



ENTECH
ENGINEERING, INC.

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

**SOIL, GEOLOGY, GEOLOGIC HAZARD STUDY
FLYING HORSE NORTH
SKETCH PLAN
EL PASO COUNTY, COLORADO**

Prepared for

Flying Horse Development, LLC
2138 Flying Horse Club Drive
Colorado Springs, Colorado 80921

Attn: Drew Balsick


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Respectfully Submitted,
ENTECH ENGINEERING, INC.


Logan L. Langford, P.G.
Geologist



Reviewed by:


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

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**SOIL, GEOLOGY, GEOLOGIC HAZARD STUDY,
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1.0 SUMMARY

Project Location

The project consists of Section 36, Township 11 South, Range 66 West and portions of Sections 30 and 31, Township 11 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 4 miles southeast of Monument, Colorado.

Project Description

Total acreage involved in the Flying Horse North Sketch Plan project is 912.5 acres. The proposed site development consists of single-family residential estate lots, low to high density lots, commercial golf club, hotel, fitness center, potential fire station, detention ponds, open space, parks and trail system. A total of 1,571 units are proposed. The development will utilize Cherokee Water and Sanitation will provide water and sewer.

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 constraints on development and land use. These include areas of seasonal and potentially seasonal shallow groundwater areas, drainage areas, areas of ponded water, floodplain, erosion, artificial fill, expansive soils, and areas of downslope creep. 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.

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.

2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site consists of Section 36, Township 11 South, Range 66 West and portions of Sections 30 and 31, Township 11 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 4 miles southwest of Monument, Colorado, at the east end of Stagecoach Road between Highway 83 and Black Forest Road. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site varies from gently to moderately sloping generally to the northeast and southwest off a ridge line that bisects the site with some steeper slopes along drainages in the western portion of the site. The ridge line that bisects the site is associated with the Palmer Divide. The drainages on site flow in westerly and northerly directions through the property. No water was observed flowing in these the drainages at the time of this investigation, however, areas of ponded water were observed behind several earthen dams. The site boundaries are indicated on the USGS Map, Figure 2. Previous land uses have included grazing and pasture land. Flying Horse North Filing No. 1 has been mostly developed and the golf course has been completed. The site contains primarily field grasses and weeds in the eastern portions of the site with areas of ponderosa pine tree coverage in the western portions of the site. Site photographs are included in Appendix A. The locations and directions of the photographs are indicated in Figure 3.

Total acreage involved in Flying Horse North Sketch Plan is 912.5 acres. Single-family residential estate lots, low to high density lots, commercial golf club, hotel, fitness center, potential fire station, detention ponds, open space, parks and trail system. The area will be serviced by Cherokee Water and Sanitation. The proposed Sketch Plan prepared by HRGreen is presented in Figure 4.

The site was previously investigated as a part of a Soil, Geology, Geologic Hazard and Wastewater Study by Entech Engineering, Inc., February 26, 2015 (Reference 1), and a Soil, Geology, Geologic Hazard and Wastewater Study by Entech Engineering, Inc., February 22, 2016 (Reference 2). Information from these reports were also used in evaluating the site.

3.0 SCOPE OF THE REPORT

The scope of the report will include a general geologic analysis utilizing published geologic data. Detailed site-specific mapping will be conducted to obtain general information in respect to major geographic and geologic features, geologic descriptions and their effects on the development of the property in accordance with El Paso Land Development Code.

4.0 FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of any bedrock features and significant surficial deposits. The Natural Resource Conservation Service (NRCS), previously the Soil Conservation Service (SCS) survey was also reviewed to evaluate the site. The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved both field reconnaissance and measurements and air photo reconnaissance and interpretation. The same mapping procedures have also been utilized to produce the Engineering Geology Map which identified pertinent geologic conditions affecting development. The field mapping was initially performed by personnel of Entech Engineering, Inc. on November 21 and December 2, 2014. Field mapping was updated by Entech Engineering, Inc., on October 31 and November 3, 2017. The site was revisited on February 24, 2022. Site photographs are included in Appendix A.

Six (6) test borings were drilled and eighteen (18) test pits excavated across the site to determine the soils classification and engineering characteristics. The borings were drilled to depths of 20 feet using a truck-mounted, continuous flight auger drilling rig supplied and operated by Entech Engineering, Inc., and the test pits were excavated to depths ranging from 3 to 8 feet.

The original field investigation consisted of fourteen (14) profile holes to determine general suitability of the site for construction. The location of the profile holes indicated on the Site Map/Testing Location Map, Figure 3. Additionally, fourteen (14) profile holes were performed on the entire Flying Horse North property in previous studies.

The locations of the Test Borings, Test Pits, and Test Pit Logs, and Profile Borings are indicated on the Development Plan/Test Location Map, Figure 3. The Test Boring Logs, Test Pit Logs, Laboratory Test Results, and Profile Hole Logs are presented in Appendices B, C, and D, respectively. Results of the testing will be discussed later in this report.

Laboratory testing was performed on the soils to classify and determine the soils engineering characteristics. Laboratory tests included moisture content testing, ASTM D-2216, grain-size analysis, ASTM D-422, and Atterberg Limits, ASTM D-4318. Swell testing included both FHA Swell Tests and Swell/Consolidation Tests. Results of the laboratory testing are included in Appendices C, and D. Summaries of Laboratory Test Results are presented in Tables 1, 2, and 3.

5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY

5.1 General Geology

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province. Approximately 10 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 northerly direction (Reference 3). The rocks in the area of the site are sedimentary in nature, and typically Tertiary to Cretaceous in age. The bedrock underlying the site consists of the Dawson Arkose Formation. Overlying this formation are unconsolidated deposits of residual, colluvial, man-made, and alluvial soils of the Quaternary Age. The residual soils are produced by the in-situ action of weathering of the bedrock on site. Some colluvial soils exist which are deposited by gravity and sheetwash. The alluvial soils were deposited by water in the drainages

on site. Man-made soils exist as earthen dams and erosion berms. 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 4), previously the Soil Conservation Service (Reference 5) has mapped five soil types on the site (Figure 5). In general, they vary from sandy loam to loam and sandy loam with subsoils of clay loam. The soils are described as follows:

<u>Type</u>	<u>Description</u>
14	Brussett loam, 1-3% slopes
26	Elbeth sandy loam, 8-15% slopes
66	Peyton sandy loam, 1-5% slopes
67	Peyton sandy loam, 5-9% slopes
68	Peyton-Pring complex, 3-8% slopes

Complete descriptions of each soil type are presented in Appendix E. The soils have generally been described to have moderate to rapid permeabilities. Limitations on development include, limited ability to support a load, shrink swell potential, slopes and frost action potential.

Possible hazards with soil erosion are present on the site. The erosion potential can be controlled with vegetation. The majority of the soils have been described to have moderate erosion hazards.

5.3 Site Stratigraphy

The Black Forest Quadrangle Geology Map showing the site is presented in Figure 6 (Reference 6). The Geology Map prepared for the site is presented in Figure 7. Three mappable units were identified on this site which are described as follows:

Qaf Artificial Fill of Quaternary Age: These are man-made fill deposits associated with erosion berms and earthen dams on-site. Additionally, temporary stockpiles were observed on the site. Other areas of fill may exist on the site other than those mapped due to on-going construction.

- Qal Recent Alluvium of Quaternary Age:** These are recent stream deposits associated with the drainages on-site. These materials generally consist of silty to clayey sands and may contain clay lenses. Highly organic soils may be encountered in some of these areas.
- 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 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. Areas of colluvial soils may exist on some of the slopes on site. These materials are derived from the bedrock materials and have been re-deposited by the action of sheetwash and gravity.

The soils listed above were mapped from site-specific mapping, the *Geologic Map of the Black Forest Quadrangle* distributed by the Colorado Geological Survey in 2003 (References 6), the *Geologic Map of the Colorado Springs-Castle Rock Area*, distributed by the US Geological Survey in 1979 (Reference 8), and the *Geologic Map of the Denver 1° x 2° Quadrangle*, distributed by the US Geological Survey in 1981 (Reference 9). The Test Borings and Test Pit Logs used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 7.

5.4 Soil Conditions

The soils encountered in the six test borings drilled on the site can be grouped into three general soil and rock types. The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1 is a silty to slightly silty sand and very clayey sand (SM, SM-SW, SC), encountered in all of the test borings at depths ranging from the existing ground surface to 8 feet bgs and extending to depths ranging from 1 foot to the termination of the borings (20 feet). This material is associated with colluvial soils and residual soils of the Dawson Sandstone. These materials were encountered at medium dense to dense states and at moist conditions. Samples tested had 12 to 47 percent of the soil size particles passing the No. 200 Sieve. Atterberg limits testing resulted in non-plastic results. A swell pressure of 150 psf was measured in the FHA Swell Test, indicating low expansion potential.

Soil Type 2 is a sandy to very sandy clay (CL), encountered in two of the test borings at depths ranging from the existing ground surface to 3 feet bgs and extending to depths ranging from 4 to 8 feet. These materials were encountered at stiff to very stiff consistencies and at moist conditions. Samples tested had 52 to 83 percent of the soil size particles passing the No. 200 Sieve. Atterberg limits testing resulted in a liquid limit of 38 and a plastic index of 21. FHA Swell Testing resulted in expansion pressures of 270 and 930 psf, indicating a low expansion potential. Expansive clays are common in the area.

Soil Type 3 consists of silty to clayey sandstone (SM, SC). This material is associated with formational Dawson Sandstone. This material was encountered in four of the test borings at depths ranging from 1 to 18 feet bgs and extending to the termination of the borings (20 feet). The sandstone was encountered at very dense states and at moist conditions. The samples tested had 9 to 20 percent of the soil size particles passing the No. 200 sieve. Atterberg limits testing resulted in non-plastic results. The silty sandstone typically exhibits low expansive potential, however, expansive claystone and siltstone are common in the area.

The soils encountered in the profile holes of the percolation tests performed as a part of the original Soil, Geology, Geologic Hazard and Wastewater Study for the entire Flying Horse North Subdivision by Entech Engineering, Inc. (References 1 and 2) consisted of silty sands and sandy to very sandy clays overlying silty sandstone. The silty sands and sandstone exhibited low expansion potential. The clays were encountered in nine of the fourteen profile holes at depths ranging from the existing ground surface to 14 feet and extending to depths ranging from one foot to the termination of the borings (15 feet). A FHA Swell pressure of 1485 psf was measured on the clays. Swell/Consolidation Tests resulted in volume changes ranging from 0.3 to 2.7 percent. These results indicate the clays exhibit low to high expansion potential.

The Test Boring Logs and Laboratory Test results as a part of this investigation are included in Appendix B and summarized in Table 1. The Profile Holes and Laboratory Test Results from References 1 and 2 are included in Appendix D.

5.5 Groundwater

Groundwater was not encountered in any of the test borings which were drilled to 15 to 20 feet. Areas of seasonal, potentially seasonal shallow groundwater, and ponded water have been mapped in the drainages on-site. These areas are discussed in the following section. Fluctuation

in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time.

It should be noted that in the sandy materials on site, some groundwater conditions might be encountered due to the variability in the soil profile. Isolated sand and gravel layers within the soils, sometimes only a few feet in thickness and width, can carry water in the subsurface. Groundwater may also flow on top of the underlying bedrock or clays. Builders and planners should be cognizant of the potential for the occurrence of such subsurface water features during construction on-site and deal with each individual problem as necessary at the time of construction.

6.0 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

As mentioned previously, detailed mapping has been performed on this site to produce an Engineering Geology Map (Figure 7). 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 earthen dams and erosion berms on-site. Additionally, temporary stockpiles were observed on the site.

Mitigation: The earthen dams lie within defined drainages and should be avoided as building sites. Some dams are to be removed or reconstructed as a part of detention ponds. The erosion berms can either be avoided or penetrated by foundations. It is anticipated the temporary stockpiles would be removed prior to construction. The fill on this site is considered uncontrolled for construction purposes. 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.

Areas of Erosion – Constraint

These are areas that are undergoing erosion by water and sheetwash producing gullies and rill erosion.

Mitigation: Due to the nature of the soils on this site, virtually all the soils are subject to erosion by wind and water. Other minor areas of erosion were observed on site other than those mapped, particularly where some rill erosion has occurred. Areas of erosion can occur across the entire site, particularly if the soils are disturbed during construction. Vegetation reduces the potential for erosion. The areas identified where erosion is actually taking place may require check dams, regrading and revegetation using channel lining mats to anchor vegetation. Further recommendations for erosion control are discussed under Section 9.0 "Erosion Control" of this report. Recommendations pertaining to revegetation may require input from a qualified landscape architect and/or the Natural Resource Conservation Service (previously Soil Conservation Service).

Expansive Soils – Constraint

The site is classified in an area of low to moderate swell potential according to *the Map of Potentially Swelling Soil and Rock in the Front Range Urban Corridor, Colorado* by Hart, 1974 (Reference 10). Expansive soils were encountered in some of the profile holes drilled on the site as a part of the entire Flying Horse North Subdivision (References 1 and 2). These occurrences are typically sporadic; therefore, none have been indicated on the maps. These clays, if encountered beneath foundations, can cause differential movement in the structure foundation. These occurrences should be identified and dealt with on an individual basis.

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. Another alternative in areas of highly expansive soils is the use of drilled pier foundation systems. Typical minimum pier depths are on the order of 25 feet or more and require penetration into the bedrock material a minimum of 4 to 6 feet, depending upon building loads. 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.

Seasonal Shallow Groundwater Area – Constraint

In these areas, we would anticipate periodic high subsurface moisture conditions and frost heave potential on a seasonal basis. Additional, highly organic soils could be encountered in these areas. These areas lie within defined drainages and it is anticipated they will be avoided by development. Any structures in or adjacent to these areas should follow the mitigation discussed below.

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 7. Any grading in these areas should be done to direct surface flow around construction to avoid areas of ponded water. Structures should not block drainages. All organic material should be completely removed prior to any fill placement. Septic fields should not be located in areas where there is the potential for shallow groundwater. The area of the site located in Filing No. 1 does not lie within any floodplain zones according to the FEMA Map Nos. 08041CO305G, and 08041CO315G, dated December 7, 2018 (Figure 9, Reference 11). A floodplain is mapped in the extreme northwestern portion of the site. A detention pond is proposed in this area which will be located in an open space. Exact locations of floodplain and specific drainage studies are beyond the scope of this report. Finished floor levels must be located a minimum of one foot above floodplain levels.

Potentially 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. The majority of these areas lie within defined drainages which can likely be avoided by the proposed development. The same mitigation recommendations for the seasonal shallow groundwater areas apply to the potentially seasonal shallow groundwater areas.

Areas of Ponded Water – Constraint

These are areas of standing water behind earth dams on site. We would not expect development in these areas. Either the dams can be avoided by construction or the areas may be completely regraded. Should complete regrading of the site be considered, all organic matter and soft, wet soils should be completely removed before filling. Any drainage into these areas should be rerouted in a non-erosive manner off of the site where it does not create areas of ponded water around proposed structures.

Downslope Creep Areas – Constraint

These areas are acceptable as building sites, however, in areas identified with this hazard classification, we would anticipate accelerated lateral and vertical movement of the near surface soils in the downslope direction.

Mitigation: The design of foundations in these areas should account for the additional pressure on the uphill side of the structure due to the creep potential. The lateral pressure distribution for sloping conditions in downslope creep area is presented in Figure 9. Tie-beams, buttresses and counterforts may be necessary in some areas. Where possible, in areas of downslope creep, structures should be designed to be as compact and rigid as possible. This will help them better tolerate the vertical and lateral movements to which the foundation system may be subjected with minimal damage. Long, rambling, irregular structures should be avoided, as they are associated with much greater potential for damaging differential movement. Additionally, structures should be designed to step up the slope. Deep cuts in these areas should be avoided. Any retaining walls proposed in these areas should also be properly designed for by a qualified professional engineer for the global slope stability. Proper control of drainage at both the surface and subsurface is important. Saturation of materials should be avoided that may create unstable conditions.

6.1 Relevance of Geologic Conditions to Land Use Planning

As mentioned earlier in this report, we understand that the development will be primarily residential with some commercial parcels. It is our opinion that the existing geologic and engineering geologic conditions will impose some constraints on the proposed development and construction. The most significant problems affecting development will be those associated with

the drainages on site that can be avoided. Other hazards on site may be satisfactorily mitigated through proper engineering design and construction practices.

The upper residual soils are typically at medium to very dense states. The granular soils encountered in the upper soil profiles of the test borings should provide good support for foundations. Expansive soils were encountered on portions of the site that will require mitigation. Foundations anticipated for the site are standard spread footings possibly in conjunction with overexcavation in areas of expansive soils. Areas containing arkosic sandstone will have high allowable bearing conditions. Difficult excavation should be anticipated in areas of shallow bedrock. Expansive layers may also 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.

Areas of seasonal and potentially seasonal high groundwater areas and ponded water were encountered on site. Due to the size of the lots and the proposed development, these areas can be avoided by construction. Absorption fields are not recommended in these areas. Structures should not block drainages. Drains may be necessary for structures adjacent to these areas to help prevent the intrusion of water into areas below grade. Typical drain details are presented in Figure 7. Portions of the site do lie within floodplain zones according to FEMA Map Nos. 08041CO305G, and 08041CO315G, dated December 7, 2018 (Figure 9, Reference 11). A floodplain is mapped in the extreme northwestern portion of the site. A detention pond is proposed in this area which will be located in an open space. Exact locations of floodplain and specific drainage studies are beyond the scope of this report.

Areas of fill were observed on site associated with dams and erosion control berms. It is anticipated the dams could be avoided by development. The erosion berms can be avoided or penetrated by foundations. Any uncontrolled fill encountered beneath foundations should be removed and recompact at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557.

Areas of erosion and gulying may require the construction of check dams and revegetation if construction encroaches on these areas. General recommendations for erosion control are discussed under Section 9.0 "Erosion Control".

Areas of downslope creep areas have been identified on this site. In areas of downslope creep, structures should be designed to be as compact and rigid as possible. Foundations may require tie-beams or additional reinforcement in these areas. Foundations should be designed to step up the slopes to avoid deep cuts. Deep cuts should be avoided on all steeper sloping areas of the site. Any retaining walls proposed should be designed for the global slope stability by a qualified professional engineer. This includes cuts made for terracing in backyards. Proper control of drainage at both the surface and subsurface is important. Saturation of materials should be avoided that may create unstable conditions.

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

7.0 ROADWAY AND EMBANKMENT CONSTRUCTION RECOMMENDATIONS

In general, the site soils are suitable for the proposed roadways and embankments. Groundwater should be expected to be encountered in deeper cuts and along 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% 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 $\pm 2\%$ 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.

8.0 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 12), portions of the area are mapped as stream terrace and floodplain deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 13), areas of the site are not mapped with any resources. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 14), the area of the site has been mapped as “Little or No Potential” for industrial minerals. It is possible sand materials on site could be an aggregate resource. However, considering the silty to clayey nature of much of these materials and abundance of similar materials through the region and the close proximity to developed land, they would be considered to have little significance as an economic resource.

According to the *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 14), 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 14).

The site has been mapped as “Fair” for oil and gas resources (Reference 14). 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.

9.0 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.

10.0 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 avoided by construction. Others can be mitigated through proper engineering design and construction practices. The proposed development and use is consistent with anticipated geologic and engineering geologic conditions.

It should be pointed out that because of the nature of data obtained by random sampling of such variable and non-homogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Individual investigations for building sites and 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 Flying Horse Development, 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.

BIBLIOGRAPHY

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TABLES

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

CLIENT FLYING HORSE DEV.
PROJECT FLYING HORSE NORTH, F-2
JOB NO. 220404

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	2-3			20.0	NV	NP	0.01			SM	SAND, SILTY
1	5	2-3			11.6						SM-SW	SAND, SLIGHTLY SILTY
1	6	15			47.3						SC	SAND, VERY CLAYEY
2	3	5			82.8	38	21	<0.01	930		CL	CLAY, SANDY
2	6	2-3			52.1				270		CL	CLAY, VERY SANDY
3	5	20			16.7						SM	SANDSTONE, SILTY
3	6	20			9.1						SM-SW	SANDSTONE, SLIGHTLY SILTY
3	2	5			18.8	NV	NP	<0.01			SM	SANDSTONE, SILTY
3	4	10			20.0						SM	SANDSTONE, SILTY

TABLE 2
SUMMARY OF LABORATORY TEST RESULTS FROM TEST PITS

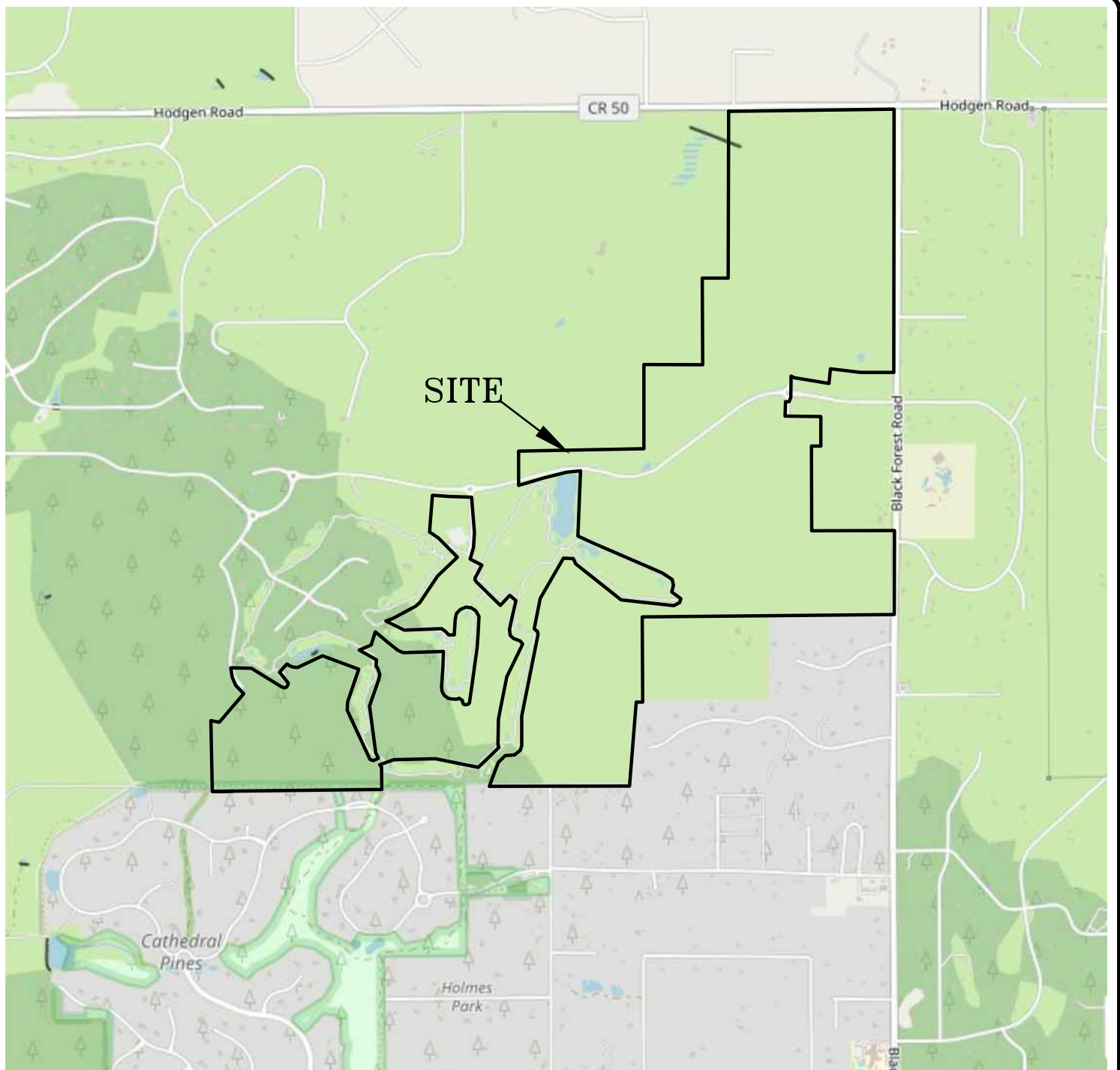
CLIENT FLYING HORSE DEVELOPMENT, LLC
PROJECT FLYING HORSE NORTH, FIL 2
JOB NO. 220404

USDA SOIL TYPE	TEST PIT NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
2	TP-1	2			41.6						SM	SANDY LOAM
2	TP-4	1			17.0						SM	SANDY LOAM
3	TP-4	5			28.1						SM	SANDY CLAY LOAM
3	TP-6	4			14.2						SM	SANDY CLAY LOAM
4	TP-2	3			68.3						CL	SANDY SILTY CLAY
4	TP-12	4			50.6						SC-CL	SANDY SILTY CLAY
4	TP-14	3			67.7						CL	SANDY SILTY CLAY
4	TP-16	2			52.5						CL	SANDY SILTY CLAY
4	TP-8	4			39.0						SC	SANDY CLAY
4	TP-10	4			44.1						SC	SANDY CLAY
4A	TP-5	3			31.8						SM	SANDSTONE, SILTY TO CLAYEY
4A	TP-7	4			16.1						SM	WEATHERED SANDSTONE, SILTY
4A	TP-7	6			15.8						SM	SANDSTONE, SILTY
4A	TP-9	6			22.6						SM	SANDSTONE, SILTY
4A	TP-18	3			50.8						SC-CL	SANDSTONE, CLAYEY

Table 3: Summary of Test Boring Results

Test Boring No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
1	>20	>20
2	1	>20
3	>20	>20
4	3	>20
5	18	>20
6	17	13

FIGURES



ENTECH
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VICINITY MAP
FLYING HORSE NORTH SKETCH PLAN
EL PASO COUNTY, CO.
FOR: FLYING HORSE DEVELOPMENT, LLC

DRAWN:
LLL

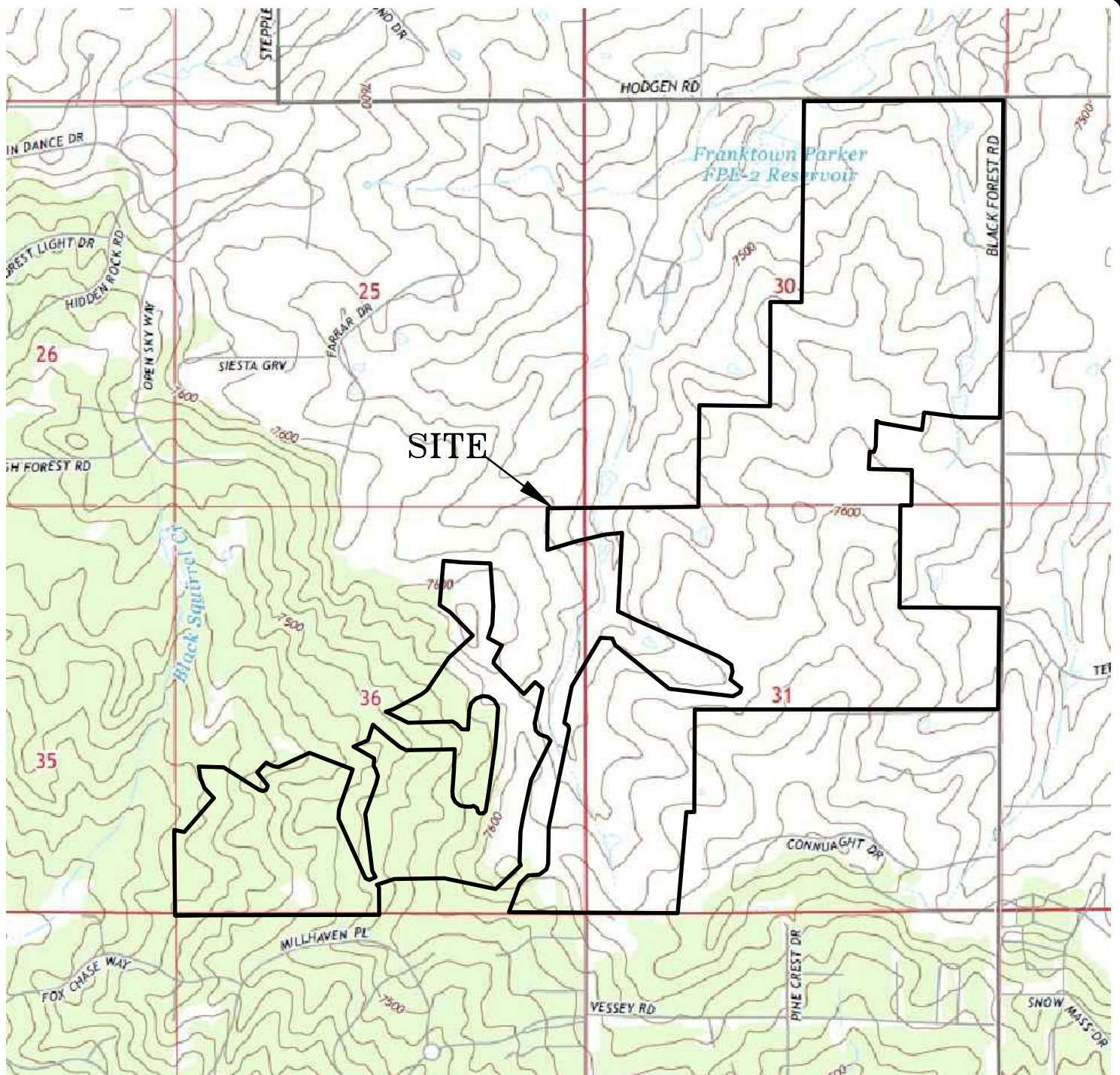
DATE:
3/7/22

CHECKED:

DATE:

JOB NO.:
220404

FIG NO.:
1



N



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COLORADO SPRINGS, CO. 80907 (719) 531-5599

USGS TOPOGRAPHY MAP
FLYING HORSE NORTH SKETCH PLAN
EL PASO COUNTY, CO.
FOR: FLYING HORSE DEVELOPMENT, LLC

DRAWN:
LLL

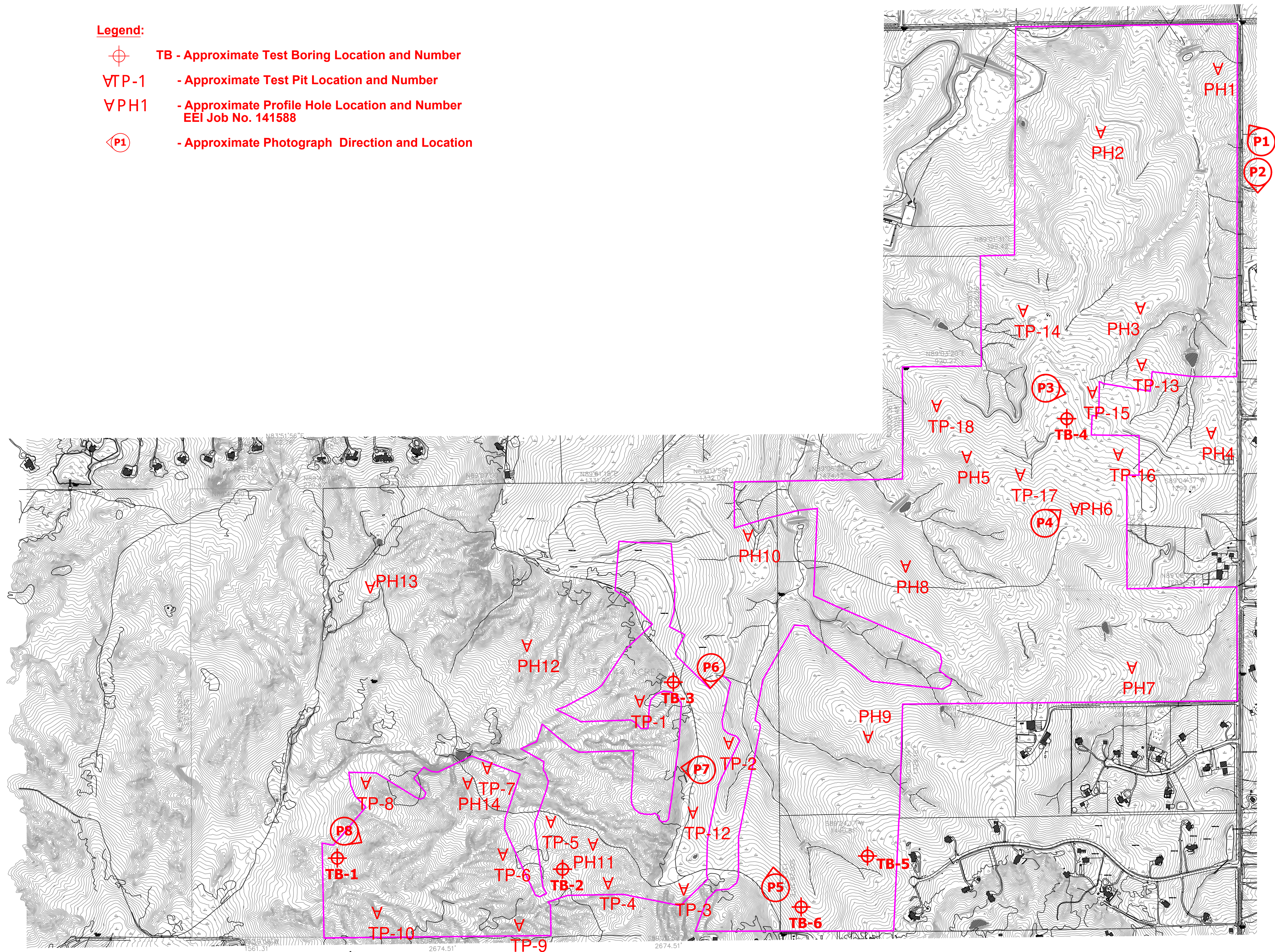
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3/7/22

CHECKED:

DATE:

JOB NO.:
220404

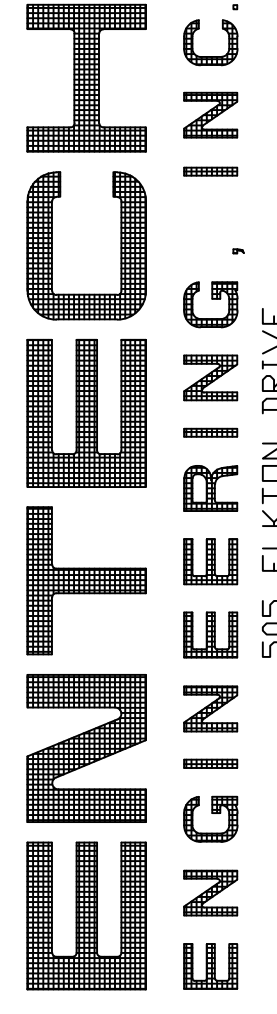
FIG NO.:
2



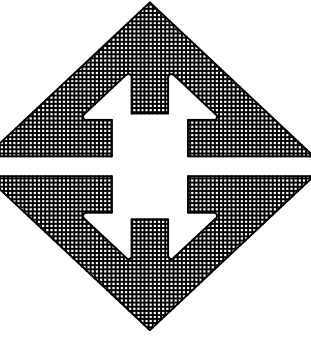
Legend:

- TB - Approximate Test Boring Location and Number
- TP - Approximate Test Pit Location and Number
- PH - Approximate Profile Hole Location and Number
EEI Job No. 141588
- P - Approximate Photograph Direction and Location

REVISION	BY



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SITE MAP/TESTING LOCATION MAP
FLYING HORSE NORTH SKETCH PLAN
EL PASO COUNTY, CO.
FOR: FLYING HORSE DEVELOPMENT, LLC

DRAWN LLL CHECKED
DATE 3/7/22
SCALE AS SHOWN
JOB NO. 220404
FIGURE No. 3

FLYING HORSE NORTH SKETCH PLAN

LEGEND

- ESTATE LOTS

LOW DENSITY

1 ACRE LOTS

MEDIUM DENSITY

HIGH DENSITY

COMMERCIAL/GOLF CLUB

HOTEL COMPLEX

CLUB

HOTEL PARKING

ROADWAY

DETENTION

SITE BOUNDARY
- SCHOOL DISTRICT LINE

FHN TRAIL

PUBLIC COUNTY TRAIL

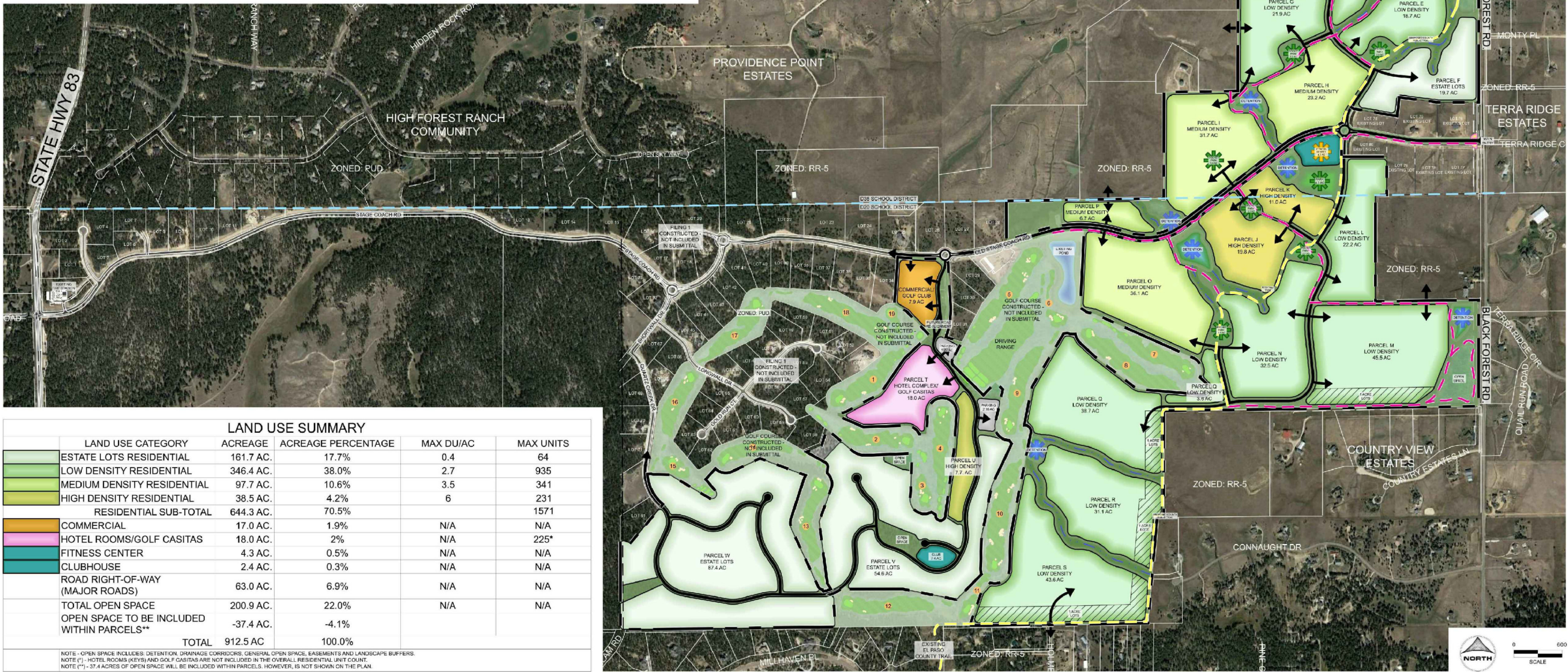
DRAINAGE WAY

PARK/POCKET PARK

FITNESS CENTER

POTENTIAL FIRE STATION

PROPOSED DETENTION



LAND USE SUMMARY				
LAND USE CATEGORY	ACREAGE	ACREAGE PERCENTAGE	MAX DU/AC	MAX UNITS
ESTATE LOTS RESIDENTIAL	161.7 AC.	17.7%	0.4	64
LOW DENSITY RESIDENTIAL	346.4 AC.	38.0%	2.7	935
MEDIUM DENSITY RESIDENTIAL	97.7 AC.	10.6%	3.5	341
HIGH DENSITY RESIDENTIAL	38.5 AC.	4.2%	6	231
RESIDENTIAL SUB-TOTAL	644.3 AC.	70.5%		1571
COMMERCIAL	17.0 AC.	1.9%	N/A	N/A
HOTEL ROOMS/GOLF CASITAS	18.0 AC.	2%	N/A	225*
FITNESS CENTER	4.3 AC.	0.5%	N/A	N/A
CLUBHOUSE	2.4 AC.	0.3%	N/A	N/A
ROAD RIGHT-OF-WAY (MAJOR ROADS)	63.0 AC.	6.9%	N/A	N/A
TOTAL OPEN SPACE	200.9 AC.	22.0%	N/A	N/A
OPEN SPACE TO BE INCLUDED WITHIN PARCELS**	-37.4 AC.	-4.1%		
TOTAL	912.5 AC	100.0%		

NOTE - OPEN SPACE INCLUDES: DETENTION, DRAINAGE CORRIDORS, GENERAL OPEN SPACE, EASEMENTS AND LANDSCAPE BUFFERS.
NOTE (*) - HOTEL ROOMS (KEYS) AND GOLF CASITAS ARE NOT INCLUDED IN THE OVERALL RESIDENTIAL UNIT COUNT.
NOTE (**) - 37.4 ACRES OF OPEN SPACE WILL BE INCLUDED WITHIN PARCELS; HOWEVER, IS NOT SHOWN ON THE PLAN.

DRAWN BY: JAG JOB DATE: 2/25/2022
APPROVED: PLS JOB NUMBER: 211030
CAD DATE: 2/25/2022
CAD FILE: J:\2021\211030\CAD\Drawings\Sketch-Plan\BUBBLE-PLAN

BAR IS ONE INCH ON OFFICIAL DRAWINGS.
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION



FLYING HORSE NORTH DEVELOPMENT, LLC.
EL PASO COUNTY, COLORADO

FLYING HORSE NORTH SKETCH PLAN
SKETCH PLAN DRAWING

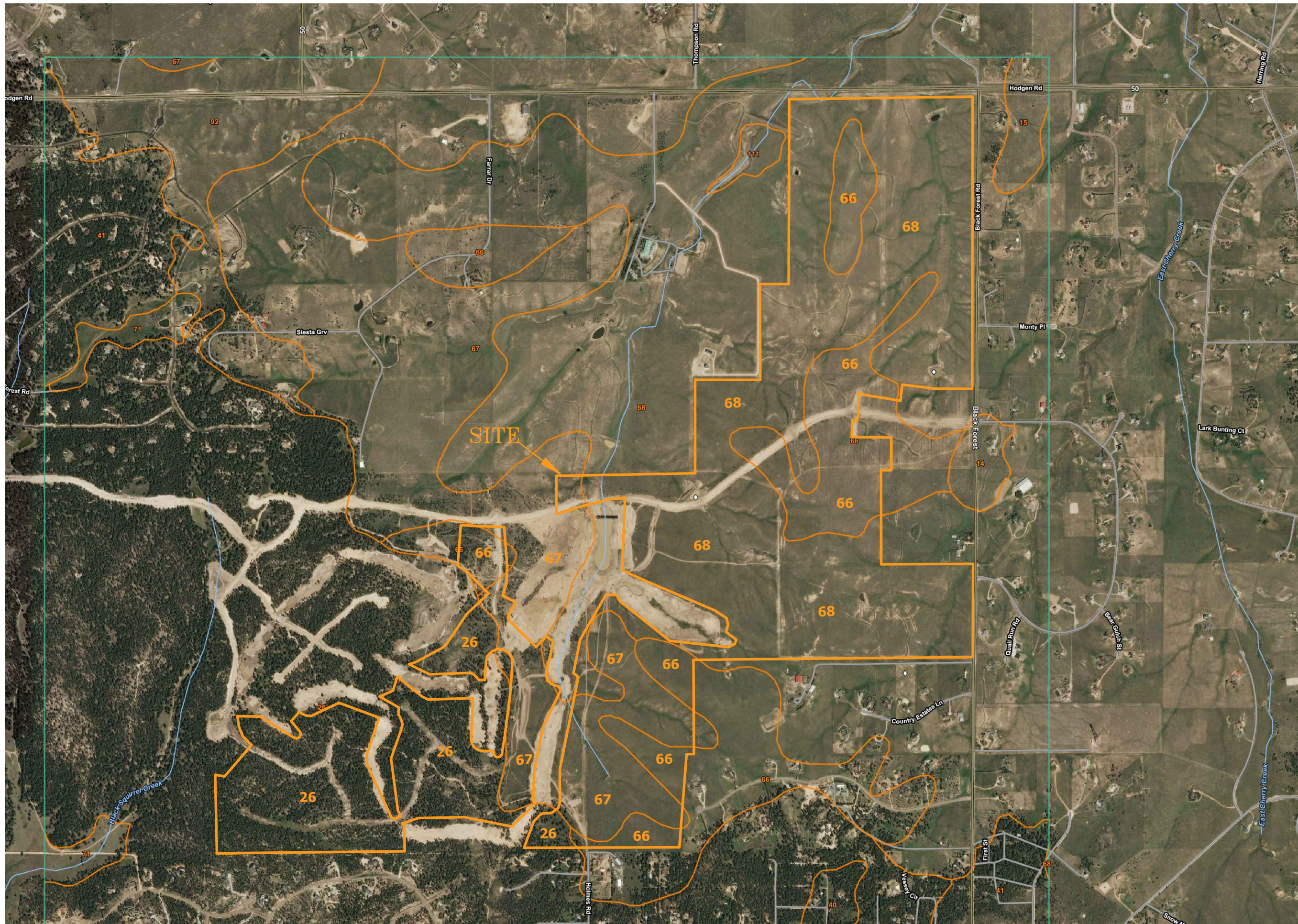
SHEET SP.2 2

REVISION	BY

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SKETCH PLAN
FLYING HORSE NORTH SKETCH PLAN
EL PASO COUNTY, CO.
FOR: FLYING HORSE DEVELOPMENT, LLC

DRAWN LLL
CHECKED
DATE 3/7/22
SCALE AS SHOWN
JOB NO. 220404
FIGURE No. 4



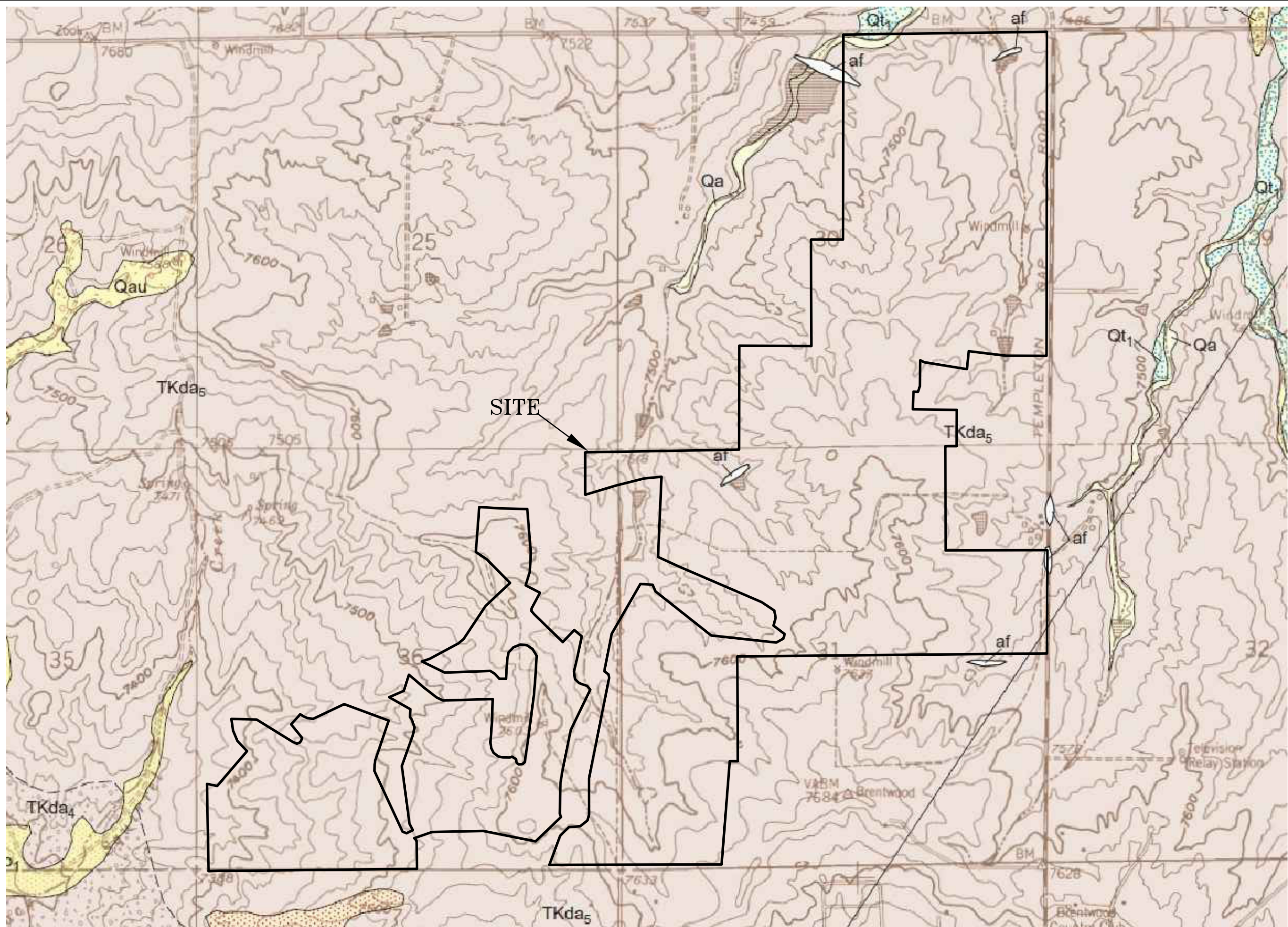
REVISION	BY




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SOIL SURVEY MAP
FLYING HORSE NORTH SKETCH PLAN
EL PASO COUNTY, CO.
FOR: FLYING HORSE DEVELOPMENT, LLC


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CHECKED
DATE 3/7/22
SCALE AS SHOWN
JOB NO. 220404
FIGURE No. 5



REVISION	BY

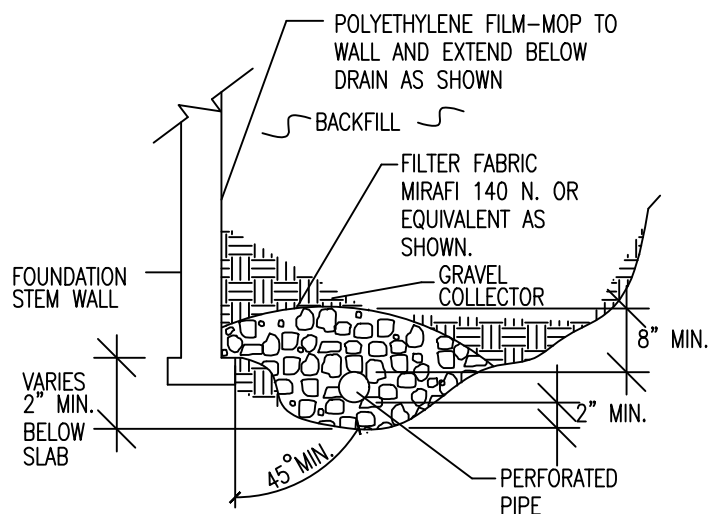


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BLACK FOREST QUADRANGLE
FLYING HORSE NORTH SKETCH PLAN
EL PASO COUNTY, CO.
FOR: FLYING HORSE DEVELOPMENT, LLC

DRAWN L.L.
CHECKED
DATE 3/7/22
SCALE AS SHOWN
JOB NO. 220404
FIGURE No. 6



-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.



DRAWN:

DATE:

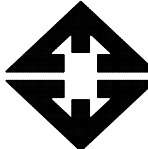
DESIGNED:

CHECKED:

JOB NO.:
220404

FIG NO.:

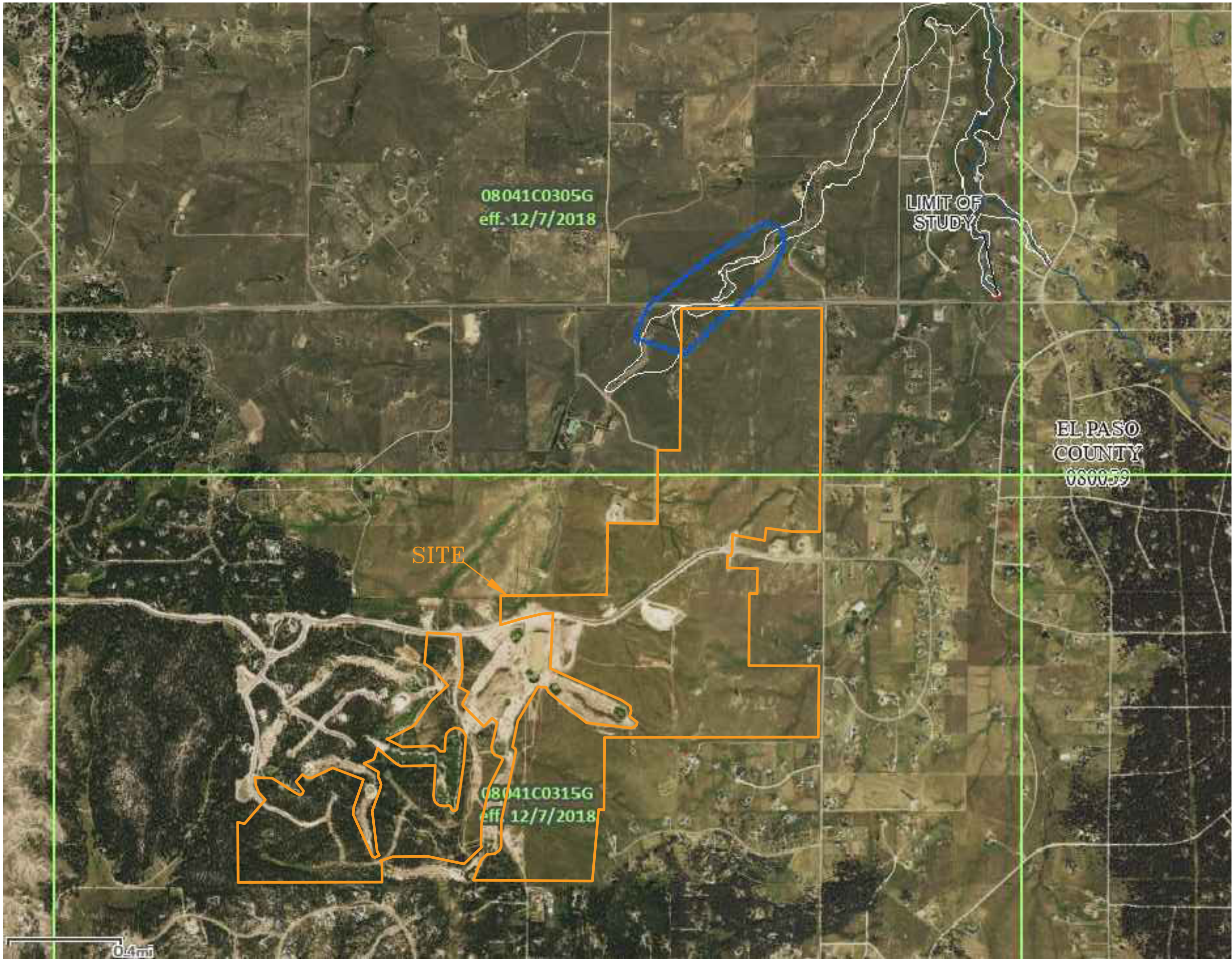
REVISION	BY

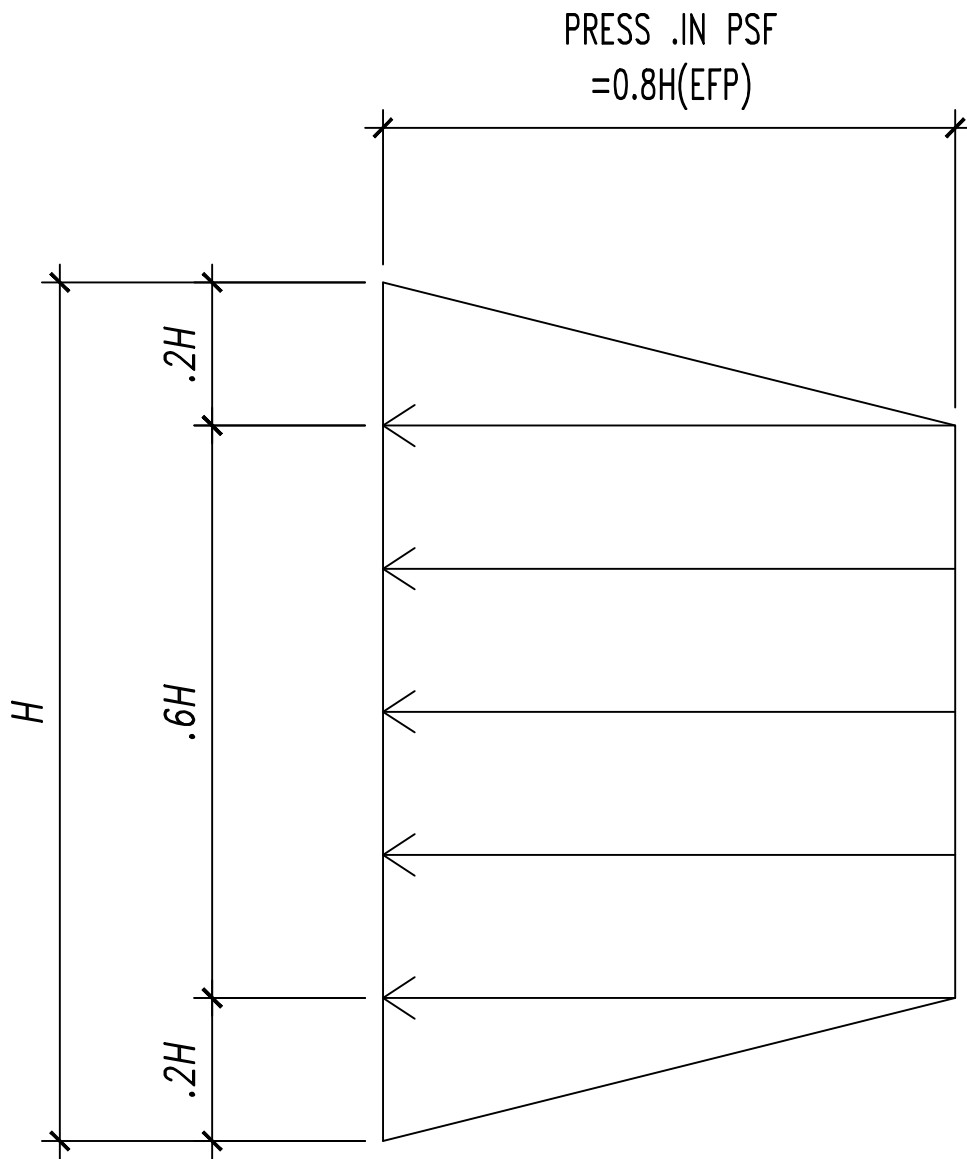


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FLOODPLAIN MAP
FLYING HORSE NORTH SKETCH PLAN
EL PASO COUNTY, CO.
FOR: FLYING HORSE DEVELOPMENT, LLC

DRAWN L.L.
CHECKED
DATE 3/7/22
SCALE AS SHOWN
JOB NO. 220404
FIGURE No. 9





PRESSURE DISTRIBUTION



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LATERAL PRESSURE DISTRIBUTION
 AREA WITH CREEP

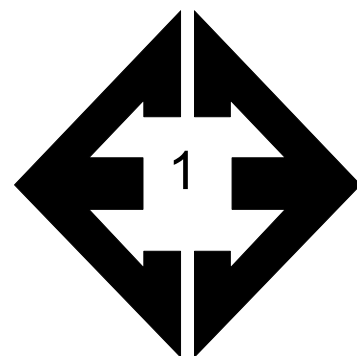
DRAWN BY:
 R. MCBRIDE

DATE DRAWN:
 03/13/13

JOB NO.:
 220404

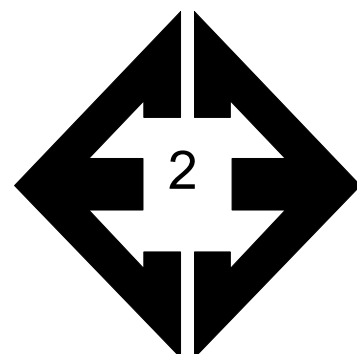
FIG. NO.:
 10

APPENDIX A: Site Photographs



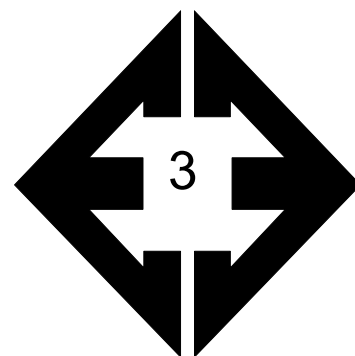
**Looking northwest
from the northeastern
side of the site along
Black Forest Road.**

February 24, 2022



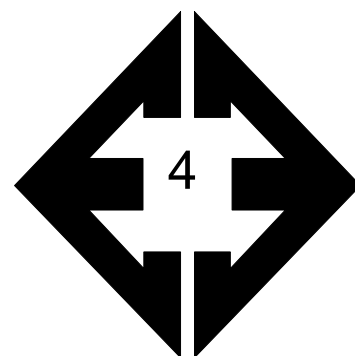
**Looking south from
the northeastern side
of the site along Black
Forest Road.**

February 24, 2022



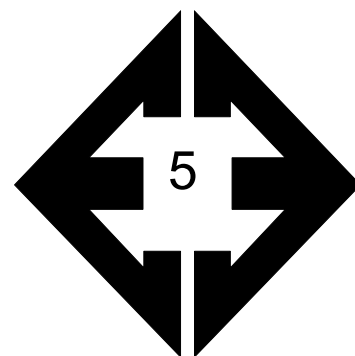
**Looking southeast
from the north-central
portion of the site.**

February 24, 2022



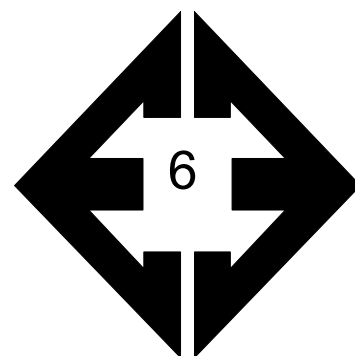
**Looking northeast
from the central
portion of the site.**

February 24, 2022



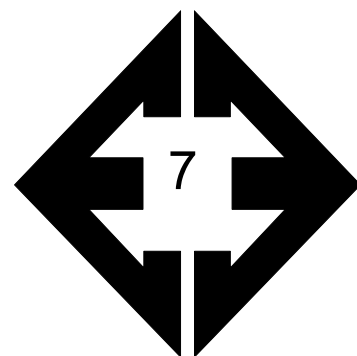
**Looking north from the
southern portion of the
site.**

February 24, 2022



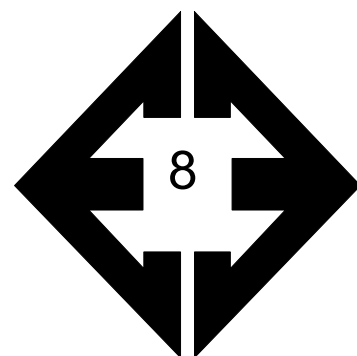
**Looking south from
the central portion of
the site.**

February 24, 2022



**Looking west from the
west-central portion of
the site.**

February 24, 2022



**Looking east from the
southwestern side of
the site.**

February 24, 2022

APPENDIX B: Test Boring and Test Pit Logs

TEST BORING NO. 1
 DATE DRILLED 2/14/2018
 Job # 220404

TEST BORING NO. 2
 DATE DRILLED 2/14/2018
 CLIENT FLYING HORSE DEV.
 LOCATION FLYING HORSE NORTH, F-2

REMARKS

DRY TO 20', 2/14/18

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM
 DENSE, MOIST

THIN CLAYEY LENSES

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			10	4.1	1
5			12	6.8	1
10			13	14.1	1
15			10	3.6	1
20			14	10.6	1

REMARKS

DRY TO 20', 2/14/18

SAND, SILTY, TAN
 SANDSTONE, SILTY TO
 CLAYEY, FINE TO COARSE
 GRAINED, RED BROWN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			50	7.0	3
5			10"	7.0	3
10			50	12.1	3
10			6"		
15			50	10.7	3
15			7"		
20			50	9.8	3
20			6"		



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TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

LLL

3/8/22

JOB NO.:
 220404

FIG NO.:

B-1

TEST BORING NO. 3
 DATE DRILLED 2/14/2018
 Job # 220404

TEST BORING NO. 4
 DATE DRILLED 2/14/2018
 CLIENT FLYING HORSE DEV.
 LOCATION FLYING HORSE NORTH, F-2

REMARKS

DRY TO 20', 2/14/18

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM
 DENSE, MOIST
 CLAY, SANDY, TAN, FIRM,
 MOIST

SAND, SILTY WITH CLAYEY
 LENSES, FINE TO COARSE
 GRAINED, TAN, MEDIUM DENSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			21	6.6	1
5			13	11.4	2
10			17	8.2	1
15			21	8.8	1
20			13	5.5	1

REMARKS

DRY TO 20', 2/14/18

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM
 DENSE, MOIST
 SANDSTONE, SILTY, FINE
 TO COARSE GRAINED, TAN,
 VERY DENSE, MOIST

SANDSTONE, SILTY, FINE
 GRAINED, GREEN TAN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			17	5.2	1
5			50	5.4	3
10			50 9"	8.2	3
15			50 8"	14.9	3
20			50 9"	16.7	3



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 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

LL

3/8/22

JOB NO.:
 220404

FIG NO.:
 B-2

TEST BORING NO. 5
 DATE DRILLED 3/4/2022
 Job # 220404

TEST BORING NO. 6
 DATE DRILLED 3/4/2022
 CLIENT FLYING HORSE DEV.
 LOCATION FLYING HORSE NORTH, F-2

REMARKS

DRY TO 20', 3/4/22

SAND, SLIGHTLY SILTY, FINE TO
 COARSE GRAINED, TAN, DENSE,

SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			42	5.1	1
			36	7.6	1
10			36	6.4	1
15			40	10.4	1
20			50	10.4	3
			10"		

REMARKS

DRY TO 20', 3/4/22

CLAY, VERY SANDY, TAN, STIFF
 TO VERY STIFF, MOIST

SAND, SILTY, FINE TO COARSE
 GRAINED, RED BROWN, MEDIUM
 DENSE, MOIST

SAND, VERY CLAYEY, FINE TO
 COARSE GRAINED, TAN, DENSE,
 MOIST

SANDSTONE, SLIGHTLY SILTY,
 FINE TO COARSE GRAINED,
 BROWN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			16	8.3	2
			30	8.4	2
10			21	8.4	1
15			41	12.6	1
20			50	6.2	3
			6"		



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

LLL

3/8/22

JOB NO.:
 220404

FIG. NO.:

B-3

TEST PIT NO. 1
DATE EXCAVATED 1/31/2018
Job # 220404

TEST PIT NO. 2
DATE EXCAVATED 1/31/2018
CLIENT FLYING HORSE DEVELOPMENT, LLC
LOCATION FLYING HORSE NORTH FIL 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
Lot ? GPS Location 39° 02' 57.3" N 104° 43' 30.1" W sandy loam, tan				gr	m	2	Lot ? GPS Location 39° 02' 53.5" N 104° 43' 19.5" W topsoil, sandy clay loam, brown sandy silty clay, fine grained, tan				bl	m	3
	1							1					
	2			gr	ma	4A		2			bl	m	4
weathered to formational silty sandstone, redish tan to tan	3							3					
	4							4					
*formational sandstone at 4.5 feet	5							5					
	6							6					
	7							7					
	8							8					
	9							9					
	10							10					

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr

Soil Structure Grade
weak - w
moderate - m
strong - s
single grain - sg
massive - ma



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COLORADO SPRINGS, COLORADO 80907

TEST PIT LOG

DRAWN:

DATE:

CHECKED:

DATE:

JOB NO.:

220404

FIG NO.:

B-4

TEST PIT NO. 3
 DATE EXCAVATED 1/31/2018
 Job # 220404

TEST PIT NO. 4
 DATE EXCAVATED 1/31/2018
 CLIENT FLYING HORSE DEVELOPMENT, LLC
 LOCATION FLYING HORSE NORTH FIL 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
Lot ? GPS Location 39° 02' 36.2" N 104° 43' 23.8" W							Lot ? GPS Location 39° 02' 37.3" N 104° 43' 38.8" W						
topsoil, sandy clay loam, brown	1			bl	m	3	sandy loam, fine to coarse grained, tan	1			gr	m	2
sandy silty clay, fine grained, tan	2			bl	m	4	sandy silty clay, tan	2			bl	m	4
	3						sandy clay loam, fine to coarse grained, tan	3			gr	m	3
	4							4					
	5							5					
	6							6					
	7							7					
	8							8					
	9							9					
	10							10					

Soil Structure Shape
 granular - gr
 platy - pl
 blocky - bl
 prismatic - pr

Soil Structure Grade
 weak - w
 moderate - m
 strong - s
 single grain - sg
 massive - ma



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST PIT LOG

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JOB NO.:

220404

FIG NO.:

B-5

TEST PIT NO. 5
 DATE EXCAVATED 1/31/2018
 Job # 220404

TEST PIT NO. 6
 DATE EXCAVATED 1/31/2018
 CLIENT FLYING HORSE DEVELOPMENT, LLC
 LOCATION FLYING HORSE NORTH FIL 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
Lot ? GPS Location 39° 02' 47.9" N 104° 43' 42.7" W							Lot ? GPS Location 39° 02' 41.3" N 104° 43' 51.0" W						
sandy loam, tan	1			gr	m	2	sandy loam, fine to coarse grained, tan	1			gr	m	2
weathered to formational silty to clayey sandstone, fine to coarse grained, olive tan	2			gr	ma	4A	alternating layers of loamy sand and sandy clay loam, fine to coarse grained, tan	2			gr	m	3
	3							3					
	4							4					
*formational sandstone at 2.5 feet	5							5					
	6							6					
	7							7					
	8							8					
	9							9					
	10							10					

Soil Structure Shape

granular - gr
 platy - pl
 blocky - bl
 prismatic - pr

Soil Structure Grade

weak - w
 moderate - m
 strong - s
 single grain - sg
 massive - ma



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JOB NO.:

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FIG NO.:

B-6

TEST PIT NO. 7
 DATE EXCAVATED 1/31/2018
 Job # 220404

TEST PIT NO. 8
 DATE EXCAVATED 1/31/2018
 CLIENT FLYING HORSE DEVELOPMENT, LLC
 LOCATION FLYING HORSE NORTH FIL 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
Lot ? GPS Location 39° 02' 50.3" N 104° 43' 56.1" W							Lot ? GPS Location 39° 02' 49.3" N 104° 44' 11.5" W						
sandy loam, fine to coarse grained, tan	1			gr	m	2	sandy loam, fine to coarse grained, tan	1			gr	m	2
weathered to formational silty to clayey sandstone, fine to coarse grained, reddish tan to tan.	2			gr	ma	4A	sandy clay, fine to coarse grained, brown	2			gr	m	4
	3							3					
	4							4					
*formational sandstone at 5 feet	5							5					
	6							6					
	7							7					
	8						highly weathered clayey sandstone, fine to coarse grained, olive tan	8			gr	ma	4A
	9							9					
	10							10					

Soil Structure Shape
 granular - gr
 platy - pl
 blocky - bl
 prismatic - pr

Soil Structure Grade
 weak - w
 moderate - m
 strong - s
 single grain - sg
 massive - ma



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FIG NO.:

B-7

TEST PIT NO. 9
DATE EXCAVATED 2/1/2018
Job # 220404

TEST PIT NO. 10
DATE EXCAVATED 2/1/2018
CLIENT FLYING HORSE DEVELOPMENT, LLC
LOCATION FLYING HORSE NORTH FIL 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
Lot ? GPS Location 39° 02' 33.7" N 104° 43' 51.3" W							Lot ? GPS Location 39° 02' 33.1" N 104° 44' 07.6" W						
topsoil, sandy clay loam, brown	1			bl	m	3	sandy loam fine to coarse grained, tan	1			gr	m	2
sandy clay loam, fine to coarse grained light brown	2						sandy clay, fine to coarse grained, tan	2			gr	m	4
	3							3					
	4							4					
	5			gr	ma	4A		5					
weathered silty sandstone fine to coarse grained, reddish tan	6							6					
	7							7					
	8							8					
	9							9					
	10							10					

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr

Soil Structure Grade
weak - w
moderate - m
strong - s
single grain - sg
massive - ma



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FIG NO.:

B-8

TEST PIT NO. 11
 DATE EXCAVATED 2/1/2018
 Job # 220404

TEST PIT NO. 12
 DATE EXCAVATED 2/1/2018
 CLIENT FLYING HORSE DEVELOPMENT, LLC
 LOCATION FLYING HORSE NORTH FIL 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
Lot ? GPS Location 39° 02' 40.0" N 104° 44' 01.5" W							Lot ? GPS Location 39° 02' 45.8" N 104° 43' 24.6" W						
sandy loam, fine to coarse grained, tan	1			gr	m	2	topsoil, sandy clay loam, brown	1			bl	m	3
sandy silty clay, fine grained, tan	2			bl	m	4	sandy silty clay, fine grained, tan	2			bl	m	4
	3							3					
	4							4					
	5							5					
	6							6					
weathered silty sandstone, fine to coarse grained, tan	7			gr	ma	4A		7					
	8							8					
	9							9					
	10							10					

Soil Structure Shape
 granular - gr
 platy - pl
 blocky - bl
 prismatic - pr

Soil Structure Grade
 weak - w
 moderate - m
 strong - s
 single grain - sg
 massive - ma



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FIG NO.:

B-9

TEST PIT NO. 13
 DATE EXCAVATED 2/1/2018
 Job # 220404

TEST PIT NO. 14
 DATE EXCAVATED 2/1/2018
 CLIENT FLYING HORSE DEVELOPMENT, LLC
 LOCATION FLYING HORSE NORTH FIL 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
Lot ? GPS Location 39° 03' 35.3" N 104° 42' 17.8" W							Lot ? GPS Location 39° 03' 41.7" N 104° 42' 36.9" W						
topsoil, sandy clay loam, brown	1			bl	m	3	topsoil, sandy clay loam, brown	1			bl	m	3
weathered very clayey sandstone, fine to coarse grained, reddish brown	2			gr	ma	4A	sandy silty clay, fine grained, tan	2			bl	m	4
	3							3					
	4							4					
interbedded claystone layer	5							5					
	6							6					
	7							7					
	8							8					
	9							9					
	10							10					

Soil Structure Shape
 granular - gr
 platy - pl
 blocky - bl
 prismatic - pr

Soil Structure Grade
 weak - w
 moderate - m
 strong - s
 single grain - sg
 massive - ma



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JOB NO.:

220404

FIG NO.:

B-10

TEST PIT NO. 15
DATE EXCAVATED 2/1/2018
Job # 220404

TEST PIT NO. 16
DATE EXCAVATED 2/1/2018
CLIENT FLYING HORSE DEVELOPMENT, LLC
LOCATION FLYING HORSE NORTH FIL 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
Lot ? GPS Location 39° 03' 36.9" N 104° 42' 31.4" W							Lot ? GPS Location 39° 03' 25.7" N 104° 42' 24.0" W						
topsoil, sandy clay loam, brown	1			bl	m	3	topsoil, sandy clay loam, brown	1			bl	m	3
sandy silty clay, fine grained, tan	2			bl	m	4	sandy silty clay, fine grained, tan	2			bl	m	4
	3							3					
	4							4					
	5							5					
	6							6					
	7							7					
weathered very clayey sandstone, fine to coarse grained, reddish brown	8			gr	ma	4A	weathered very clayey sandstone, fine to coarse grained, reddish brown	8			gr	ma	4A
	9							9					
	10							10					

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr

Soil Structure Grade
weak - w
moderate - m
strong - s
single grain - sg
massive - ma



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JOB NO.:





















220404

FIG NO.:

B-11

TEST PIT NO. 17
 DATE EXCAVATED 2/1/2018
 Job # 220404

TEST PIT NO. 18
 DATE EXCAVATED 2/1/2018
 CLIENT FLYING HORSE DEVELOPMENT, LLC
 LOCATION FLYING HORSE NORTH FIL 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
Lot ? GPS Location 39° 03' 23.1" N 104° 42' 36.0" W							Lot ? GPS Location 39° 03' 25.7" N 104° 42' 24.0" W						
topsoil, sandy clay loam, brown	1			bl	m	3	topsoil, sandy clay loam, brown	1			bl	m	3
weathered to formational silty to clayey sandstone, fine to coarse grained, brown to tan	2			gr	ma	4A	sandy silty clay, fine grained, tan	2			bl	m	4
	3						weathered to formational silty to clayey sandstone, fine to coarse grained, brown to tan	3			gr	ma	4A
	4							4					
	5							5					
*formational sandstone at 5.5 feet	6						*formational sandstone at 5 feet	6					
	7							7					
	8							8					
	9							9					
	10							10					

Soil Structure Shape
 granular - gr
 platy - pl
 blocky - bl
 prismatic - pr

Soil Structure Grade
 weak - w
 moderate - m
 strong - s
 single grain - sg
 massive - ma



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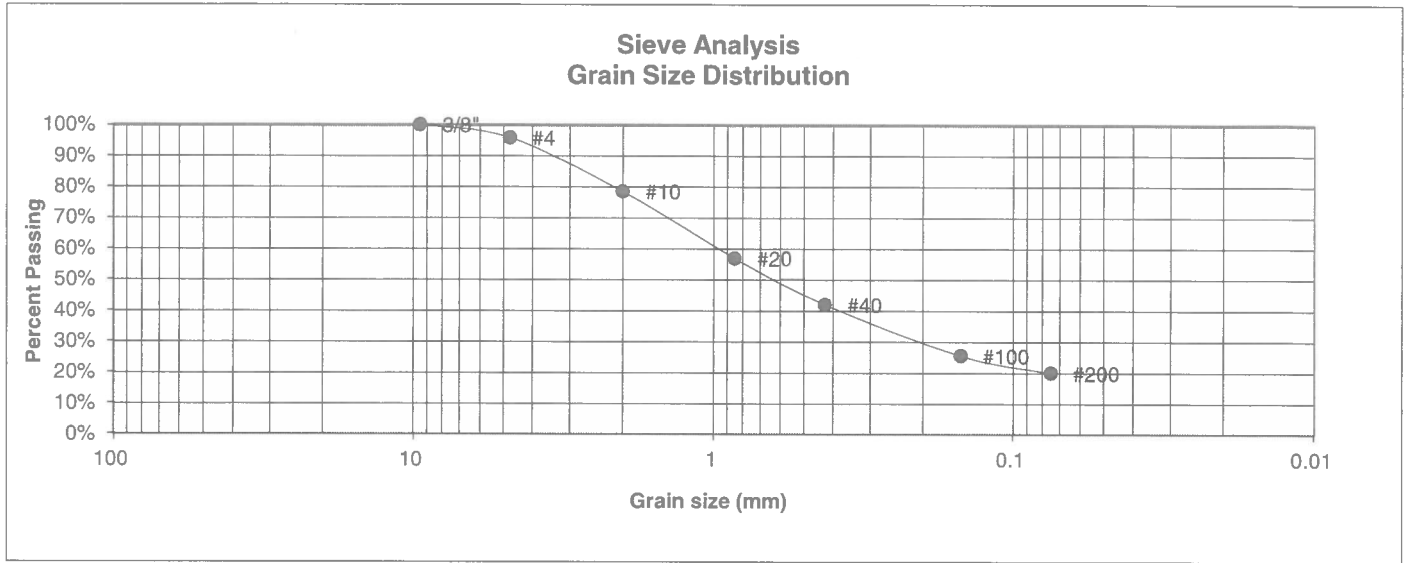
220404

FIG NO.:

B-12

APPENDIX C: Laboratory Test Results

UNIFIED CLASSIFICATION	SM	CLIENT	FLYING HORSE DEV.
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-2
TEST BORING #	1	JOB NO.	220404
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.9%
10	78.5%
20	57.0%
40	42.0%
100	25.6%
200	20.0%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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**LABORATORY TEST
RESULTS**

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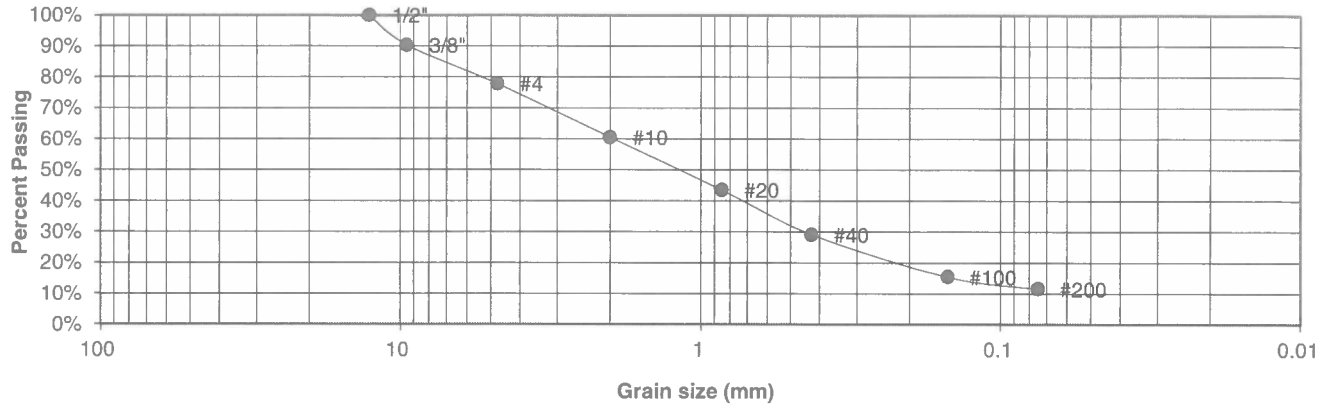
JOB NO.:
220404

FIG NO.:

C-1

UNIFIED CLASSIFICATION	SM-SW	CLIENT	FLYING HORSE DEV.
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-2
TEST BORING #	5	JOB NO.	220404
DEPTH (FT)	2-3	TEST BY	BL

Sieve Analysis Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	90.3%
4	77.8%
10	60.5%
20	43.5%
40	29.1%
100	15.4%
200	11.6%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)



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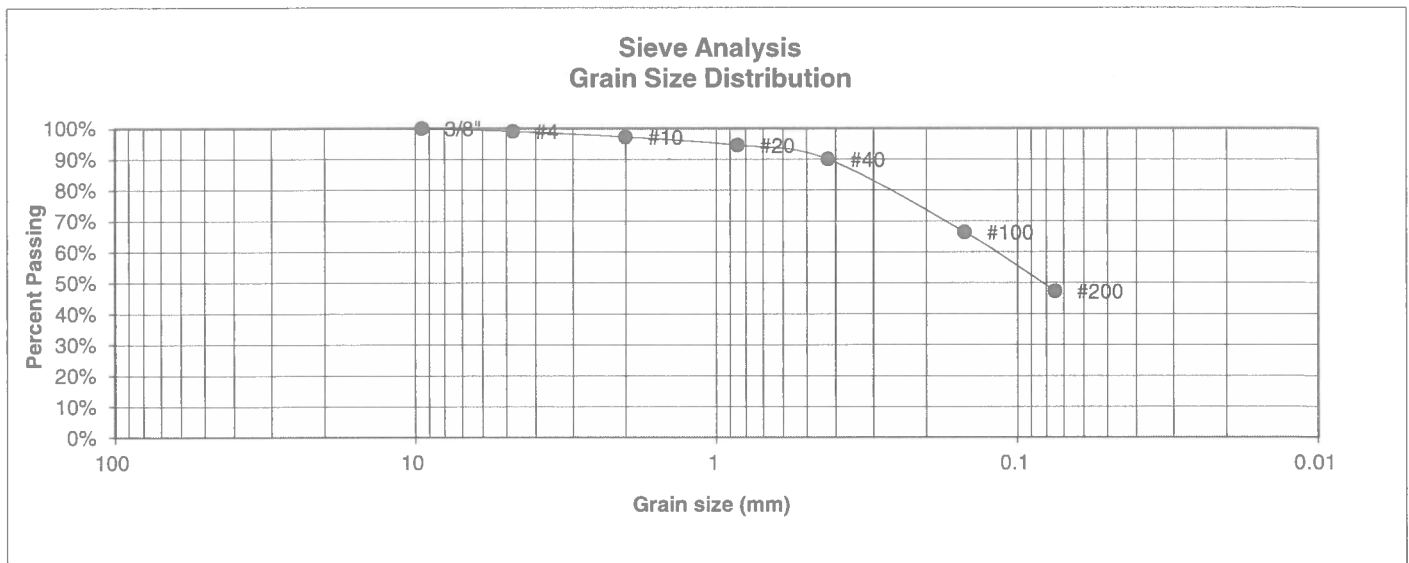
3/8/22

JOB NO.:
220404

FIG NO.:

C-2

UNIFIED CLASSIFICATION	SC	CLIENT	FLYING HORSE DEV.
SOIL TYPE #	1	PROJECT	FLYING HORSE NORTH, F-2
TEST BORING #	6	JOB NO.	220404
DEPTH (FT)	15	TEST BY	BL



U.S.
Sieve #

Percent
Finer

Atterberg
Limits

3"

Plastic Limit

1 1/2"

Liquid Limit

3/4"

Plastic Index

1/2"

3/8"

100.0%

4

99.0%

10

97.2%

20

94.6%

40

90.0%

100

66.4%

200

47.3%

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)



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LABORATORY TEST RESULTS

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DATE:

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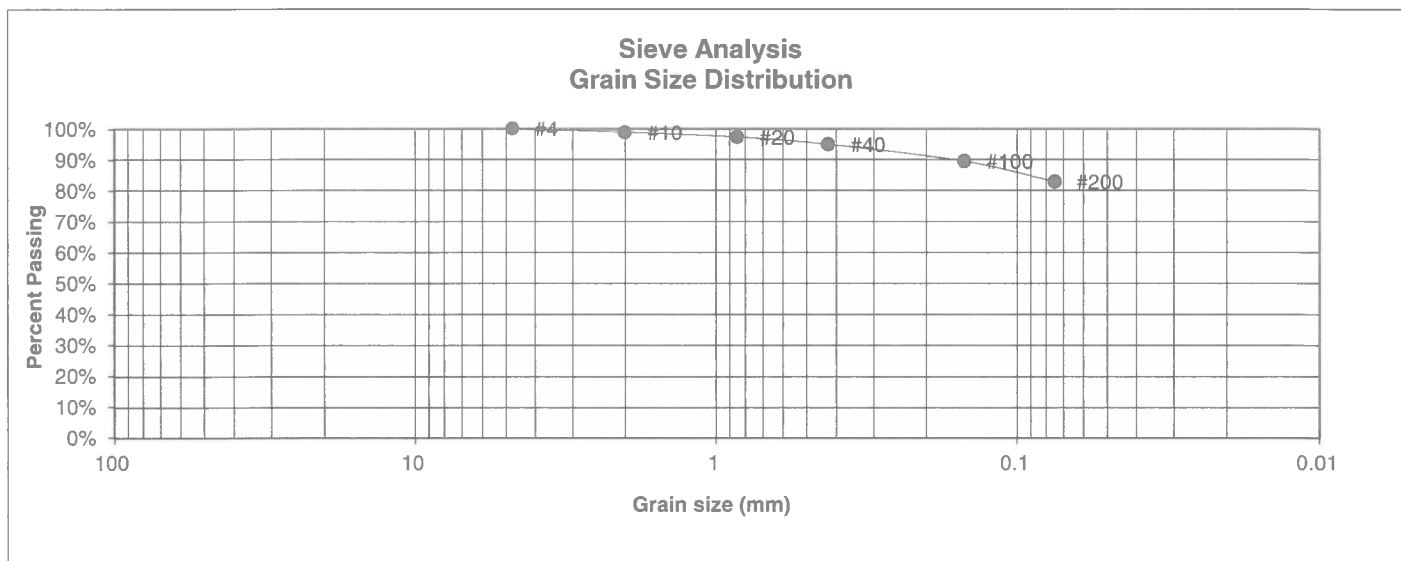
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JOB NO.:
220404

FIG NO.:

C-3

<u>UNIFIED CLASSIFICATION</u>	CL	<u>CLIENT</u>	FLYING HORSE DEV.
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	FLYING HORSE NORTH, F-2
<u>TEST BORING #</u>	3	<u>JOB NO.</u>	220404
<u>DEPTH (FT)</u>	5	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.8%
20	97.2%
40	94.9%
100	89.5%
200	82.8%

<u>Atterberg Limits</u>	
Plastic Limit	17
Liquid Limit	38
Plastic Index	21

<u>Swell</u>	
Moisture at start	7.5%
Moisture at finish	18.5%
Moisture increase	11.1%
Initial dry density (pcf)	105
Swell (psf)	930



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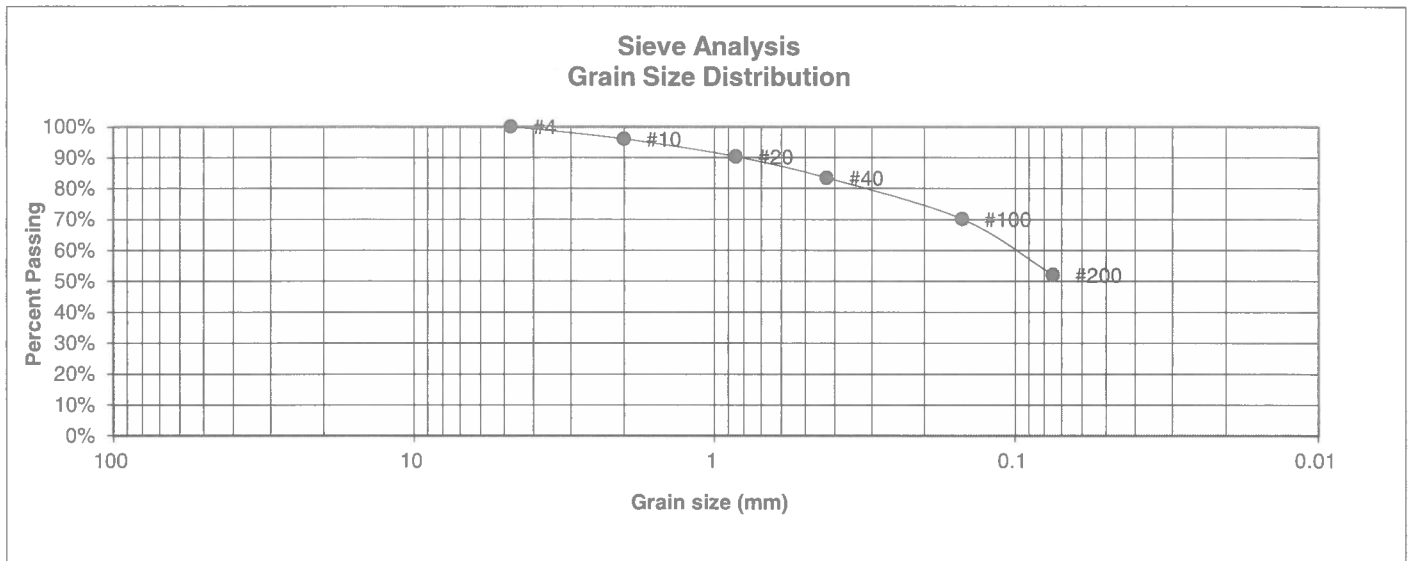
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JOB NO.:
220404

FIG NO.:

C-4

UNIFIED CLASSIFICATION	CL	CLIENT	FLYING HORSE DEV.
SOIL TYPE #	2	PROJECT	FLYING HORSE NORTH, F-2
TEST BORING #	6	JOB NO.	220404
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	96.0%
20	90.3%
40	83.4%
100	70.2%
200	52.1%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell	
Moisture at start	11.5%
Moisture at finish	21.3%
Moisture increase	9.8%
Initial dry density (pcf)	101
Swell (psf)	270



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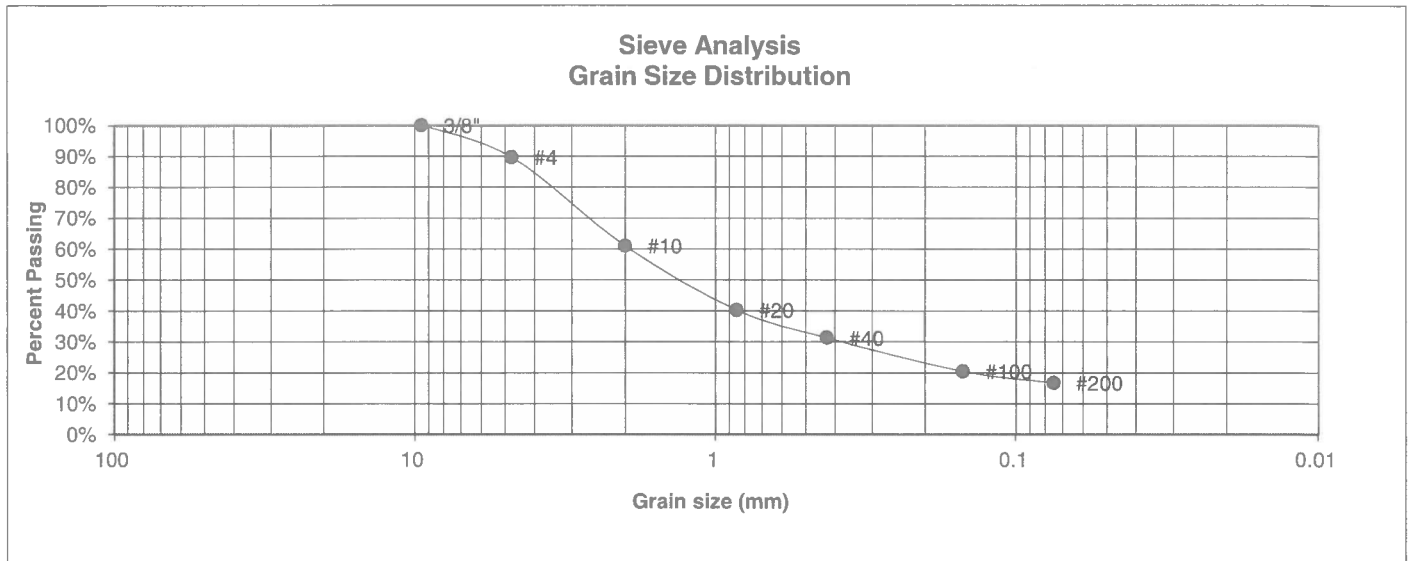
LABORATORY TEST RESULTS

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		LL	3/8/22

JOB NO.:
220404

FIG NO.:
C-5

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	FLYING HORSE DEV.
<u>SOIL TYPE #</u>	3	<u>PROJECT</u>	FLYING HORSE NORTH, F-2
<u>TEST BORING #</u>	5	<u>JOB NO.</u>	220404
<u>DEPTH (FT)</u>	20	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	89.7%
10	61.0%
20	40.3%
40	31.3%
100	20.5%
200	16.7%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)



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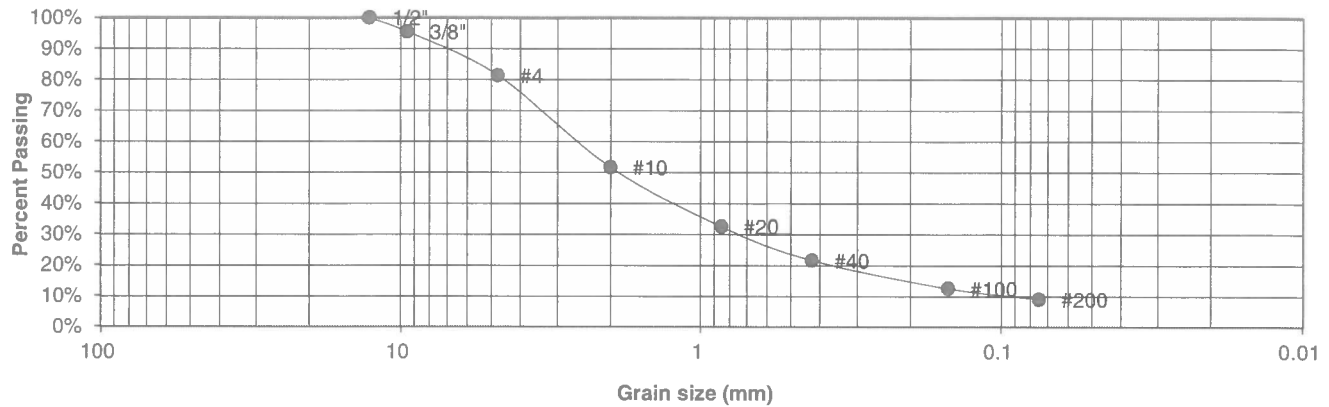
JOB NO.:
220404

FIG NO.:

C-6

UNIFIED CLASSIFICATION	SM-SW	CLIENT	FLYING HORSE DEV.
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-2
TEST BORING #	6	JOB NO.	220404
DEPTH (FT)	20	TEST BY	BL

Sieve Analysis Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	95.5%
4	81.4%
10	51.6%
20	32.5%
40	21.6%
100	12.6%
200	9.1%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)



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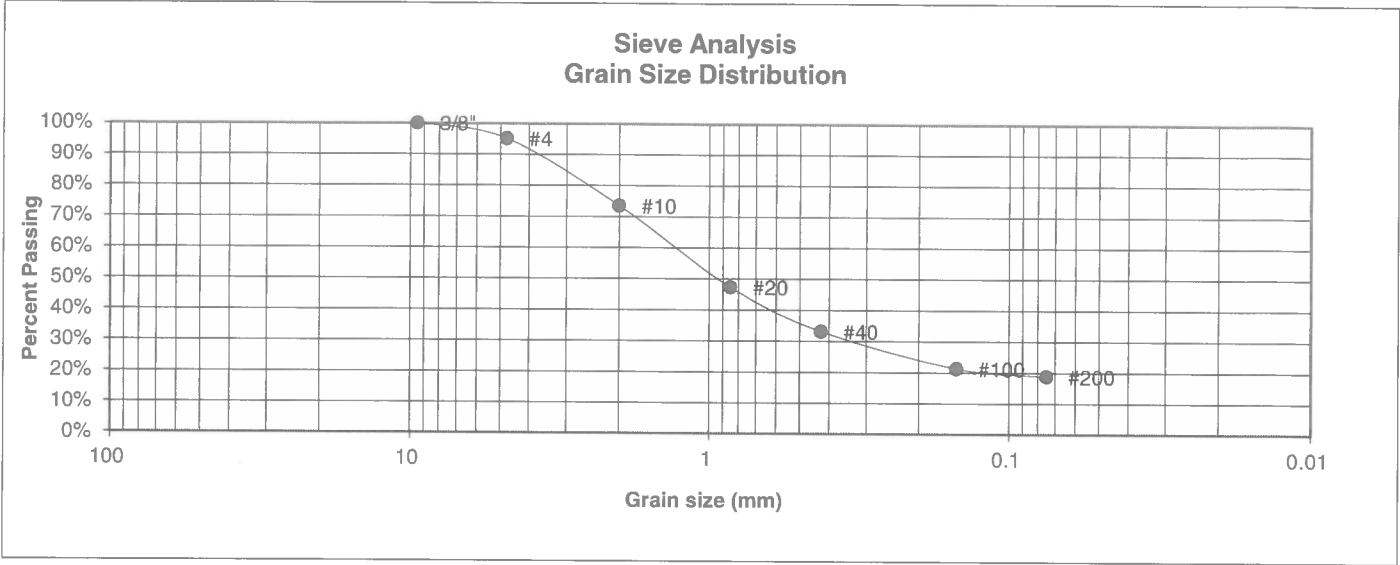
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JOB NO.:
220404

FIG NO.:

C-7

UNIFIED CLASSIFICATION	SM	CLIENT	FLYING HORSE DEV.
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-2
TEST BORING #	2	JOB NO.	220404
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.1%
10	73.4%
20	47.3%
40	33.1%
100	21.3%
200	18.8%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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LABORATORY TEST
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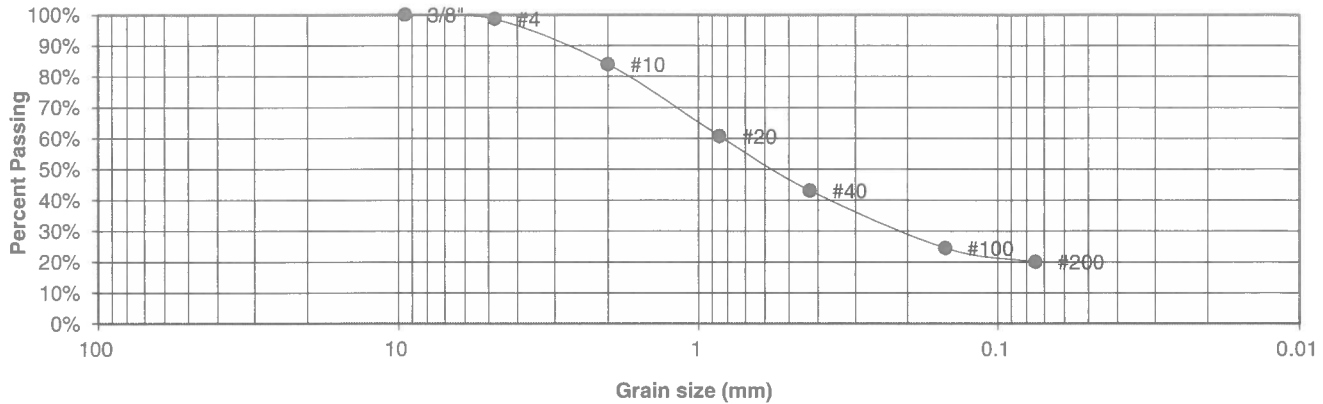
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FIG NO.:
C-8

UNIFIED CLASSIFICATION	SM	CLIENT	FLYING HORSE DEV.
SOIL TYPE #	3	PROJECT	FLYING HORSE NORTH, F-2
TEST BORING #	4	JOB NO.	220404
DEPTH (FT)	10	TEST BY	BL

Sieve Analysis Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.6%
10	84.0%
20	60.7%
40	43.0%
100	24.5%
200	20.0%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)



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DATE:

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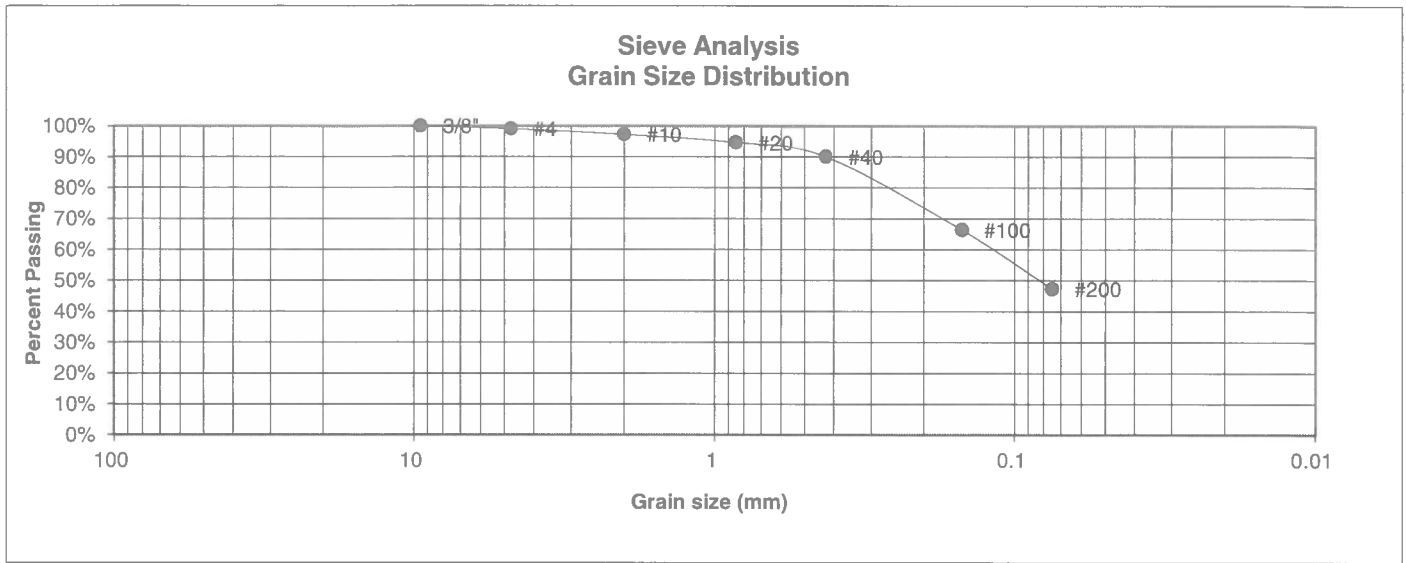
3/8/22

JOB NO.:
220404

FIG NO.:

L-9

UNIFIED CLASSIFICATION	SC	CLIENT	FLYING HORSE DEV.
SOIL TYPE #	2	PROJECT	FLYING HORSE NORTH, F-2
TEST BORING #	6	JOB NO.	220404
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.0%
10	97.2%
20	94.6%
40	90.0%
100	66.4%
200	47.3%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

LLL

3/8/22

JOB NO.:
220404

FIG NO.:

C-10

CLIENT	FLYING HORSE DEV.	JOB NO.	220404
PROJECT	FLYING HORSE NORTH, F-2	DATE	3/8/2022
LOCATION	FLYING HORSE NORTH, F-2	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	2-3	1	SM	0.01
TB-3	5	2	CL	<0.01
TB-4	10	3	SM	<0.01

QC BLANK PASS



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**LABORATORY TEST
SULFATE RESULTS**

DRAWN:

DATE:

CHECKED:

DATE:

LLL

3/8/22

JOB NO.:
220404

FIG NO.:

C-11

APPENDIX D: Profile Hole Logs and Laboratory Test Results
Entech Job No. 160118/141588

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT NES, INC.
 PROJECT SHAMROCK RANCH
 JOB NO. 141588

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	2-3			23.9						SM	SAND, SILTY
1	11	2-3			17.6	NV	NP	<0.01			SM	SAND, SILTY
1	14	2-3			30.8						SM	SAND, SILTY
1	5	2-3			22.3	22	3				SM	SAND, SILTY
1	9	10			19.8				152		SM	SAND, SILTY
1	12	10			36.5			0.01			SM	SAND, SILTY
2	8	10	10.8	111.7	55.5	36	12			0.3	CL	CLAY, VERY SANDY
2	2	5			61.4						CL	CLAY, VERY SANDY
2	3	2-3	11.1	116.2	84.8	32	13			0.7	CL	CLAY, SANDY
2	4	5			74.5				1485		CL	CLAY, SANDY
2	6	2-3	10.7	112.3	96.5	39	17			0.6	CL	CLAY, SANDY
2	10	5	14.3	113.6	62.5					2.7	CL	CLAY, SANDY
3	13	5			20.0						SM	SANDSTONE, SILTY
3	1	15			24.0						SM	SANDSTONE, SILTY
3	3	10			23.8	NV	NP				SM	SANDSTONE, SILTY
3	6	15			12.7						SM	SANDSTONE, SILTY
3	7	10			26.3						SM	SANDSTONE, SILTY

Table 2: Summary of Profile Boring Test Results

Percolation Test No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
1	9/11*	>15
2	>15	>15
3	9/>15*	>15
4	>15	>15
5	3/>15*	>15
6	8/10*	>15
7	11/>15*	>15
8	>15	>15
9	14	>15
10	>15	>15
11	9/11*	>15
12	11	>15
13	1	>15
14	11	>15

* Weathered bedrock/Formational bedrock

PROFILE HOLE NO. 1
 DATE DRILLED 1/23/2015
 Job # 141588

PROFILE HOLE NO. 2
 DATE DRILLED 1/23/2015
 CLIENT NES, INC.
 LOCATION SHAMROCK RANCH

REMARKS

DRY TO 15', 1/24/15

CLAY, SANDY, BROWN

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM
 DENSE, MOIST

WEATHERED SANDSTONE, SILTY,
 FINE TO COARSE GRAINED, GRAY
 BROWN, DENSE, MOIST

SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, GRAY, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			19	6.1	2
5			21	4.7	1
10			35	11.1	3
15			50	15.9	3
			10"		
20					

REMARKS

DRY TO 15', 1/24/15

CLAY, SANDY TO VERY SANDY,
 BROWN TO TAN, STIFF TO FIRM,
 MOIST

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM DENSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			25	7.2	2
5			9	7.8	2
10			22	4.9	1
15			29	5.8	1
20					



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PROFILE BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

JOB NO.:

141588

FIG NO.:

B-1

PROFILE HOLE NO. 3
 DATE DRILLED 1/23/2015
 Job # 141588

PROFILE HOLE NO. 4
 DATE DRILLED 1/23/2015
 CLIENT NES, INC.
 LOCATION SHAMROCK RANCH

REMARKS

DRY TO 15', 1/24/15

CLAY, SANDY, BROWN, STIFF TO FIRM, MOIST

SAND, SILTY, TAN

WEATHERED SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			24	8.2	2
5			13	6.8	2
					1
10			40	4.1	3
15			42	8.3	3
20					

REMARKS

DRY TO 15', 1/24/15

CLAY, SANDY, TAN, STIFF, MOIST

SAND, CLAYEY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST

CLAY, SANDY, BROWN, FIRM, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			16	8.6	2
5			15	9.1	2
10			18	8.8	1
15			12	18.2	2
20					



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 COLORADO SPRINGS, COLORADO 80907

PROFILE BORING LOG

DRAWN:

DATE:

CHECKED: *h*

DATE: 2/12/15

JOB NO.:

141588

FIG NO.:

B-2

PROFILE HOLE NO. 5
 DATE DRILLED 2/2/2015
 Job # 141588

PROFILE HOLE NO. 6
 DATE DRILLED 1/26/2015
 CLIENT NES, INC.
 LOCATION SHAMROCK RANCH

REMARKS

DRY TO 15', 2/3/15

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM DENSE
 TO DENSE, MOIST TO VERY MOIST
 WEATHERED SANDSTONE, SILTY,
 CLAYEY, FINE TO COARSE
 GRAINED, TAN, DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			16	2.7	1
5			42	11.5	3
10			42	14.3	3
15			45	4.4	3
20					

REMARKS

DRY TO 15', 1/27/15

CLAY, SANDY, TAN, STIFF,
 MOIST

WEATHERED SANDSTONE, SILTY,
 FINE TO COARSE GRAINED, TAN,
 DENSE, MOIST
 SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			21	22.4	2
5			16	8.9	2
10			42	8.7	3
15			50 11"	4.9	3
20					



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

PROFILE BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

2/12/15

JOB NO.:

141588

FIG NO.:

B-3

PROFILE HOLE NO. 7
 DATE DRILLED 1/26/2015
 Job # 141588

PROFILE HOLE NO. 8
 DATE DRILLED 2/2/2015
 CLIENT NES, INC.
 LOCATION SHAMROCK RANCH

REMARKS

DRY TO 15', 1/27/15

CLAY, SANDY, TAN, FIRM, MOIST

SAND, CLAYEY, FINE TO COARSE
 GRAINED, BROWN, DENSE, MOIST

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM DENSE,
 MOIST

WEATHERED SANDSTONE,
 SILTY, FINE TO COARSE
 GRAINED, TAN, DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			12	6.6	2
5			44	7.3	2
10			14	7.5	1
15			46	8.8	3
20					

REMARKS

DRY TO 15', 2/3/15

CLAY, SANDY TO VERY SANDY,
 TAN, STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			15	9.0	2
5			28	9.2	2
10			24	5.7	2
15			29	6.9	2
20					



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 COLORADO SPRINGS, COLORADO 80907

PROFILE BORING LOG

DRAWN:

DATE:

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2/12/15

JOB NO.:

141588

FIG NO.:

B-4

PROFILE HOLE NO. 9
 DATE DRILLED 2/3/2015
 Job # 141588

PROFILE HOLE NO. 10
 DATE DRILLED 2/2/2015
 CLIENT NES, INC.
 LOCATION SHAMROCK RANCH

REMARKS

DRY TO 15', 2/4/15

SAND, SILTY WITH CLAYEY LENSES,
 FINE TO COARSE GRAINED, TAN,
 MEDIUM DENSE TO LOOSE, MOIST

SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, GRAY, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			24	5.6	1
5			18	6.2	1
10			6	8.9	1
15			50	11.2	3
20					

REMARKS

DRY TO 15', 2/5/15

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, DENSE, MOIST

CLAY, SANDY, TAN, VERY STIFF,
 MOIST

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM DENSE TO
 LOOSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			32	3.8	1
5			42	9.2	2
10			17	3.7	1
15			6	3.3	1
20					



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 COLORADO SPRINGS, COLORADO 80907

PROFILE BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

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2/12/15

JOB NO.:

141588

FIG NO.:

B-5

PROFILE HOLE NO. 11
 DATE DRILLED 12/1/2014
 Job # 141588

PROFILE HOLE NO. 12
 DATE DRILLED 12/1/2014
 CLIENT NES, INC.
 LOCATION SHAMROCK RANCH

REMARKS

DRY TO 15', 12/2/14

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM DENSE,
 MOIST

WEATHERED SANDSTONE, SILTY,
 FINE TO COARSE GRAINED, TAN,
 DENSE, MOIST

SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			27	6.7	1
5			25	4.8	1
10			32	7.8	3
15			50 6"	10.0	3
20					

REMARKS

DRY TO 15', 12/2/14

SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, LOOSE TO MEDIUM
 DENSE, MOIST

SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			7	10.5	1
5			22	5.6	1
10			25	8.8	1
15			50 7"	7.7	3
20					



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PROFILE BORING LOG

DRAWN:

DATE:

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DATE: 2/12/15

JOB NO.:

141588

FIG NO.:

B-6

PROFILE HOLE NO. 13
 DATE DRILLED 12/1/2014
 Job # 141588

PROFILE HOLE NO. 14
 DATE DRILLED 1/26/2015
 CLIENT NES, INC.
 LOCATION SHAMROCK RANCH

REMARKS

DRY TO 15', 12/2/14

SAND, SILTY, TAN
 SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
1					1
3			50 10"	8.0	3
5			50 10"	8.3	3
10			50 6"	9.9	3
15			50 4"	8.2	3
20					

REMARKS

DRY TO 15', 12/2/14

SAND, SILTY TO CLAYEY, FINE TO
 COARSE GRAINED, TAN, LOOSE,
 MOIST

CLAY, SANDY, TAN, FIRM, MOIST
 SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM DENSE,
 MOIST

SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, DENSE
 TO VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
1					
3			4	12.2	1
5			9	15.2	2
10			12	14.4	1
15			50 6"	8.8	3
20					



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 COLORADO SPRINGS, COLORADO 80907

PROFILE BORING LOG

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JOB NO.:

141588

FIG NO.:

B-7

APPENDIX E: Soil Survey Descriptions

El Paso County Area, Colorado

14—Brussett loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367j

Elevation: 7,200 to 7,500 feet

Frost-free period: 115 to 125 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Brussett and similar soils: 85 percent

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

Description of Brussett

Setting

Landform: Flats

Landform position (three-dimensional): Talf

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Eolian deposits

Typical profile

A - 0 to 8 inches: loam

BA - 8 to 12 inches: loam

Bt - 12 to 26 inches: clay loam

Bk - 26 to 60 inches: silt loam

Properties and qualities

Slope: 1 to 3 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): 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

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3c

Hydrologic Soil Group: B

Ecological site: R048AY222CO - Loamy Park

Hydric soil rating: No

Minor Components

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 19, Aug 31, 2021

El Paso County Area, Colorado

26—Elbeth sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 367y

Elevation: 7,300 to 7,600 feet

Farmland classification: Not prime farmland

Map Unit Composition

Elbeth and similar soils: 85 percent

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

Description of Elbeth

Setting

Landform: Hills

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from arkose

Typical profile

A - 0 to 3 inches: sandy loam

E - 3 to 23 inches: loamy sand

Bt - 23 to 68 inches: sandy clay loam

C - 68 to 74 inches: sandy clay loam

Properties and qualities

Slope: 8 to 15 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 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: F048AY908CO - Mixed Conifer

Hydric soil rating: No

Minor Components

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 19, Aug 31, 2021

El Paso County Area, Colorado

66—Peyton sandy loam, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 369c

Elevation: 6,800 to 7,600 feet

Farmland classification: Prime farmland if irrigated and the product of
I (soil erodibility) x C (climate factor) does not exceed 60

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, flats

Landform position (three-dimensional): Side slope, tal

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: 1 to 5 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): 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): 4c

Hydrologic Soil Group: B

Ecological site: R049XY216CO - Sandy Divide

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 19, Aug 31, 2021

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

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 19, Aug 31, 2021

El Paso County Area, Colorado

68—Peyton-Pring complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369f

Elevation: 6,800 to 7,600 feet

Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 40 percent

Pring and similar soils: 30 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: 3 to 5 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): 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): 4c

Hydrologic Soil Group: B

Ecological site: R049XY216CO - Sandy Divide

Hydric soil rating: No

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

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 19, Aug 31, 2021