ENTECH
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SOILS AND GEOLOGY STUDY
PRELIMINARY PLAN STERLING RANCH EAST – FILING NO. 6
EL PASO COUNTY, COLORADO

Prepared for:
Classic SRJ
2138 Flying Horse Club Drive
Colorado Springs, CO 80921

Attn: Loren Moreland

September 24, 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: 09/24/24

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

LLL/JG

PCD No. _____

Table of Contents

1 SUMMARY

Project Location

The project lies in portions of the SW¼ of Section 27 and NW¼ of Section 34, Township 12 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately one-mile northeast of Colorado Springs, Colorado.

Project Description

Sterling Ranch East Filing No. 6 consists of 49.26 acres, with one hundred and ninety-eight (198) single-family residential lots proposed. The proposed development will be serviced by Sterling Ranch Metropolitan District.

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, potential for expansive soils, and seasonally shallow groundwater areas. 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 site is located in portions of the SW¼ of Section 27 and NW¼ of Section 34, Township 12 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately one-mile northeast of Colorado Springs, Colorado, at the northeast corner of future Briargate Parkway and Sterling Ranch Road. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site is gradually sloping to the south-southwest with a minor drainage located in the northeastern portion of the site. The drainage was dry at the time of our site observation. 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, and weeds. Site photographs, taken September 12, 2024, are included in Appendix A.

Sterling Ranch East Filing No. 6 is 49.26 acres, with one hundred and ninety-eight (198) single-family residential lots proposed. Proposed grading is shown on Figures 3 and 6. The Site and Exploration Plan is presented in Figure 3.

3 SCOPE OF THE REPORT

The scope of the report includes 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 mapping 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 Geology/Engineering Geology 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. (Entech) on September 12, 2024.

Geologic Hazard Studies were previously performed by Entech for the entire Sterling Ranch development, October 31, 2006 (Reference 1), and nearby or adjacent Sterling Ranch East Parcels in 2022 (References 2 through 4). Information from these reports was used in evaluating the site.

Five test borings were drilled as part of this investigation to determine general soil and bedrock characteristics. The locations of the test borings are indicated on the Site and Exploration Plan, Figure 3. The Test Boring Logs are presented in Appendix B, and Summarized on Table B-1. Results of this testing will be discussed later in this report.

Laboratory testing was also performed on some of the soils to classify and determine the soils engineering characteristics. Laboratory tests included grain-size analysis ASTM D-422, Atterberg Limits ASTM D-4318, and 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.

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 12¼ miles to the west 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 the southeastern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be very gently dipping in a northeasterly direction (Reference 5). The rocks in the area of the site are sedimentary in nature and typically Upper Cretaceous in age. The bedrock underlying the site consists of the Dawson Formation of Tertiary to Cretaceous Age. The Dawson Formation typically consists of arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone. Overlying this formation are variable layers of eolian sands, alluvial deposits, and residual soil. The residual soils were derived from the in-situ weathering of the bedrock materials on-site. These soils consisted of silty to clayey sands and sandy clays. 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 6), previously the Soil Conservation Service (Reference 7) has mapped two soil types on the site (Figure 4). In general, the soils classify as coarse sandy loam. The soils are described as follows:

Type	Description
19	Columbine Gravelly Sandy Loam, 0 to 3% slopes
71	Pring Coarse Sandy Loam, 3 to 8% slopes

Complete descriptions of each soil type are presented in Appendix D. The soils have generally been described to have moderate to moderately rapid permeability. 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 Falcon NW Quadrangle Geology Map showing the site is presented in Figure 5 (Reference 8). The Geology Map prepared for the site is presented in Figure 6. Four mappable units were identified on this site which are described as follows:

Qaf **Artificial Fill of Quaternary Age:** These recent man-made deposits associated with fill for the existing water main along the western and southern side of the site in addition to filling and grading that has been placed for future Briargate Parkway and Sterling Ranch Road. Additionally, fill stockpiles are located along the southwestern side of the filing.

Qes **Eolian Sand of Quaternary Age:** These deposits are fine to medium grained soil deposited on the site by the action of 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, and tend to have a relatively high permeability and low density.

Qao_1 **Old alluvium one of Holocene Age:** These materials consist of stream-deposited alluvium, typically classified as a silty to well-graded sand, brown to dark brown in color and of moderate density occurring as terrace deposits. Old Alluvium One can

sometimes be very highly stratified containing thing layers of very silty and clayey soil. This unit correlates to the Louviers Alluvium in the Denver area.

Tkd **Dawson Formation of Tertiary to Cretaceous Age:** The Dawson formation typically consists of arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone. Overlying this formation is a variable layer of residual and/or colluvial soils. The residual soils were derived from the in-situ weathering of the bedrock materials on-site. The colluvial soils have been transported by the action of sheetwash and gravity. These soils consisted of silty to clayey sands and sandy clays.

The soils listed above were mapped from site-specific mapping, the *Geologic Map of the Falcon NW Quadrangle* distributed by the Colorado Geological Survey in 2003 (Reference 8), the *Geologic Map of the Colorado Springs-Castle Rock Area*, distributed by the US Geological Survey in 1978 (Reference 9), and the *Geologic Map of the Pueblo 1^0 x 2^0 Quadrangle*, distributed by the US Geological Survey in 1981 (Reference 10). The Test Borings were also used in evaluating the site and are included in Appendix B. The Geology/Engineering 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 four general soil types. The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1 slightly silty sand to sand with silt (SW-SM, SM), encountered in all of borings at the existing ground surface and extending to depths ranging from 13 to 19 feet bgs and to the termination of TB-5 (20 feet). These soils were encountered at loose to dense states and at dry to moist conditions. The majority of the soils were encountered and medium dense states.

Soil Type 2 sandy clay (CL), encountered in TB-2 at 9 feet bgs and extending to approximately 13 feet. The clay was encountered at hard consistencies and at moist conditions. One-dimensional Swell/Consolidation Testing resulted in a consolidation of 0.8%, indicated a low consolidation potential.

Soil Type 3 completely weathered to highly weathered silty to clayey sandstone, or silty to clayey sand when classified as a soil (SM, SC). The sandstone was encountered in TB-1 – TB-4 at depths ranging from 13 to 19 feet bgs and extending to 19 feet in TB-1 and to the termination of

TB-2 – TB-4 (20 feet). The sandstone was encountered at dense to very dense states and at moist conditions.

Soil Type 4 sandy claystone, or a clay with sand when classified as a soil (CL). The claystone was encountered in TB-1 at 19 feet bgs and extended to the termination of the boring (20 feet). The claystone was encountered at hard consistencies and at moist conditions.

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 an existing water main along the western and southern side of the site in addition to filling and grading that has been placed for future Briargate Parkway and Sterling Ranch Road. Additionally, fill stockpiles are located along the southwestern side of the filing.

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.

Collapsible Soils – 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. Additionally, areas mapped as Qes (eolian sand) have the potential for hydrocompation.

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

Expansive soils were encountered in the two of test borings drilled on site. These occurrences are typically sporadic; therefore, none have been indicated on the maps. The clays and claystone,

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 5 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.

Bedrock – Constraint

Bedrock was encountered in four the test borings at depths ranging from 13 to 19 feet. A Summary of the Depth to Bedrock is included in Table B-1. Shallow bedrock may be encountered in some areas of this site, and will likely be encountered in deep cuts for utility excavations. Where claystone or sandstone are encountered, excavation/grading may be difficult requiring track excavators.

Groundwater and Floodplain Areas – Constraint

The site is not mapped within floodplain zones according to the FEMA Map Nos. 08041CO533G and 08041CO535G, Figure 7 (Reference 11). The topography of the site is gradually sloping to the south-southwest with a minor drainage located in the northeastern portion of the site. The drainage was dry at the time of our site observation, and no areas of ponded water were observed within Filing No. 6. The minor drainage in the northeastern portion of the filing has been identified as a potentially seasonal shallow groundwater area and is shown on the Geology/Engineering Geology Map, Figure 6. This area mapped as potentially seasonal shallow groundwater has been identified in the National Wetland Inventory as Freshwater Emergent Wetland habitats classified as PEM1C (Palustrine – P, Emergent – EM, Persistent – 1, Seasonally Flooded – C) (Figure 9, Reference 11). 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 a minor drainage that is located in the northeastern portion of the site. Grading plans indicate these areas

will be filled during site grading. Groundwater was not encountered in TB-3, which was drilled to a depth of 20 feet and placed in the minor drainage.

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. Fill added to these areas further raise foundations above groundwater levels. Foundations should be kept a minimum of 3 feet above groundwater levels. Areas may experience higher groundwater levels during period of higher precipitation where water can flow through permeable sands on top of less permeable bedrock materials. 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. It is anticipated that the potential seasonally shallow groundwater areas will be mitigated with site grading. Specific recommendations should be made after additional investigation and site grading has been completed.

Radon – Hazard

Radon levels for the area have been reported by the Colorado Geologic Survey in the open file, Report No. 91-4 (Reference 13). Average Radon levels for the 80908-zip code is 3.40 pCi/l. The following is a table of radon levels in this area:

Average Radon Levels for the 80908 Zip Code	
0 < 4 pCi/L	50.00%
4 < 10 pCi/L	50.00%
10 < 20 pCi/L	0.00%
> 20 pCi/L	0.00%

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 residential. It is our opinion that the existing geologic and engineering geologic conditions will impose some minor constraints on the proposed development and construction. The minor constraints affecting development will be those associated with the potential for artificial fill, hydrocompaction, potential for expansive soils, and potential seasonally shallow groundwater areas on the site that can be satisfactorily mitigated through proper engineering design and construction practices.

The soils were generally encountered at medium dense states with some loose areas. 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, and will require track mounted equipment for the dense sandstone.

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.

An area of potentially seasonal high groundwater is mapped in the northeast side of the site. These areas will likely be mitigated with site grading. Fill added to these areas further raise foundations above groundwater levels. TB-3 drilled in this area was dry to a depth of 20 feet. Foundations should be kept a minimum of 3 feet above groundwater levels. Areas may experience higher groundwater levels during period of higher precipitation where water can flow through permeable sands on top of less permeable bedrock materials. 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. Exact locations of floodplain and specific drainage studies are beyond the scope of this report.

The granular site soils are susceptible to erosion and gullying and may require the construction of check dams and revegetation of the site soils after construction. General recommendations for erosion control are discussed under Section 8.0 "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 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 14), the area is not mapped with any aggregate deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 15), areas of the site are not mapped with any resources. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 16), the area of the site has been mapped as “Fair” for industrial minerals. However, considering the silty 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 16), 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-site (Reference 16).

The site has been mapped as “Fair” for oil and gas resources (Reference 16). 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 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

In general, the site soils are suitable for the proposed roadways and embankments. Groundwater is not expected to be encountered, however, may be encountered in deeper cuts for utilities. 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% 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 Classic SRJ. 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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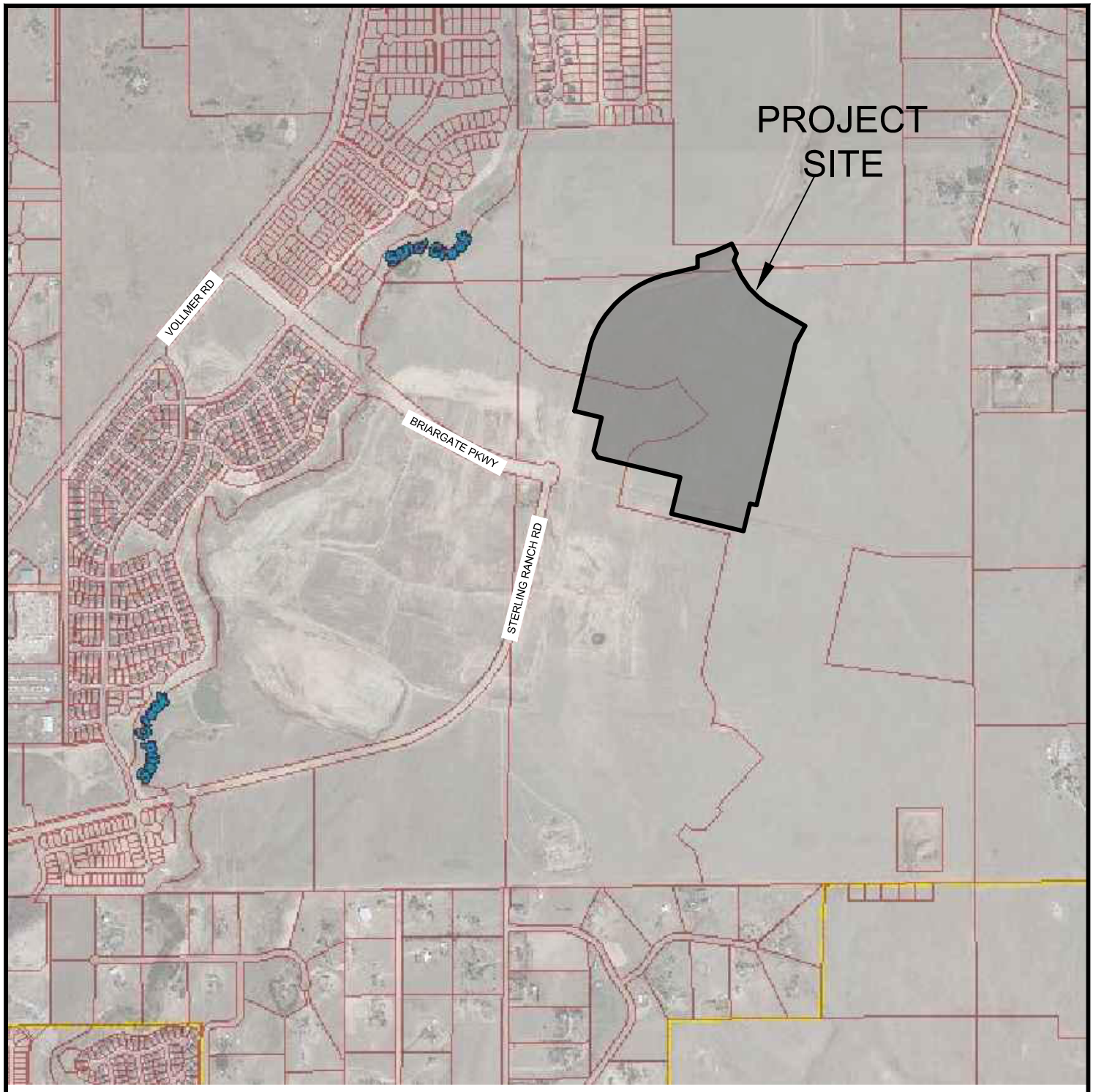
FIGURES



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ENTECH ENGINEERING, INC.

VICINITY MAP

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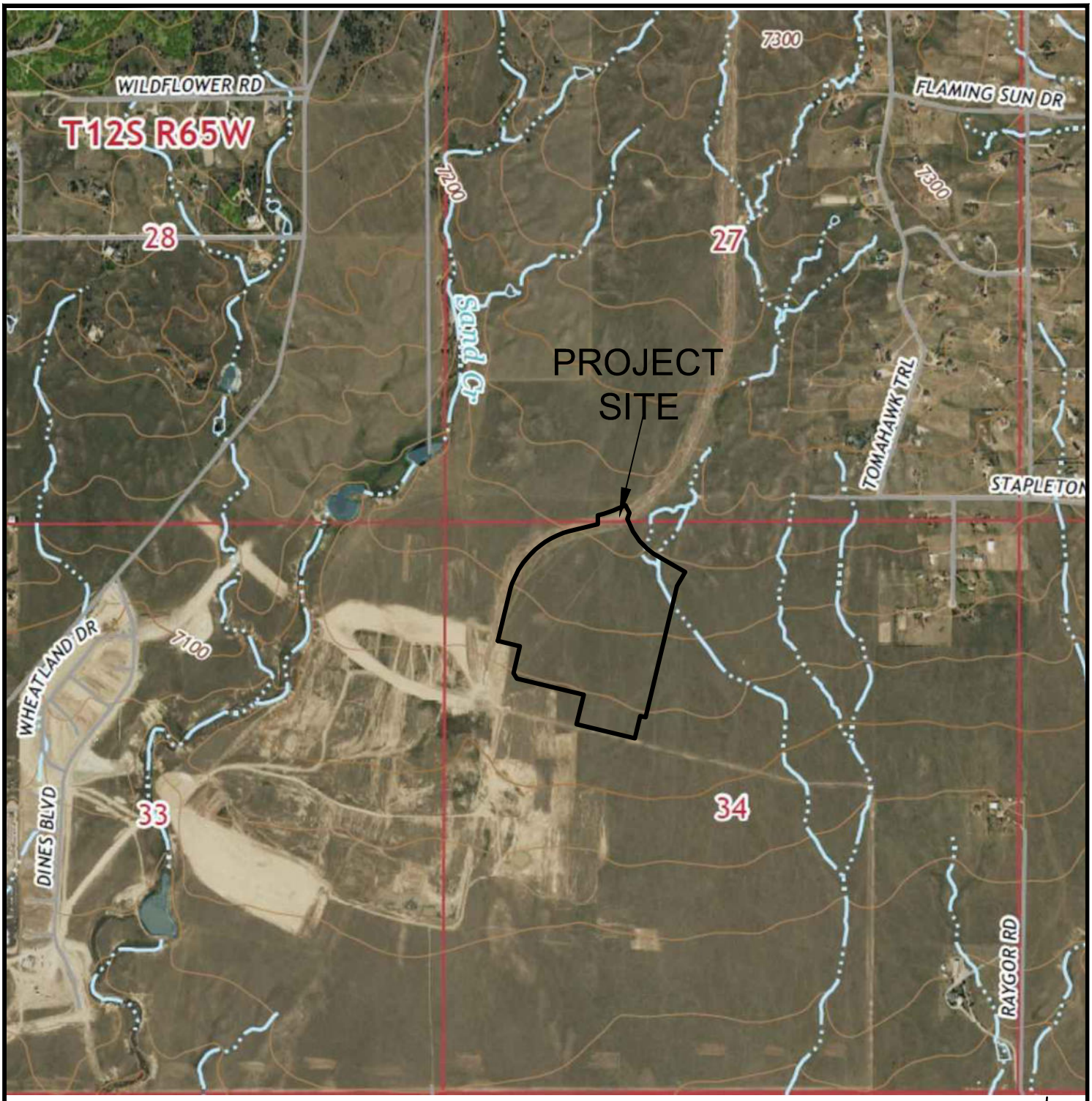
FIG. 1



ENTECH ENGINEERING, INC.

USGS TOPOGRAPHY MAP

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JOB NO.
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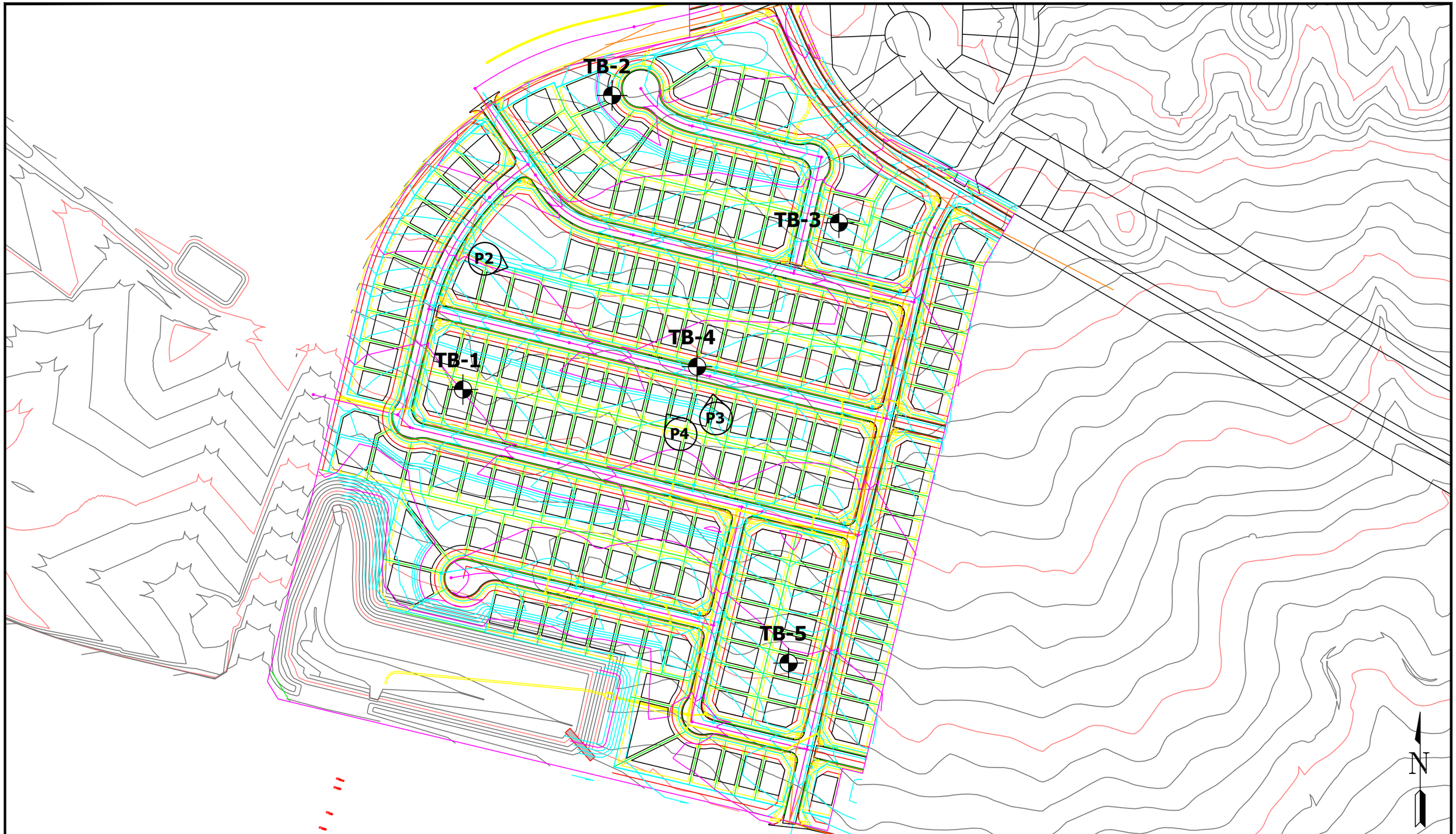
FIG. 2



TB- APPROXIMATE TEST BORING LOCATION AND NUMBER

P2 - APPROXIMATE PHOTOGRAPH LOCATION AND NUMBER

ENTECH ENGINEERING, INC.

SITE AND EXPLORATION PLAN

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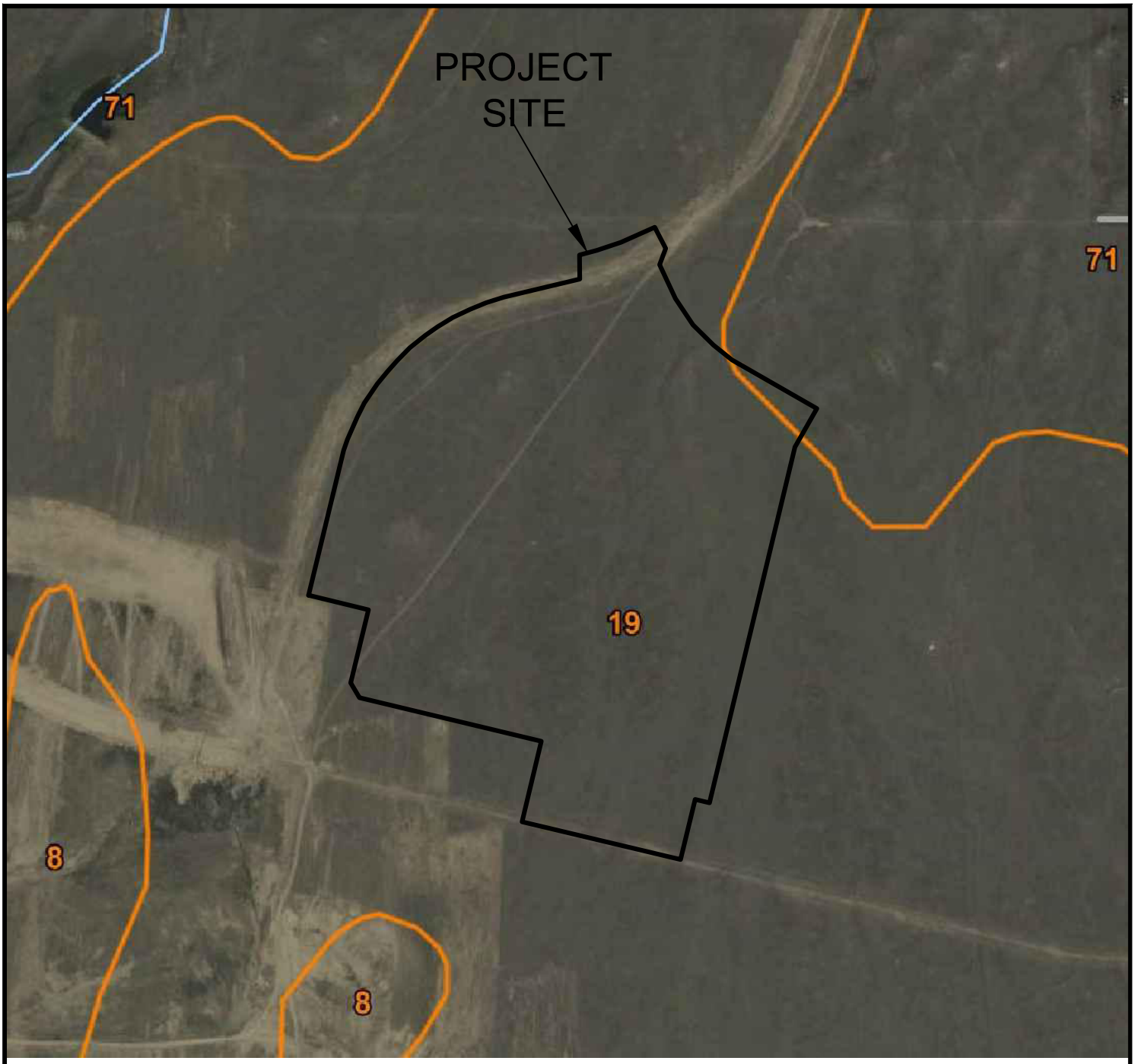
FIG. 3



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USDA SOIL MAP

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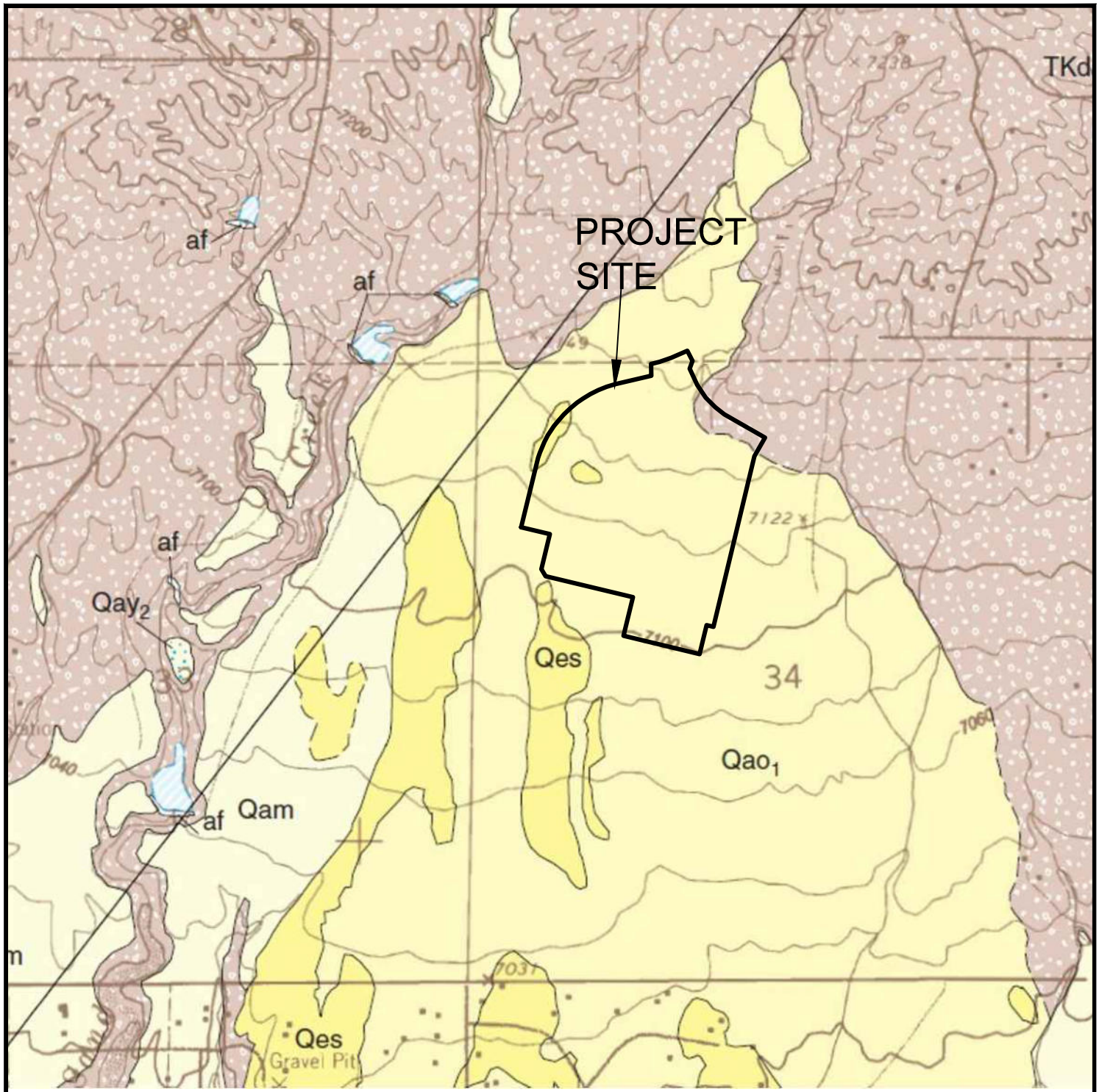
FIG. 4



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GEOLOGIC MAP OF THE FALCON NW QUADRANGLE

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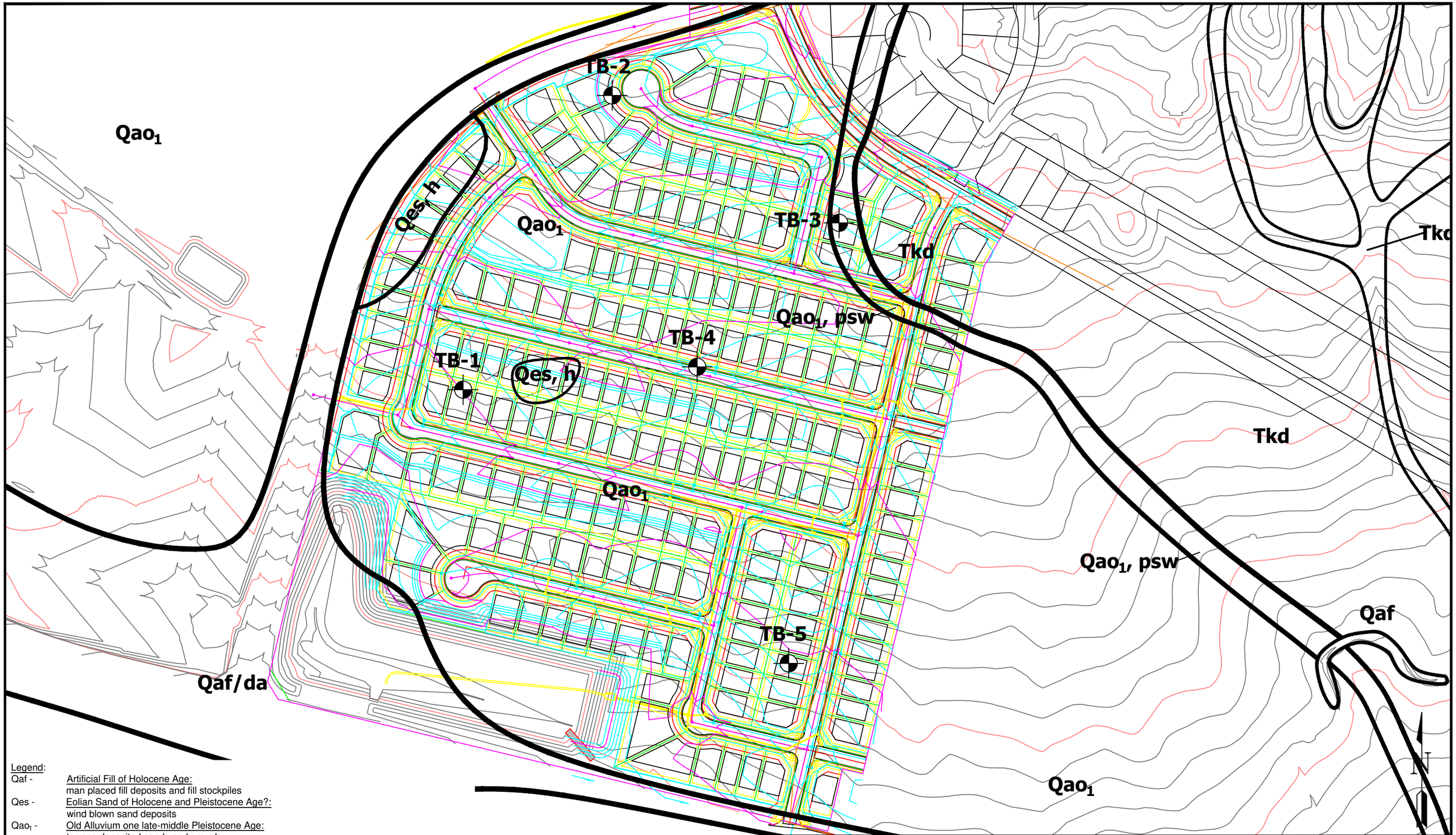
FIG. 5



Legend:

Qaf -	Artificial Fill of Holocene Age:	man placed fill deposits and fill stockpiles
Qes -	Eolian Sand of Holocene and Pleistocene Age?:	wind blown sand deposits
Qao_1 -	Old Alluvium one late-middle Pleistocene Age:	terrace deposited sands and gravels
Tkd -	Dawson Formation of Tertiary to Cretaceous Age:	arkosic sandstone with interbedded claystone and siltstone
da -	disturbed area	
h -	hydrocompaction	
psw -	potential seasonally shallow groundwater area	

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GEOLOGY / ENGINEERING MAP

STERLING RANCH EAST FILING NO. 6
CLASSIC SRJ

JOB NO. 241419

FIG. 6

N

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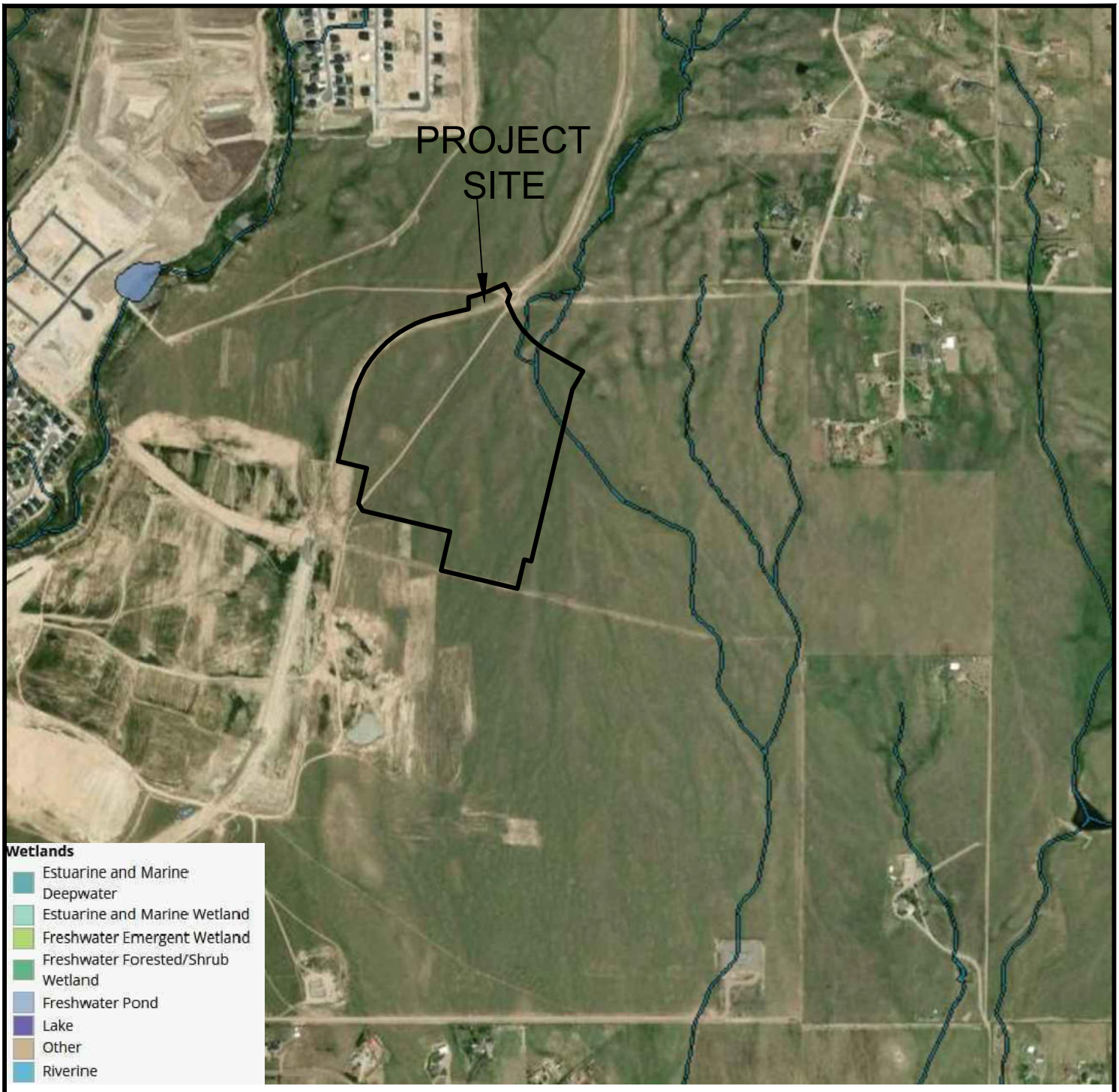
FEMA FLOODPLAIN MAP

STERLING RANCH EAST FILING NO. 6
CLASSIC SRJ

JOB NO. 241419

FIG. 7



N

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USFWS WETLANDS MAP

STERLING RANCH EAST FILING NO. 6
CLASSIC SRJ

JOB NO.
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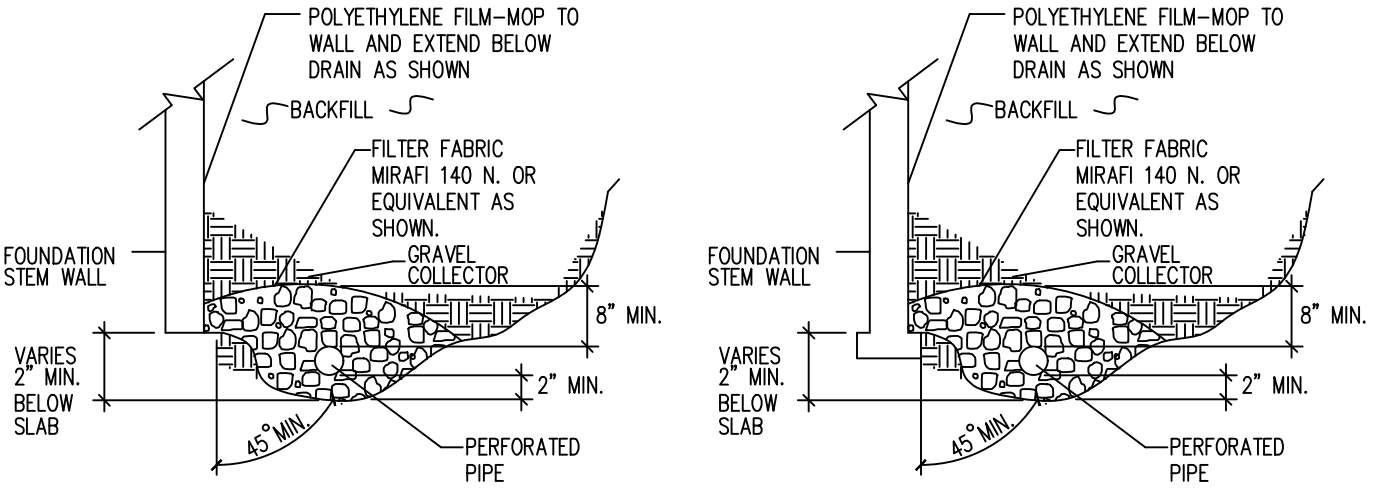
FIG. 8



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.

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PERIMETER DRAIN DETAIL

STERLING RANCH EAST FILING NO. 6
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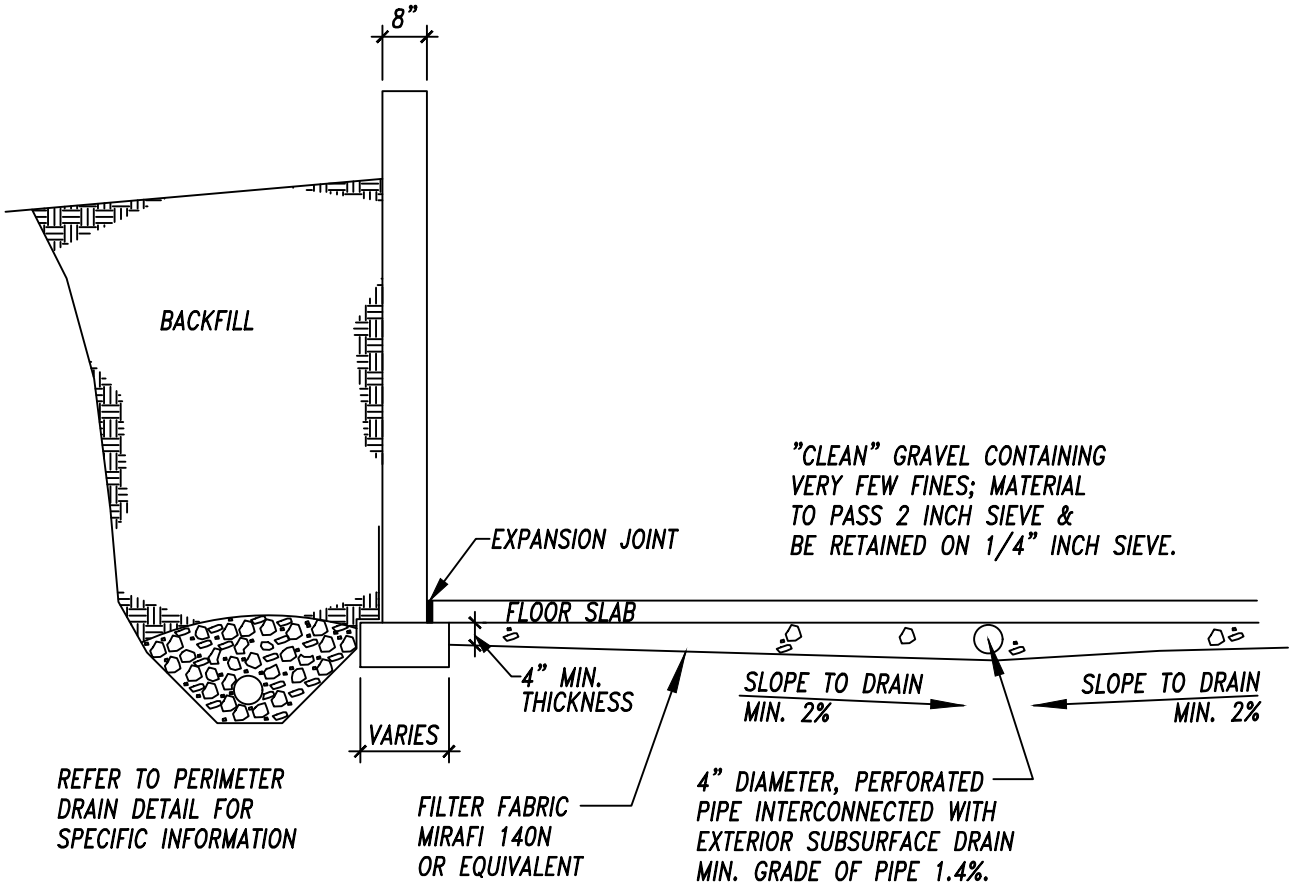
FIG. 9



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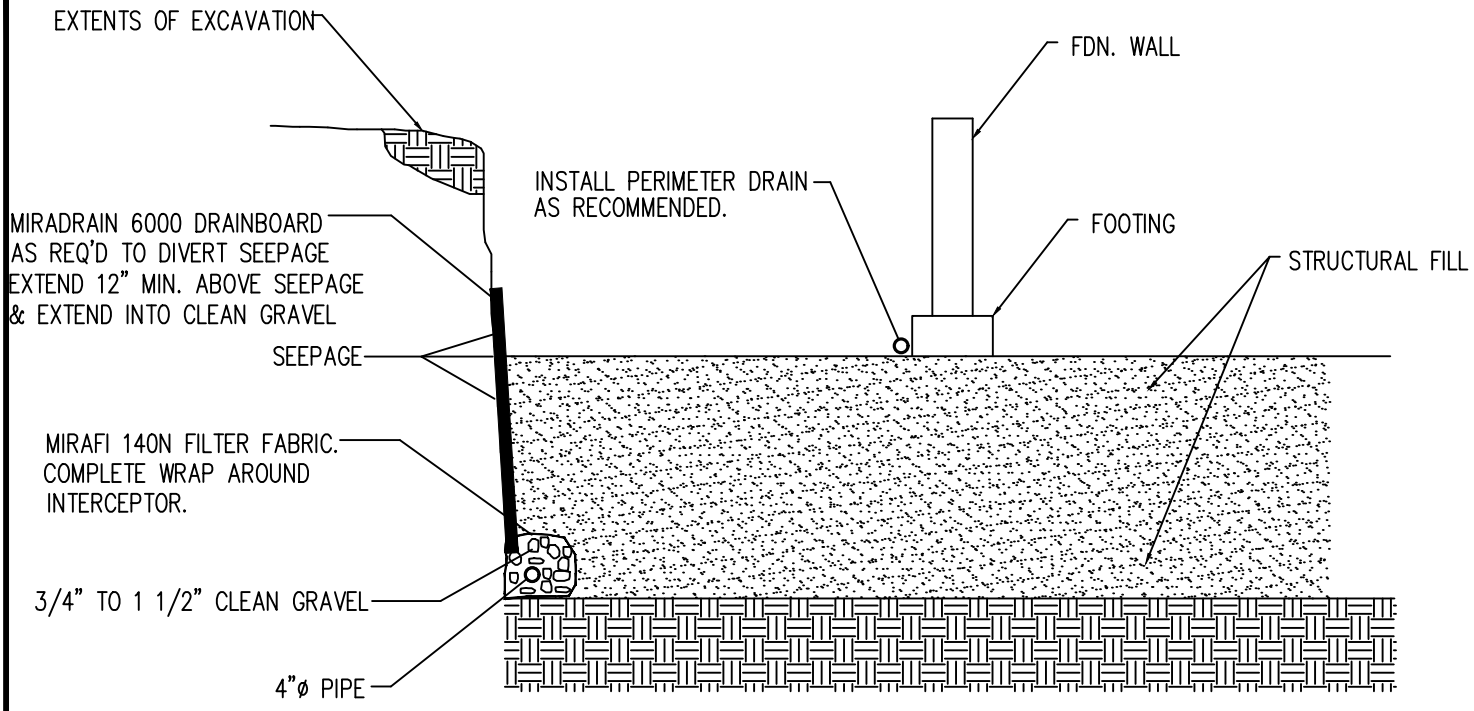
TYP. UNDERSLAB DRAINAGE LAYER (CAPILLARY BREAK)

STERLING RANCH EAST FILING NO. 6

CLASSIC SRJ

JOB NO. 241419

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.

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INTERCEPTOR DRAIN DETAIL

STERLING RANCH EAST FILING NO. 6
CLASSIC SRJ

JOB NO.
241419

FIG. 11

APPENDIX A: Site Photographs

1

Looking southwest from the northwestern portion of the site.

September 12, 2024

2

Looking east from the northwestern portion of the site.

September 12, 2024

Job No. 241419

3

Looking north from the central portion of the site.

September 12, 2024

4

Looking northwest from the central portion of the site.

September 12, 2024

Job No. 241419

APPENDIX B: Test Boring Logs

TABLE B-1

DEPTH TO GROUNDWATER & BEDROCK

TEST BORING	DEPTH TO GROUNDWATER (ft.)	DEPTH TO BEDROCK (ft.)
1	17.5	14
2	>20	13
3	>20	13
4	>20	19
5	18	>20

TEST BORING 1
DATE DRILLED 9/5/2024

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 17.5', 9/6/24						
6" TOPSOIL						
SAND, SILTY, BROWN to OLIVE, MEDIUM DENSE to DENSE, DRY to MOIST				22	2.7	1
	5			31	5.5	1
	10			25	8.9	1
SANDSTONE, EXTREMELY WEAK, GREEN-GRAY, COMPLETELY WEATHERED (SAND, CLAYEY, VERY DENSE, MOIST) ▼	15			50	11.9	3
CLAYSTONE, EXTREMELY WEAK, GREEN-GRAY, HIGHLY WEATHERED (CLAY, WITH SAND, HARD, MOIST)	20			38	14.1	4

TEST BORING 2
DATE DRILLED 9/5/2024

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 9/3/24						
6" TOPSOIL						
SAND, SILTY, BROWN to OLIVE, MEDIUM DENSE, DRY to MOIST				26	1.7	1
	5			24	4.3	1
CLAY, SANDY, GREEN-GRAY, HARD, MOIST	10			33	17.0	2
SANDSTONE, VERY WEAK, GREEN-GRAY, HIGHLY WEATHERED (SAND, CLAYEY, VERY DENSE, MOIST)	15			50/11"	12.2	3
	20			50/10"	14.2	3

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TEST BORING LOGS

STERLING RANCH EAST, FILING NO. 6
CLASSIC SRJ

JOB NO. 241419

FIG. B-1

TEST BORING 3
DATE DRILLED 9/5/2024

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 9/3/24						
24" TOPSOIL						
SAND, SILTY, DARK BROWN to OLIVE, MEDIUM DENSE, DRY to MOIST				20	2.5	1
	5			11	3.5	1
	10			12	4.1	1
SANDSTONE, VERY WEAK, OLIVE, COMPLETELY WEATHERED (SAND, CLAYEY, VERY DENSE, MOIST)	15			50/11"	12.1	3
	20			50/10"	14.3	3

TEST BORING 4
DATE DRILLED 9/5/2024

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 9/3/24						
6" TOPSOIL						
SAND, WITH SILT, BROWN to OLIVE, MEDIUM DENSE, DRY to MOIST				21	1.5	1
	5			20	1.2	1
	10			21	3.6	1
SAND, CLAYEY, OLIVE, MEDIUM DENSE, MOIST	15			20	13.5	1
SANDSTONE, EXTREMELY WEAK, OLIVE, COMPLETELY WEATHERED (SAND, CLAYEY, VERY DENSE, MOIST)	20			50	10.7	3

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TEST BORING LOGS

STERLING RANCH EAST, FILING NO. 6
CLASSIC SRJ

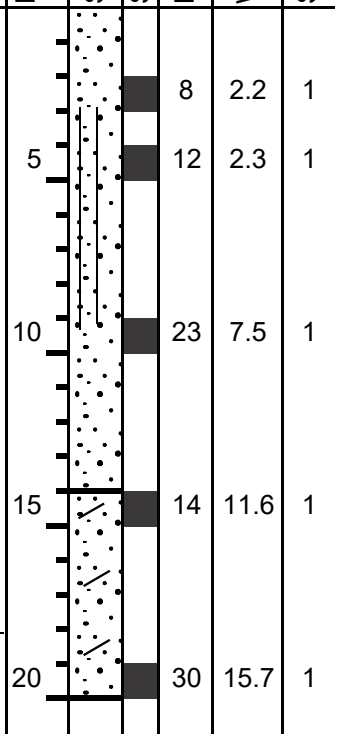
JOB NO. 241419

FIG. B-2

TEST BORING 5
DATE DRILLED 9/5/2024

REMARKS

WATER @ 18', 9/6/24



Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
12" TOPSOIL					
SAND, SLIGHTLY SILTY, BROWN to OLIVE, LOOSE to MEDIUM DENSE, MOIST			8	2.2	1
5			12	2.3	1
10			23	7.5	1
SAND, CLAYEY, OLIVE, MEDIUM DENSE to DENSE, MOIST			14	11.6	1
20			30	15.7	1

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TEST BORING LOGS

STERLING RANCH EAST, FILING NO. 6
CLASSIC SRJ

JOB NO. 241419

FIG. B-3

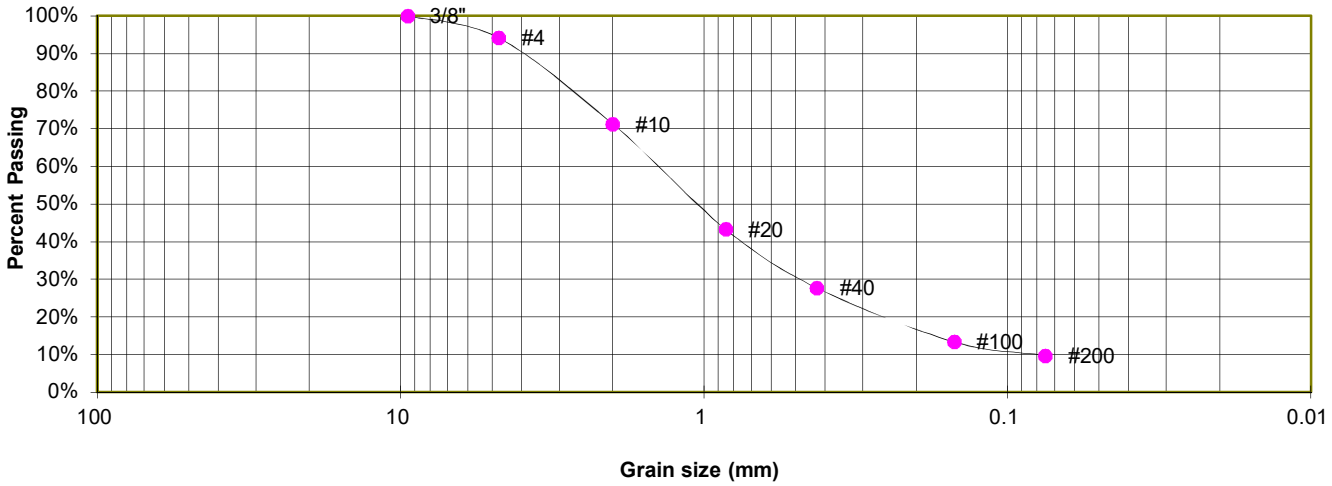
APPENDIX C: Laboratory Testing Results

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	SULFATE (WT %)	SWELL/ CONSOL (%)	USCS	SOIL DESCRIPTION
1	4	5			9.7				0.00		SW-SM	SAND, WITH SILT
1	5	2-3			4.8						SW	SAND, SLIGHTLY SILTY
2	2	10	10.3	124.2	57.8	37	24	13	<0.01	-0.8	CL	CLAY, SANDY
3	3	15			13.9	NV	NP	NP	<0.01		SM	SANDSTONE (SAND, SILTY)
4	1	20			83.8	34	22	12	<0.01		CL	CLAYSTONE (CLAY, WITH SAND)

Project: Sterling Ranch East, Filing No. 6
Client: Classic SRJ
Job No: 241419

TEST BORING	4	SOIL DESCRIPTION	SAND, WITH SILT
DEPTH (FT)	5	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.1%
10	71.3%
20	43.3%
40	27.7%
100	13.4%
200	9.7%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW-SM

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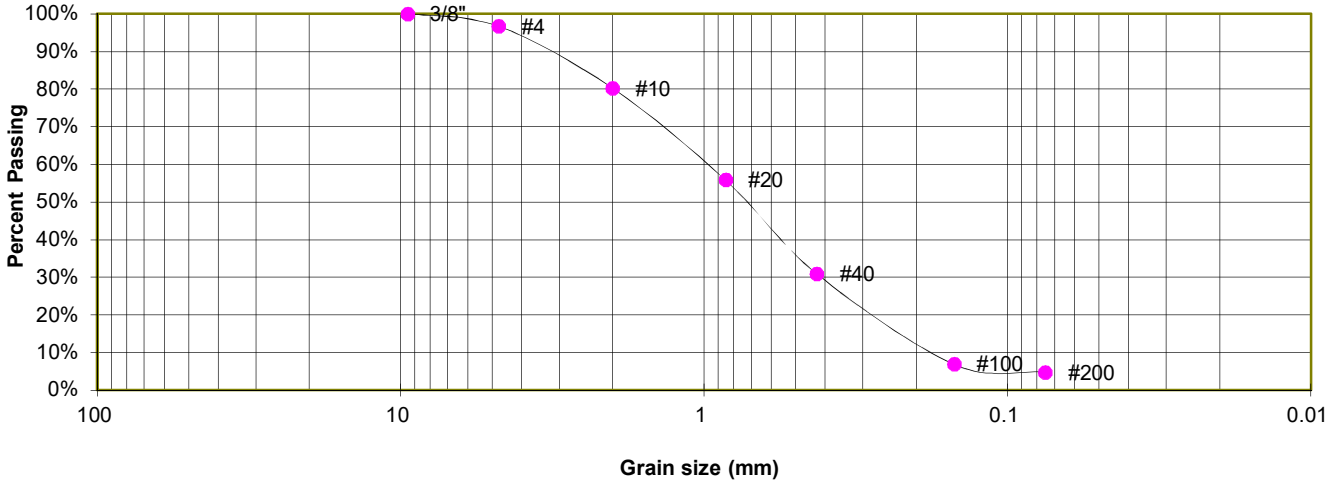
LABORATORY TEST RESULTS

STERLING RANCH EAST, FILING NO. 6
CLASSIC SRJ

JOB NO. 241419

FIG. C-1

TEST BORING	5	SOIL DESCRIPTION	SAND, SLIGHTLY SILTY
DEPTH (FT)	2-3	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.7%
10	80.2%
20	55.8%
40	30.9%
100	6.9%
200	4.8%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW

ENTECH ENGINEERING, INC.

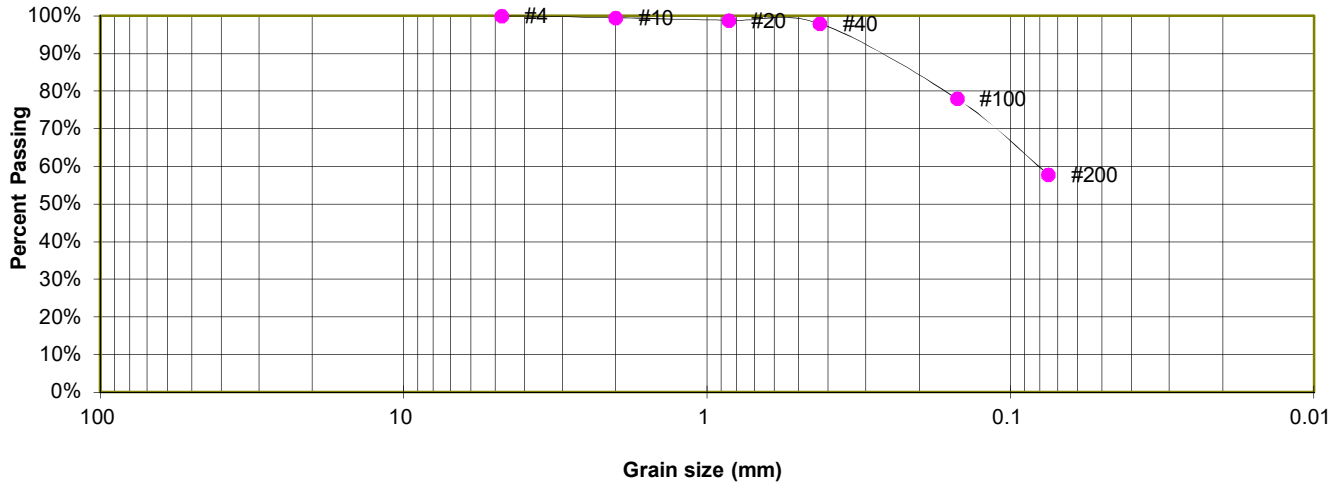
LABORATORY TEST RESULTS

STERLING RANCH EAST, FILING NO. 6
CLASSIC SRJ

JOB NO. 241419

FIG. C-2

TEST BORING	2	SOIL DESCRIPTION	CLAY, SANDY
DEPTH (FT)	10	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.5%
20	98.8%
40	97.9%
100	78.0%
200	57.8%

ATTERBERG LIMITS

Plastic Limit	24
Liquid Limit	37
Plastic Index	13

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL

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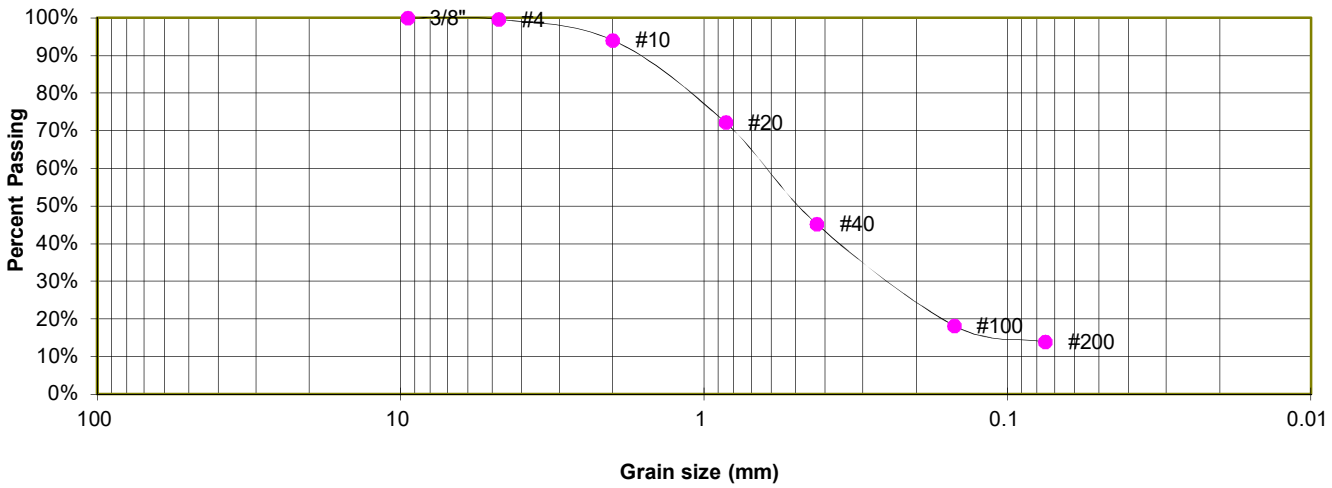
LABORATORY TEST RESULTS

STERLING RANCH EAST, FILING NO. 6
CLASSIC SRJ

JOB NO. 241419

FIG. C-3

TEST BORING	3	SOIL DESCRIPTION	SANDSTONE (SAND, SILTY)
DEPTH (FT)	15	SOIL TYPE	3



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.7%
10	94.1%
20	72.2%
40	45.2%
100	18.2%
200	13.9%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

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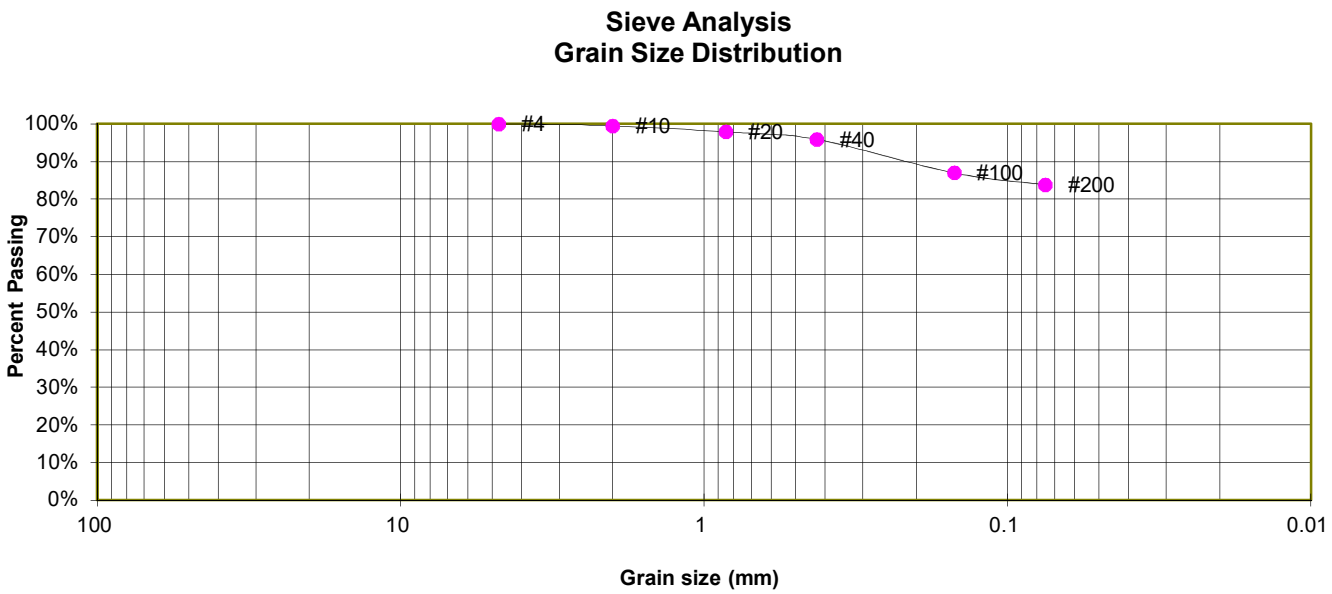
LABORATORY TEST RESULTS

STERLING RANCH EAST, FILING NO. 6
CLASSIC SRJ

JOB NO. 241419

FIG. C-4

TEST BORING	1	SOIL DESCRIPTION	CLAYSTONE (CLAY, WITH SAND)
DEPTH (FT)	20	SOIL TYPE	4



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.5%
20	97.9%
40	95.9%
100	87.0%
200	83.8%

ATTERBERG LIMITS

Plastic Limit	22
Liquid Limit	34
Plastic Index	12

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL

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LABORATORY TEST RESULTS

STERLING RANCH EAST, FILING NO. 6
CLASSIC SRJ

JOB NO. 241419

FIG. C-5

TEST BORING	2	SOIL DESCRIPTION	CLAY, SANDY
DEPTH (FT)	10	SOIL TYPE	2

SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 124
NATURAL MOISTURE CONTENT: 10.3%
SWELL/COLLAPSE (%): -0.8%

ENTECH ENGINEERING, INC.

SWELL TEST RESULTS

STERLING RANCH EAST, FILING NO. 6
CLASSIC SRJ

JOB NO. 241419

FIG. C-6

APPENDIX D: Soil Survey Descriptions

El Paso County Area, Colorado

19—Columbine gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367p
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Flood plains, fan terraces, fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam
C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very 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: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent

Landform: Swales
Hydric soil rating: Yes

Other soils
Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

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

El Paso County Area, Colorado

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

Map Unit Setting

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

Map Unit Composition

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

Description of Pring

Setting

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

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

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

Minor Components

Pleasant

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

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

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