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GEOLOGIC HAZARD STUDY
KARMAN LINE
SOUTH CURTIS ROAD AND DRENNAN ROAD
EL PASO COUNTY, COLORADO

Prepared for

Norris Ranch Joint Ventures, LLC
455 East Pikes Peak Avenue, Ste 101
Colorado Springs, CO 80903

Attn: Craig Dossey

October 19, 2022
Revised March 30, 2023

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Logan L. Langford, P.G.
Geologist

LLL

Encl.

Entech Job No. 230486
AAprojects/2023/230486 Geohaz

Reviewed by:

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3-31-23
PROFESSIONAL ENGINEER

LAND USE REVIEW DIVISION
PLANNING & COMMUNITY DEVELOPMENT DEPARTMENT

CITY OF COLORADO SPRINGS

APPLICATION FORM FOR GEOLOGIC HAZARD REPORT

Applicant: Norris Ranch Joint Ventures, LLC Telephone: 719-733-8606 Fax _____

Address: 455 E. Pikes Peak Ave, Ste 101 _____ Zip Code: 80903 E-mail: craig.dossey@vertexcos.com

Premises Involved: Development Plan/Subdivision Plat Name: Karman Line

Tax Schedule No(s). 44000-00-269, 44000-00-326, 44000-00-340, 44000-00-341, 44000-00-454, 45000-00-091, 45000-00-134, & 45000-00-135
(This can be obtained from the El Paso County Tax Assessor located at 27 E. Vermijo Avenue on the 2nd Floor; phone: 520-6600 or at their web site http://www.land.elpasoco.com)

GEOLOGIC HAZARD REPORT REQUIRED: (FIVE (5) PRELIMINARY COPIES)

An application review fee will be required to accompany these applications (make checks payable to City of Colorado Springs). The fee schedule is as follows:

Review of Geologic Hazard Reports	City Planning Fee: $300 plus any Colorado Geological Survey Review Cost Over $300
	City Engineering Fee: $284

The following documents have been included and considered as part of this report (checked off by individual(s) preparing the geologic report):

Development Plan: _____

Landscape Plan (if applicable): _____

Grading Plan: _____

Drainage Report (necessary if debris and/or mud flow hazard is present): _____

ENGINEERS STATEMENT

I hereby attest that I am qualified to prepare a Geologic Hazard Study in accordance with the provisions of Section 504 of the Geologic Hazards Ordinance of Colorado Springs. I am qualified as:

__X__ Professional Geologist as defined by CRS 34-1-201(3); or,

_____ Professional Engineer as defined by Board Policy Statement 50.2 - "Engineering in Natural Hazard Areas" of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors. Board authority as defined by CRS 12-25-107(1).

Submitted by: _____ Date: 3/31/2023
Logan L. Langford, P.G., Entech Engineering, Inc.

This Geologic Hazard Study is filed in accordance with the Zoning Code of the Code of the City of Colorado Springs, 2001, as amended.

City Engineer Date

City Planning Director Date

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1.0 SUMMARY

Project Location

The project lies in portions of Sections 32, 33, and 34, Township 14 South, Range 64 West of the 6th Principal Meridian, and portions of Sections 3, 4, and 5 Township 15 South, Range 64 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 3¼ miles east of Colorado Springs, Colorado, northwest of South Curtis Road and Drennan Road.

Project Description

The project is to consist of the annexation of 1783.1 acres into the City of Colorado Springs for future development. The proposed development is anticipated to consist of low to high density residential, commercial, and open space areas with associated site improvements. The development will be serviced by Colorado Springs Utilities.

Scope of Report

This report presents the results of our geologic evaluation and recommended treatment of engineering geologic hazards for the site.

Land Use and Engineering Geology

This site was found to be suitable for the anticipated development. Areas were encountered where the geologic conditions will impose some constraints on development and land use. These include areas of artificial fill, expansive soils, erosion, hydrocompaction, downslope creep, potentially unstable slopes, seasonal and potentially seasonal shallow groundwater areas, ponded water, floodplains, debris flow susceptible areas, and potential for high radon. Based on the anticipated 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 future 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 is located in portions of Sections 32, 33, and 34, Township 14 South, Range 64 West of the 6th Principal Meridian, and portions of Sections 3, 4, and 5 Township 15 South, Range 64 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 3¼ miles east of Colorado Springs, Colorado, northwest of South Curtis Road and Drennan Road. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site is generally gradually sloping to the south in the eastern portion of the site, with moderate to steep slopes along the ridges and drainages associated with Williams Creek in the western portion of the site. Williams Creek along with several other minor drainages are located along the western portion of the site. An unnamed drainage is located along the eastern side of the site. Several ponds were observed on the site; however, the majority of the ponds were dry. Water was not observed in any of the creeks or drainages at the time of our site investigation.

The site boundaries are indicated on the USGS Map, Figure 2. Previous and current land uses consist of grazing and pasture land for the Norris Cattle Company. Minor sand quarry/fill borrow areas are located in the southern and northeastern portions of the site. The fill borrow areas are primarily free of vegetation, and the undisturbed areas of the site contain primarily field grasses, cacti, yucca, weeds, and scattered trees along portions of the drainages. Site photographs, taken March 3, 2022 and August 15, 2022, are included in Appendix A.

Total acreage of the proposed annexation is 1783.1 acres. The anticipated future development will consist of low to high density residential, commercial, and open space areas with associated site improvements. Proposed development and grading plans were not available at the time of this report. The proposed Master Plan is presented in Figure 3, and the Site Plan/Test Boring Location Map is presented in Figure 4.

3.0 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.

4.0 FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of any bedrock features and significant surficial deposits. The Natural Resources Conservation Service (Reference 1), previously the Soil Conservation Service (Reference 2) survey, was reviewed to evaluate the site. The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved both field reconnaissance and measurements and air photo reconnaissance and interpretation. The same mapping procedures have also been utilized to produce the Engineering Geology Map which identified pertinent geologic conditions affecting development. The field mapping was performed by personnel of Entech Engineering, Inc. on March 3, 2022 and August 15, 2022.

Thirty test borings were drilled across the site as part of this investigation to determine general soil and bedrock characteristics. The locations of the test borings are indicated on the Site Plan/Test Boring Location Map, Figure 4. The Test Boring Logs are presented in Appendix B. Results of this testing will be discussed later in this report.

Laboratory testing was performed on select samples 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, 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 1.

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 15 miles to the west is a major structural feature known as the Ute Pass Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the 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 6). 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, and the Laramie Formation of Cretaceous Age. Overlying this formation are unconsolidated deposits of man-made fill, eolian, and alluvium and colluvium soils of Quaternary Age. The alluvium and colluvium soils were deposited by water on site and as stream terraces along the drainages located on the site. Man-made fill deposits exist as erosion berms, earthen dams associated with the ponds across the site, and trash and debris in a minor drainage in the southern portion of the site. 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 1), previously the Soil Conservation Service (Reference 2) has mapped fifteen soil types on the site (Figure 5). In general, the soils classify as sandy loam, loamy coarse sand, loam, clay loam, and fine sandy loams. The soils are described as follows:

Type	Description
2	Ascalon Sandy Loam, 1 to 3% slopes
3	Ascalon Sandy Loam, 3 to 9% slopes
10	Blendon Sandy Loam, 0 to 3% slopes
30	Fort Collins Loam, 0 to 3% slopes
31	Fort Collins Loam, 3 to 8% slopes
56	Nelson-Tassel Fine Sandy Loams, 3 to 18% slopes
75	Razor-Midway Complex
78	Sampson Loam, 0 to 3% slopes
84	Stapleton Sandy Loam, 8 to 15% slopes

86	Stoneham Sandy Loam, 3 to 8
89	Tassel Fine Sandy Loam, 3 to 18% slopes
97	Truckton Sandy Loam, 3 to 9% slopes
105	Vona Sandy Loam, warm, 3 to 6% slopes
108	Wiley Silt Loam, 3 to 9% slopes
116	Udic Haplusterts

Complete descriptions of each soil type are presented in Appendix D. The soils have generally been described to have low to very rapid permeabilities and moderate erosion hazards. Limitations to development are varied on the different soil types and include frost heave action potential. The hazard of flooding exists in floodplain areas. Possible hazards with soil erosion are present on the site. The erosion potential can be controlled with vegetation.

5.3 Site Stratigraphy

The Corral Bluffs Quadrangle Geologic Map showing the site is presented in Figure 6 (Reference 6). The Geology Map prepared for the site is presented in Figure 7. Eight mappable units were identified on this site, which are described as follows:

Qal **Recent Alluvium of Quaternary Age:** These are recent stream deposits that have been deposited in the drainages across of the site. These materials consist of silty to clayey sands and sandy clays. Some of these alluviums may contain highly organic soils.

Qaf **Artificial Fill of Quaternary Age:** These are man-made fill deposits associated with erosion berms, earthen dams for ponds located across the site, and trash and debris in the head of a drainage in the southern portion of the site. Other areas of fill may be encountered that are not indicated on the map.

Qpc **Piney Creek Alluvium of Quaternary Age:** This material is a water-deposited alluvium, typically classified as a silty to well-graded sand, brown to dark brown in color and of moderate density. The Piney Creek Alluvium can sometimes be very highly stratified containing thin layers of very silty and clayey soil.

Qes **Eolian Sand of Quaternary Age:** These deposits are fine to medium grained soil deposited on the site by the action of the prevailing winds from the west and northwest. They typically occur as large dune deposits or narrow ridges. These soil types are typically tan to brown in color and tend to have very uniform or well-sorted gradation. These materials tend to have a relatively high permeability and low density.

Qac **Alluvium and Colluvium Soil of Quaternary Age:** These materials consist of undifferentiated gravelly sand and sandy gravel deposited by the action of sheetwash and gravity as well as by the action of water.

Qn **Nussbaum Alluvium of Pleistocene Age:** These materials typically consist of poorly sorted stratified silty sands and gravels with cobbles and boulders. This material was deposited by the action of water along the mountain front as upper stream terraces.

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.

Kl **Laramie Formation of Cretaceous Age:** The Laramie Formation typically consists of fine-grained massive sandstone units with interbedded siltstone, claystone and coal seams. These were deposited in beach and lagoonal environments. 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 Corral Bluffs Quadrangle* distributed by the United States Geological Survey in 1968 (Reference 7), and the *Geologic Map of the Pueblo 1^0 x 2^0 Quadrangle*, distributed by the US Geological

Survey in 1981 (Reference 6). The Test Borings were also 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

Four soil and rock types were encountered in the test borings drilled on the site: Type 1: slightly silty to very silty sand, very clayey sand (SM, SM-SW, SC), Type 2: and clay-sand (CL, CH, CL-SC), Type 3: clayey sandstone (SC), and Type 4: sandy to very sandy claystone (CL). Each material type was classified using the results of the laboratory testing and the Unified Soil Classification System (USCS).

Soil Type 1 slightly silty to very silty sand, very clayey sand (SM-SW, SM, SC), was encountered in twenty-eight of the test borings at depths ranging from the existing ground surface to 13 feet, and extending to depths ranging from 6 to 19 feet bgs or the termination of the test borings (20 feet). These soils were encountered at very loose to dense states and at dry to moist conditions. Samples tested had 5 to 45 percent of the soil sized particles passing the No. 200 Sieve. Atterberg Limits Testing resulted in non-plastic results. Swell/Consolidation Testing on a sample of the very clayey resulted in a consolidation of 3.9 percent, indicated a moderate to high consolidation potential. Sulfate testing resulted in less than 0.01 percent sulfate by weight indicating the sand exhibits negligible potential for below grade concrete degradation.

Soil Type 2 very sandy to sandy clay and clay-sand (CL, CH, CL-SC), encountered in twelve of the test borings at depths ranging from the existing surface grade to 19 feet and extending to depths ranging from 3 to 16 feet bgs, and to the termination of Test Boring 28 (20 feet). These soils were encountered at firm to stiff consistencies and moist conditions. Samples tested had 50 to 95 percent of the soil sized particles passing the No. 200 Sieve. Atterberg Limits Testing resulted in liquid limits of 43 to 50 and plastic indexes of 24 to 28. FHA Swell Testing resulted in expansion pressures of 150 to 330 psf, indicating low expansion potentials. Swell/Consolidation Testing resulted in volume changes of -2.3 to 3.5, indicating a low to moderate consolidation and low to high expansion potentials. Sulfate testing resulted in less than 0.01 to 0.18 percent sulfate by weight indicating the clay exhibits negligible to moderate potential for below grade concrete degradation.

Soil Type 3 silty to clayey sandstone (SM, SC), the sandstone was encountered in two of the test borings at depths ranging from 9 to 19 feet bgs and extending to termination of the test borings (20 feet). The sandstone was encountered at dense to very dense states and at dry to moist conditions. Samples tested had 23 percent of the soil sized particles passing the No. 200 Sieve.

Soil Type 4 sandy to very sandy claystone (CL), encountered in four of the test borings at depths ranging from 6 to 14 feet bgs and extending to depths ranging from to the termination of the test borings (20 feet). The claystone was encountered at hard consistencies and at moist conditions. Samples tested had 61 to 79 percent of the soil sized particles passing the No. 200 Sieve. Atterberg Limits Testing resulted in liquid limits of 30 to 45 and plastic indexes of 15 to 22. Swell/Consolidation Testing resulted in a volume change of 3.9 percent, which indicates a high expansion potential. Sulfate testing resulted in 0.00 percent sulfate by weight indicating the claystone exhibits negligible potential for below grade concrete degradation.

The Test Boring Logs are presented in Appendix B. Laboratory Test Results are presented in Appendix C. A Summary of Laboratory Test Results is presented in Table 1.

5.5 Groundwater

Groundwater was not encountered in the test borings which were drilled to 20 feet. 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. 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.

Two old water wells from an old homestead site located along Williams Creek in the western portion and the un-named drainage in the northeastern portion of the site of the site were

checked for water during our field mapping. The Williams Creek homestead water well was measured to be 99 feet with a trace amount of water at 99 feet. The water well located at the homestead site along the un-named drainage in the northeastern portion of the site had water at 56 feet.

6.0 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

Areas of artificial fill were observed in areas of the site associated with erosion berms, earthen dams, fill piles, and trash and debris in the head of a drainage in the southern portion of the site. Mitigation: It is anticipated the fill can be avoided or removed (regraded) during site development. Where uncontrolled fill is encountered beneath foundations or roadways, mitigation will be necessary. Mitigation typically involves removal and recompaction at a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557. Any new fill placed to the site should be placed on native or controlled fill soils, and compacted as structural fill.

Hydrocompaction – Constraint

Areas in which hydrocompaction have been identified are acceptable as building sites. In areas identified for this hazard classification, however, we anticipate a potential for settlement movements upon saturation of these surficial soils. The low density, uniform grain sized, windblown sand deposits are particularly susceptible to this type of phenomenon. Additionally, loose or collapsible soils other than those mapped may be encountered on this site.

Mitigation: The potential for settlement movement is directly related to saturation of the soils below the foundation areas. Therefore, good surface and subsurface drainage is extremely critical in these areas in order to minimize the potential for saturation of these soils. The ground surface around all permanent structures should be positively sloped away from the structure to

all points, and water must not be allowed to stand or pond anywhere on the site. We recommend that the ground surface within 10 feet of the structures be sloped away with a minimum gradient of five percent. If this is not possible on the upslope side of the structures, then a well-defined swale should be created to intercept the surface water and carry it quickly and safely around and away from the structures. Roof drains should be made to discharge well away from the structures and into areas of positive drainage. Where several structures are involved, the overall drainage design should direct water away from structures. Planting and watering in the immediate vicinity of the structures, as well as general lawn irrigation, should be minimized.

Areas of loose or collapsible soils may also be encountered in these areas. Should loose or collapsible soils be encountered beneath foundations, removal and recompaction of the upper 2 to 3 feet with thorough moisture conditioning at a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 will be necessary. Specific recommendations should be made after additional investigation of each building site.

Expansive Soils – Constraint

Expansive soils were encountered in some the test borings drilled on site. These occurrences are typically sporadic; they have been indicated on the Geology Map where encountered, Figure 7. The clays and claystone, if encountered at foundation grade, can cause differential movement in structures.

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 site once development plans have been created.

Slope Stability and Landslide Hazard

The majority of the slopes on-site are gently sloping and do not exhibit any past or potential unstable slopes or landslides. The steeper slopes are primarily located in the western portion of the site along Williams Creek and drainages. The steeper banks along the creek and drainages have been mapped as potentially unstable slopes. The mitigation recommendations for these areas are as follows:

Potentially Unstable Slope Areas – Hazard

These slopes are considered stable in their present condition; however, considerable care must be exercised in these areas not to create a condition which would tend to activate instability. The steeper slopes along portions of Williams Creek and other drainages across the site should be avoided by development unless properly mitigated with regrading. Structures can also be placed at a sufficient distance from the potentially unstable slopes. Additional investigation is recommended once development plans are created. Based on the size of the site and anticipated development these areas can likely be avoided or mitigated.

Mitigation: According to the Master Plan shown on Figure 3, it is anticipated the majority of these areas are to be avoided. Building should be avoided on the potentially unstable slopes unless they are stabilized. A minimum setback of 30 feet from the crest of these slopes is recommended. Stabilization could involve regrading to slope angles no steeper than 3:1 or the use of engineer-designed retaining walls, tiebacks, or buttresses. Where retaining walls are not used, erosion protection may be necessary to prevent undercutting by the creek during periods of high water. **Specific slope stabilization recommendations are beyond the scope of this report.**

Subsidence Area – Hazard

Based on a review of a Subsidence Investigation Report for the Colorado Springs area by Dames and Moore, 1985 (Reference 10) and the mining report for the Colorado Springs coalfield (Reference 11), the site is not undermined. The closest underground mine in the area is the Franceville Coal Mine, approximately 1 mile to the northwest of the site. The site is not mapped within any potential subsidence zones.

Faults

The closest fault is the Ute Pass Fault, located approximately 15 miles west of the site (Reference 3, Figure 4). No faults are mapped in the site itself. Previously, Colorado was mapped entirely within Seismic Zone 1, a very low seismic risk. Additionally, the International Residential Code (IRC), 2003, currently places this area in Seismic Design Category B, also a low seismic risk. According to a report by the Colorado Geological Survey by Kirkman and Rogers, Bulletin 43 (1981) (Reference 16), this area should be designed for Zone 2 due to more recent data on the potential for movement in this area and any resultant earthquakes.

Groundwater and Floodplain Areas – Constraint

Williams Creek and associated minor drainages are located in the western portion of the site and an unnamed drainage is located along the eastern side of the site that generally flow in southerly directions. The drainage in the eastern portion of the site has been mapped as floodplain zone according to the FEMA Map Nos. 08041CO790G and 08041CO795G, Figure 8 (Reference 12). Areas where potentially seasonal shallow, seasonal shallow, and ponded water have been indicated on the site geology/engineering geology map, Figure 6. Any construction considered in a floodplain area will require approval. Lots immediately adjacent to the floodplain may experience higher groundwater levels during peak flows. Subsurface perimeter drains are recommended for structures adjacent to the floodplains and drainages to help prevent the intrusion of water into areas below grade. Typical drain details are presented in Figure 10. Finished floor levels must be a minimum of one floor above the floodplain level. **Exact floodplain locations and drainage studies are beyond the scope of this report.**

Additionally, areas of potentially seasonal shallow, seasonal shallow and ponded water were observed across the site. The majority of the ponds located on the site were dry, with the exception of a stock tank in the east-central portion of the site. Groundwater was not encountered in the test borings which were drilled to 20 feet. An old water well is located along Williams Creek in the western portion of the site that measured 99 feet deep, a trace amount water was encountered at 99 feet. Additionally, a similar old water well is located near the old homestead in the northeast portion of the site. This well had water at 56 feet during our site visit on August 15, 2022. A minimum separation of 3 feet between foundation components and groundwater levels is recommended. These areas are discussed as follows:

Seasonal Shallow Groundwater: In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and possible frost heave potential, depending on the soil conditions. These areas are located within some of the drainages and behind earthen dams across the site. It is anticipated these areas would be regraded and filled or avoided by the development. Areas of shallow groundwater may exhibit unstable subgrade conditions in terms of bearing support of construction equipment during overlot grading. Areas immediately adjacent to drainage may also experience higher subsurface moisture conditions during periods of higher flows.

Mitigation: In these locations, foundations subject to severe frost heave potential should penetrate sufficient depth so as to discourage the formation of ice lenses beneath foundations. At this location and elevation, a foundation depth for frost protection of 30 inches is recommended. In areas where high subsurface moisture conditions are anticipated periodically, a subsurface perimeter drain will be necessary to help prevent the intrusion of water into areas located below grade. A typical perimeter drain detail is presented in Figure 9. Structures should not block drainages. Swales should be created to intercept surface runoff and carry it safely around and away from structures.

Potentially Seasonal Shallow Groundwater: Areas along drainage swales and erosion control berms and embankments that exist across the site have been identified as potentially seasonal shallow groundwater. It is anticipated these areas would be regraded and filled as a part of the proposed site plan. Fill added to these areas further raise foundations above groundwater levels. Foundations should be kept as high as possible. 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 may be necessary to prevent the intrusion of water into areas below grade. Typical drain details are presented in Figure 9. Where shallow groundwater is encountered, underslab drains or interceptor drains may be necessary. Typical drain details are presented in Figure 11 and 12. It is anticipated that the shallow water areas will be mitigated with site grading and the installation of sewer underdrains. Specific recommendations should be made after site grading and additional investigation has been completed.

Areas of Ponded Water

Areas of ponded water exists behind some of the earthen dams across the site. Should construction or regrading of the pond areas on 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 where it does not create areas of ponded water around any proposed structures.

Areas of Erosion – Constraint

These are areas that are undergoing erosion by water and sheetwash producing gullies and rill erosion. The areas of significant erosion observed on the site are located along the main drainages across the site.

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 8.0 "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).

Debris Fans/Debris Flow Susceptibility

The site is mapped within an area susceptible to debris flows according to the *Debris Flow Susceptibility Map of El Paso County, Colorado,* by McCoy, Morgan, and Berry (Reference 14, Figure 9). Based on site observations, recent debris fans were not observed on the site. Due to the material type and steepness of the slopes, the potential for significant erosion and sediment laden flows originating along the heads of drainages in the northwestern portion of the of the site following significant precipitation events exist. Any site grading should be constructed to direct surface flows around the structure and carried off-site in a non-erosive manor.

Radon – Hazard

Radon levels for the area have been reported by the Colorado Geologic Survey in the open file, Report No. 91-4 (Reference 14). Average Radon levels for the 80908-zip code is 3.40 pCi/l. The following is a table of radon levels in this area:

	80908
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 areas and sealing joints. Specific requirements for mitigation should be based on site specific testing.

6.1 Relevance of Geologic Conditions to Land Use Planning

We understand that the development will be mixed use with primarily residential, park and open space areas, drainage easements, and regional detention ponds. Grading plans were not available at the time of this report. 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 potentially unstable slopes on site that will primarily be mitigated by avoidance or the site grading. Other hazards on site can be satisfactorily mitigated through proper engineering design and construction practices.

The upper materials are typically at medium dense states. The granular soils encountered in the upper soil profiles of the test borings should provide good support for foundations. Loose soils, if encountered at foundation depth, will require mitigation. Foundations anticipated for the site are standard spread footings possibly in conjunction with overexcavation in areas of expansive soils or recompaction in areas of loose soils. 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 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.

Bedrock was not encountered in the majority of the test borings, drilled to depths of 20 feet. Shallow bedrock was encountered in the northwest portion of the site and on the ridge in the central portion of the site.

Areas of erosion and gullying 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".

Areas of hydrocompaction have been identified on this site where there is the potential for settlement movements upon saturation of the surficial soils. Good surface and subsurface drainage are critical in these areas, and the ground surface should be positively sloped away from structures at all points. Roof drains should be made to discharge well away from structures and planting and watering in the immediate vicinity of structures should be minimized.

Potentially unstable slope areas were observed along Williams Creek and in the central portion of the site along a cut of the former borrow area. The steeper slopes along Williams Creek will be avoided by the development, and the areas within the former borrow area will likely be regarded during site development. Any fill placed along the slopes should be properly benched into the slope. 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.

The Williams Creek drainage lies west of the site and has been mapped as a floodplain zone, and the un-named drainage in the eastern portion of the site has also been mapped as a floodplain zone according to the FEMA Map Nos. 08041CO790G and 08041CO795G. Exact locations of floodplain and specific drainage studies are beyond the scope of this report. Groundwater was not encountered in any of the test borings to depths of 20 feet. Shallower groundwater should be expected within or adjacent to the drainages.

Areas of seasonal and potential seasonal shallow groundwater have been mapped on the site. These areas can be regraded and surface drainage piped to storm sewers; however, structures immediately adjacent to drainage areas may experience higher water levels during periods of high moisture. Additionally, a potentially seasonal shallow groundwater area has been mapped in the southern portions of the site. It is anticipated this area will be filled and regraded. All soft or organic soils should be removed prior to fill placement. Unstable soils may be encountered where excavations approach the groundwater level. Shallow groundwater areas may also affect utility installation. Geo-grids or shotrock may be necessary to stabilize excavations. Foundations should be kept as high as possible. Foundations in or adjacent to seasonal shallow groundwater areas may require drains to control seepage within the foundation zone. Typical drain details are presented in Figures 9 through 11. To evaluate groundwater conditions and drainage requirements, additional investigation is recommended after grading and installation of the storm sewer.

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. Additional investigation is recommended as plans are developed.

7.0 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 15), portions of the site are mapped as upland 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 16), portions of the site are mapped as U3 – Upland deposits: sand, E3 – Eolian sands: wind deposited sands, and F3: Floodplain deposits: sand. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 17), tracts in the area of the site have been mapped as "Good" for industrial minerals. Old quarries exist on the site and in the area of the site for sand and gravel.

According to *the Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 17), the tracts in the area of the site have been mapped as "Fair to Moderate" for coal resources and "Little or no Potential" metallic mineral resources. The site has been mapped as "Fair" for oil and gas resources (Reference 17). 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.

8.0 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 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.

9.0 ROADWAY AND EMBANKMENT CONSTRUCTION RECOMMENDATIONS

In general, the site soils are suitable for anticipated roadway and embankment constructions. Groundwater should be expected to be encountered along drainages and low-lying 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 (granular soils), and at least 95% of its maximum Standard Proctor Dry Density, ASTM D-698 (cohesive soils). 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 is recommended when grading plans are developed. Investigations will also be required for pavement designs once roadway grading is completed and utilities are installed.

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 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 Norris Ranch Joint Ventures, LLC for application to the proposed annexation 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.

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TABLES

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

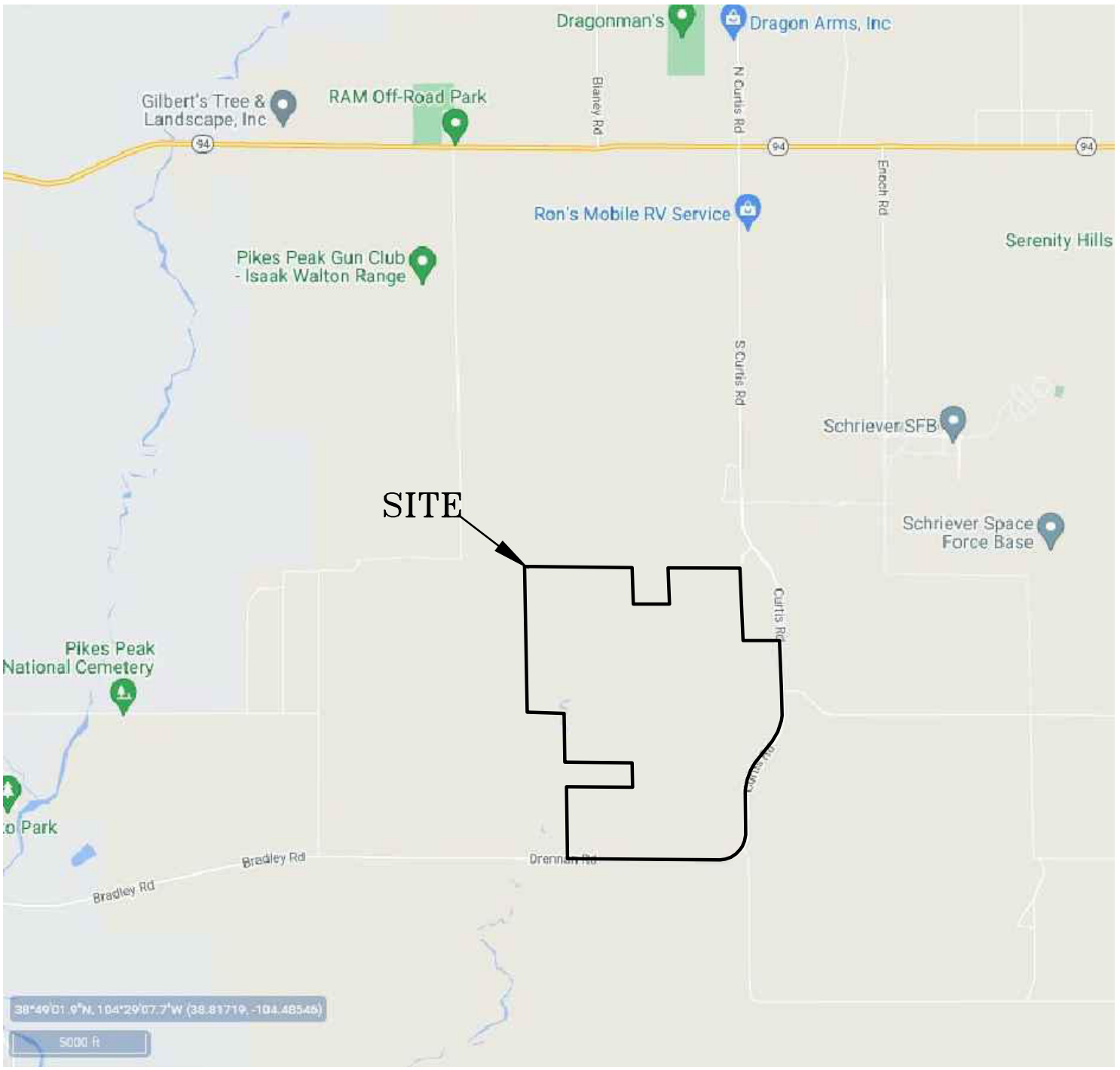
CLIENT GUMAN AND ASSOCIATES
PROJECT S. CURTIS RD. & DRENNAN RD.
JOB NO. 220200

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	6	10			24.7	NV	NP	<0.01			SM	SAND, SILTY
1	9	5			14.5	NV	NP	<0.01			SM	SAND, SILTY
1	10	2-3			8.9						SM-SW	SAND, SLIGHTLY SILTY
1	12	5			33.9						SM	SAND, SILTY
1	13	15			5.4						SM-SW	SAND, SLIGHTLY SILTY
1	16	10			7.8						SM-SW	SAND, SLIGHTLY SILTY
1	17	5			5.4	NV	NP				SM-SW	SAND, SLIGHTLY SILTY
1	18	10			8.3						SM-SW	SAND, SLIGHTLY SILTY
1	19	5			17.7						SM	SAND, SILTY
1	20	15			11.0	NV	NP				SM-SW	SAND, SLIGHTLY SILTY
1	21	2-3			43.1						SM	SAND, VERY SILTY
1	22	5			10.9						SM-SW	SAND, SLIGHTLY SILTY
1	23	5			16.2						SM	SAND, SILTY
1	27	10	7.4	102.1	44.7					-3.9	SC	SAND, VERY CLAYEY
1	29	5			45.0						SM	SAND, VERY SILTY
2	1	10	13.3	113.4	94.5	50	28	0.18		3.5	CH	CLAY, SANDY
2	2	2-3	11.0	103.0	84.6	43	25	<0.01		2.0	CL	CLAY, SANDY
2	4	5			55.4						CL	CLAY, VERY SANDY
2	5	2-3			76.8				330		CL	CLAY, SANDY
2	8	2-3	16.1	86.0	67.8	47	24	0.02		0.3	CL	CLAY, SANDY
2	11	10	15.2	86.9	68.3					-2.3	CL	CLAY, SANDY
2	14	2-3			66.8						CL	CLAY, SANDY
2	15	2-3			67.7						CL	CLAY, SANDY
2	24	15	1.1	89.0	69.8					-1.0	CL	CLAY, SANDY
2	25	2-3			70.0				150		CL	CLAY, SANDY
2	28	10			50.0						CL-SC	CLAY-SAND
2	30	2-3			55.2						CL	CLAY, VERY SANDY
3	26	20			22.7						SC	SANDSTONE, CLAYEY
4	3	20			61.0	30	15				CL	CLAYSTONE, VERY SANDY
4	7	20	14.6	111.7	79.2	45	22	0.00		3.9	CL	CLAYSTONE, SANDY

TABLE 2: Summary of Depth of Bedrock and Groundwater

Test Boring No.	Depth of Bedrock (ft.)	Depth of Groundwater (ft.)
1	6	>20
2	11	>20
3	6	>20
4	>20	>20
5	>20	>20
6	>20	>20
7	14	>20
8	>20	>20
9	>20	>20
10	>20	>20
11	>20	>20
12	>20	>20
13	>20	>20
14	>20	>20
15	>20	>20
16	>20	>20
17	>20	>20
18	>20	>20
19	>20	>20
20	>20	>20
21	>20	>20
22	>20	>20
23	>20	>20
24	>20	>20
25	>20	>20
26	19	>20
27	>20	>20
28	>20	>20
29	>20	>20
30	9	>20

FIGURES



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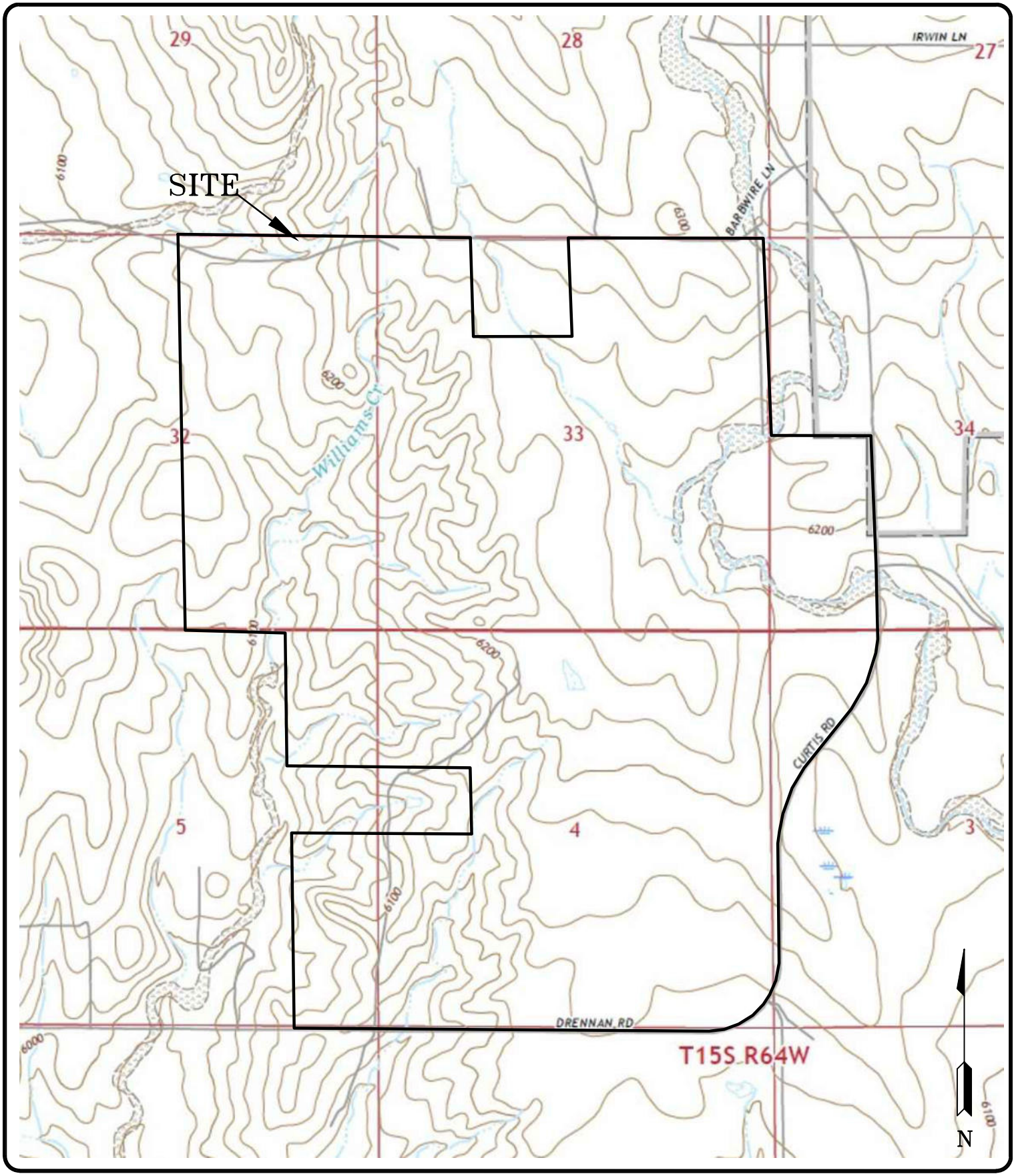
COLORADO SPRINGS, CO. 80907 (719) 531-5599

VICINITY MAP
KARMAN LINE
SOUTH CURTIS ROAD & DRENNAN ROAD
EL PASO COUNTY, COLORADO
FOR: FOR: NORRIS RANCH JOINT VENTURES, LLC

DRAWN:	DATE:	CHECKED:	DATE:
LLL	3/30/23		

JOB NO.: 230486

FIG NO.: 1



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USGS TOPOGRAPHY MAP
NORRIS RANCH PROPERTIES
SOUTH CURTIS ROAD & DRENNAN ROAD
EL PASO COUNTY, COLORADO
FOR: NORRIS RANCH JOINT VENTURES, LLC

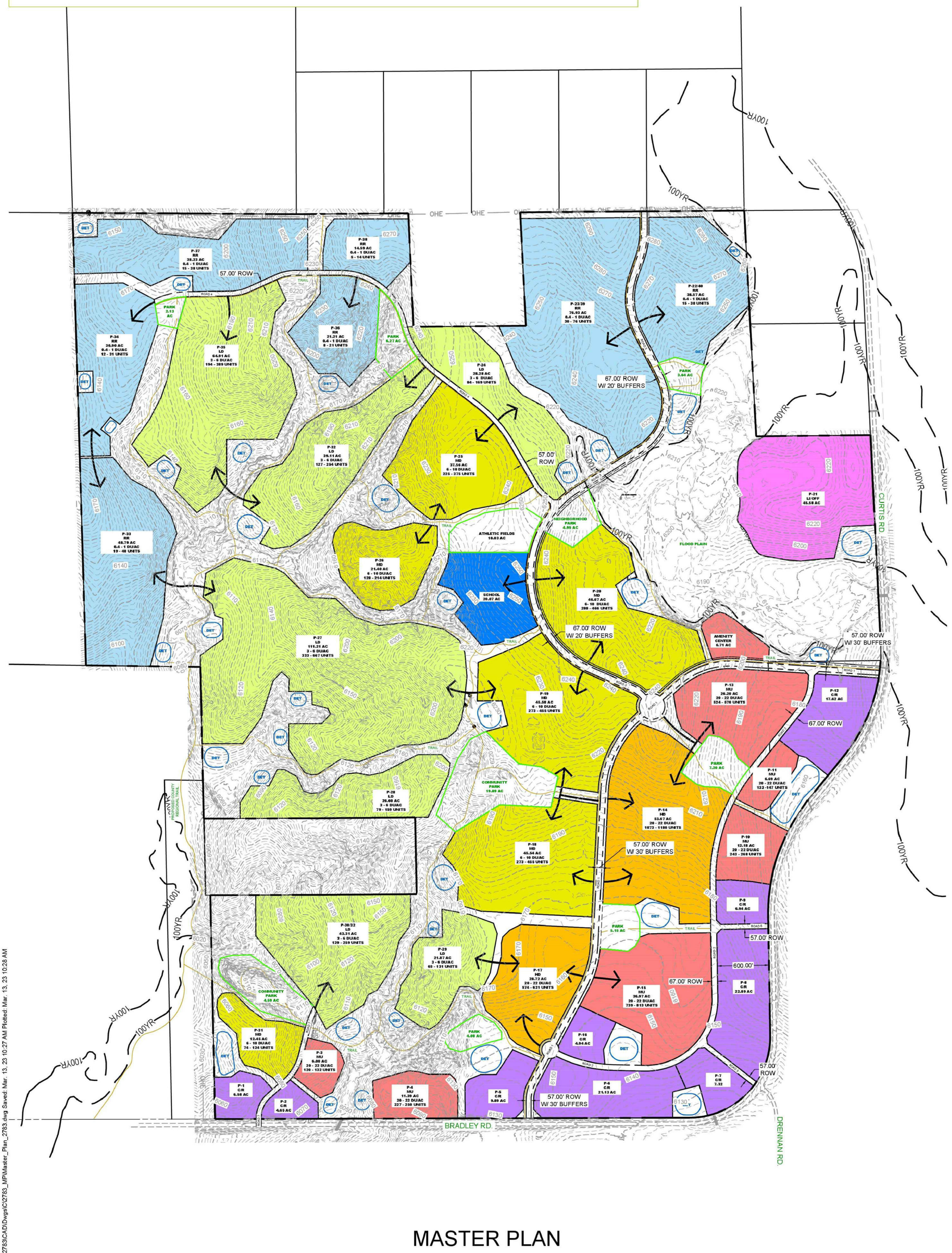
DRAWN:	DATE:	CHECKED:	DATE:
LLL	3/30/23		

JOB NO.: 230486

FIG NO.: 2

LAND USE SUMMARY

USE TYPE	DENSITY (DU/AC)	ACREAGE	UNIT RANGE
RURAL RESIDENTIAL (RR)	0.4 - 1	269.22 AC	108 - 269
HIGH DENSITY (HD)	20 - 22	82.39 AC	1,647 - 1,811
MEDIUM DENSITY (MD)	6 - 10	209.20 AC	1,253 -2,089
LOW DENSITY (LD)	3 - 6	335.29 AC	1,011 - 2,028
MIXED-USE (MU)	20 - 22	99.43 AC	1,986 - 2,186
COMMERCIAL/RETAIL (C/R)	N/A	105.12 AC	N/A
LIGHT INDUSTRIAL/OFFICE (LI/OFF)	N/A	45.58 AC	N/A
TOTAL			6,000 - 8,379



MASTER PLAN

NORRIS RANCH

NORTH

0 500' 1,000' 1,500'

SCALE: 1" = 500'

March 13, 2023

Base mapping compiled from best available information

HRGreen

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MASTER PLAN
KARMAN LINE
SOUTH CURTIS ROAD & DRENNAN ROAD
EL PASO COUNTY, COLORADO
FOR: NORRIS RANCH JOINT VENTURES, LLC

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CHECKED
DATE 3/30/23
SCALE AS SHOWN
JOB NO. 230486
FIGURE No. 3

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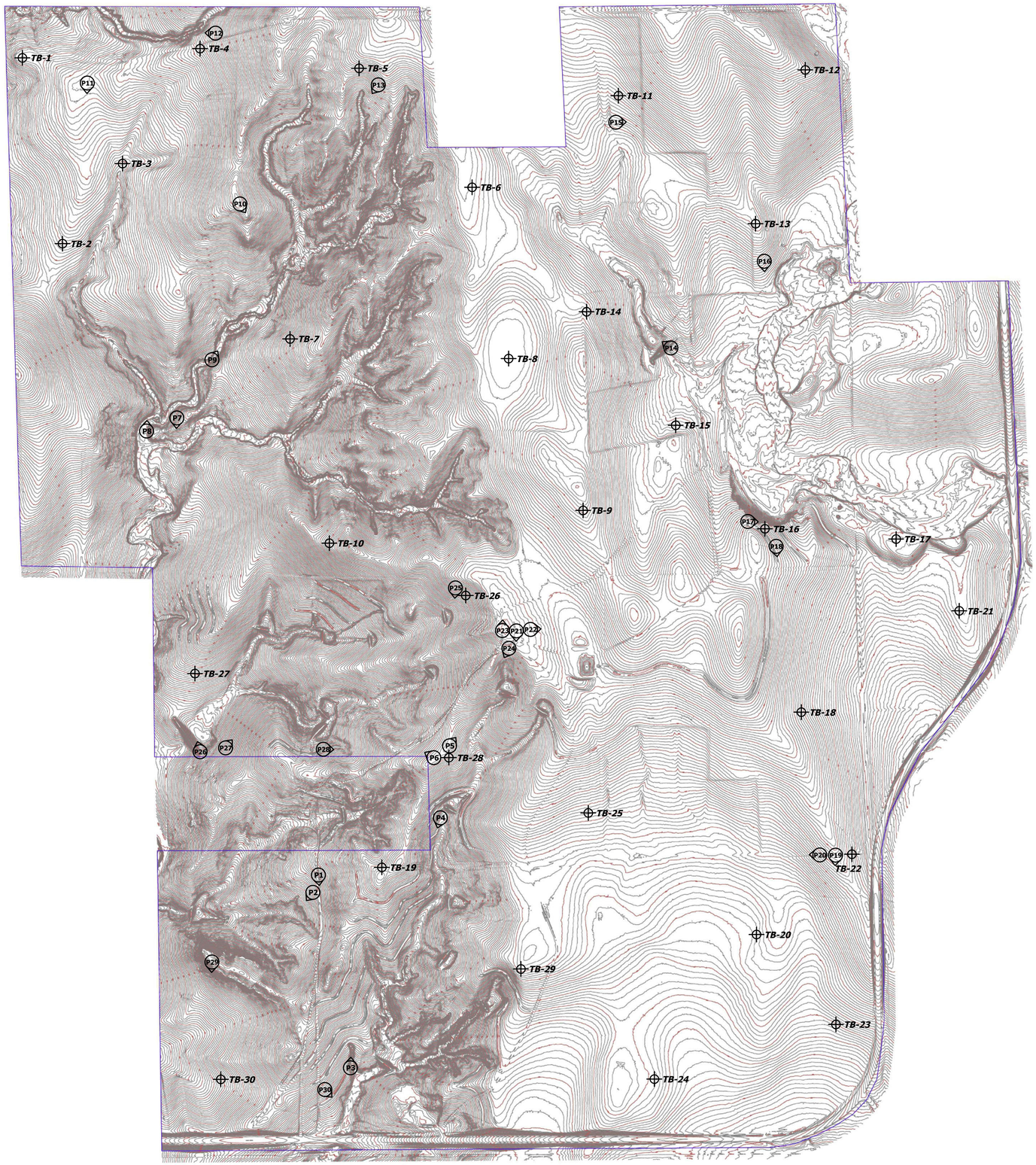

Legend:

TB - Approximate Test Boring Location and Number

P1 - Approximate Photograph Direction and Location

N

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SITE MAP/TESTING LOCATION MAP
KARMAN LINE
SOUTH CURTIS ROAD & DRENNAN ROAD
EL PASO COUNTY, COLORADO
FOR: NORRIS RANCH JOINT VENTURES, LLC

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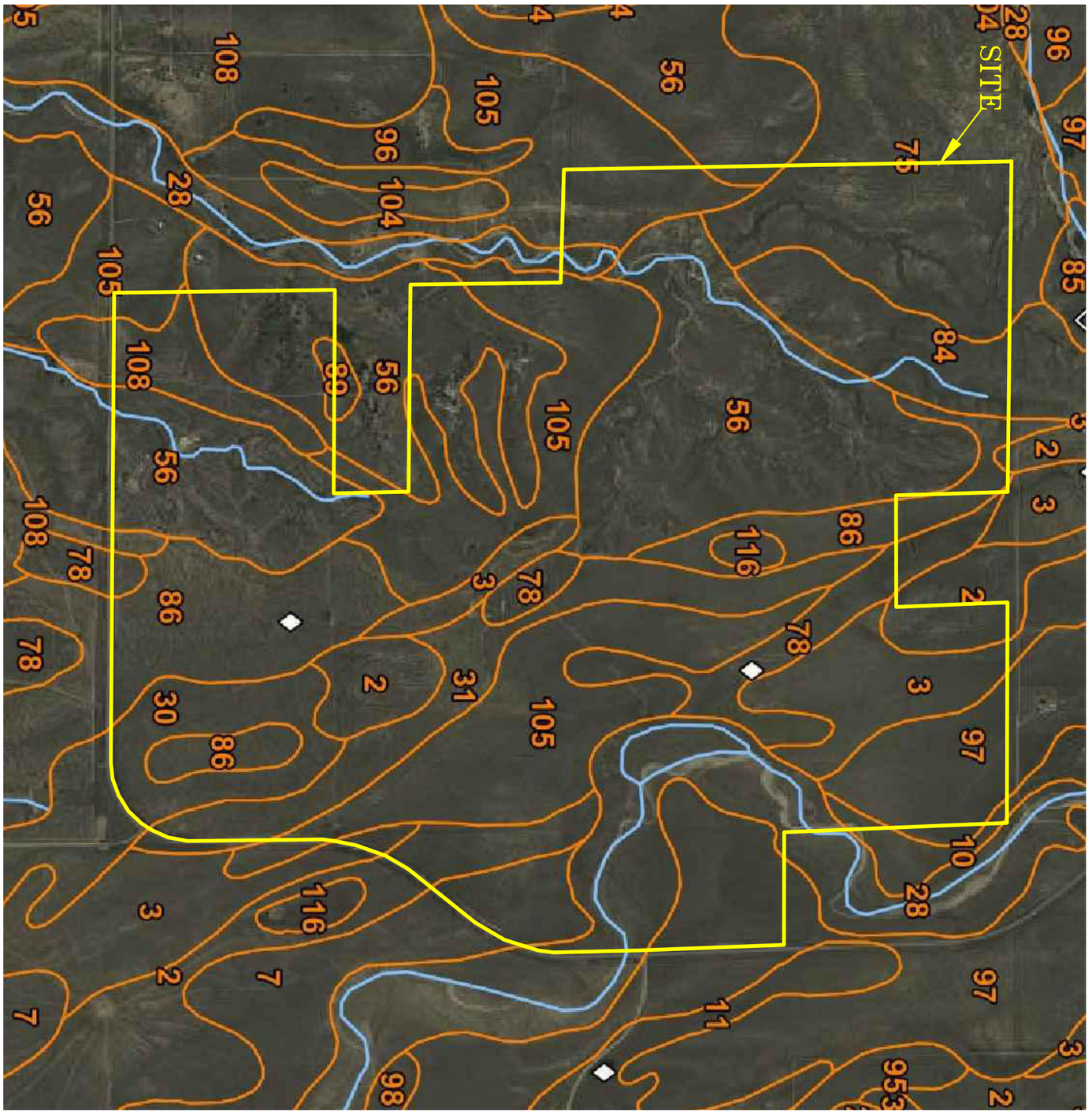
DATE	3/30/23
SCALE	AS SHOWN
JOB NO.	230486
FIGURE No.	4



SOIL SURVEY MAP
KARMAN LINE
SOUTH CURTIS ROAD & DRENNAN ROAD
EL PASO COUNTY, COLORADO
FOR: NORRIS RANCH JOINT VENTURES, LLC

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DATE 3/30/23
SCALE AS SHOWN
JOB NO. 230486
FIGURE No. 5

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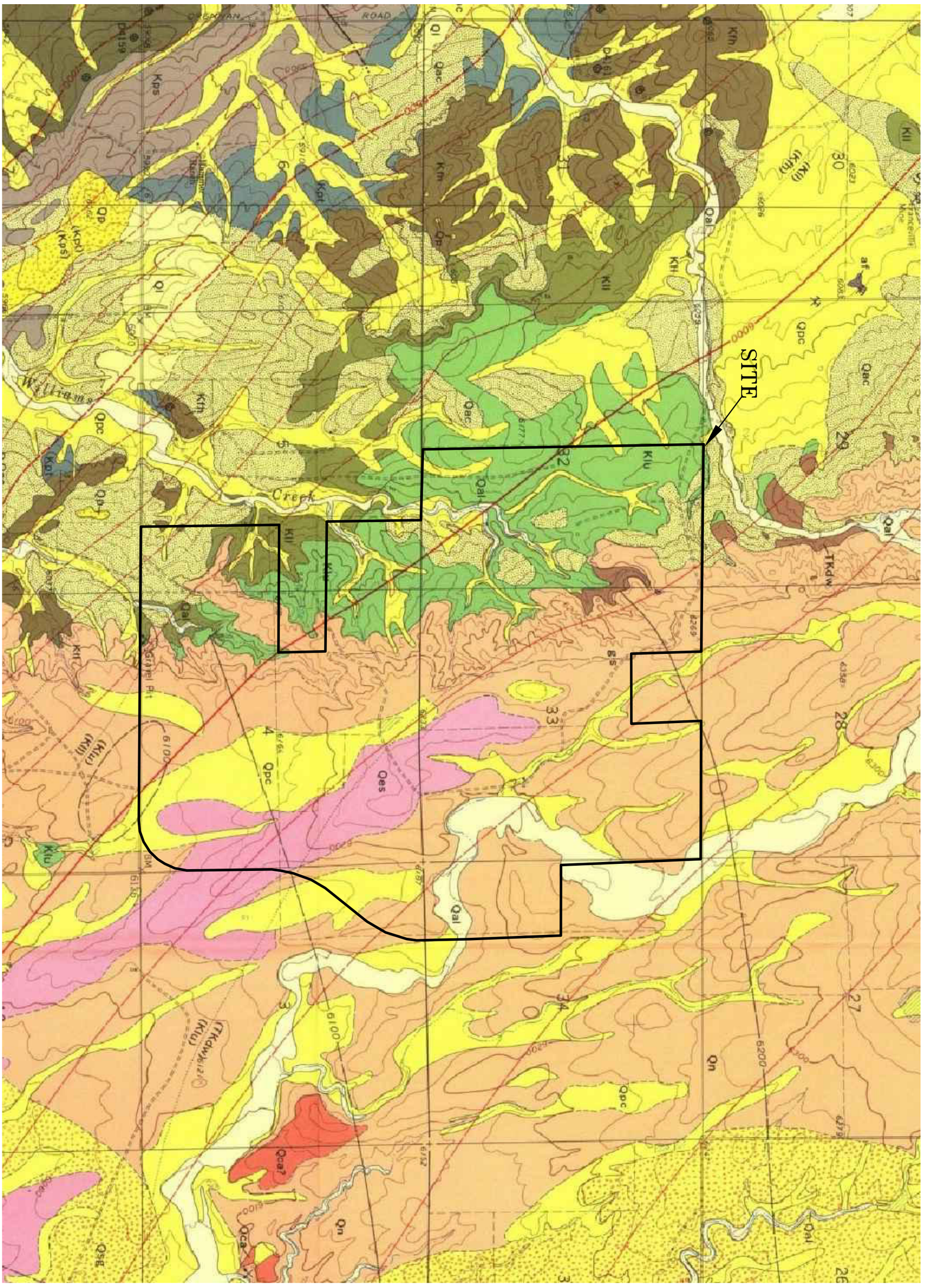

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CHECKED	
DATE	3/10/23
SCALE	AS SHOWN
JOB NO.	230486
FIGURE No.	6

CORRAL BLUFFS QUADRANGLE GEOLOGIC MAP
KARMAN LINE
SOUTH CURTIS ROAD & DRENNAN ROAD
EL PASO COUNTY, COLORADO
FOR: NORRIS RANCH JOINT VENTURES, LLC

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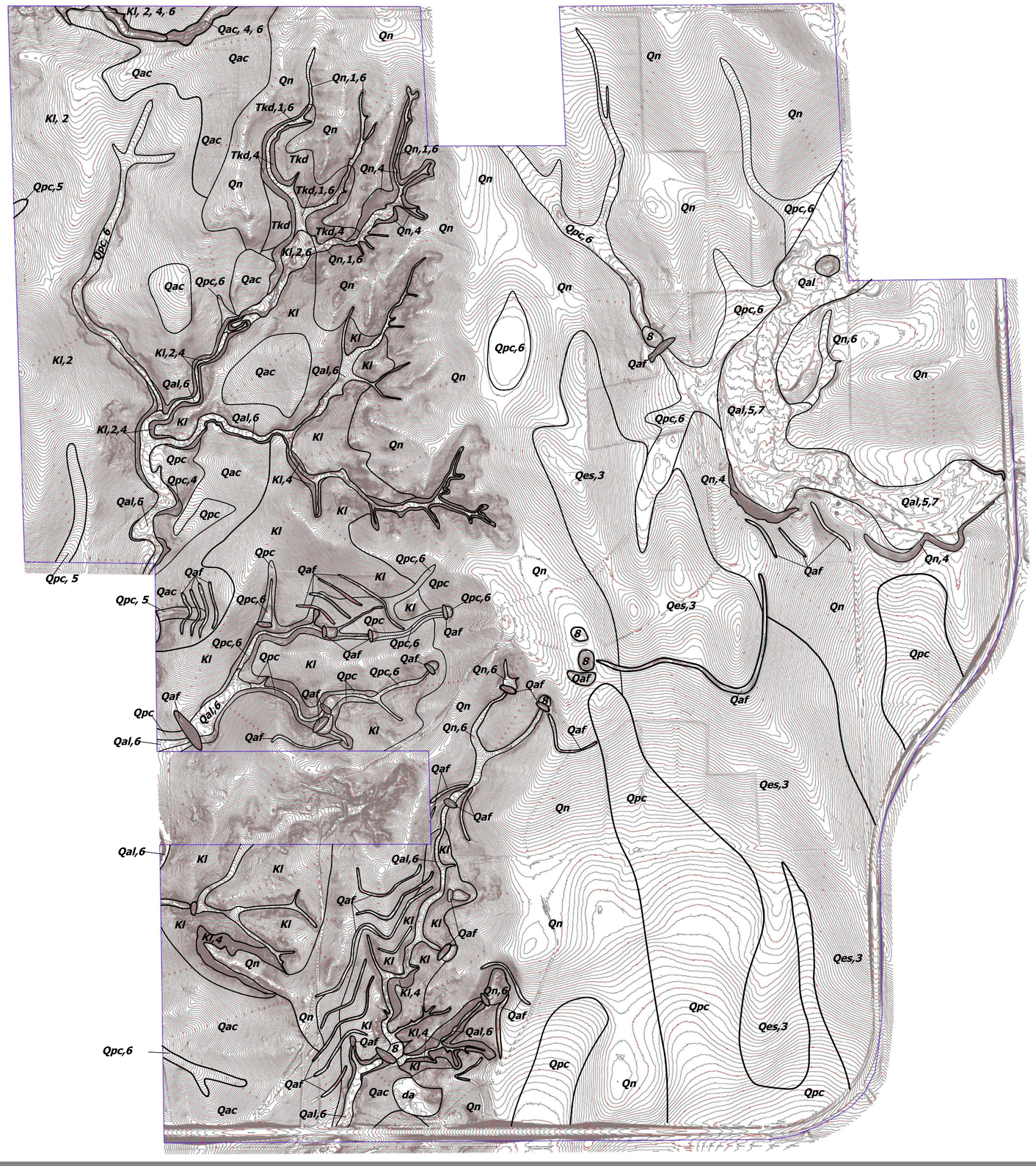

Legend:

Qal - Alluvium of Quaternary Age:
recent stream deposited materials

Qaf - Artificial Fill of Quaternary Age:
man-made fill deposits associated with erosion berms, and earthen dams

Qpc - Piney Creek Alluvium of Quaternary Age:
water deposited sands and clays

Qes - Eolian Sand of Quaternary Age:
wind blown sand deposits

Qac - Alluvium and Colluvium undifferentiated of Quaternary Age:
water deposited gravelly sand and sandy gravel

Qn - Nussbaum Alluvium of Pleistocene Age:
sandy stream terrace deposits

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

Kl - Laramie Formation of Cretaceous Age:
sheetwash and residual soil deposits overlying fine grained sandstone with interbedded shale and coal lenses

(1) er - erosion
(2) ex - expansive
(3) h - hydrocompaction
(4) pu - potentially unstable slopes
(5) fp - floodplain
(6) psw - potentially seasonal shallow groundwater area
(7) sw - seasonally shallow groundwater areas
(8) w - water

N

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GEOLOGY/ENGINEERING GEOLOGY MAP
KARMAN LINE
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EL PASO COUNTY, COLORADO
FOR: NORRIS RANCH JOINT VENTURES, LLC

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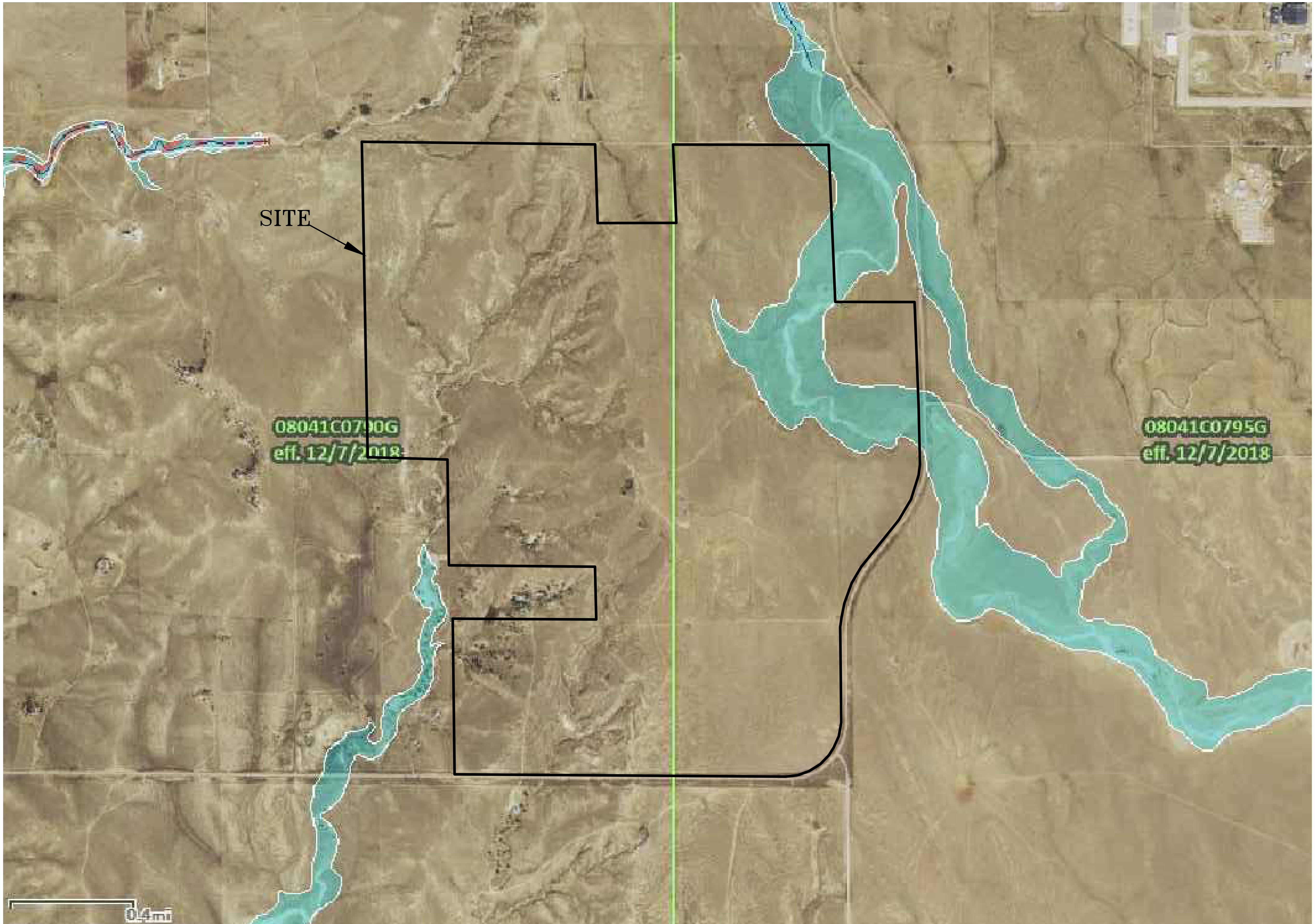
DATE	3/30/23
SCALE	AS SHOWN
JOB NO.	230486
FIGURE No.	7



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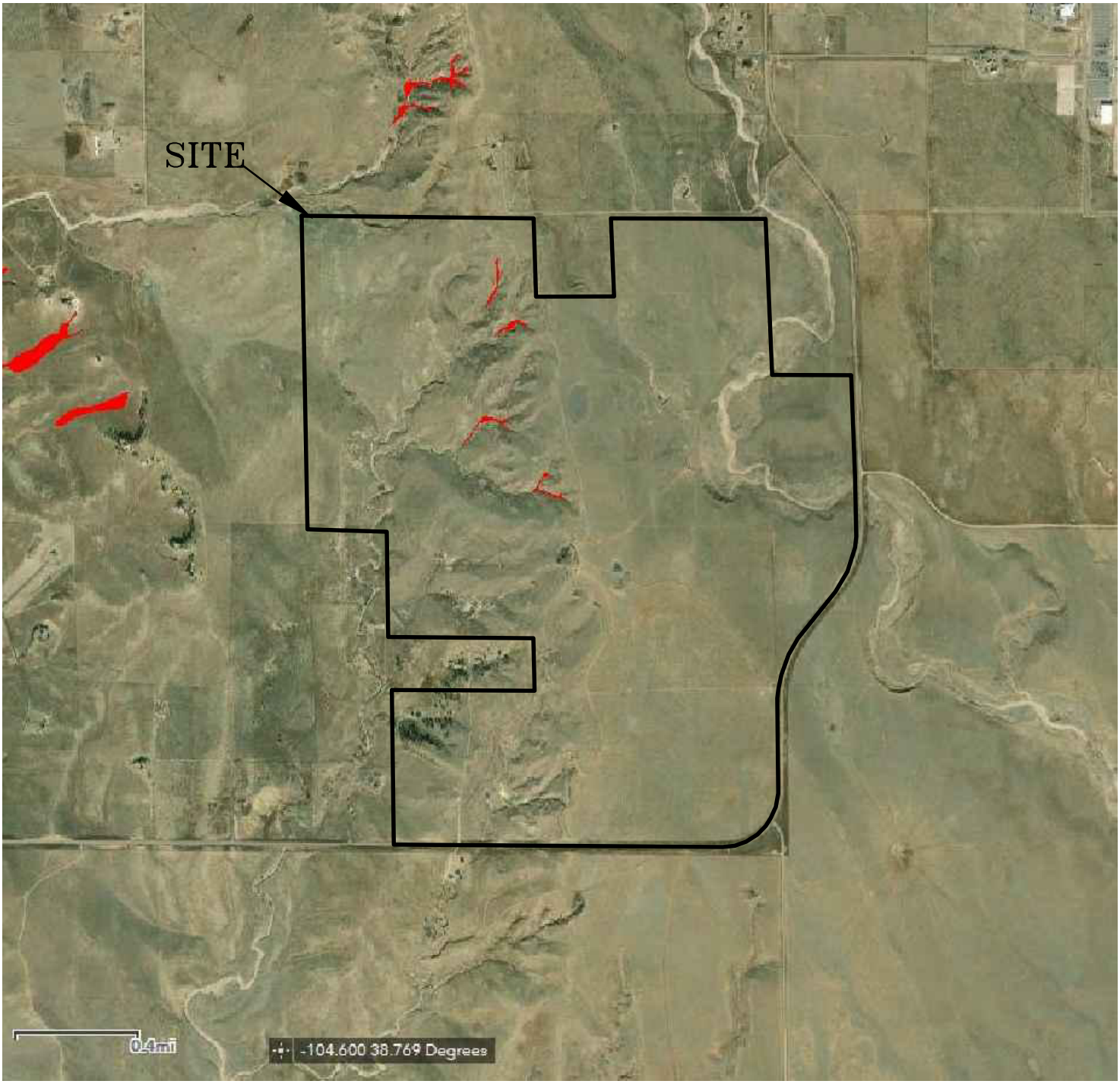
FLOODPLAIN MAP
KARMAN LINE
SOUTH CURTIS ROAD & DRENNAN ROAD
EL PASO COUNTY, COLORADO
FOR: NORRIS RANCH JOINT VENTURES, LLC

DRAWN: LLL
CHECKED:
DATE: 3/30/23
SCALE: AS SHOWN
JOB NO.: 230486
FIGURE No.: 8



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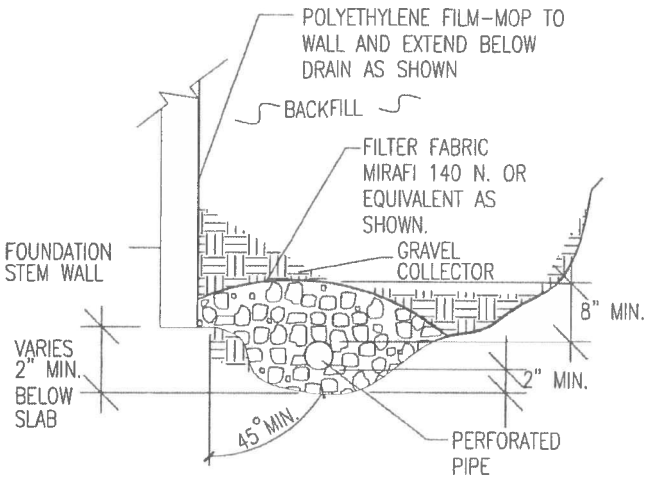
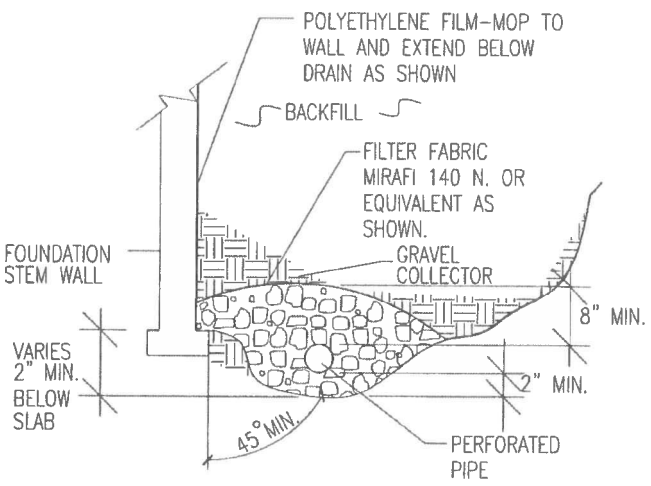
DEBRIS FLOW SUSCEPTIBILITY MAP
KARMAN LINE
SOUTH CURTIS ROAD & DRENNAN ROAD
EL PASO COUNTY, COLORADO
FOR: NORRIS RANCH JOINT VENTURES, LLC

DRAWN:	DATE:	CHECKED:	DATE:
LLL	3/30/23		

JOB NO.: 230486

FIG NO.: 9





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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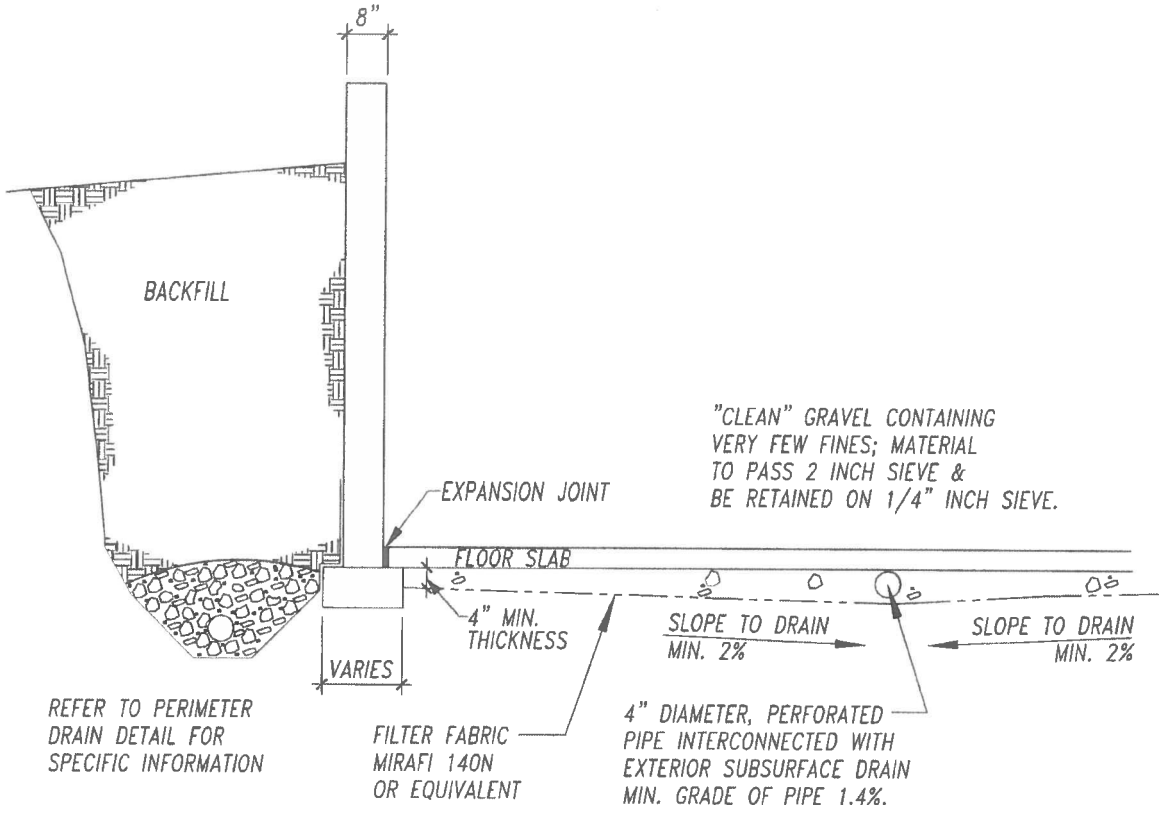
PERIMETER DRAIN DETAIL

DRAWN:	DATE:	DESIGNED:	CHECKED:

JOB NO.: 230486

FIG NO.: 10



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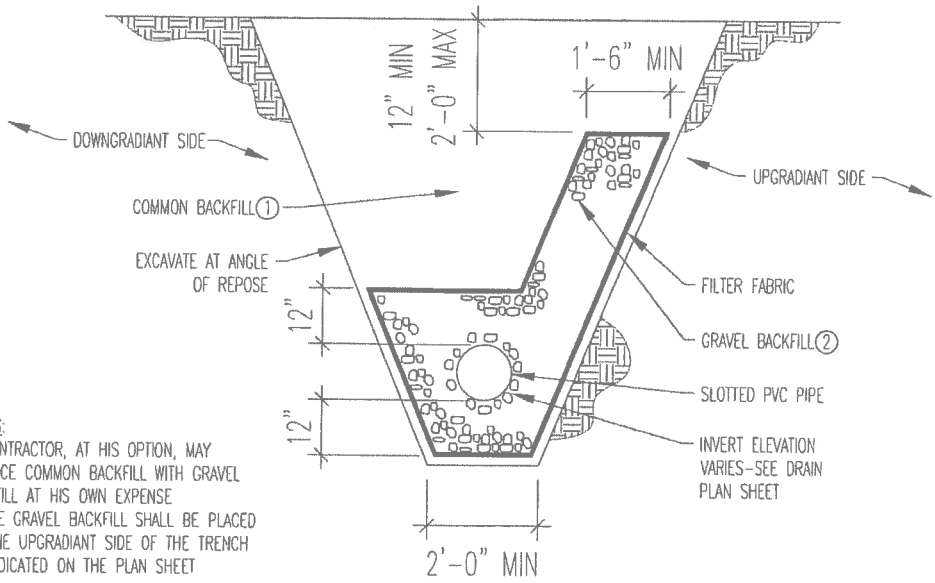
TYP. UNDERSLAB DRAINAGE
LAYER (CAPILLARY BREAK)

DRAWN BY:	DATE:	DESIGNED BY:	CHECKED:

JOB NO.: 230486

FIG NO.: 11

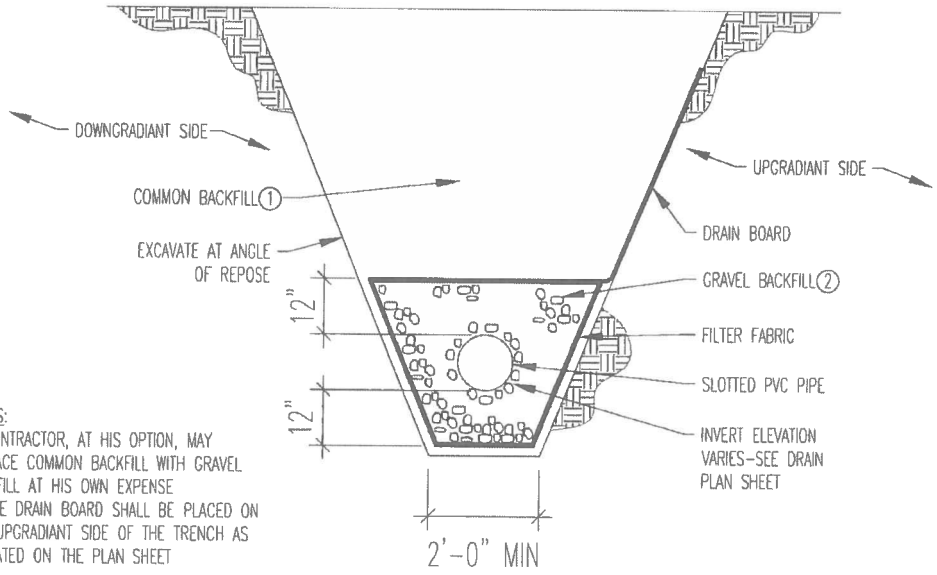


NOTES:
1. CONTRACTOR, AT HIS OPTION, MAY REPLACE COMMON BACKFILL WITH GRAVEL BACKFILL AT HIS OWN EXPENSE
2. THE GRAVEL BACKFILL SHALL BE PLACED ON THE UPGRADIANT SIDE OF THE TRENCH AS INDICATED ON THE PLAN SHEET

EXTEND PIPE TO DAYLIGHT

INTERCEPTOR DRAIN DETAIL

N.T.S.



NOTES:
1. CONTRACTOR, AT HIS OPTION, MAY REPLACE COMMON BACKFILL WITH GRAVEL BACKFILL AT HIS OWN EXPENSE
2. THE DRAIN BOARD SHALL BE PLACED ON THE UPGRADIANT SIDE OF THE TRENCH AS INDICATED ON THE PLAN SHEET

EXTEND PIPE TO DAYLIGHT

INTERCEPTOR DRAIN DETAIL

N.T.S.

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INTERCEPTOR DRAIN DETAIL

DRAWN BY:	DATE:	DESIGNED:	CHECKED:

JOB NO.: 230486

FIG. NO.: 12

APPENDIX A: Site Photographs

1

Looking south from the southwestern portion of the site.

March 3, 2022

2

Looking west toward rock outcrop and drainage in the southwestern portion of the site.

March 3, 2022

Job No. 230486

3

Looking north at trash pit in the head of a drainage southern portion of the site.

March 3, 2022

4

Looking southwest along drainage in the south-central portion of the site

March 3, 2022

Job No. 230486

5

Looking northeast from the south-central portion of the site.

March 3, 2022

6

Looking northwest from the central portion of the site.

March 3, 2022

Job No. 230486

7

Looking south from towards Williams Creek drainage the west portion of the site.

March 3, 2022

8

Looking north along Williams Creek drainage in the west portion of the site.

March 3, 2022

Job No. 230486

9

Looking northeast along drainage in the northwestern portion of the site.

March 3, 2022

10

Looking southeast from the northwestern portion of the site.

March 3, 2022

Job No. 230486

11

Looking south from the northwestern portion of the site.

March 3, 2022

12

Looking west from the northern portion of the site.

March 14, 2022

Job No. 230486

13

Looking southwest along head of drainage in the northern portion of the site.

March 3, 2022

14

Looking west towards pond in the northeastern portion of the site.

August 15, 2022

Job No. 230486

15

Looking east from the northeastern portion of the site.

March 3, 2022

16

Looking south from the northeaster portion of the site.

August 15, 2022

Job No. 230486

17

Looking east from potentially unstable slopes along drainage in the east-central portion of the site.

August 15, 2022

18

Looking south from the east-central portion of the site.

March 14, 2022

Job No. 230486

19

Looking south from the southeastern portion of the site.

March 14, 2022

20

Looking west from the southeastern portion of the site.

August 15, 2022

Job No. 230486

21

Looking south from the central portion of the site.

August 15, 2022

22

Looking east from the central portion of the site.

August 15, 2022

Job No. 230486

23

Looking north from the central portion of the site.

August 15, 2022

24

Looking southwest from the central portion of the site.

March 3, 2022

Job No. 230486

25

Looking south from the central portion of the site.

August 15, 2022

26

Looking north from the western portion of the site along embankment near Williams Creek.

March 14, 2022

Job No. 230486

27

Looking northeast from the western portion of the site.

August 15, 2022

28

Looking east from the western portion of the site.

March 14, 2022

Job No. 230486

29

Looking south from outcrop in the southwestern portion of the site.

August 15, 2022

30

Looking southeast from the southern portion of the site.

August 15, 2022

Job No. 230486

APPENDIX B: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 3/24/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			22	9.6	2
5			38	15.1	2
10			50 7"	14.8	4
15			50 10"	15.6	4
20			50 10"	17.8	4

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

CLAYSTONE, SANDY, DARK BROWN, HARD, MOIST

TEST BORING NO. 2
DATE DRILLED 3/24/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			21	11.0	2
5			20	10.6	2
10			26	6.1	1
15			50 8"	13.9	4
20			50 7"	18.1	4

CLAY, SANDY, GRAY BROWN, STIFF, MOIST

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

CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: B- 1

TEST BORING NO. 3
DATE DRILLED 3/24/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE TO DENSE, MOIST			19	12.1	1
5			33	14.2	1
CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST					
10			50/9"	9.7	4
15			50/8"	12.8	4
20			50/7"	9.9	4

TEST BORING NO. 4
DATE DRILLED 3/24/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
CLAY, VERY SANDY, TAN, STIFF TO FIRM, MOIST			16	7.1	2
5			14	8.2	2
SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE TO DENSE, MOIST					
10			12	8.3	1
15			35	20.9	1
20			42	14.0	1

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TEST BORING LOG

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/30/23

JOB NO.: 230486
FIG NO.: B- 2

TEST BORING NO. 5
DATE DRILLED 3/24/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
						CLAY, SANDY, TAN, FIRM TO STIFF, MOIST
			14	8.8	2	
5			18	7.1	2	
						SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO DENSE, MOIST
10			19	3.1	1	
15			39	5.8	1	
20			29	3.1	1	

TEST BORING NO. 6
DATE DRILLED 3/24/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
						SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, LOOSE TO DENSE, MOIST
			9	9.0	1	
5			13	9.9	1	
10			12	4.3	1	
15			44	4.2	1	
20			23	4.4	1	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/30/23

JOB NO.: 230486
FIG NO.: B- 3

TEST BORING NO. 7
DATE DRILLED 3/25/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO DENSE, MOIST			22	4.1	1
5			19	5.0	1
10			32	8.4	1
CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST 15			50	10.5	4
20			50/8"	11.4	4

TEST BORING NO. 8
DATE DRILLED 3/25/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
CLAY, SANDY, GRAY BROWN, STIFF, MOIST			22	12.0	2
SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST TO DRY 5			20	4.5	1
10			16	2.1	1
15			19	2.4	1
20			26	3.5	1

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: B- 4

TEST BORING NO. 9
DATE DRILLED 3/25/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
						SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST
			18	1.7	1	
5			23	1.0	1	
10			11	2.7	1	
15			18	1.8	1	
20			10	3.5	1	

TEST BORING NO. 10
DATE DRILLED 3/25/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
						SAND, SLIGHTLY SILTY TO SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST
			21	1.8	1	
5			22	1.5	1	
10			12	2.0	1	
15			10	6.8	1	
20			19	4.0	1	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/30/23

JOB NO.: 230486
FIG NO.: B- 5

TEST BORING NO. 11
DATE DRILLED 3/25/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			19	7.5	2	CLAY, SANDY, BROWN TO TAN, STIFF, MOIST
5			19	10.7	2	
10			17	7.0	2	
15			25	6.9	1	SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST
20			23	7.0	1	

TEST BORING NO. 12
DATE DRILLED 3/25/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			9	1.6	1	SAND, SILTY, FINE TO MEDIUM GRAINED, BROWN TO TAN, LOOSE TO MEDIUM DENSE, DRY TO MOIST
5			12	5.3	1	
10			10	4.7	1	
15			12	9.9	1	
20			16	11.4	1	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/30/23

JOB NO.: 230486
FIG NO.: B- 6

TEST BORING NO. 13
DATE DRILLED 3/25/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			17	3.6	1	SAND, SLIGHTLY SILTY, FINE TO MEDIUM GRAINED, TAN, DENSE TO MEDIUM DENSE, MOIST TO DRY
5			31	0.6	1	
10			13	1.0	1	
15			12	1.8	1	
20			18	1.8	1	

TEST BORING NO. 14
DATE DRILLED 3/25/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			9	14.0	2	CLAY, SANDY, TAN, FIRM, MOIST
5			10	3.3	1	SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST TO DRY
10			16	7.4	1	
15			17	6.6	1	
20			17	1.4	1	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/22

JOB NO.: 230486
FIG NO.: B-7

TEST BORING NO. 15
DATE DRILLED 3/25/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			14	7.5	2
5			14	4.3	1
10			18	4.8	1
15			28	12.6	1
20			17	1.2	1

CLAY, SANDY, TAN, FIRM, MOIST

SAND, SILTY, FINE TO MEDIUM GRAINED, BROWN TO TAN, MEDIUM DENSE, MOIST TO DRY

TEST BORING NO. 16
DATE DRILLED 3/25/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			20	5.1	1
5			16	9.0	1
10			12	3.1	1
15			10	5.9	1
20			10	7.0	1

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

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: B- 8

TEST BORING NO. 17
DATE DRILLED 3/25/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			8	1.3	1	SAND, SLIGHTLY SILTY, FINE TO MEDIUM GRAINED, TAN, LOOSE TO MEDIUM DENSE, DRY TO MOIST
5			16	2.5	1	
10			13	4.0	1	
15			23	4.6	1	
20			20	2.9	1	

TEST BORING NO. 18
DATE DRILLED 3/25/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			16	5.6	1	SAND, SLIGHTLY SILTY, FINE TO MEDIUM GRAINED, TAN, LOOSE TO MEDIUM DENSE, MOIST
5			16	4.7	1	
10			3	3.2	1	
15			10	4.6	1	
20			12	5.0	1	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/30/23

JOB NO.: 230486
FIG NO.: B- 9

TEST BORING NO. 19
DATE DRILLED 3/28/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			32	4.4	1	SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, DENSE TO MEDIUM DENSE, MOIST
5			19	3.8	1	
10			13	3.8	1	
15			18	20.1	1	
20			20	24.9	1	

TEST BORING NO. 20
DATE DRILLED 3/28/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			14	8.3	1	SAND, SLIGHTLY SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST
5			11	8.9	1	
10			14	9.7	1	
15			16	3.4	1	
20			21	5.0	1	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/22

JOB NO.: 230486
FIG NO.: B- 10

TEST BORING NO. 21
DATE DRILLED 3/28/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			16	5.7	1	SAND, VERY SILTY, FINE TO MEDIUM GRAINED, BROWN TO TAN, MEDIUM DENSE, MOIST
5			18	7.8	1	
10			15	4.1	1	
15			10	4.5	1	
20			14	6.7	1	

TEST BORING NO. 22
DATE DRILLED 3/28/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			17	2.6	1	SAND, SLIGHTLY SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST
5			16	2.6	1	
10			19	4.9	1	
15			18	4.1	1	
20			16	5.9	1	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: B- 11

TEST BORING NO. 23
DATE DRILLED 3/25/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			15	3.9	1	SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST TO DRY
5			24	0.7	1	
10			27	5.3	1	
15			27	2.6	1	
20			25	2.6	1	

TEST BORING NO. 24
DATE DRILLED 3/25/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			16	7.8	1	SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST
5			16	7.9	1	
10			24	3.2	1	
15			25	8.2	2	CLAY, SANDY, TAN, STIFF, MOIST
						SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, DENSE, MOIST
20			38	4.1	1	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: B- 12

TEST BORING NO. 25
DATE DRILLED 3/25/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			14	7.4	2	CLAY, SANDY, TAN, FIRM, MOIST
5			16	5.8	1	SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE TO DENSE, DRY TO MOIST
10			11	2.9	1	
15			16	4.3	1	
20			32	5.0	1	

TEST BORING NO. 26
DATE DRILLED 3/25/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			28	5.1	1	SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE TO DENSE, MOIST TO DRY
5			31	2.8	1	
10			32	3.8	1	
15			14	1.2	1	
20			50/11"	2.6	3	SANDSTONE, CLAYEY, FINE GRAINED, TAN, VERY DENSE, **DRY**

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLC	3/30/23

JOB NO.: 230486
FIG NO.: B- 13

TEST BORING NO. 27
DATE DRILLED 3/25/2022
Job # 230486

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 3/30/22						
SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST				16	5.0	1
	5			10	4.9	1
SAND, VERY CLAYEY, FINE GRAINED, TAN, LOOSE, MOIST	10			7	10.1	1
SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, DENSE, DRY	15			42	1.8	1
	20			49	2.7	1

TEST BORING NO. 28
DATE DRILLED 3/25/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 3/30/22						
SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST				16	3.7	1
	5			18	8.8	1
CLAY-SAND, TAN, STIFF, MOIST	10			24	6.8	2
SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, DRY	15			26	1.7	1
CLAY, SANDY, TAN, STIFF, MOIST	20			22	10.5	2

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COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: B- 14

TEST BORING NO. 29
DATE DRILLED 3/25/2022
Job # 230486

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
						SAND, VERY SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE TO DENSE, MOIST TO DRY
			19	3.9	1	
5			25	4.7	1	
10			21	5.5	1	
15			25	2.9	1	
20			32	5.2	1	

TEST BORING NO. 30
DATE DRILLED 3/25/2022
CLIENT NORRIS RANCH JOINT VENTURES
LOCATION NORRIS RANCH

REMARKS

DRY TO 20', 3/30/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
						CLAY, VERY SANDY, TAN, STIFF, MOIST
			16	5.7	2	
5			16	4.2	2	
10			50/6"	9.7	3	SANDSTONE, SILTY, FINE TO MEDIUM GRAINED, TAN, VERY DENSE, MOIST
15			50/7"	5.7	3	
20			50/4"	9.6	3	

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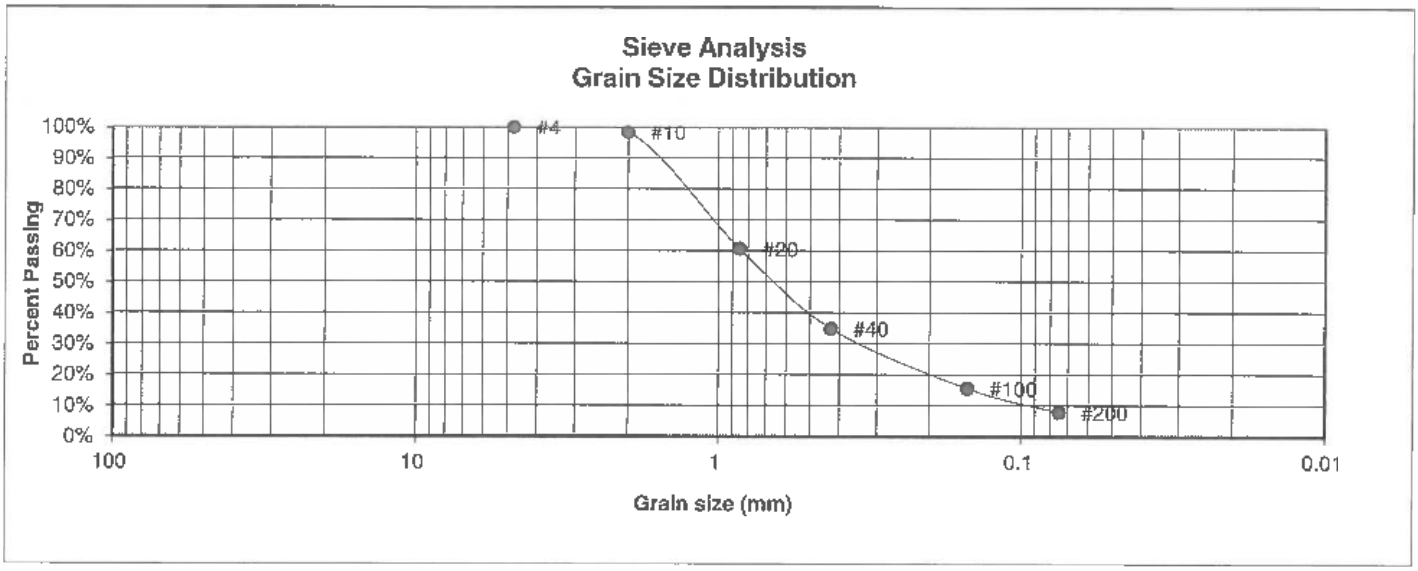
TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: B- 15

APPENDIX C: Laboratory Test Results

UNIFIED CLASSIFICATION	SM-SW	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	16	JOB NO.	230486
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.4%
20	60.5%
40	34.8%
100	15.4%
200	7.8%

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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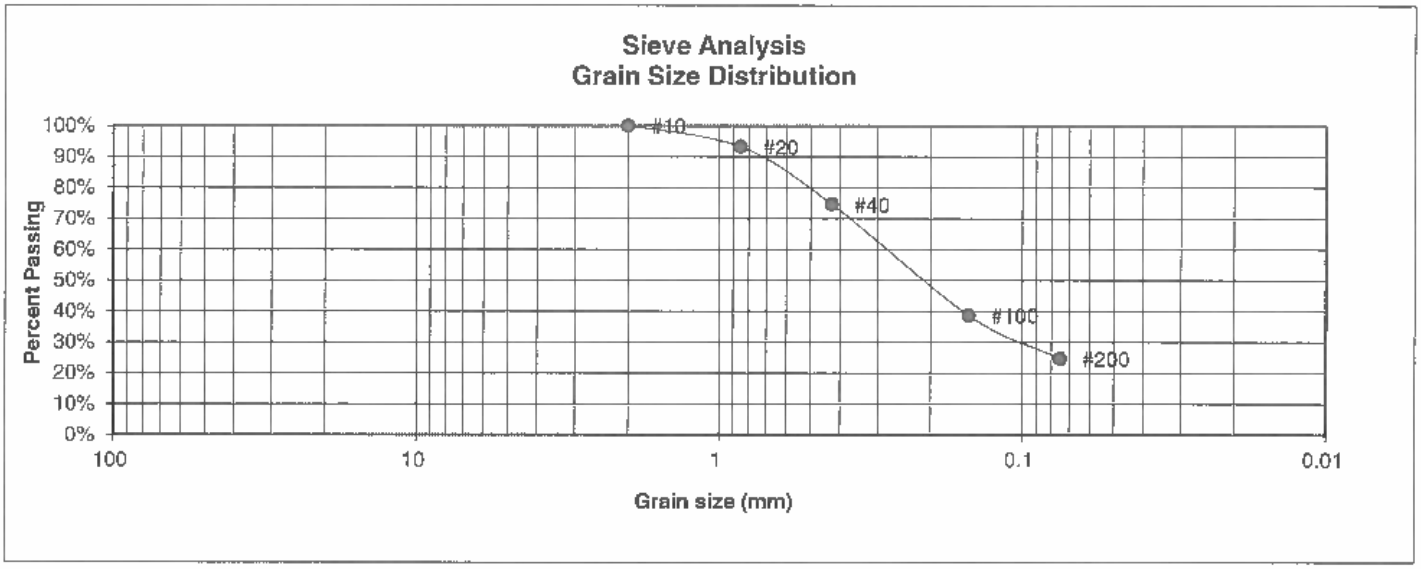
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-1

UNIFIED CLASSIFICATION	SM	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	6	JOB NO.	230486
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	93.2%
40	74.5%
100	38.7%
200	24.7%

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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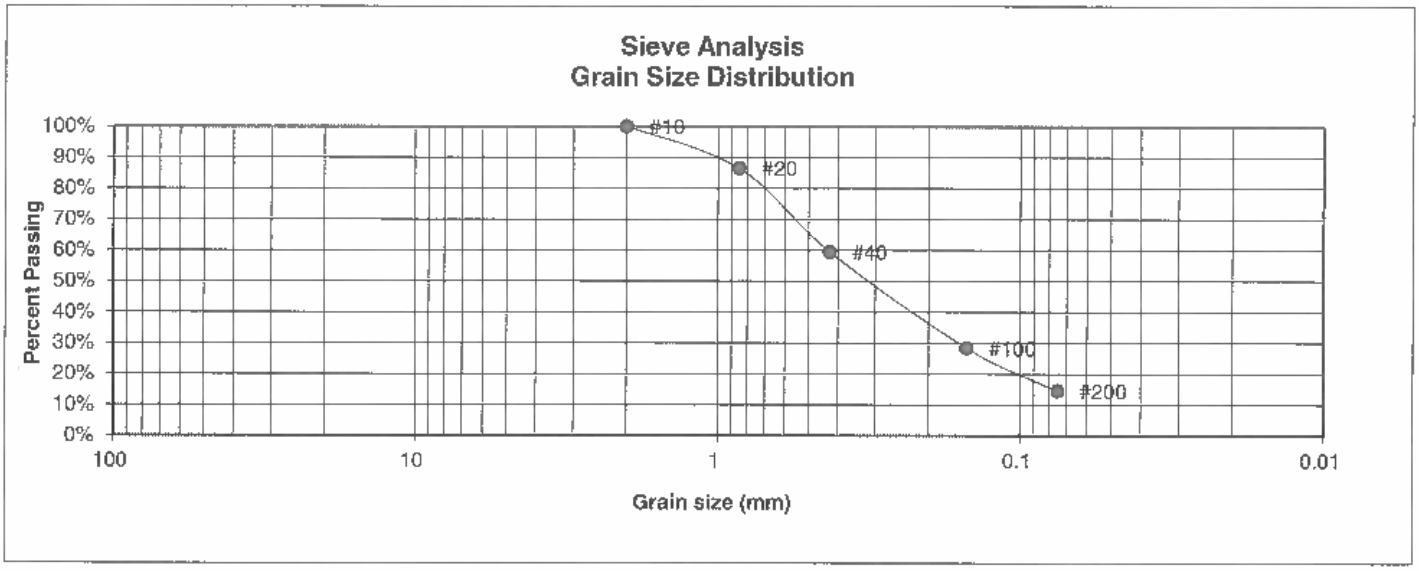
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-2

UNIFIED CLASSIFICATION	SM	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	9	JOB NO.	230486
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	86.5%
40	59.4%
100	28.4%
200	14.5%

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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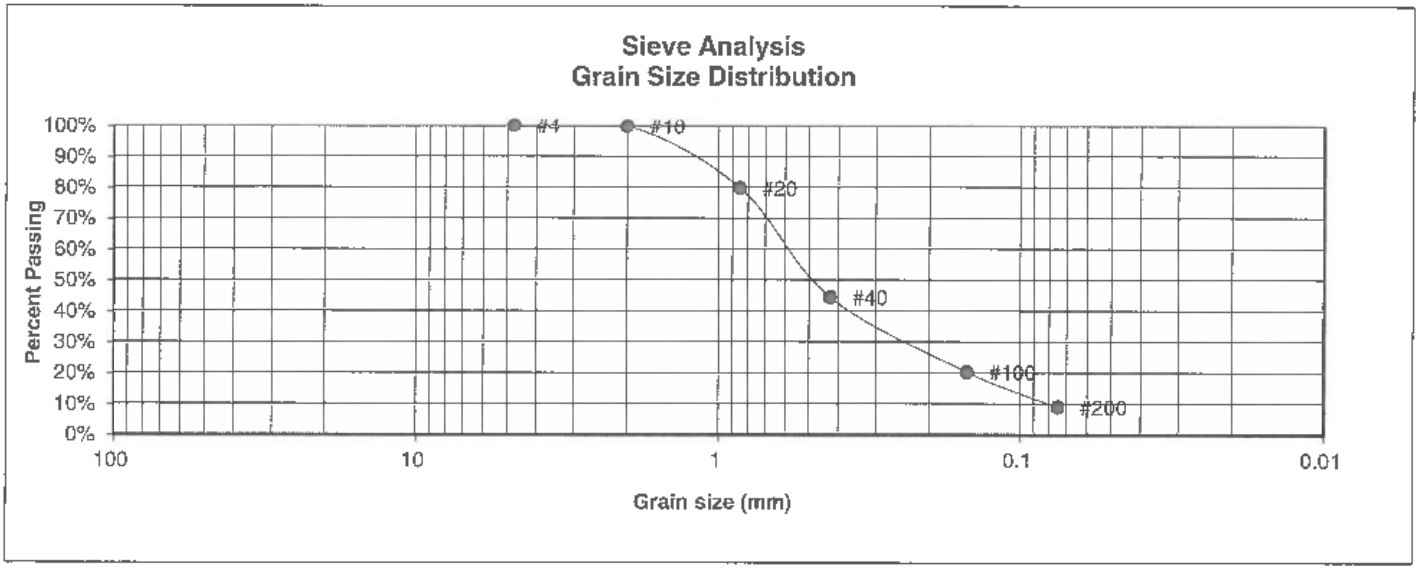
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-3

UNIFIED CLASSIFICATION	SM-SW	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	10	JOB NO.	230486
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	99.8%
20	79.7%
40	44.4%
100	20.2%
200	8.9%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
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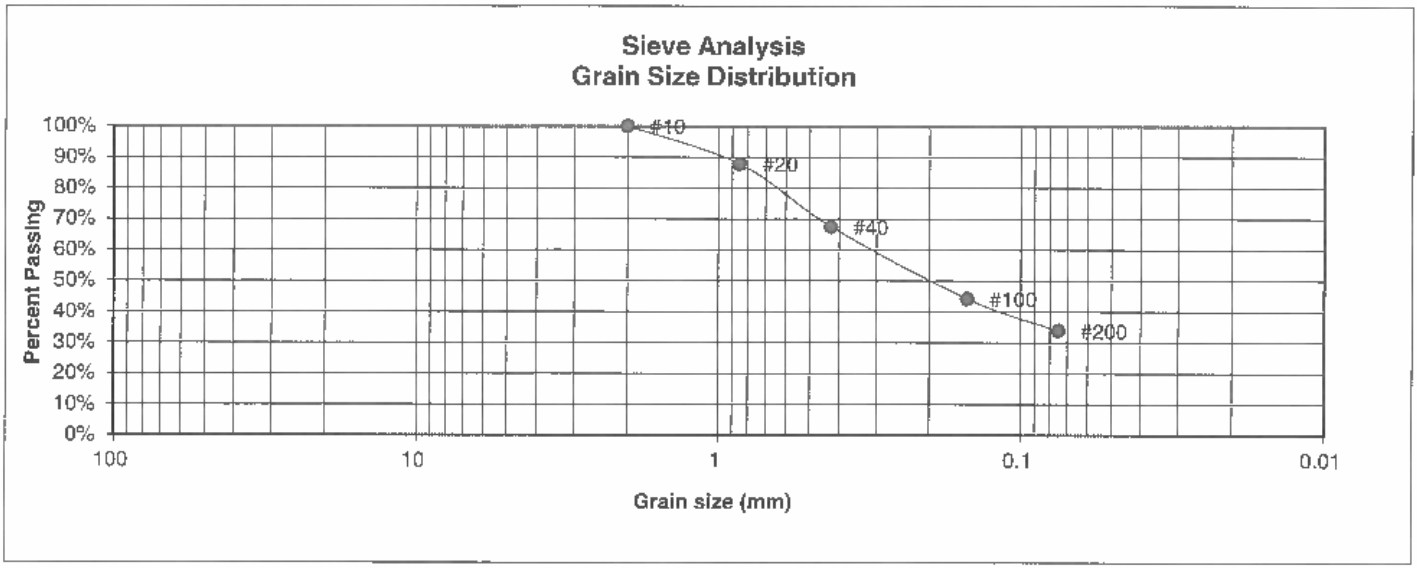
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-4

UNIFIED CLASSIFICATION	SM	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	12	JOB NO.	230486
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	87.8%
40	67.5%
100	44.2%
200	33.9%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
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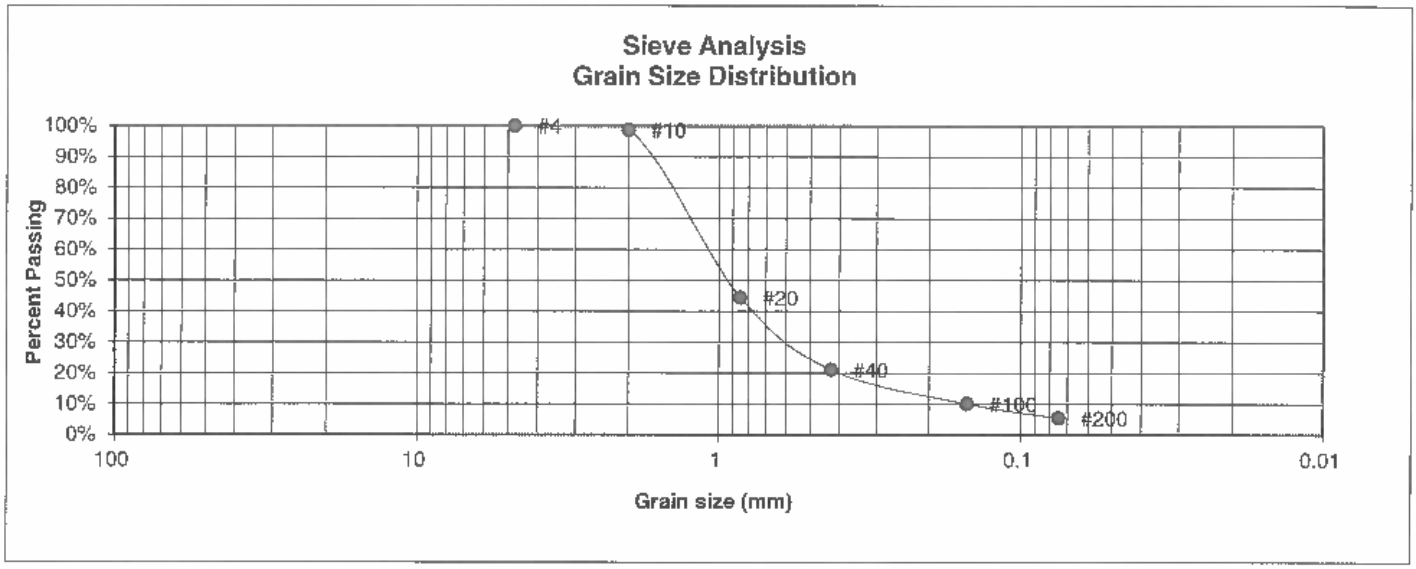
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-5

UNIFIED CLASSIFICATION	SM-SW	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	13	JOB NO.	230486
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.7%
20	44.4%
40	21.0%
100	10.1%
200	5.4%

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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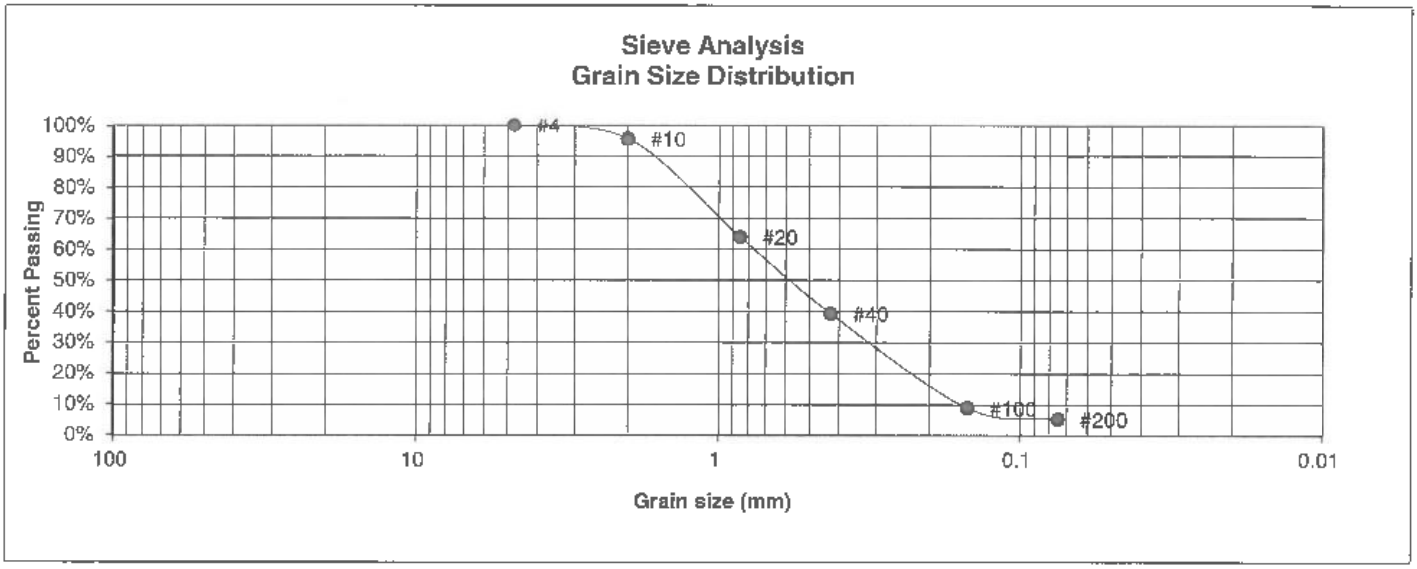
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-6

UNIFIED CLASSIFICATION	SM-SW	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	17	JOB NO.	230486
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	95.5%
20	63.9%
40	39.2%
100	9.0%
200	5.4%

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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COLORADO SPRINGS, COLORADO 80907

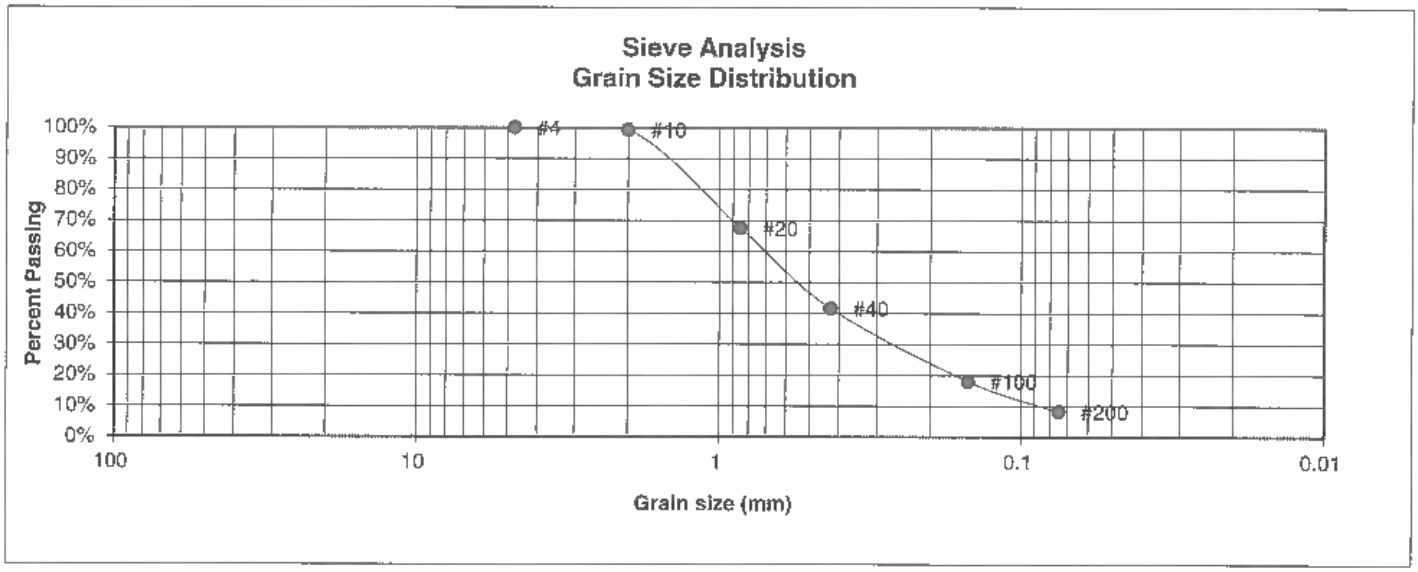
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-7

UNIFIED CLASSIFICATION	SM-SW	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	18	JOB NO.	230486
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.3%
20	67.5%
40	41.6%
100	18.0%
200	8.3%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
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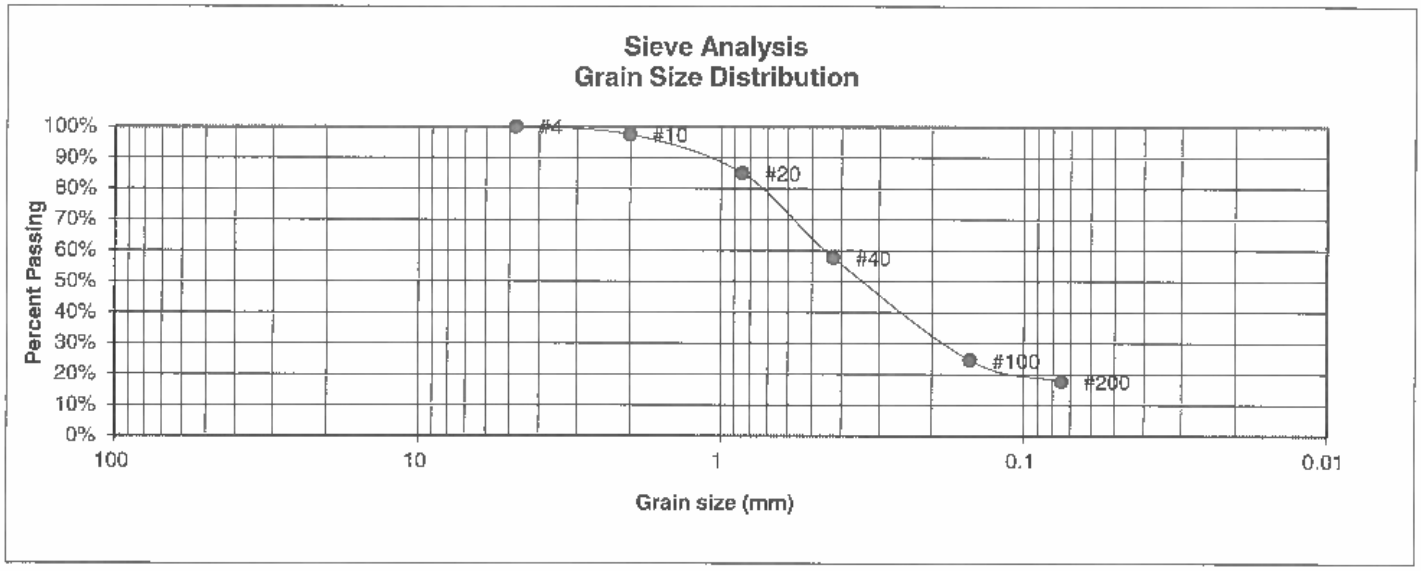
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-8

UNIFIED CLASSIFICATION	SM	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	19	JOB NO.	230486
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	97.6%
20	85.0%
40	57.6%
100	24.5%
200	17.7%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

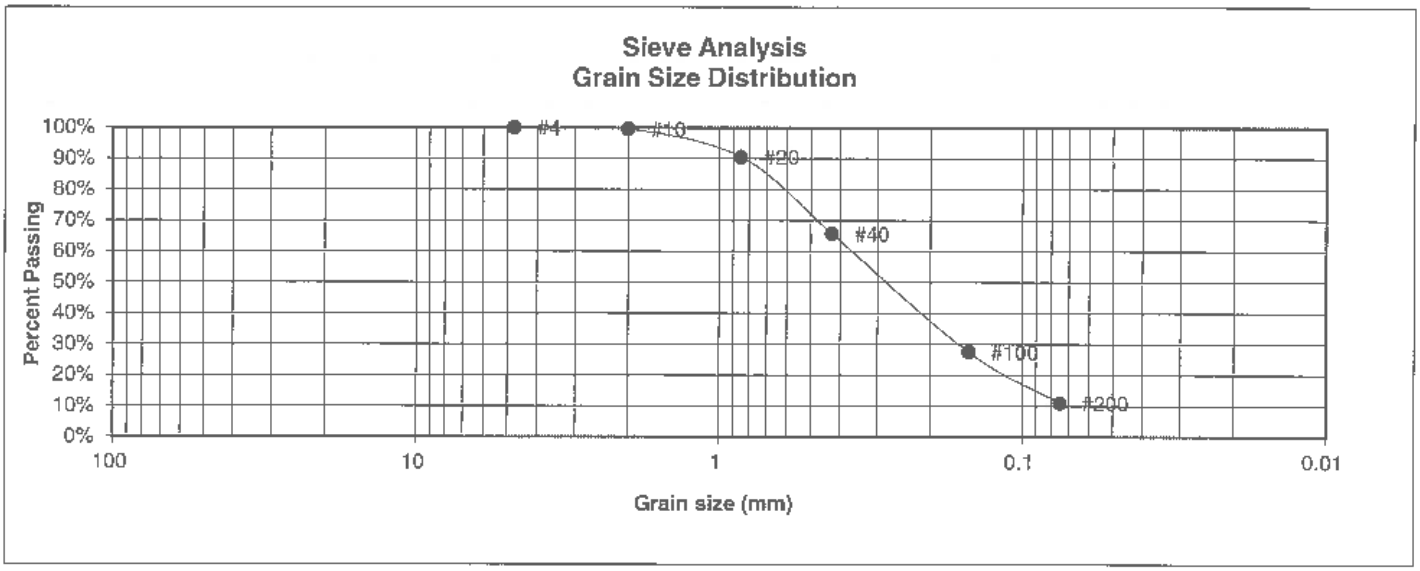
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-9

UNIFIED CLASSIFICATION	SM-SW	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	20	JOB NO.	230486
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.5%
20	90.5%
40	65.7%
100	27.5%
200	11.0%

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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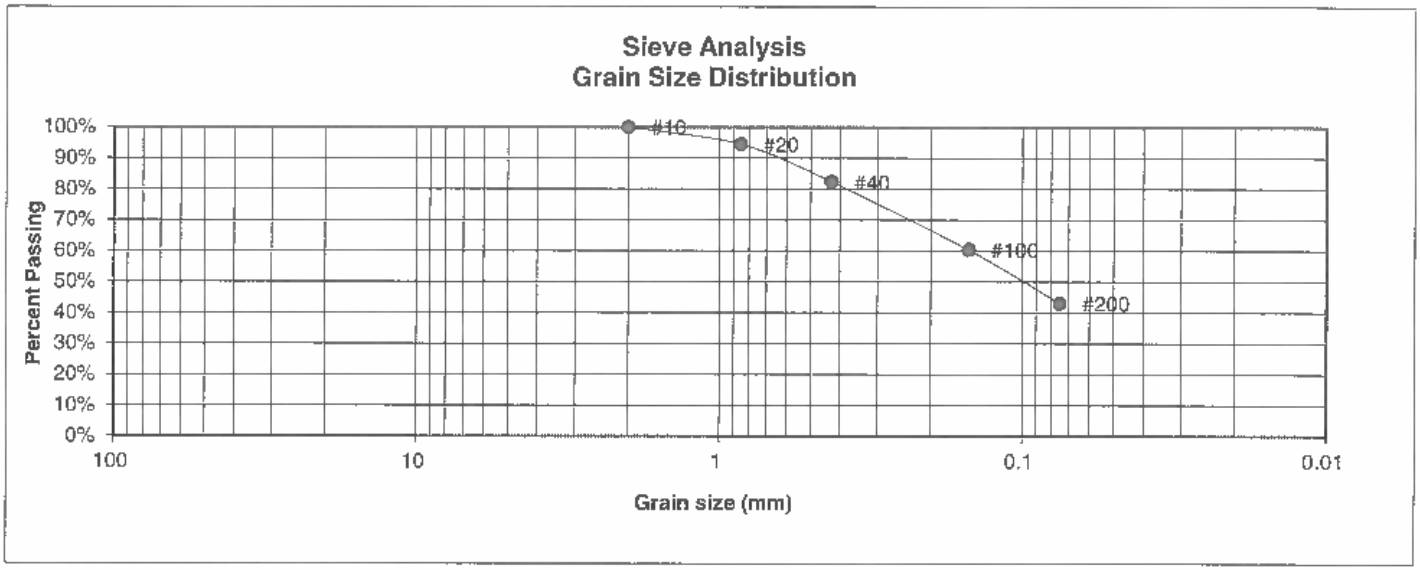
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-10

UNIFIED CLASSIFICATION	SM	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	21	JOB NO.	230486
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	94.4%
40	82.2%
100	60.3%
200	43.1%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
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COLORADO SPRINGS, COLORADO 80907

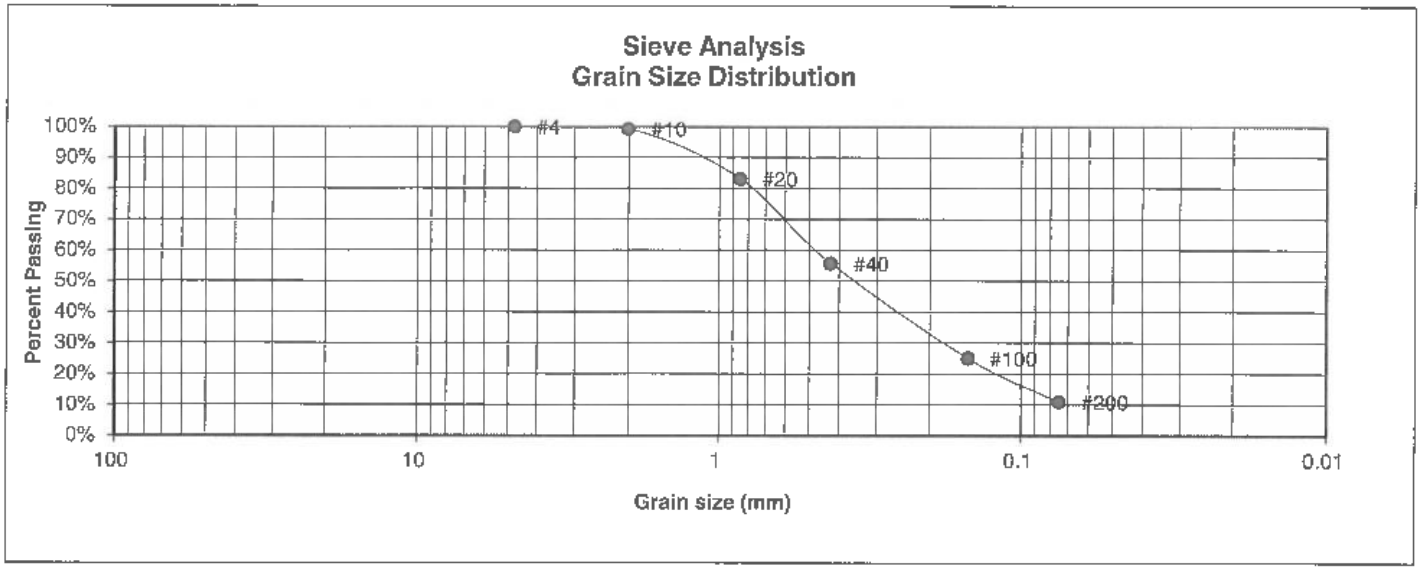
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-11

UNIFIED CLASSIFICATION	SM-SW	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	22	JOB NO.	230486
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.2%
20	83.0%
40	55.6%
100	25.0%
200	10.9%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

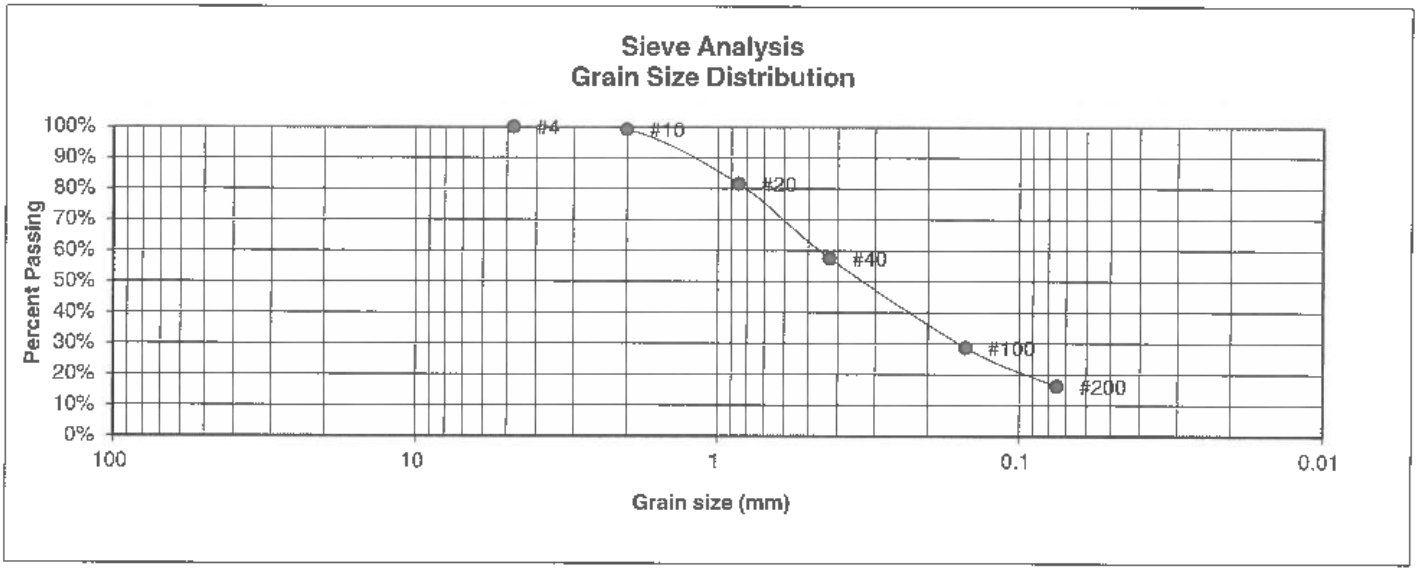
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-12

UNIFIED CLASSIFICATION	SM	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	23	JOB NO.	230486
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.2%
20	81.5%
40	57.5%
100	28.7%
200	16.2%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

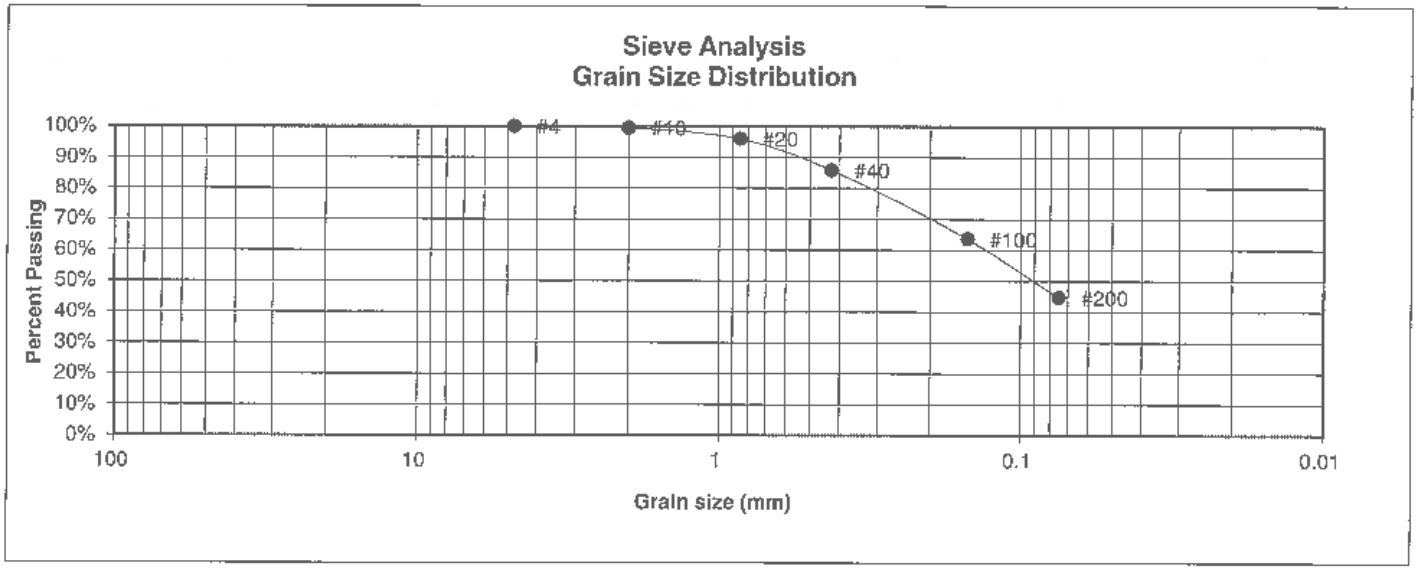
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-13

UNIFIED CLASSIFICATION	SC	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	27	JOB NO.	230486
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.5%
20	95.9%
40	85.8%
100	63.6%
200	44.7%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

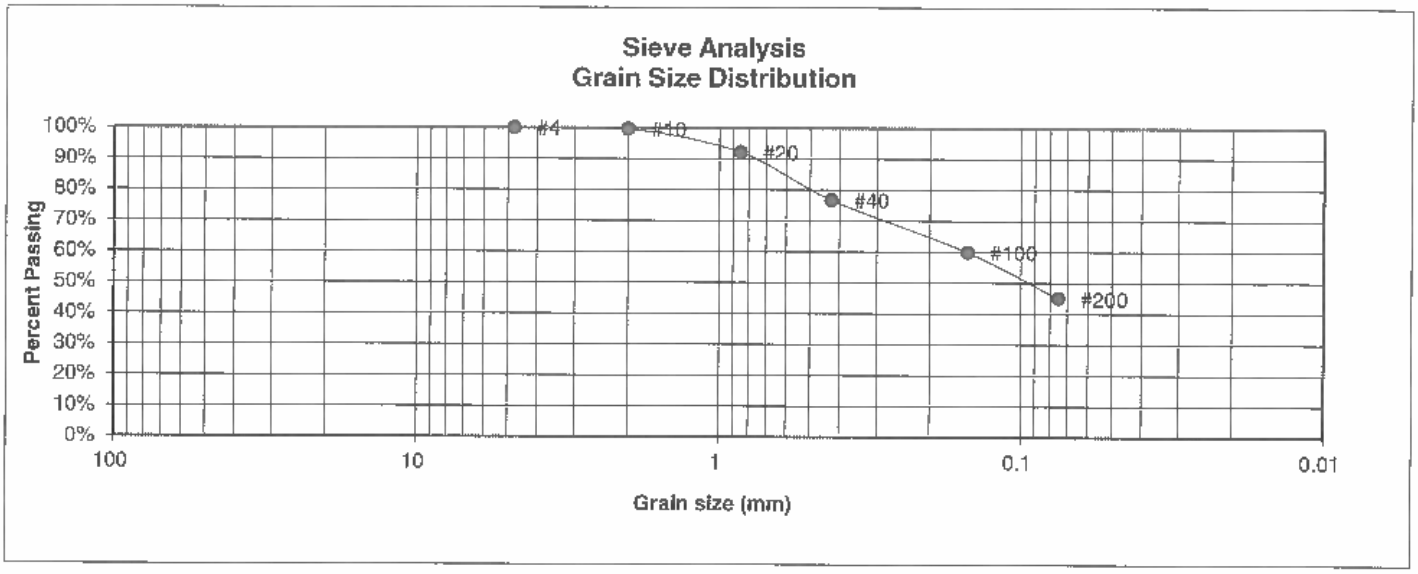
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-14

UNIFIED CLASSIFICATION	SM	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	1	PROJECT	NORRIS RANCH
TEST BORING #	29	JOB NO.	230486
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.6%
20	92.1%
40	76.7%
100	59.9%
200	45.0%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

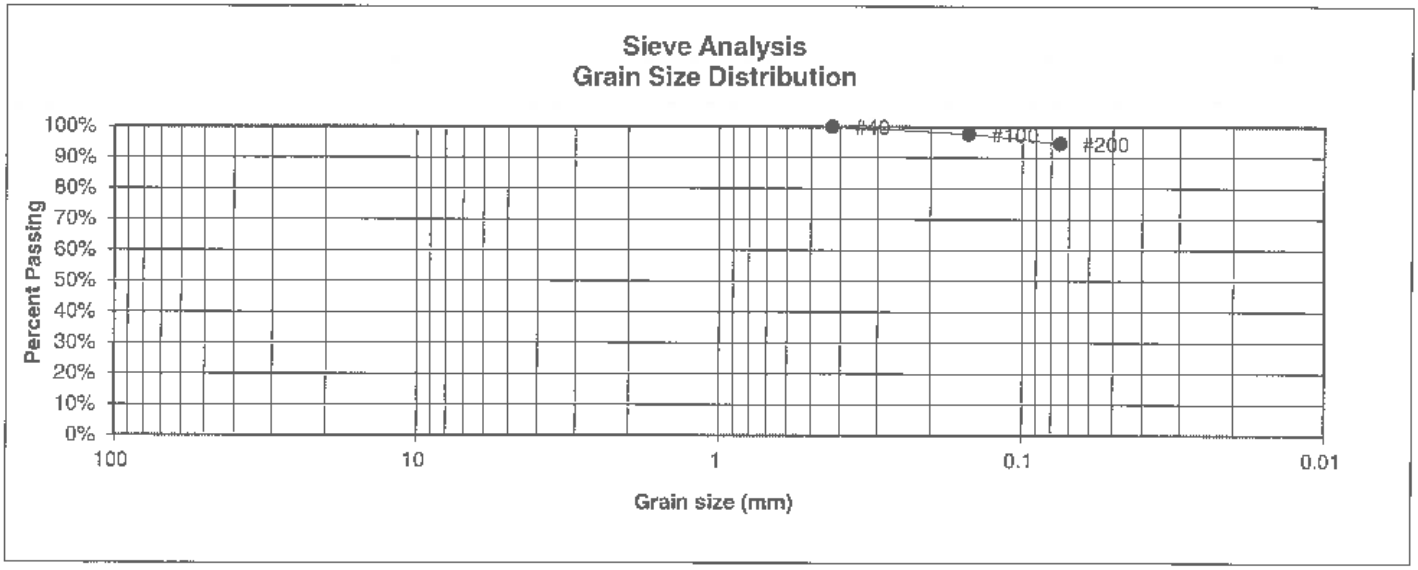
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-15

UNIFIED CLASSIFICATION	CH	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	1	JOB NO.	230486
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	100.0%
100	97.6%
200	94.5%

Atterberg Limits	
Plastic Limit	22
Liquid Limit	50
Plastic Index	28

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

ENTECH ENGINEERING, INC.
506 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

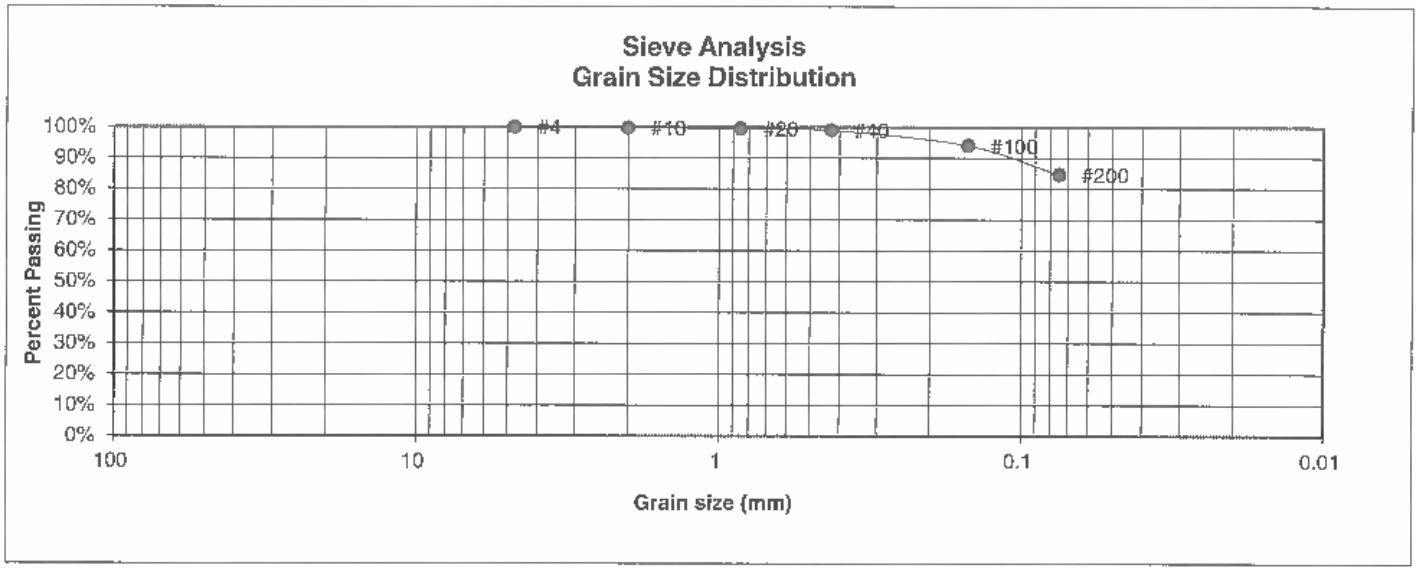
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-16

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	2	JOB NO.	230486
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	99.7%
20	99.5%
40	98.9%
100	94.0%
200	84.6%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	43
Plastic Index	25

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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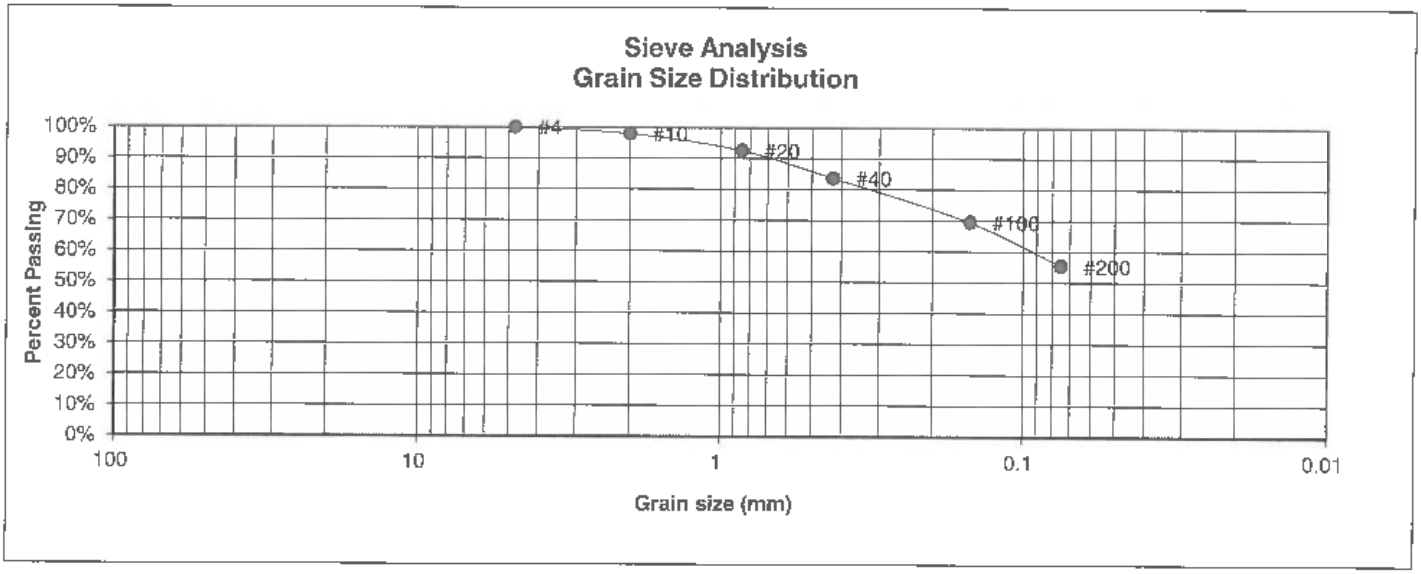
JOB NO.: 230486

FIG NO.: C-17

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	4	JOB NO.	230486
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	97.9%
20	92.4%
40	83.6%
100	69.5%
200	55.4%

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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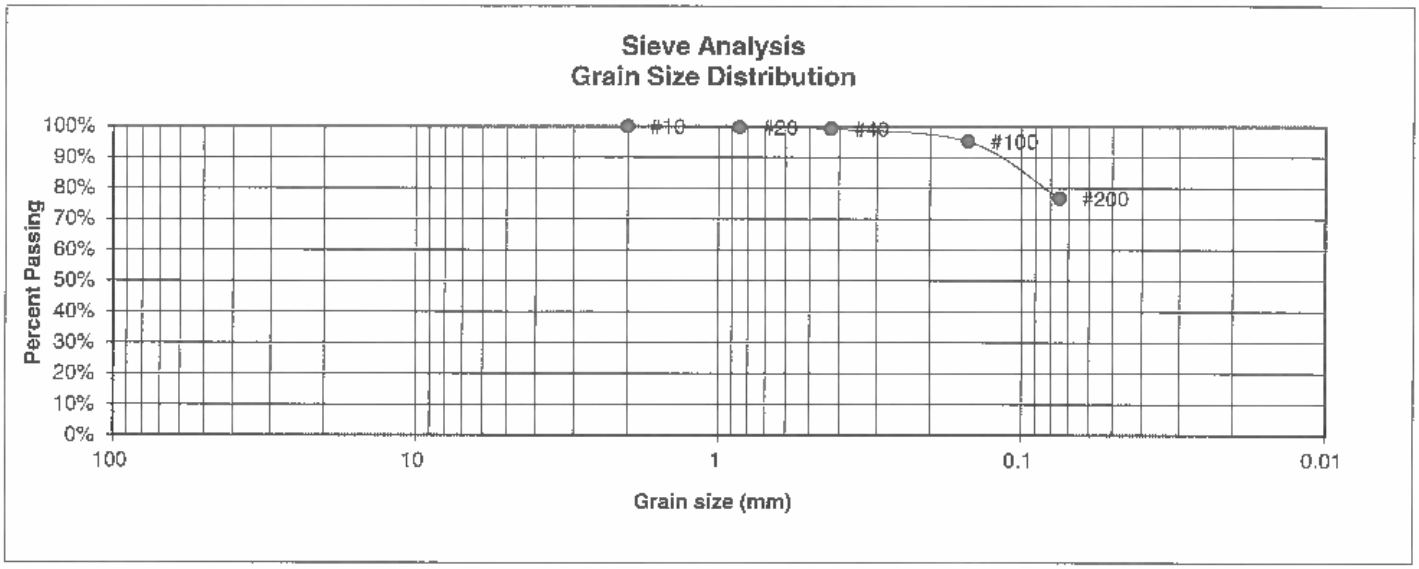
FIG NO.: C-16

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	5	JOB NO.	230486
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.7%
40	99.1%
100	95.2%
200	76.8%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	

Swell	
Moisture at start	17.6%
Moisture at finish	22.9%
Moisture increase	5.4%
Initial dry density (pcf)	96
Swell (psf)	330

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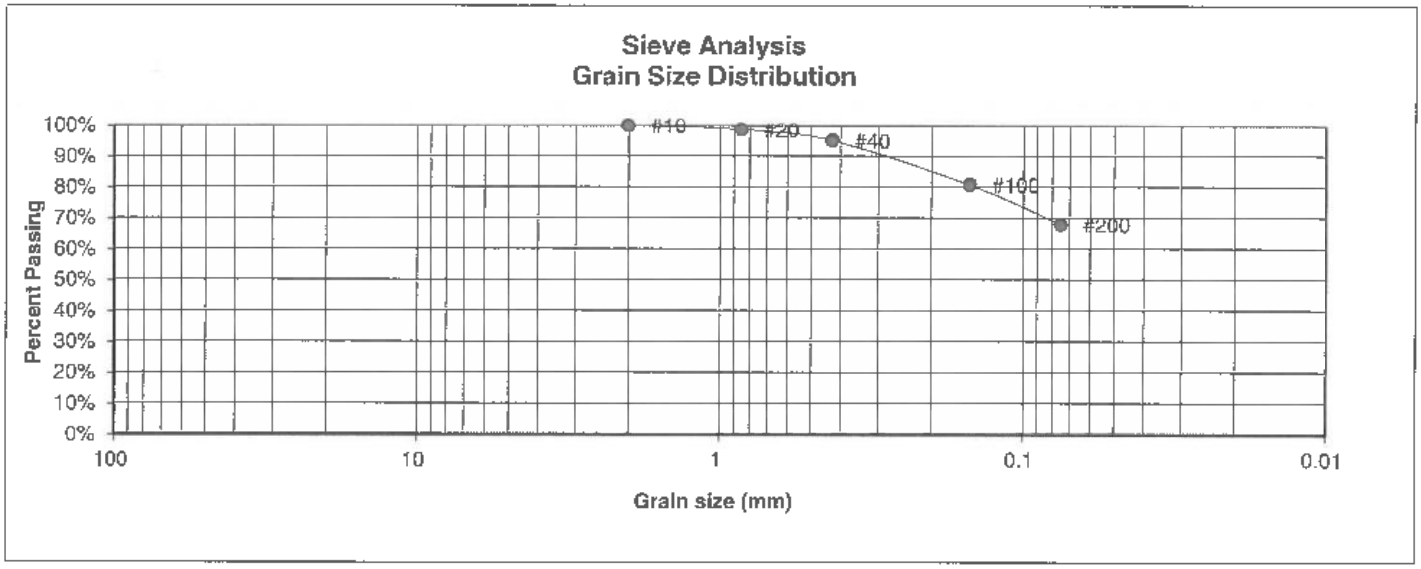
FIG NO.: C-19

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	8	JOB NO.	230486
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	98.6%
40	95.0%
100	80.7%
200	67.8%

Atterberg Limits	
Plastic Limit	23
Liquid Limit	47
Plastic Index	24

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

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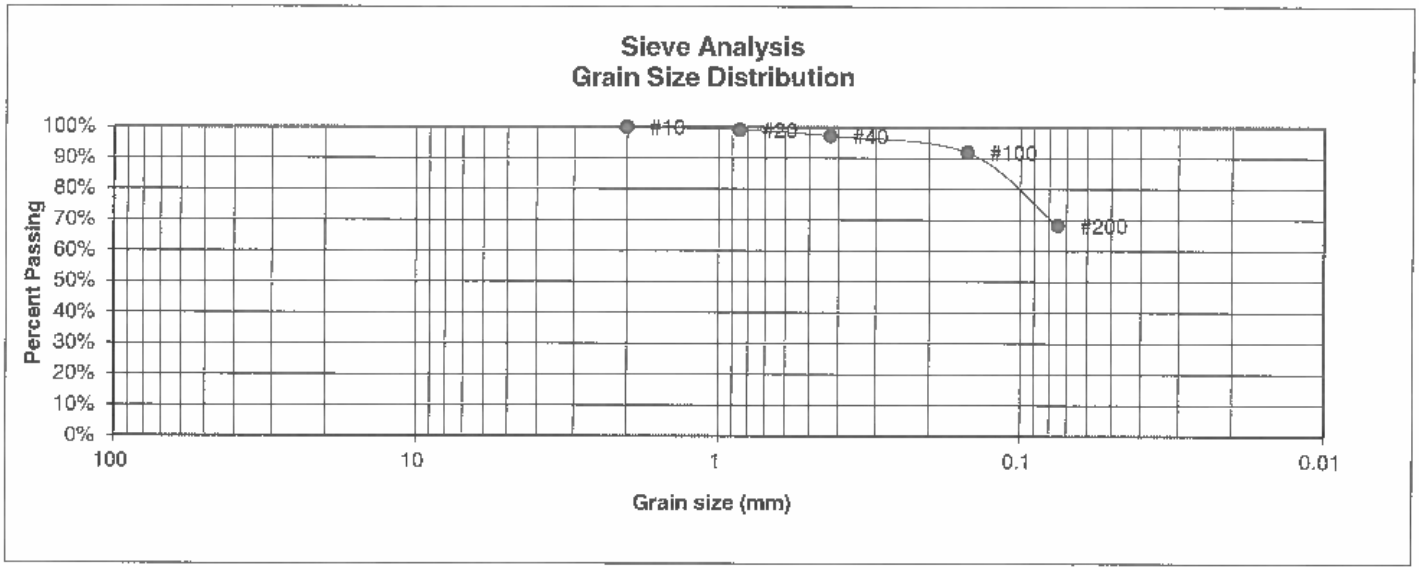
FIG NO.: C-20

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	11	JOB NO.	230486
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.1%
40	97.1%
100	91.9%
200	68.3%

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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LABORATORY TEST RESULTS

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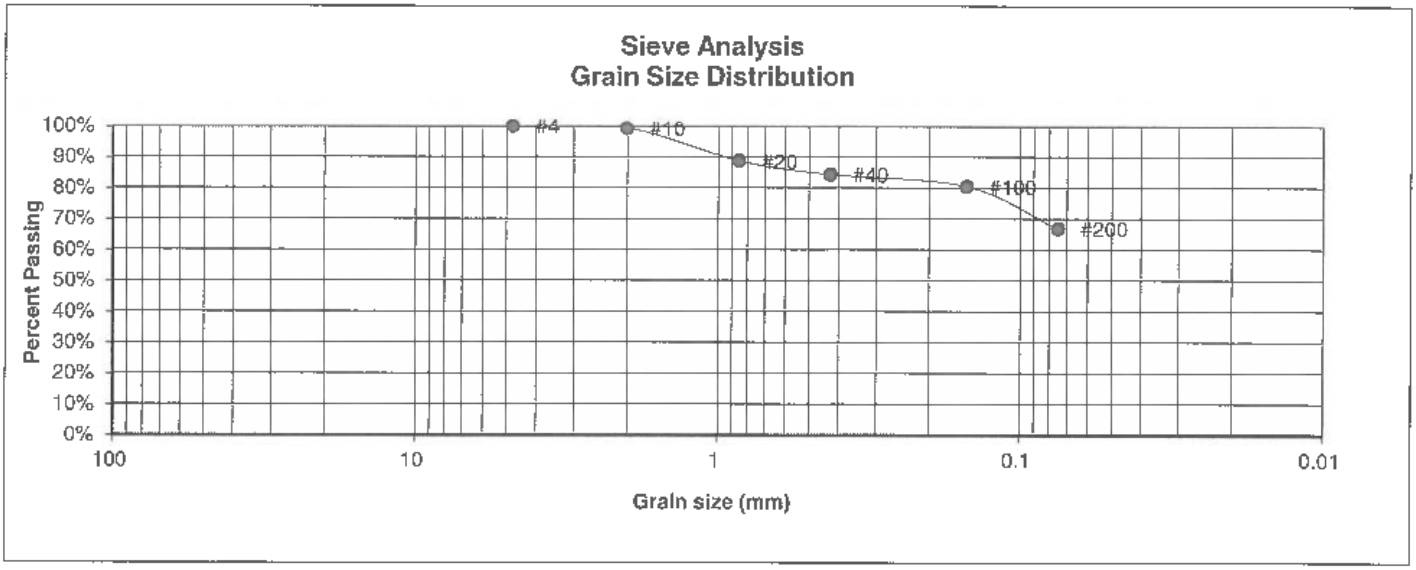
JOB NO.: 230486

FIG NO.: C-2

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	14	JOB NO.	230486
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	99.3%
20	88.7%
40	84.3%
100	80.4%
200	66.8%

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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LABORATORY TEST RESULTS

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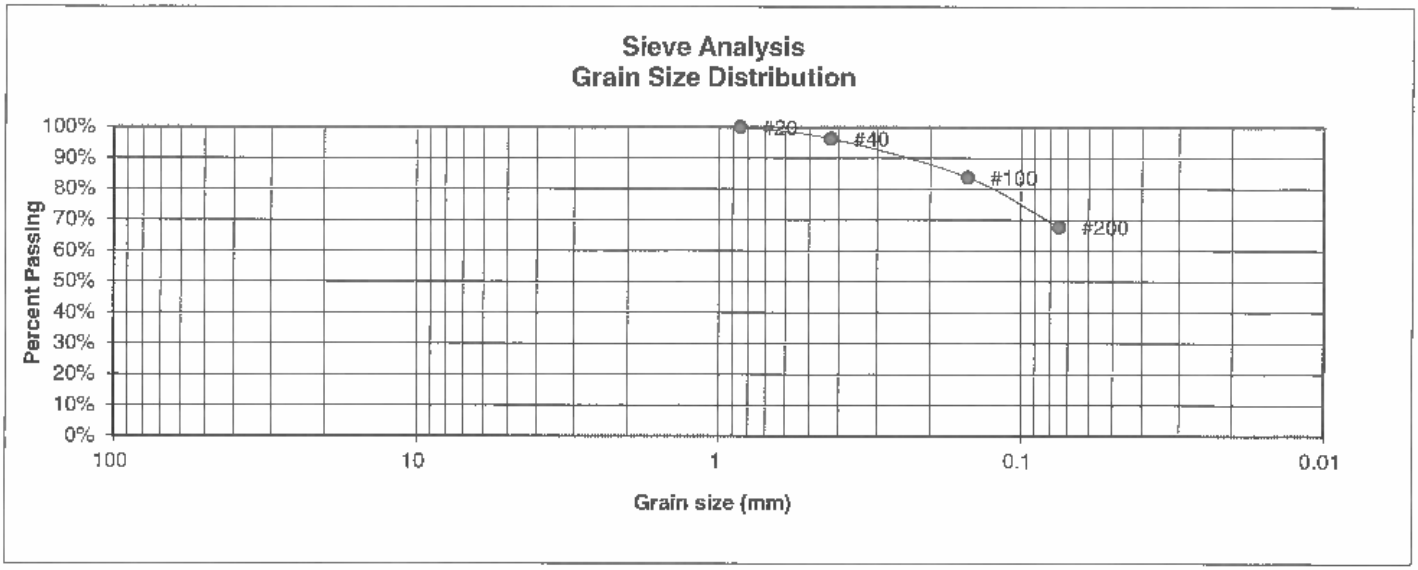
FIG NO.: C-22

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	15	JOB NO.	230486
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	96.3%
100	83.7%
200	67.7%

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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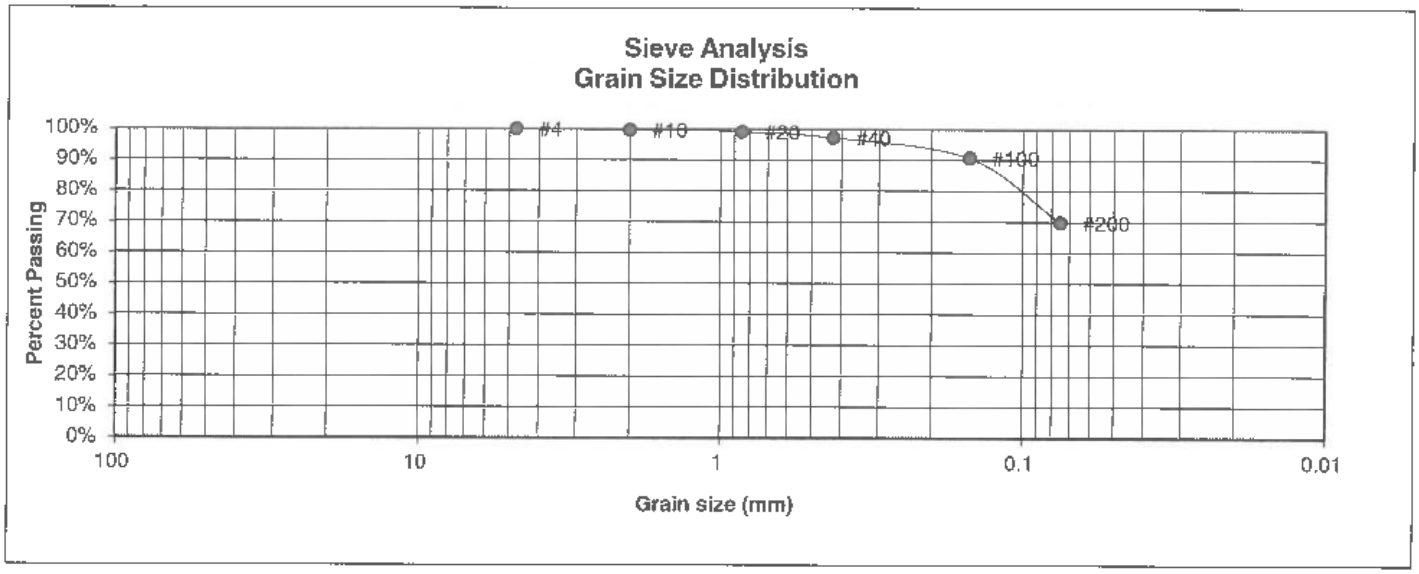
JOB NO.: 230486

FIG NO.: C-23

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	24	JOB NO.	230486
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	99.1%
40	97.2%
100	90.7%
200	69.8%

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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LABORATORY TEST RESULTS

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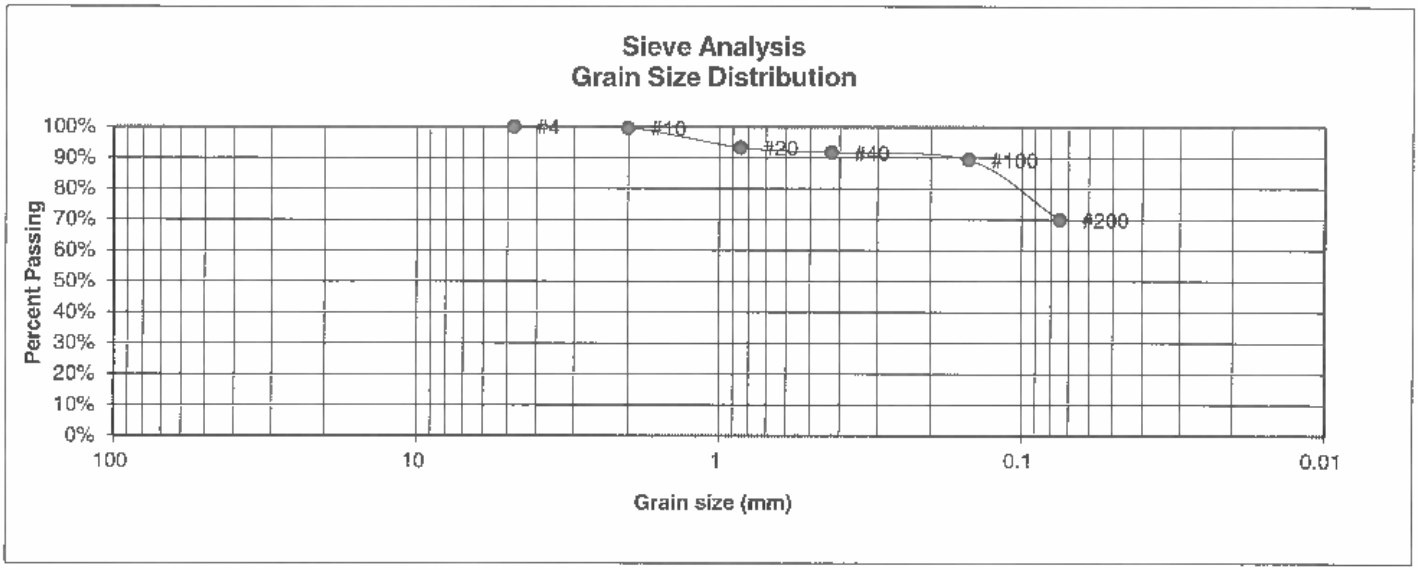
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-24

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	25	JOB NO.	230486
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	99.6%
20	93.3%
40	91.6%
100	89.3%
200	70.0%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	18.9%
Moisture at finish	20.6%
Moisture increase	1.7%
Initial dry density (pcf)	99
Swell (psf)	150

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LABORATORY TEST RESULTS

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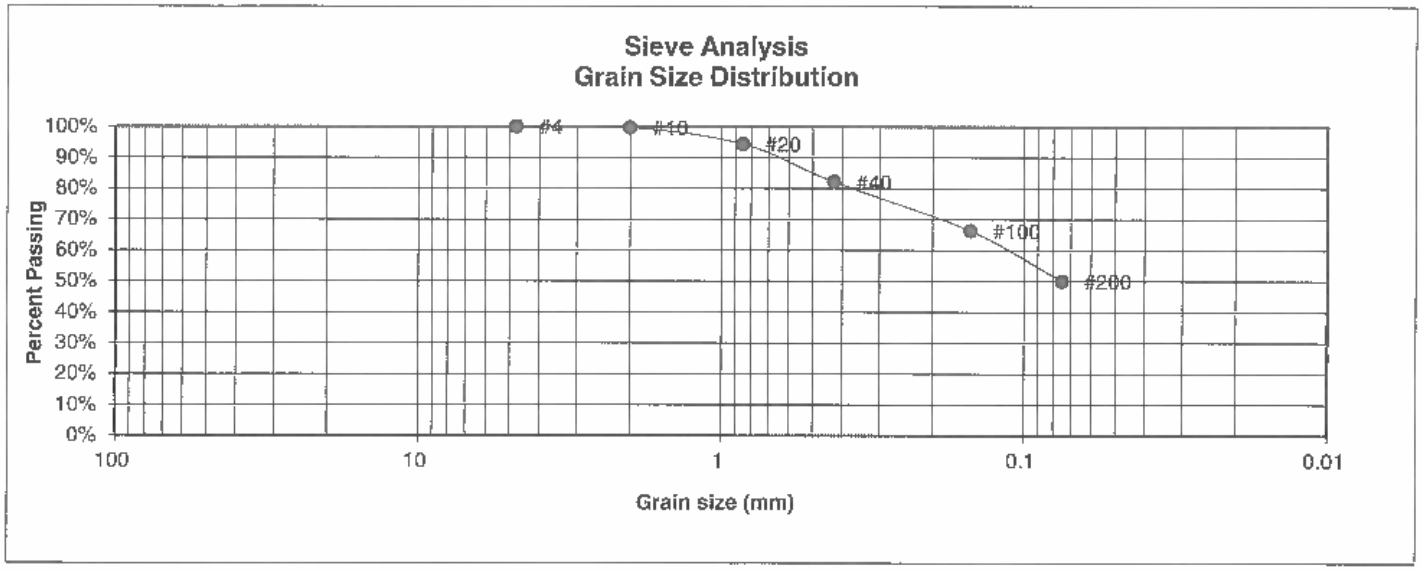
JOB NO.: 230486

FIG NO.: C-25

UNIFIED CLASSIFICATION	CL-SC	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	28	JOB NO.	230486
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	94.4%
40	82.1%
100	66.3%
200	50.0%

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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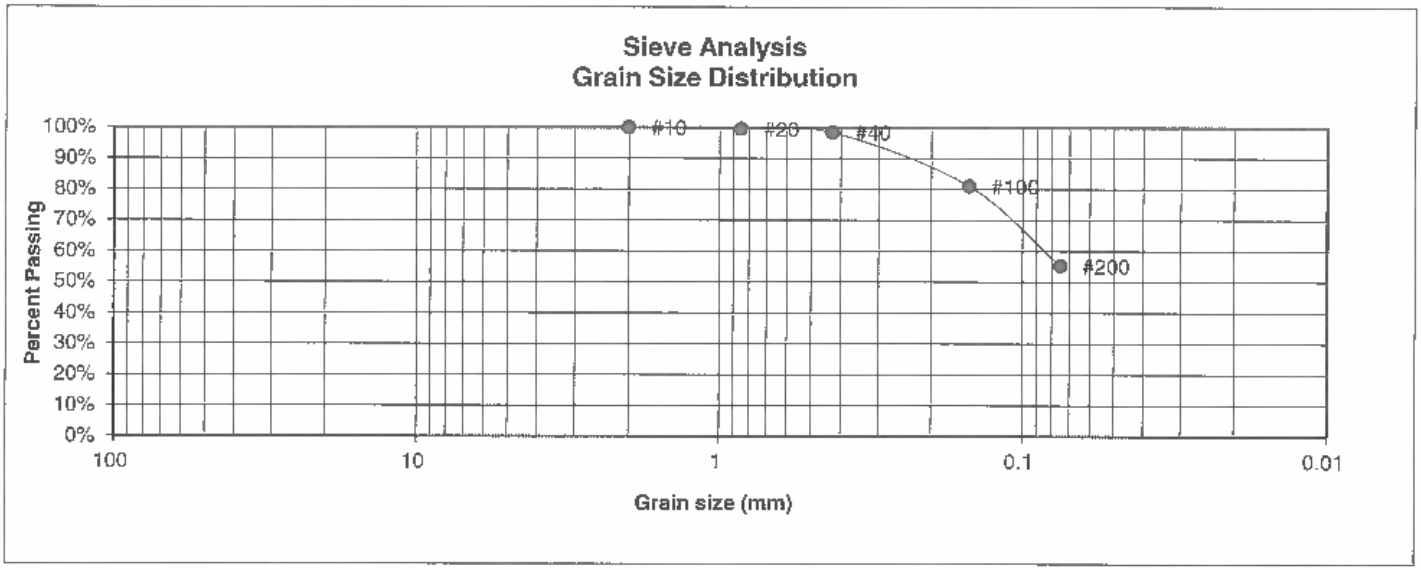
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-26

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	2	PROJECT	NORRIS RANCH
TEST BORING #	30	JOB NO.	230486
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.4%
40	98.3%
100	81.0%
200	55.2%

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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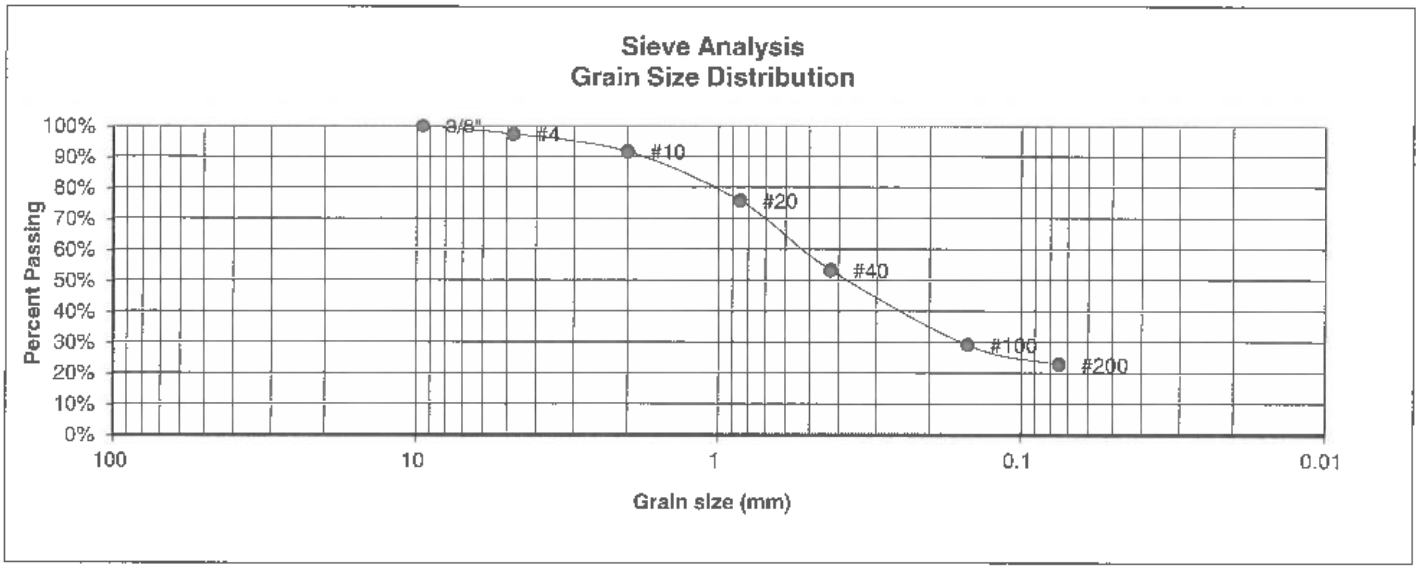
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-27

UNIFIED CLASSIFICATION	SC	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	3	PROJECT	NORRIS RANCH
TEST BORING #	26	JOB NO.	230486
DEPTH (FT)	20	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.2%
10	91.5%
20	75.6%
40	53.2%
100	29.0%
200	22.7%

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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LABORATORY TEST RESULTS

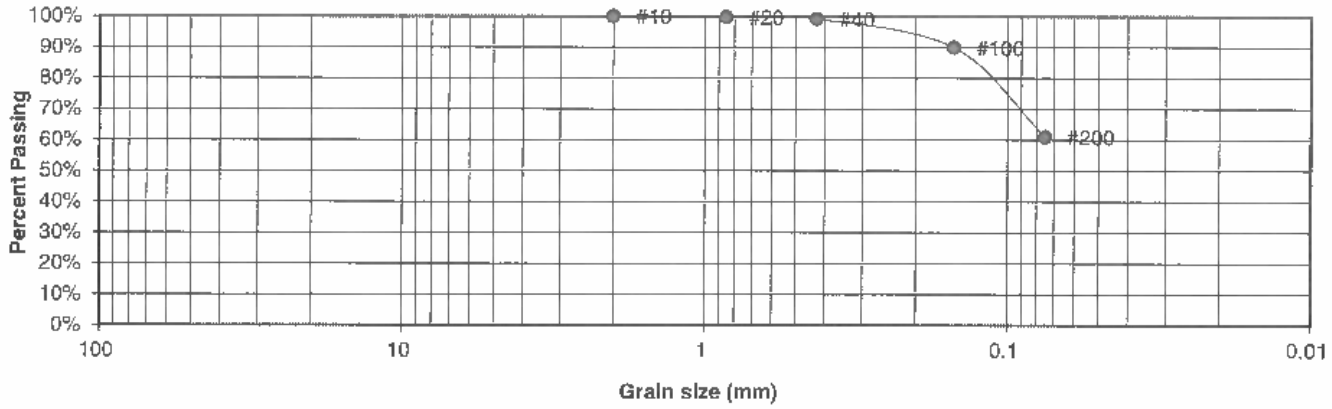
DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-28

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	4	PROJECT	NORRIS RANCH
TEST BORING #	3	JOB NO.	230486
DEPTH (FT)	20	TEST BY	BL

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.7%
40	99.1%
100	89.9%
200	61.0%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	30
Plastic Index	15

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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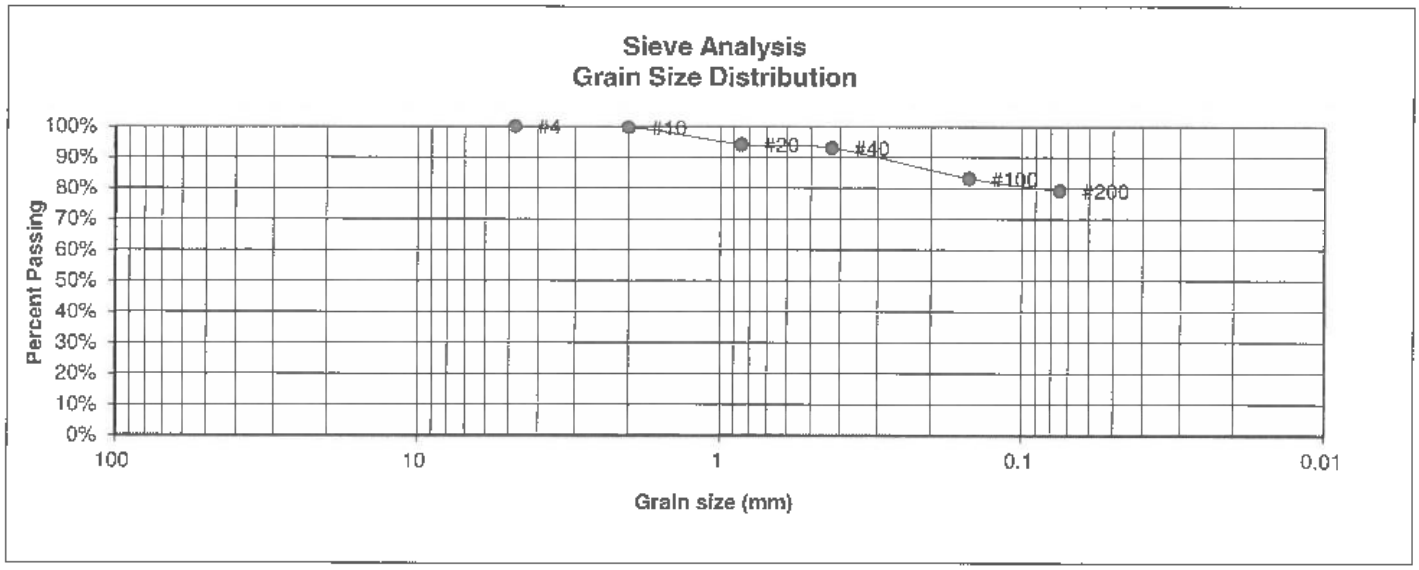
JOB NO.: 230486

FIG NO.: C-29

UNIFIED CLASSIFICATION	CL	CLIENT	NORRIS RANCH JOINT VENTURES
SOIL TYPE #	4	PROJECT	NORRIS RANCH
TEST BORING #	7	JOB NO.	230486
DEPTH (FT)	20	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	94.1%
40	93.0%
100	83.1%
200	79.2%

Atterberg Limits	
Plastic Limit	23
Liquid Limit	45
Plastic Index	22

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

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
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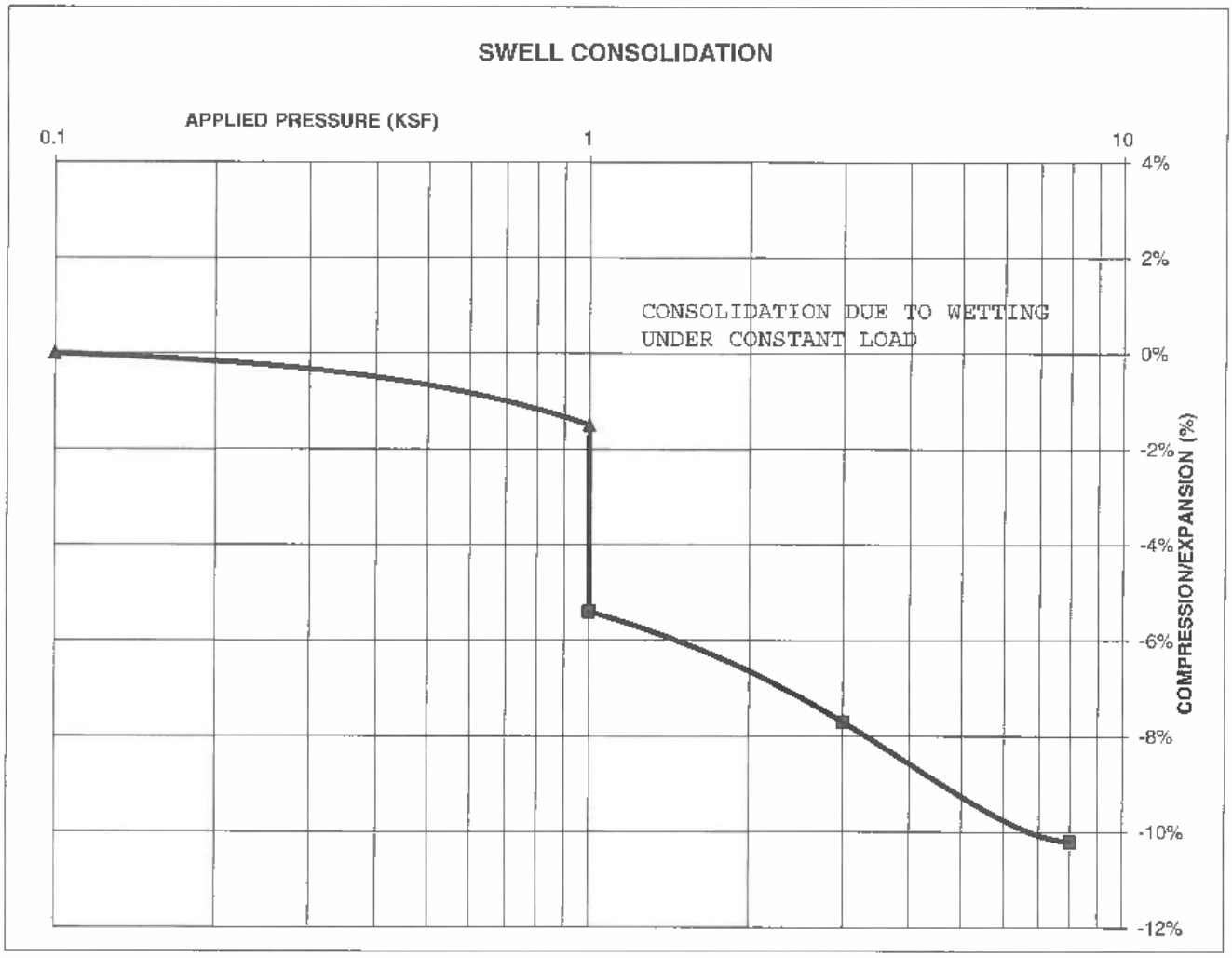
FIG NO.: C-30

CONSOLIDATION TEST RESULTS

TEST BORING #	27	DEPTH(ft)	10
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			102
NATURAL MOISTURE CONTENT			7.4%
SWELL/CONSOLIDATION (%)			-3.9%

JOB NO. 230486
CLIENT NORRIS RANCH JOINT VENTURES
PROJECT NORRIS RANCH



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SWELL CONSOLIDATION
TEST RESULTS

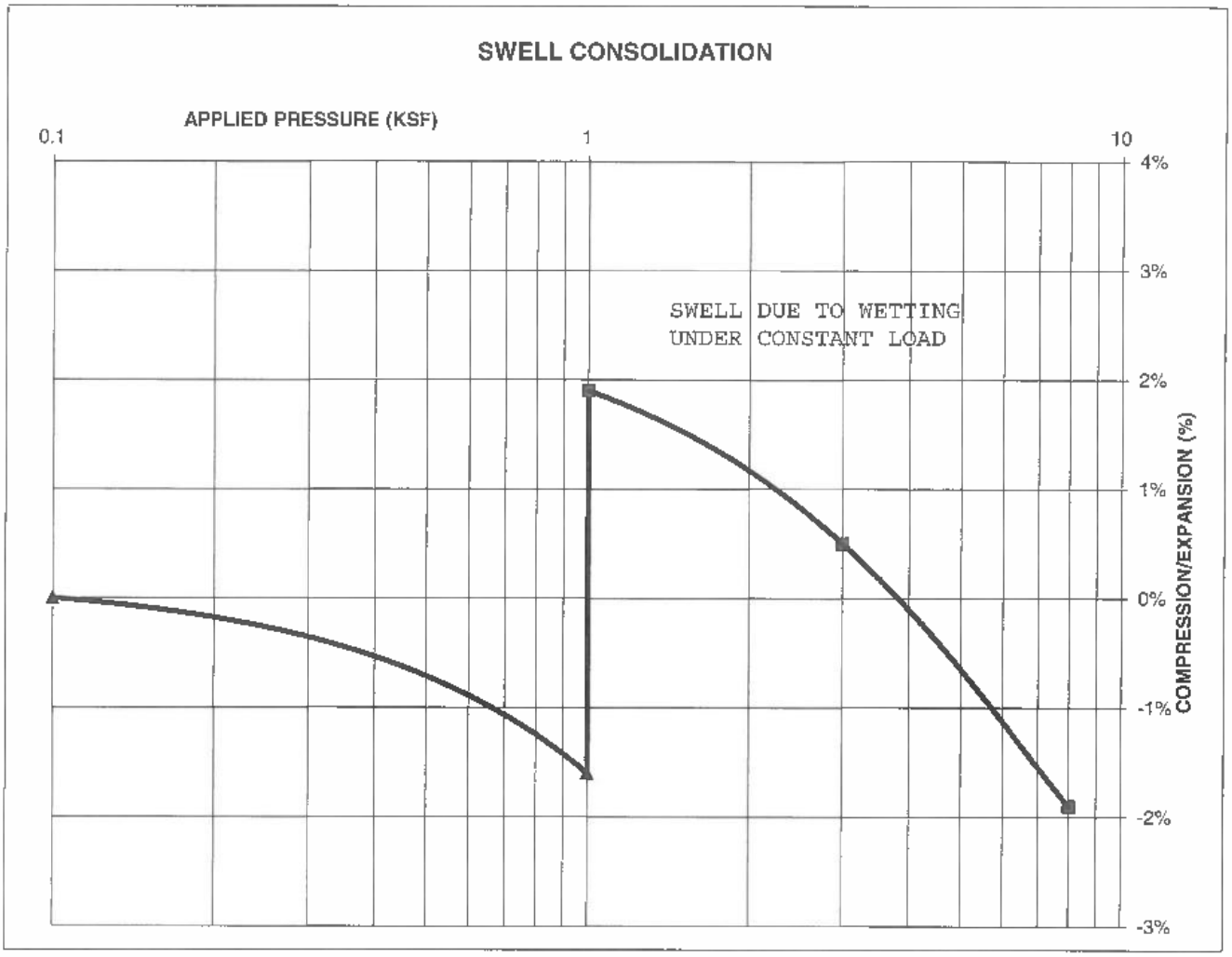
DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: C-31

CONSOLIDATION TEST RESULTS

TEST BORING #	1	DEPTH(ft)	10
DESCRIPTION	CH	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			113
NATURAL MOISTURE CONTENT			13.3%
SWELL/CONSOLIDATION (%)			3.5%

JOB NO. 230486
CLIENT NORRIS RANCH JOINT VENTURES
PROJECT NORRIS RANCH



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SWELL CONSOLIDATION
TEST RESULTS

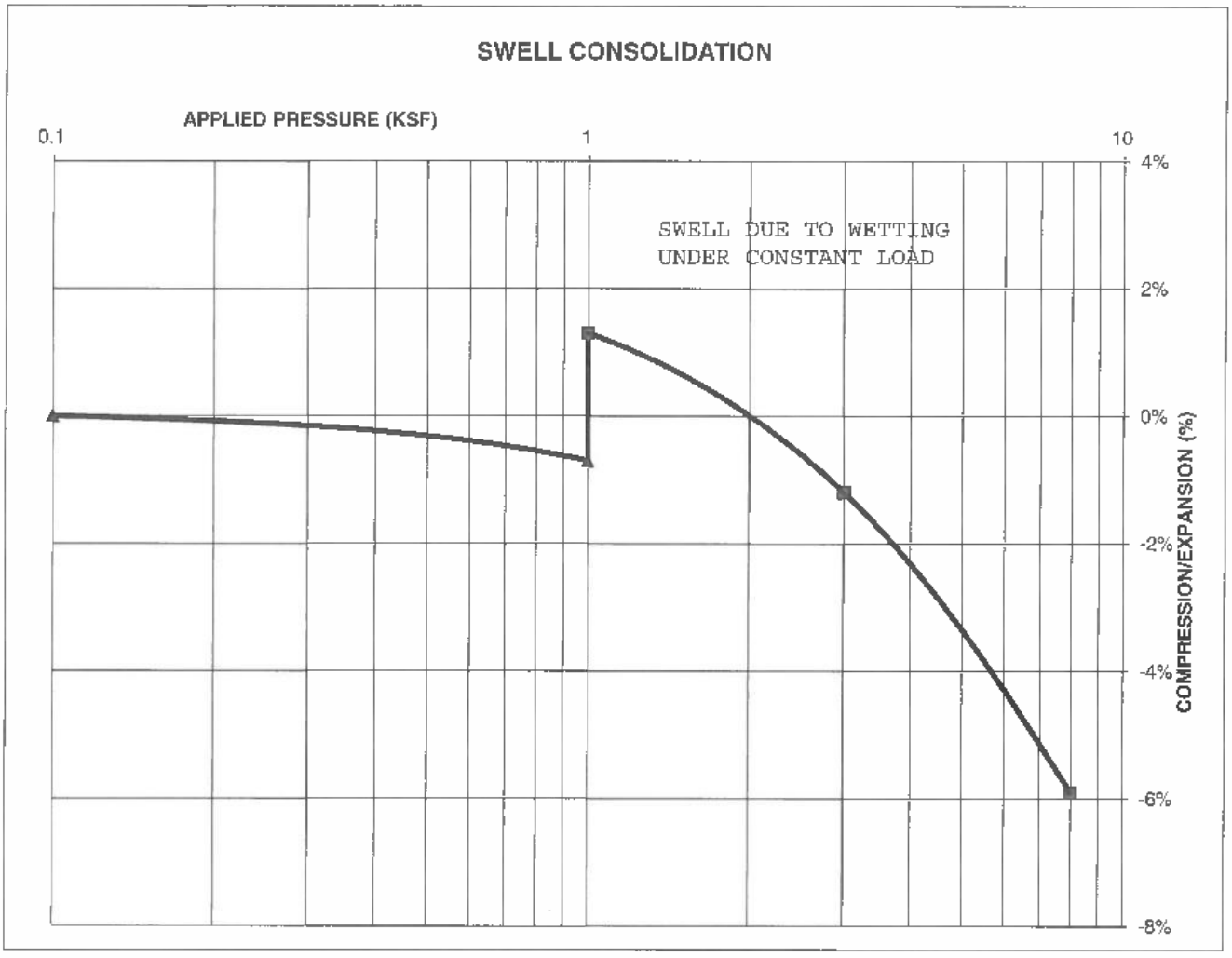
DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: C-32

CONSOLIDATION TEST RESULTS

TEST BORING #	2	DEPTH(ft)	2-3
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			103
NATURAL MOISTURE CONTENT			11.0%
SWELL/CONSOLIDATION (%)			2.0%

JOB NO. 230486
CLIENT NORRIS RANCH JOINT VENTURES
PROJECT NORRIS RANCH



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SWELL CONSOLIDATION
TEST RESULTS

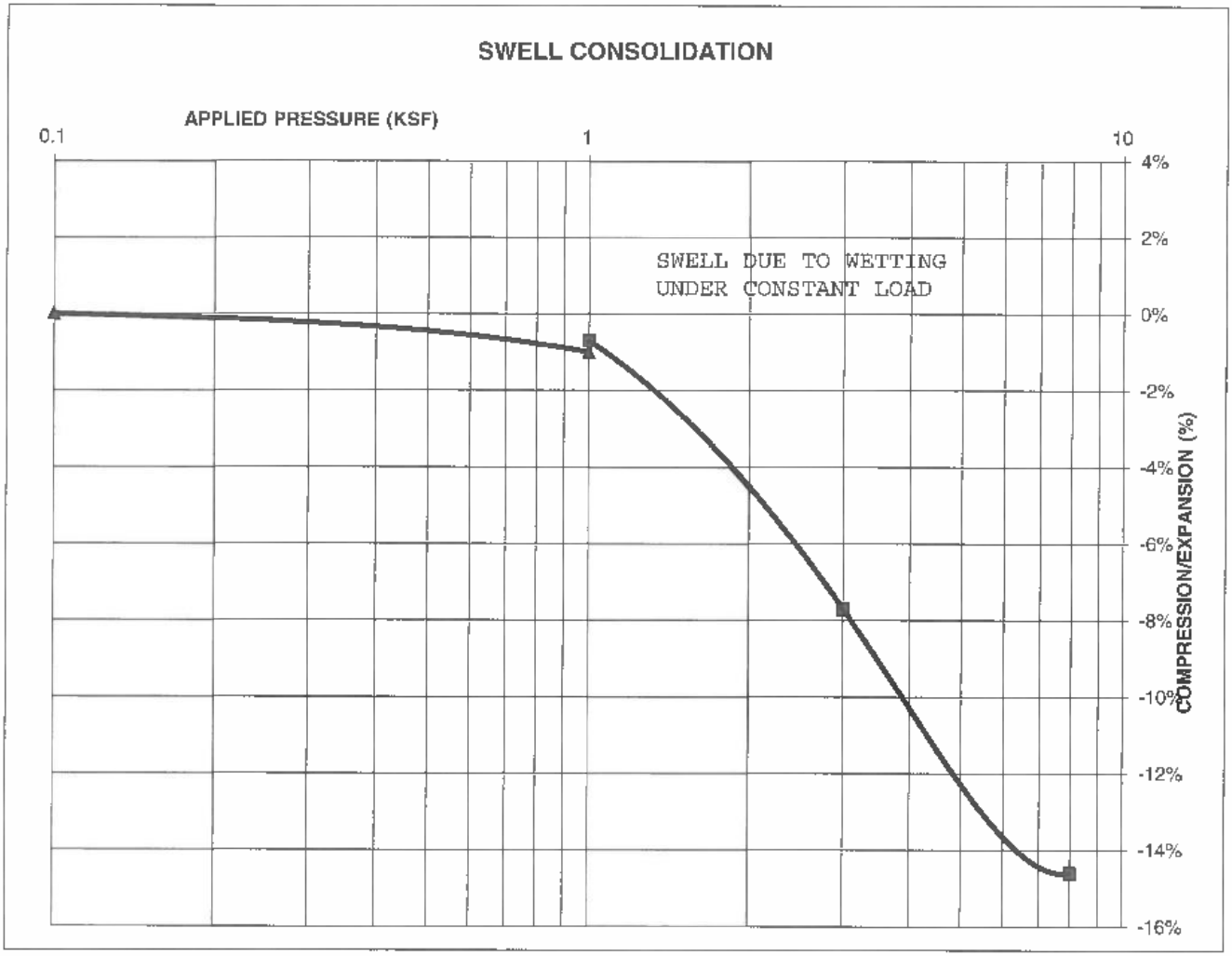
DRAWN:	DATE:	CHECKED:	DATE:
		LL	3/30/23

JOB NO.: 230486
FIG NO.: C-33

CONSOLIDATION TEST RESULTS

TEST BORING #	8	DEPTH(ft)	2-3
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			86
NATURAL MOISTURE CONTENT			16.1%
SWELL/CONSOLIDATION (%)			0.3%

JOB NO. 230486
CLIENT NORRIS RANCH JOINT VENTURES
PROJECT NORRIS RANCH



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SWELL CONSOLIDATION
TEST RESULTS

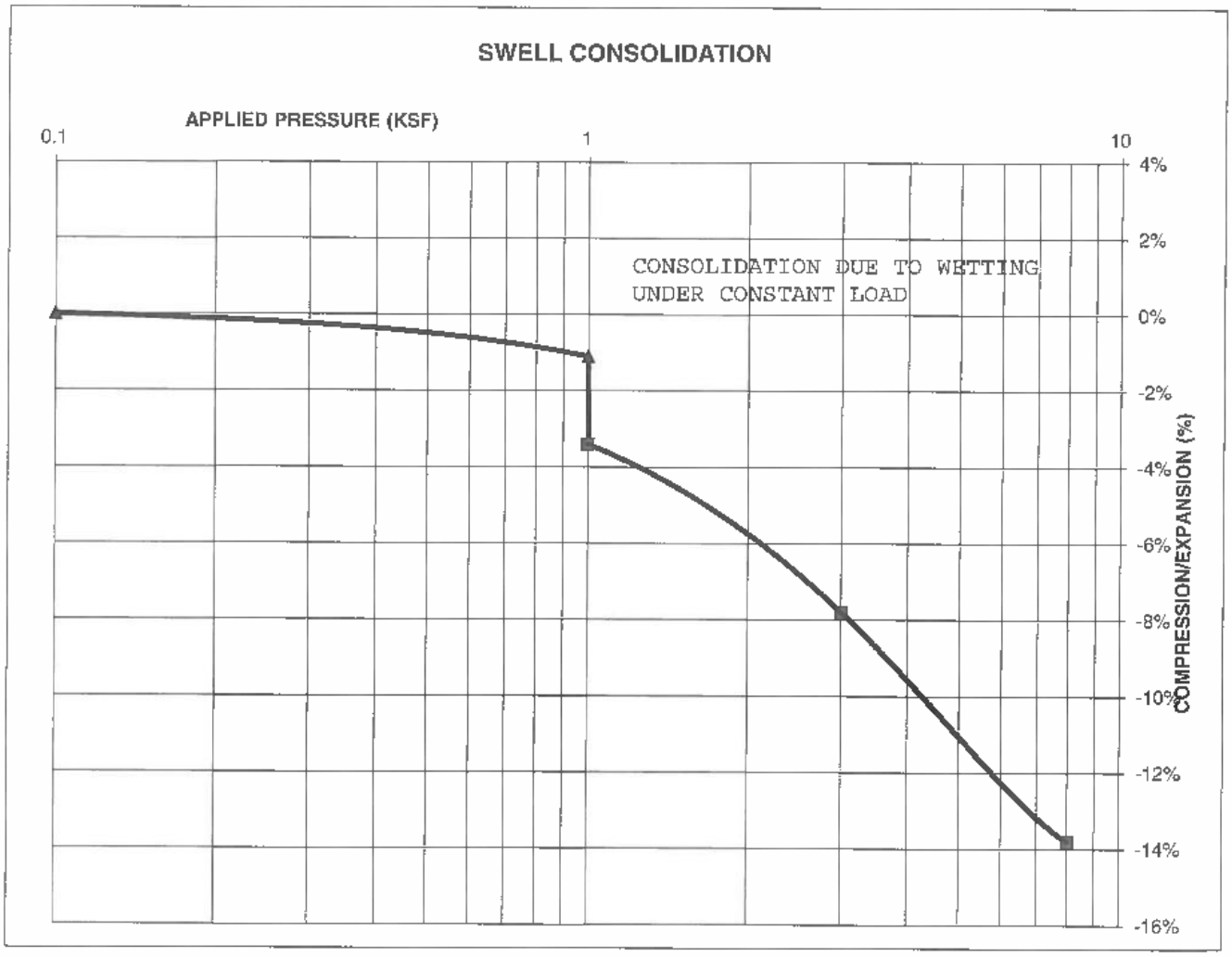
DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: C-34

CONSOLIDATION TEST RESULTS

TEST BORING #	11	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			87
NATURAL MOISTURE CONTENT			15.2%
SWELL/CONSOLIDATION (%)			-2.3%

JOB NO. 230486
CLIENT NORRIS RANCH JOINT VENTURES
PROJECT NORRIS RANCH



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SWELL CONSOLIDATION
TEST RESULTS

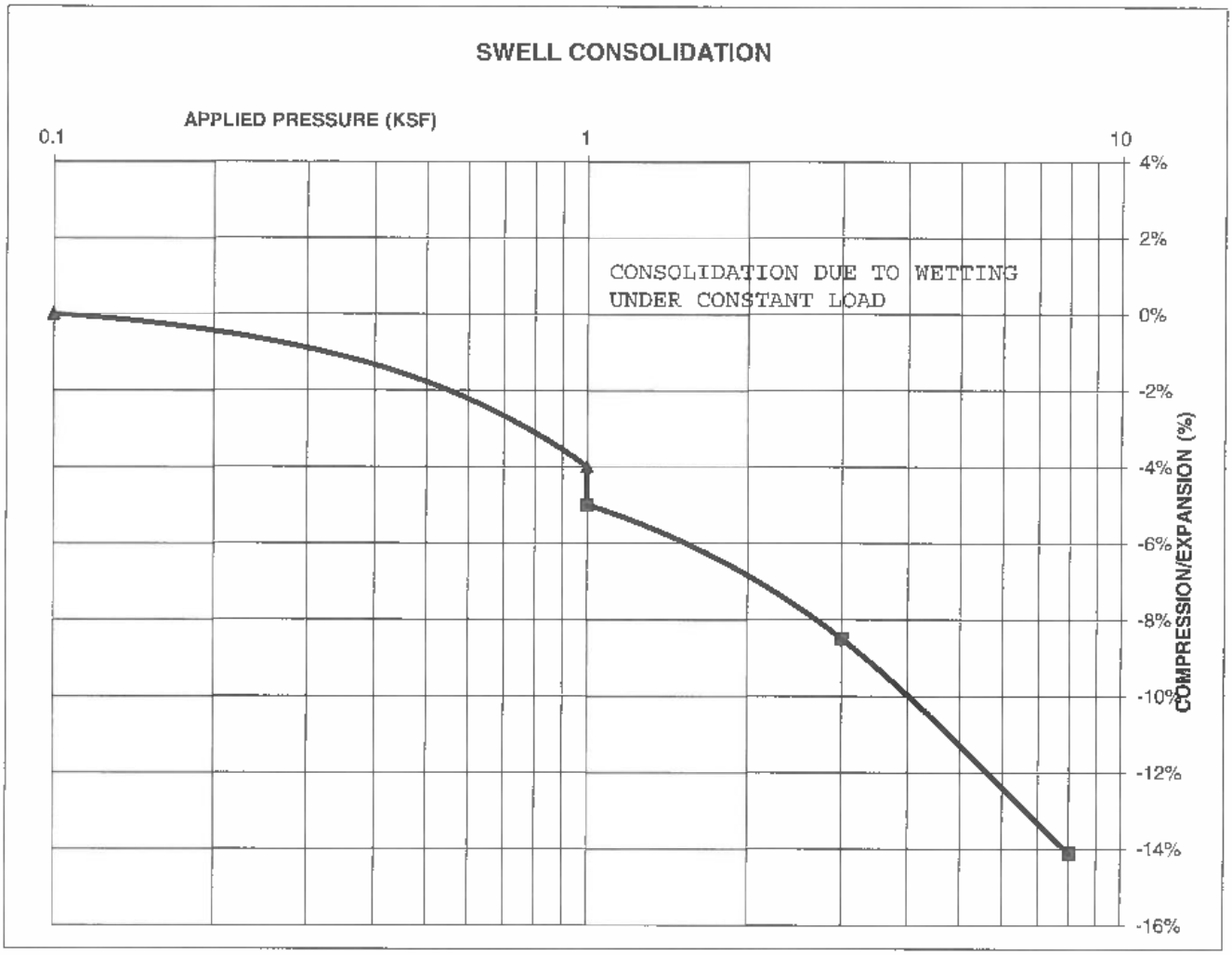
DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: C-35

CONSOLIDATION TEST RESULTS

TEST BORING #	24	DEPTH(ft)	15
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			89
NATURAL MOISTURE CONTENT			1.1%
SWELL/CONSOLIDATION (%)			-1.0%

JOB NO. 230486
CLIENT NORRIS RANCH JOINT VENTURES
PROJECT NORRIS RANCH



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

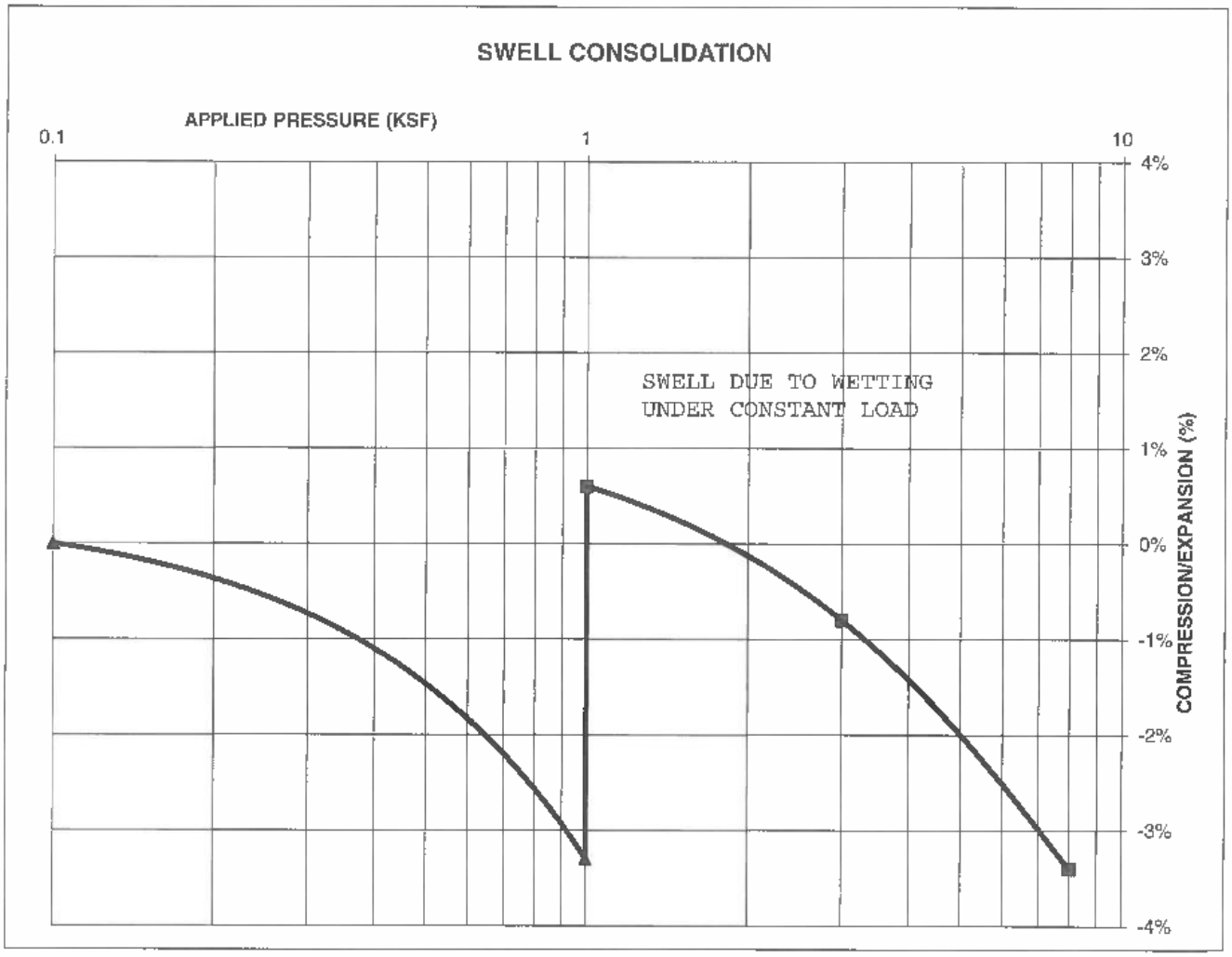
DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: C-36

CONSOLIDATION TEST RESULTS

TEST BORING #	7	DEPTH(ft)	15
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			112
NATURAL MOISTURE CONTENT			14.6%
SWELL/CONSOLIDATION (%)			3.9%

JOB NO. 230486
CLIENT NORRIS RANCH JOINT VENTURES
PROJECT NORRIS RANCH



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ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486
FIG NO.: C-37

CLIENT	NORRIS RANCH JOINT VENTURES	JOB NO.	230486
PROJECT	NORRIS RANCH	DATE	3/31/2022
LOCATION	NORRIS RANCH	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	10	2	CL	0.18
TB-2	2-3	2	CL	<0.01
TB-6	10	1	SM	<0.01
TB-7	20	4	CL	0.00
TB-8	2-3	2	CL	0.02
TB-9	5	1	SM	<0.01

QC BLANK PASS

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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/30/23

JOB NO.: 230486

FIG NO.: C-38

APPENDIX D: Soil Survey Descriptions

El Paso County Area, Colorado

2—Ascalon sandy loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367q
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ascalon and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or eolian deposits

Typical profile

A - 0 to 8 inches: sandy loam
Bt - 8 to 21 inches: sandy clay loam
BC - 21 to 27 inches: sandy loam
Ck1 - 27 to 48 inches: sandy loam
Ck2 - 48 to 60 inches: loamy sand

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 to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R069XY026CO - Sandy Plains LRU's A and B
Other vegetative classification: SANDY PLAINS (069BY026CO)
Hydric soil rating: No

Minor Components

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 19, Aug 31, 2021

El Paso County Area, Colorado

3—Ascalon sandy loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2tlny
Elevation: 3,870 to 5,960 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 95 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Ascalon

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 6 inches: sandy loam
Bt1 - 6 to 12 inches: sandy clay loam
Bt2 - 12 to 19 inches: sandy clay loam
Bk1 - 19 to 35 inches: fine sandy loam
Bk2 - 35 to 80 inches: fine sandy loam

Properties and qualities

Slope: 3 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 to high (0.60 to 5.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.1 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Olnest

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Vona

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

El Paso County Area, Colorado

10—Blendon sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3671
Elevation: 6,000 to 6,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blendon and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blendon

Setting

Landform: Terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

A - 0 to 10 inches: sandy loam
Bw - 10 to 36 inches: sandy loam
C - 36 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 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 to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

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 19, Aug 31, 2021

El Paso County Area, Colorado

30—Fort Collins loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3683
Elevation: 5,200 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Fort collins and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fort Collins

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 9 inches: loam
Bt - 9 to 16 inches: clay loam
Bk - 16 to 21 inches: clay loam
Ck - 21 to 60 inches: loam

Properties and qualities

Slope: 0 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 to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B

Ecological site: R067BY002CO - Loamy Plains
Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

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

Other soils
Percent of map unit: 1 percent
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

31—Fort Collins loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 3684
Elevation: 5,200 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 52 degrees F
Farmland classification: Not prime farmland

Map Unit Composition

Fort collins and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fort Collins

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 9 inches: loam
Bt - 9 to 16 inches: clay loam
Bk - 16 to 21 inches: clay loam
Ck - 21 to 60 inches: loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains

Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

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 19, Aug 31, 2021

El Paso County Area, Colorado

56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes

Map Unit Setting

National map unit symbol: 3690
Elevation: 5,600 to 6,400 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Nelson and similar soils: 55 percent
Tassel and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nelson

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: fine sandy loam
Ck - 5 to 23 inches: fine sandy loam
Cr - 23 to 27 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Description of Tassel

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous slope alluvium over residuum weathered from sandstone

Typical profile

A - 0 to 4 inches: fine sandy loam
C - 4 to 10 inches: fine sandy loam
Cr - 10 to 14 inches: weathered bedrock

Properties and qualities

Slope: 3 to 18 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
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
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

El Paso County Area, Colorado

75—Razor-Midway complex

Map Unit Setting

National map unit symbol: 369p
Elevation: 5,300 to 6,100 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Razor and similar soils: 60 percent
Midway and similar soils: 35 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Razor

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Clayey slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: stony clay loam
Bw - 4 to 22 inches: cobbly clay loam
Bk - 22 to 29 inches: cobbly clay
Cr - 29 to 33 inches: weathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R069XY047CO - Alkaline Plains LRU's A and B
Other vegetative classification: ALKALINE PLAINS (069AY047CO)
Hydric soil rating: No

Description of Midway

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: clay loam
C - 4 to 13 inches: clay
Cr - 13 to 17 inches: weathered bedrock

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 15 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R069XY046CO - Shaly Plains LRU's A and B
Other vegetative classification: SHALY PLAINS (069AY045CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

El Paso County Area, Colorado

78—Sampson loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 369s
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Sampson

Setting

Landform: Depressions, alluvial fans, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 15 inches: loam
Bt - 15 to 34 inches: clay loam
Bk - 34 to 60 inches: sandy clay loam

Properties and qualities

Slope: 0 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 to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R049XB202CO - Loamy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

El Paso County Area, Colorado

84—Stapleton sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 36b0
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Stapleton

Setting

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

Typical profile

A - 0 to 11 inches: sandy loam
Bw - 11 to 17 inches: gravelly sandy loam
C - 17 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 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 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

El Paso County Area, Colorado

86—Stoneham sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 36b2
Elevation: 5,100 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Stoneham

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium

Typical profile

A - 0 to 4 inches: sandy loam
Bt - 4 to 8 inches: sandy clay loam
Btk - 8 to 11 inches: sandy clay loam
Ck - 11 to 60 inches: loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

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

Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: SANDY PLAINS (069AY026CO)
Hydric soil rating: No

Minor Components

Other soils
Percent of map unit: 4 percent
Hydric soil rating: No

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

El Paso County Area, Colorado

89—Tassel fine sandy loam, 3 to 18 percent slopes

Map Unit Setting

National map unit symbol: 36b5
Elevation: 5,600 to 6,400 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 47 to 51 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Tassel

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous slope alluvium over residuum weathered from sandstone

Typical profile

A - 0 to 4 inches: fine sandy loam
C - 4 to 10 inches: sandy loam
Cr - 10 to 14 inches: weathered bedrock

Properties and qualities

Slope: 3 to 18 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
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
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: SANDY PLAINS (069AY026CO)

Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 5 percent
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

97—Truckton sandy loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2x0j2
Elevation: 5,300 to 6,850 feet
Mean annual precipitation: 14 to 19 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 85 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Truckton

Setting

Landform: Interfluves, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Re-worked alluvium derived from arkose

Typical profile

A - 0 to 4 inches: sandy loam
Bt1 - 4 to 12 inches: sandy loam
Bt2 - 12 to 19 inches: sandy loam
C - 19 to 80 inches: sandy loam

Properties and qualities

Slope: 3 to 9 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
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline (0.1 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Blakeland

Percent of map unit: 8 percent
Landform: Interfluves, hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Bresser

Percent of map unit: 7 percent
Landform: Interfluves, low hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Ecological site: R049XB210CO - Sandy Foothill
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

105—Vona sandy loam, warm, 3 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2t517
Elevation: 3,400 to 6,000 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Vona, Warm

Setting

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

Typical profile

A - 0 to 5 inches: sandy loam
Bt1 - 5 to 12 inches: sandy loam
Bt2 - 12 to 17 inches: sandy loam
Bk - 17 to 41 inches: sandy loam
BCk - 41 to 79 inches: loamy sand

Properties and qualities

Slope: 3 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very 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
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 3.9 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R067BY024CO - Sandy Plains
Forage suitability group: Loamy, Dry (G067BW019CO)
Other vegetative classification: Sandy Plains #24 (067XY024CO_2), Loamy, Dry (G067BW019CO)
Hydric soil rating: No

Minor Components

Olnest, warm

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: Loamy, Dry (G067BW019CO)
Hydric soil rating: No

Valent, warm

Percent of map unit: 5 percent
Landform: Sand sheets
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R067BY015CO - Deep Sand
Other vegetative classification: Deep Sands #15 (067XY015CO_3), Sandy, Dry (G067BW026CO)
Hydric soil rating: No

Otero, warm

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: SANDY PLAINS (067XY024CO_1), Loamy, Dry (G067BW019CO)
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

108—Wiley silt loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 367b
Elevation: 5,200 to 6,200 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Wiley

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous silty eolian deposits

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 16 inches: silt loam
Bk - 16 to 60 inches: silt loam

Properties and qualities

Slope: 3 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 to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains

Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

Other soils
Percent of map unit: 4 percent
Hydric soil rating: No

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

El Paso County Area, Colorado

116—Udic Haplusterts

Map Unit Setting

National map unit symbol: 2qnmp
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 49 to 52 degrees F
Frost-free period: 115 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Udic Haplusterts, Ponded

Setting

Landform: Closed depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Typical profile

A - 0 to 5 inches: clay
Bw - 5 to 17 inches: clay
Bss1 - 17 to 28 inches: clay
Bss2 - 28 to 36 inches: clay
Bss3 - 36 to 68 inches: clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 3c
Land capability classification (nonirrigated): 4c

Hydrologic Soil Group: D
Ecological site: R067BY010CO - Closed Upland Depression
Hydric soil rating: No

Minor Components

Feterita, ponded
Percent of map unit: 9 percent
Landform: Closed depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R067BY010CO - Closed Upland Depression
Other vegetative classification: Clayey Plains #42 (067XY042CO_2)
Hydric soil rating: Yes

Pachic haplustolls
Percent of map unit: 6 percent
Landform: Terraces, closed depressions
Landform position (three-dimensional): Dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Ecological site: R067BY010CO - Closed Upland Depression
Other vegetative classification: LOAMY FOOTHILLS (048AY284CO)
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021