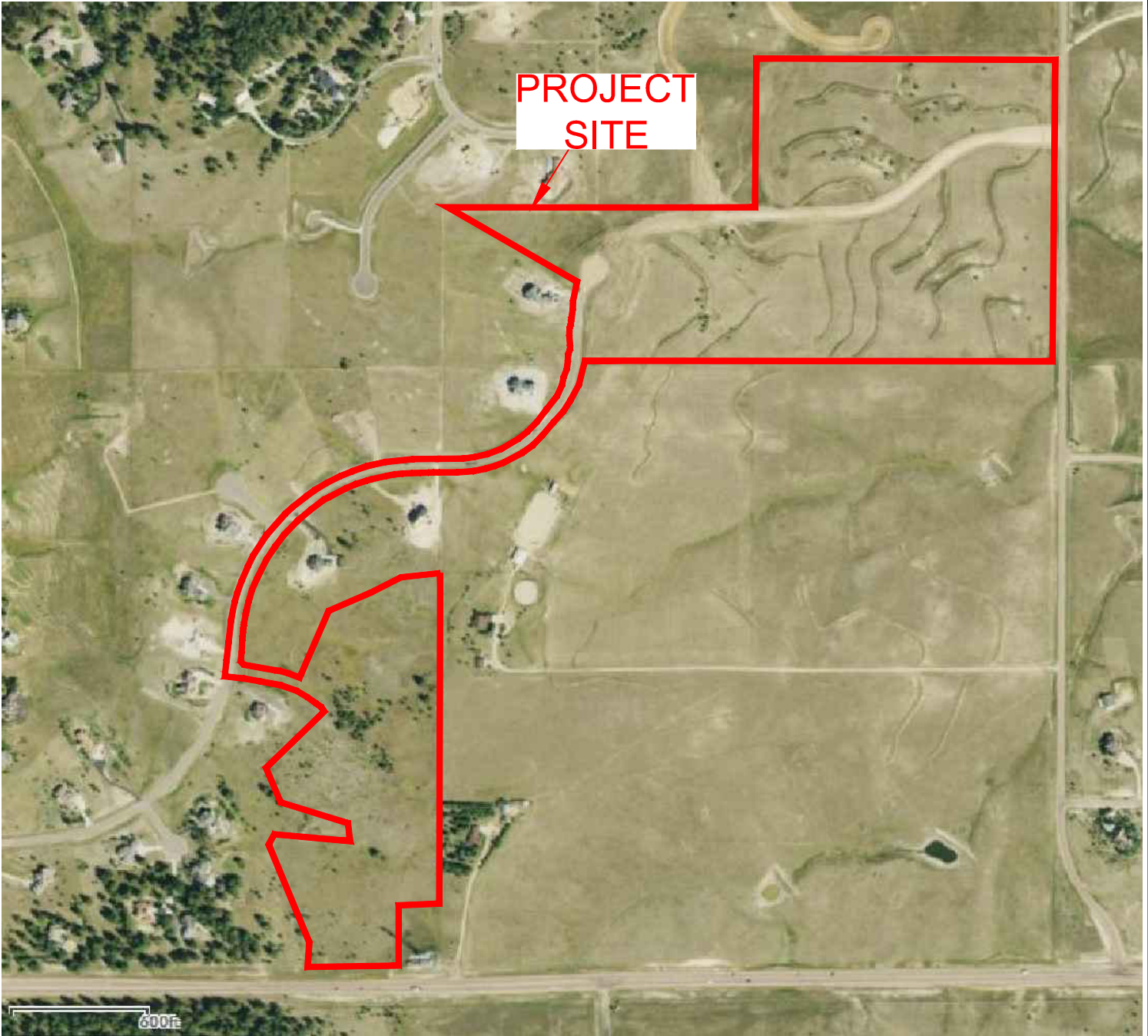
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**SITE PLAN/TESTING LOCATION MAP**  
SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

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**FIG. 6A**



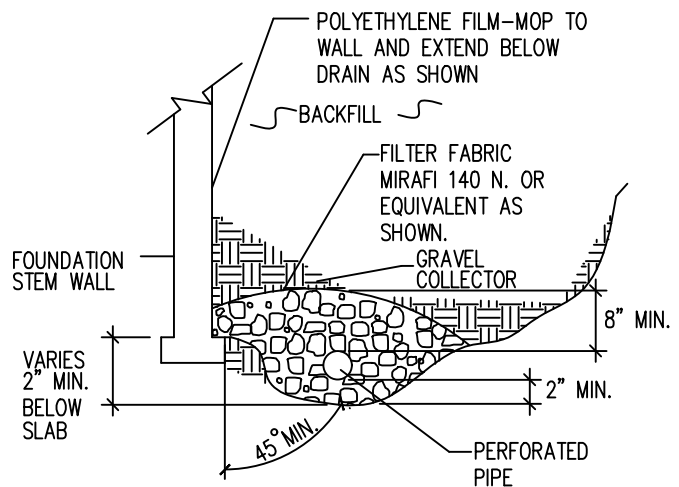
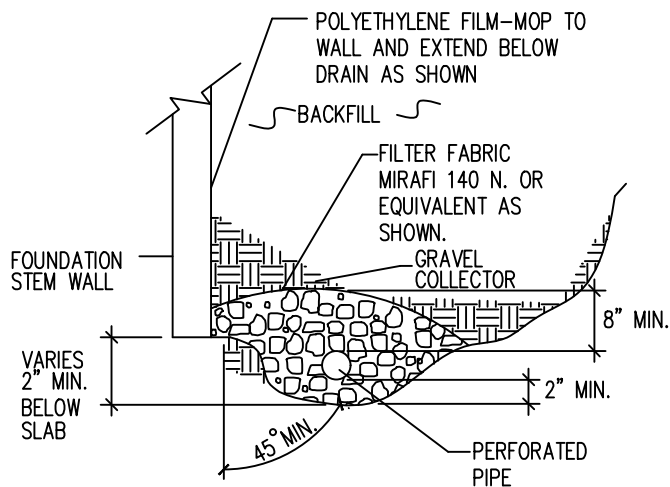


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**FEMA FLOODPLAIN MAP**  
SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

JOB NO.  
230662

**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.

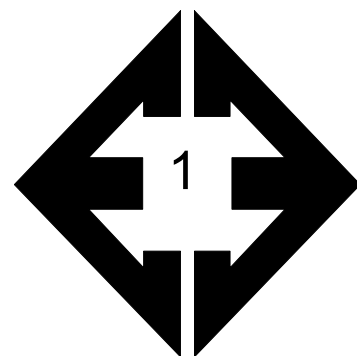
—FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

—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.

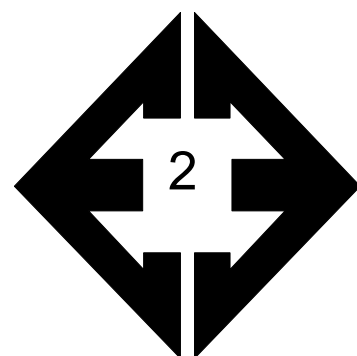
## **APPENDIX A: Photographs**





**Looking south from  
the northeastern  
portion of the site.**

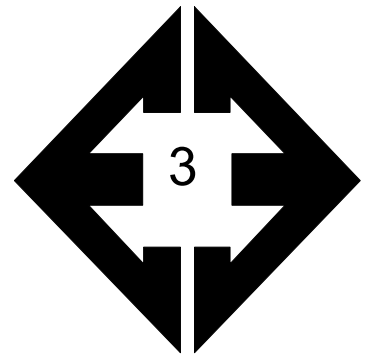
May 1, 2023



**Looking west from the  
northeastern portion of  
the site.**

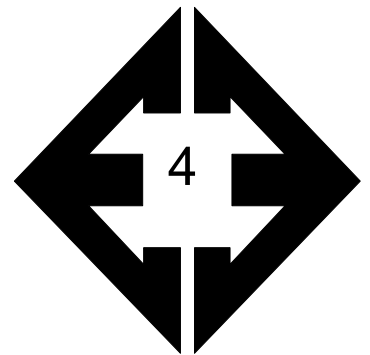
May 1, 2023





**Looking west from the  
northern portion of the  
site.**

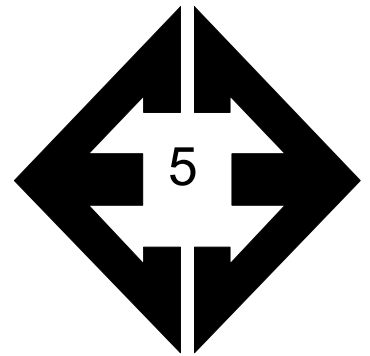
May 1, 2023



**Looking east from the  
northern portion of the  
site.**

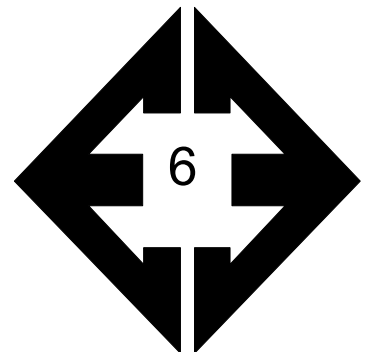
May 1, 2023





**Looking southwest  
from northwestern  
portion of the site.**

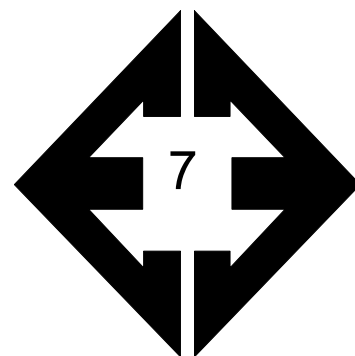
May 1, 2023



**Looking south from  
the southern portion of  
site.**

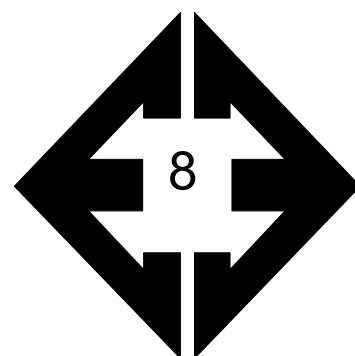
May 18, 2023





**Looking west from  
southern portion of the  
site.**

May 18, 2023



**Looking northeast  
from the southern  
portion of the site.**

May 18, 2023

## **APPENDIX B: Test Boring**

TEST BORING 1  
DATE DRILLED 5/1/2023

TEST BORING 2  
DATE DRILLED 5/1/2023

REMARKS

REMARKS

DRY TO 20', 5/4/23

DRY TO 19.5', 5/4/23

SAND, WITH SILT, TAN, DENSE,  
MOIST

SAND, WITH SILT, TAN, DENSE,  
MOIST

CLAY, WITH SAND, TAN, HARD,  
MOIST

SANDSTONE, SILTY, VERY WEAK,  
TAN, VERY DENSE, DRY TO MOIST

SANDSTONE, SILTY, VERY WEAK,  
TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			48	3.9	1
5			35	3.1	1
10			31	4.8	1
15			33	7.5	1
20			50 11"	11.4	3

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			22	9.3	1
5			46	11.9	2
10			50 11"	2.2	3
15			50 5"	15.2	3
20			50 6"	7.9	3



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## TEST BORING LOGS

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**FIG. B-1**



TEST BORING 3  
DATE DRILLED 5/1/2023

REMARKS

DRY TO 18', 5/4/23

SAND, WITH SILT, TAN, DENSE  
TO MEDIUM DENSE, MOIST

CLAY, WITH SAND, LIGHT BROWN,  
VERY STIFF, DRY  
SANDSTONE, SILTY, VERY WEAK,  
TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			32	7.6	1
			24	14.9	1
10			19	2.3	2
15			50 7"	21.9	3
20			50 8"	14.9	3

TEST BORING 4  
DATE DRILLED 5/1/2023

REMARKS

DRY TO 19', 5/4/23

SAND, CLAYEY, LIGHT BROWN,  
MEDIUM DENSE TO DENSE,

SANDSTONE, SILTY, VERY WEAK,  
TAN, VERY DENSE, DRY TO MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			19	5.7	1
			31	6.7	1
10			50 10"	2.0	3
15			50 9"	4.9	3
20			50 5"	10.7	3



## TEST BORING LOGS

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**FIG. B-2**

TEST BORING 5  
DATE DRILLED 5/1/2023

REMARKS

DRY TO 18.5', 5/4/23

SANDSTONE, SILTY, VERY WEAK,  
TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			$\frac{50}{11"}$	6.0	3
5			$\frac{50}{11"}$	3.6	3
10			$\frac{50}{10"}$	7.2	3
15			$\frac{50}{6"}$	14.1	3
20			$\frac{50}{4"}$	9.5	3

TEST BORING 6  
DATE DRILLED 5/2/2023

REMARKS

DRY TO 19', 5/4/23

SAND, WITH SILT, TAN, DENSE,  
MOIST

CLAY, WITH SANDY, BROWN,  
VERY STIFF, MOIST

SAND, WITH SILT, TAN, MEDIUM  
DENSE TO DENSE, MOIST

SANDSTONE, SILTY, VERY WEAK,  
TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			33	6.2	1
5			21	9.3	2
10			27	8.1	1
15			35	7.2	1
20			$\frac{50}{6"}$	5.2	3



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## TEST BORING LOGS

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**FIG. B-3**

TEST BORING 7  
DATE DRILLED 5/2/2023

REMARKS

DRY TO 20', 5/4/23

SAND, WITH SILT, LIGHT BROWN  
TO TAN, DENSE TO MEDIUM  
DENSE, MOIST

SANDSTONE, SILTY, VERY WEAK,  
TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			43	4.6	1
5			36	4.8	1
10			18	5.4	1
15			<u>50</u> 7"	6.5	3
20			<u>50</u> 10"	10.0	3

TEST BORING 8  
DATE DRILLED 5/2/2023

REMARKS

DRY TO 19', 5/4/23

SAND, WITH SILT, LIGHT BROWN,  
DENSE, MOIST

SANDSTONE, SILTY, VERY WEAK,  
TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			34	7.0	1
5			<u>50</u> 9"	3.9	3
10			<u>50</u> 11"	3.8	3
15			<u>50</u> 7"	8.7	3
20			<u>50</u> 7"	8.9	3



## TEST BORING LOGS

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230662

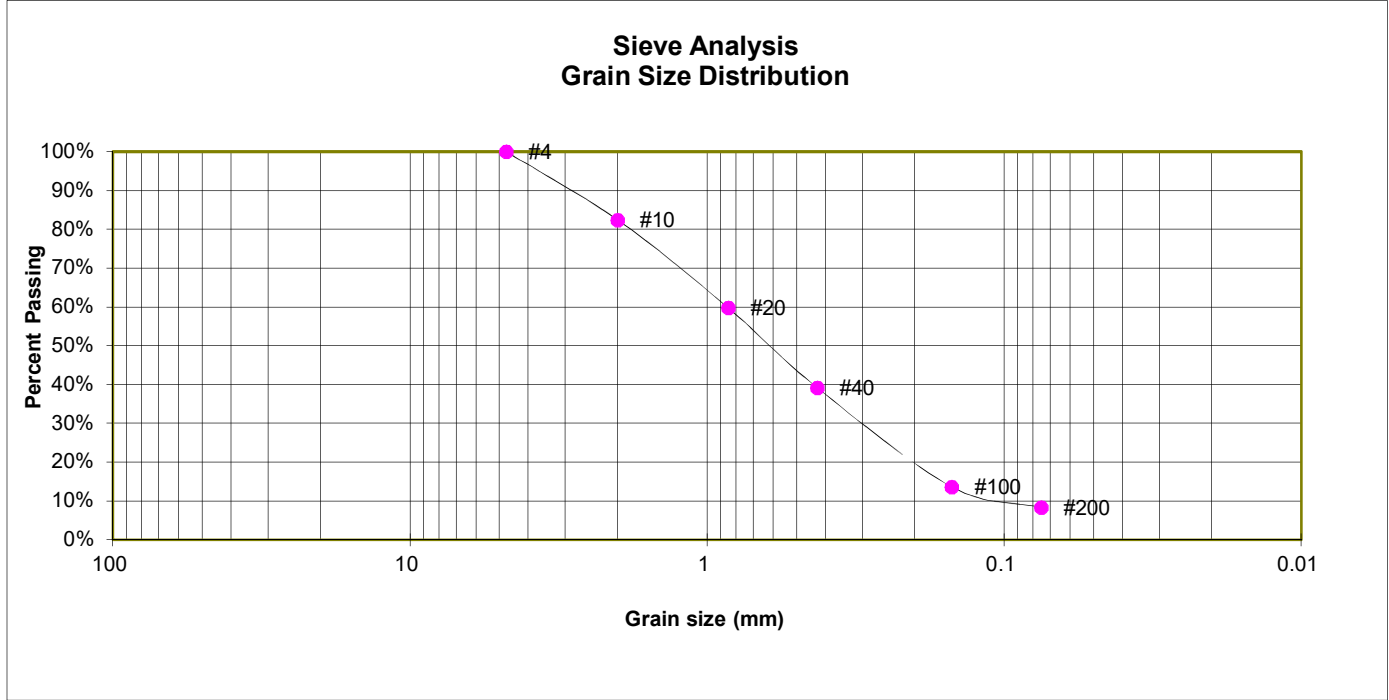
**FIG. B-4**

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

**TABLE B-1**  
**SUMMARY OF LABORATORY TEST RESULTS**

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	10			8.3					SM-SW	SAND, WITH SILT
1	4	2-3			27.5	26	9	0.0		SC	SAND, CLAYEY
1	7	10			10.8					SM-SW	SAND, WITH SILT
2	2	2-3			74.2					CL	CLAY, WITH SAND
2	3	10			52.6	23	9	0.0		CL	CLAY, SANDY
2	6	5	11.2	113.9	74.9				1.2	CL	CLAY, WITH SAND
3	5	5			10.4	NV	NP	0.0		SM-SW	SANDSTONE, WITH SILT
3	8	5			12.1					SM	SANDSTONE, SILTY

<u>TEST BORING</u>	1	<u>SOIL DESCRIPTION</u>	SAND, WITH SILT
<u>DEPTH (FT)</u>	10	<u>USCS CLASSIFICATION</u>	SM-SW
<u>SOIL TYPE</u>	1	<u>AASHTO CLASSIFICATION</u>	



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	82.4%
20	59.8%
40	39.1%
100	13.6%
200	8.3%



**LABORATORY TEST RESULTS**

SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

JOB NO.  
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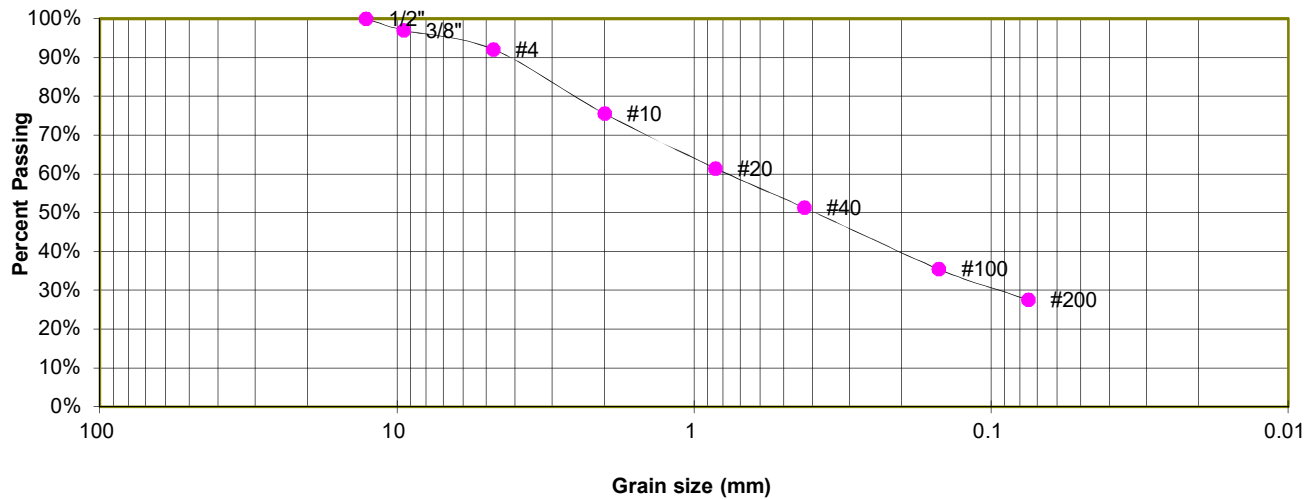
**FIG. B-1**



TEST BORING 4  
DEPTH (FT) 2-3  
SOIL TYPE 1

SOIL DESCRIPTION SAND, CLAYEY  
USCS CLASSIFICATION SC  
AASHTO CLASSIFICATION

**Sieve Analysis  
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.0%
4	92.1%
10	75.5%
20	61.5%
40	51.3%
100	35.4%
200	27.5%

**Atterberg Limits**

Plastic Limit	17
Liquid Limit	26
Plastic Index	9



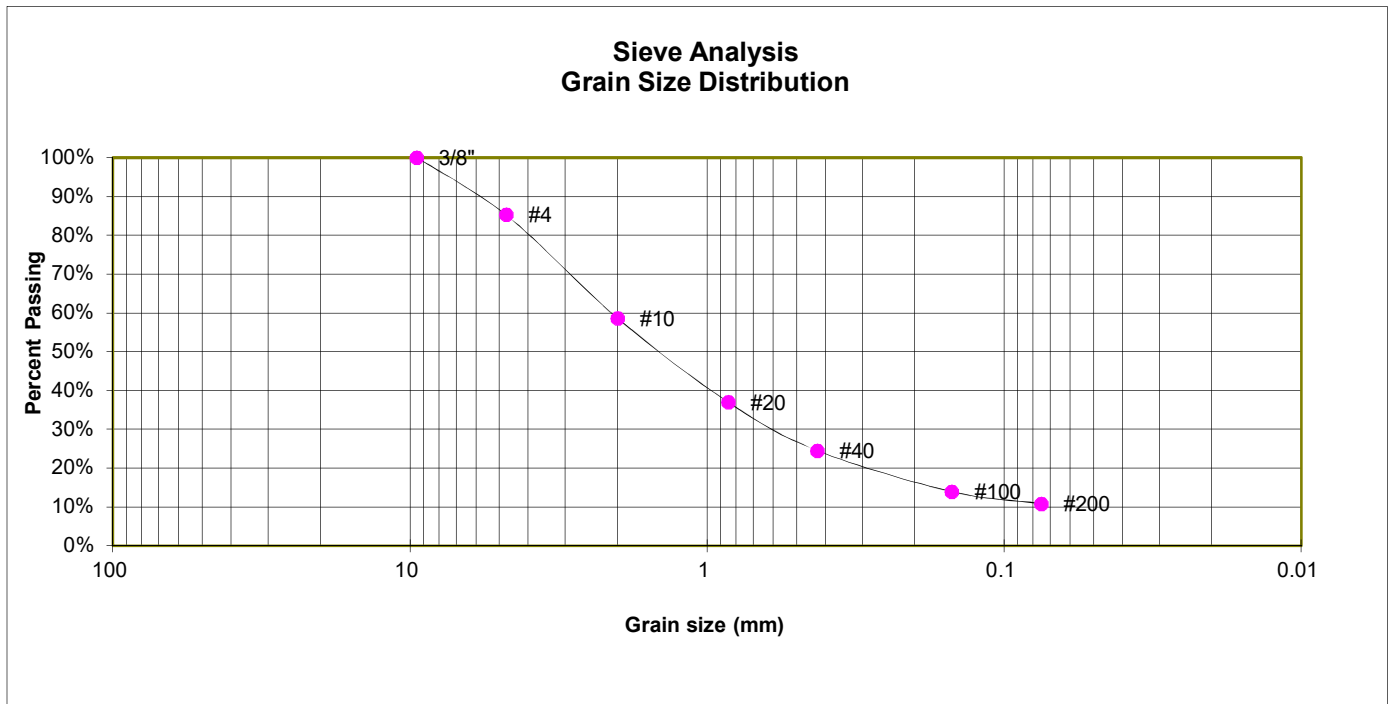
**LABORATORY TEST RESULTS**

SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

JOB NO.  
230662

**FIG. B-2**

<u>TEST BORING</u>	7	<u>SOIL DESCRIPTION</u>	SAND, WITH SILT
<u>DEPTH (FT)</u>	10	<u>USCS CLASSIFICATION</u>	SM-SW
<u>SOIL TYPE</u>	1	<u>AASHTO CLASSIFICATION</u>	



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	85.3%
10	58.6%
20	37.0%
40	24.5%
100	13.9%
200	10.8%



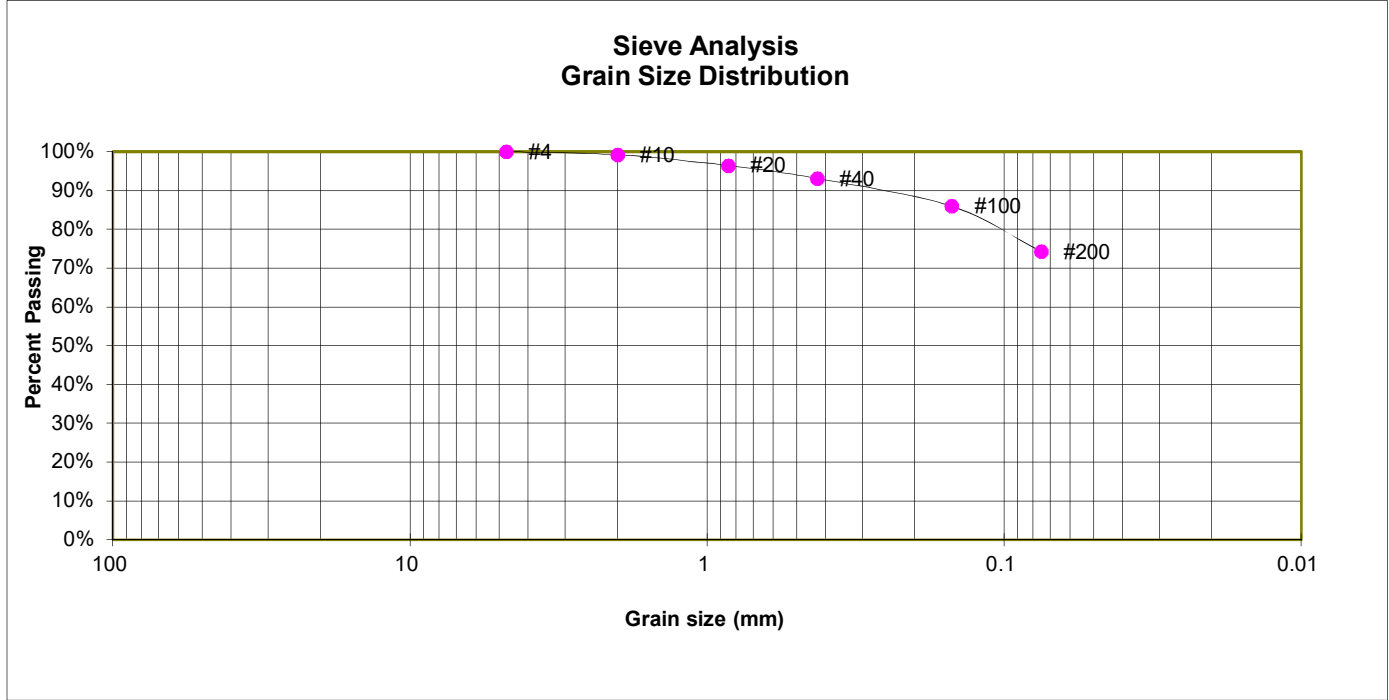
## LABORATORY TEST RESULTS

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**FIG. B-3**

<u>TEST BORING</u>	2	<u>SOIL DESCRIPTION</u>	CLAY, WITH SAND
<u>DEPTH (FT)</u>	2-3	<u>USCS CLASSIFICATION</u>	CL
<u>SOIL TYPE</u>	2	<u>AASHTO CLASSIFICATION</u>	



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.2%
20	96.4%
40	93.0%
100	85.9%
200	74.2%



**LABORATORY TEST RESULTS**

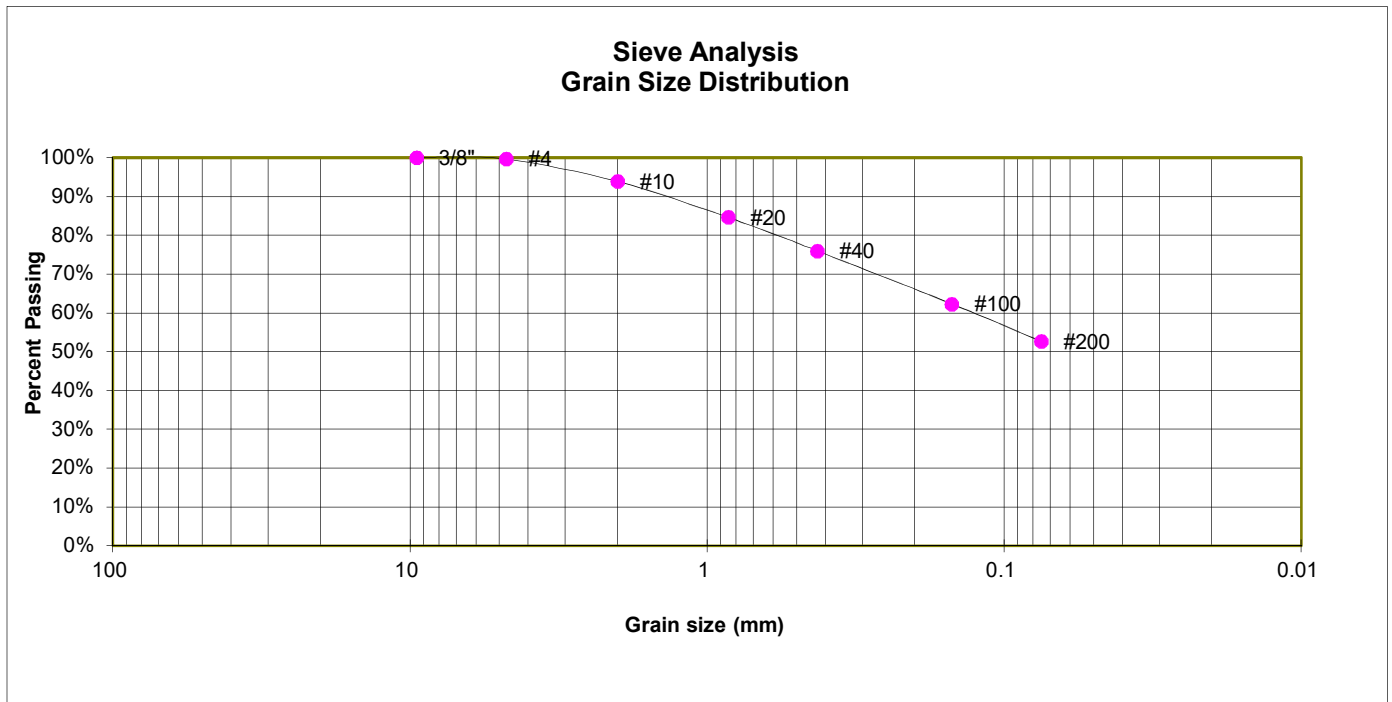
SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

JOB NO.  
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**FIG. B-4**

TEST BORING 3  
 DEPTH (FT) 10  
 SOIL TYPE 2

SOIL DESCRIPTION CLAY, SANDY  
 USCS CLASSIFICATION CL  
 AASHTO CLASSIFICATION



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.6%
10	93.8%
20	84.6%
40	76.0%
100	62.3%
200	52.6%

Atterberg Limits	
Plastic Limit	14
Liquid Limit	23
Plastic Index	9



## LABORATORY TEST RESULTS

SETTLERS RANCH FILING NO. 3  
 HODGEN SETTLERS RANCH, LLC

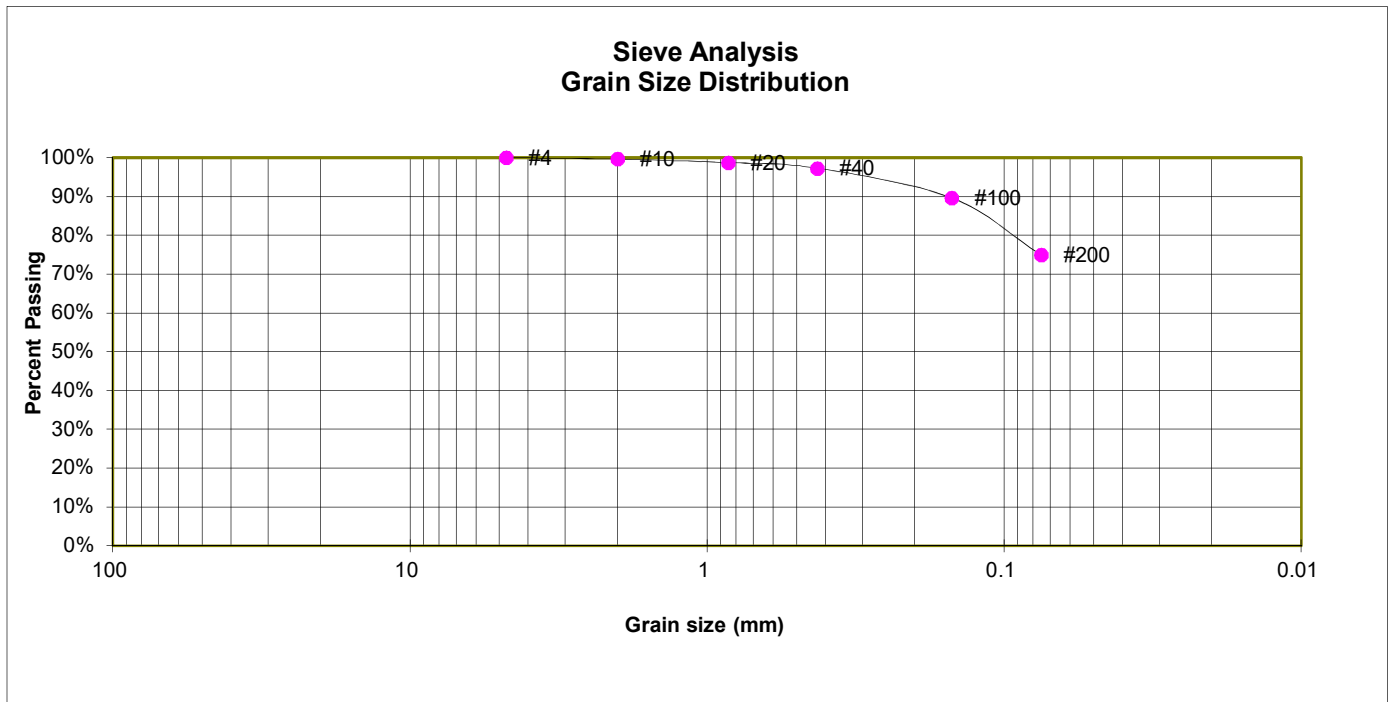
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**FIG. B-5**



TEST BORING 6  
DEPTH (FT) 5  
SOIL TYPE 2

SOIL DESCRIPTION CLAY, WITH SAND  
USCS CLASSIFICATION CL  
AASHTO CLASSIFICATION



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.6%
20	98.7%
40	97.3%
100	89.6%
200	74.9%



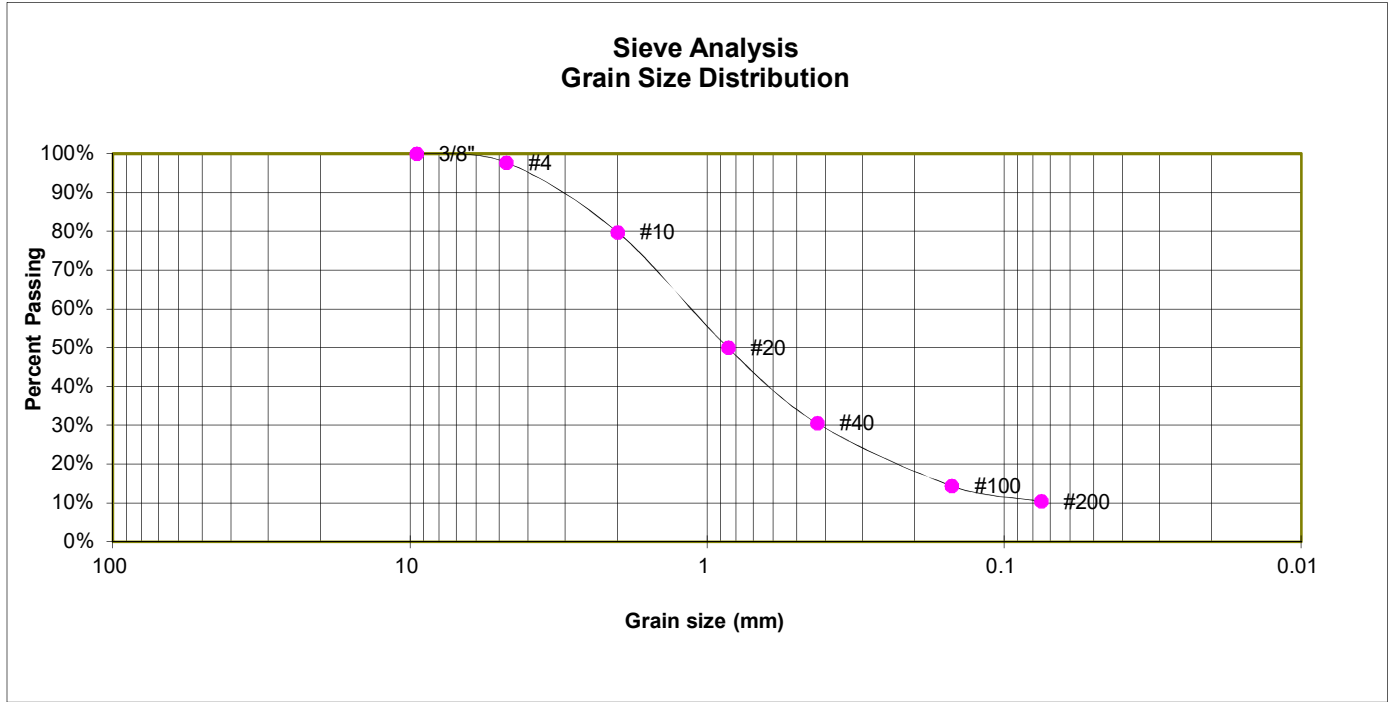
## LABORATORY TEST RESULTS

SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

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**FIG. B-6**

<u>TEST BORING</u>	5	<u>SOIL DESCRIPTION</u>	SANDSTONE, WITH SILT
<u>DEPTH (FT)</u>	5	<u>USCS CLASSIFICATION</u>	SM-SW
<u>SOIL TYPE</u>	3	<u>AASHTO CLASSIFICATION</u>	



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.7%
10	79.8%
20	50.0%
40	30.5%
100	14.4%
200	10.4%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP



**LABORATORY TEST RESULTS**

SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

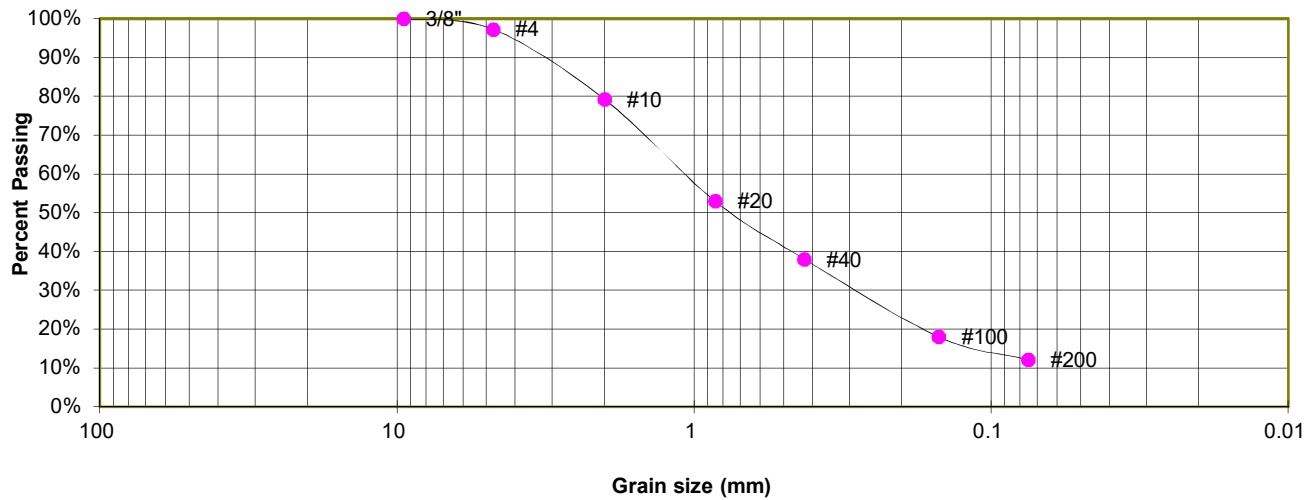
JOB NO.  
230662

**FIG. B-7**

TEST BORING 8  
DEPTH (FT) 5  
SOIL TYPE 3

SOIL DESCRIPTION SANDSTONE, SILTY  
USCS CLASSIFICATION SM  
AASHTO CLASSIFICATION

**Sieve Analysis  
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.3%
10	79.2%
20	53.0%
40	38.0%
100	18.0%
200	12.1%



**LABORATORY TEST RESULTS**

SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

JOB NO.  
230662

**FIG. B-8**

TEST BORING 6  
DEPTH (FT) 5

SOIL DESCRIPTION CLAY, WITH SANDY  
SOIL TYPE 2



**SWELL/CONSOLIDATION TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 114  
NATURAL MOISTURE CONTENT: 11.2%  
SWELL/CONSOLIDATION (%): 1.2%



**LABORATORY TEST RESULTS**

SETTLERS RANCH FILING NO. 3  
HODGEN SETTLERS RANCH, LLC

JOB NO.  
230662

**FIG. B-9**



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

## El Paso County Area, Colorado

### 67—Peyton sandy loam, 5 to 9 percent slopes

#### Map Unit Setting

*National map unit symbol:* 369d

*Elevation:* 6,800 to 7,600 feet

*Mean annual air temperature:* 43 to 45 degrees F

*Frost-free period:* 115 to 125 days

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Peyton and similar soils:* 85 percent

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

#### Description of Peyton

##### Setting

*Landform:* Hills

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

##### Typical profile

*A - 0 to 12 inches:* sandy loam

*Bt - 12 to 25 inches:* sandy clay loam

*BC - 25 to 35 inches:* sandy loam

*C - 35 to 60 inches:* sandy loam

##### Properties and qualities

*Slope:* 5 to 9 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well drained

*Runoff class:* Medium

*Capacity of the most limiting layer to transmit water*

*(Ksat):* Moderately high (0.20 to 0.60 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:* Moderate (about 7.3 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4e

*Hydrologic Soil Group:* B

*Ecological site:* R049XY216CO - Sandy Divide

*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

### 92—Tomah-Crowfoot loamy sands, 3 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 36b9

*Elevation:* 7,300 to 7,600 feet

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Tomah and similar soils:* 50 percent

*Crowfoot and similar soils:* 30 percent

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

#### Description of Tomah

##### Setting

*Landform:* Alluvial fans, hills

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium derived from arkose and/or residuum weathered from arkose

##### Typical profile

*A - 0 to 10 inches:* loamy sand

*E - 10 to 22 inches:* coarse sand

*Bt - 22 to 48 inches:* stratified coarse sand to sandy clay loam

*C - 48 to 60 inches:* coarse sand

##### Properties and qualities

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well drained

*Runoff class:* Medium

*Capacity of the most limiting layer to transmit water*

*(Ksat):* Moderately high to high (0.60 to 2.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water supply, 0 to 60 inches:* Low (about 4.6 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4e

*Hydrologic Soil Group:* B

*Ecological site:* R049XY216CO - Sandy Divide

*Hydric soil rating:* No



## Description of Crowfoot

### Setting

*Landform:* Hills, alluvial fans

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium

### Typical profile

*A - 0 to 12 inches:* loamy sand

*E - 12 to 23 inches:* sand

*Bt - 23 to 36 inches:* sandy clay loam

*C - 36 to 60 inches:* coarse sand

### Properties and qualities

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well drained

*Runoff class:* Medium

*Capacity of the most limiting layer to transmit water*

*(Ksat):* Moderately high to high (0.60 to 2.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water supply, 0 to 60 inches:* Low (about 4.7 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4e

*Hydrologic Soil Group:* B

*Ecological site:* R049XY216CO - Sandy Divide

*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