



ENTECH
ENGINEERING, INC.

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

December 7, 2021

Rockwood Homes
5436 Carvel Grove
Colorado Springs, CO 80922

Attn: Pat Hiner

Re: Soil, Geology and Geologic Hazard Evaluation
Trinity Subdivision
20040 Highway 94
Tax Schedule Nos. 34000-00-455
El Paso County, Colorado

Dear Mr. Hiner:

GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site is located in the SE¼ of Section 9, Township 14 South, Range 63 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 12½ miles east of Colorado Springs, Colorado, east of Peyton Highway and Highway 94 in El Paso County, Colorado. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site is generally sloping to the southeast with a small north-south trending ridge in the western portion of the site. No drainages were observed on the site, but blowouts with low lying areas were located in portions of Lots 12, 25, 33, 44, and 45. The drainage swale flows in a westerly direction. Water was not observed in the drainages at the time of this investigation. The site boundaries are indicated on the USGS Map, Figure 2. Previous land uses have included agricultural grazing and undeveloped land. The site contains primarily field grasses, weeds, yucca and cacti. Site photographs, taken October 13, 2021, are included in Appendix A.

Total acreage involved in the proposed subdivision is 137.92-acres. Forty-eight rural, residential lots are proposed as part of the replat. The proposed lot sizes range in size but are approximately 2.5 to 3-acres. The lots will be serviced by individual on-site wastewater treatment systems and municipal water. The Site Plan is presented in Figure 3.

LAND USE AND ENGINEERING GEOLOGY

This site was found to be suitable for the proposed development, which will consist of rural, residential lots and associated site improvements. Areas were encountered where the geologic conditions will impose some constraints on development and land use. These include areas of hydrocompactive soils, and potentially seasonal shallow groundwater areas. Based on the proposed development plan, it appears that these areas will have some impacts on the development. These conditions will be discussed in greater detail in the report.

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

SCOPE OF THE REPORT

The scope of the report includes:

A general geologic analysis utilizing published geologic data. Detailed site-specific mapping will be conducted to obtain general information with respect to major geographic and geologic features, geologic descriptions and their effects on the development of the property.

FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of bedrock features and significant surficial deposits. The Natural Resource Conservation Service (NRCS) (Reference 2), previously the Soil Conservation Service (SCS) survey was also reviewed to evaluate the site (Reference 3). The position of mappable units within the subject site are shown on the Geologic Map Figure, 6. Our mapping procedures involved both field reconnaissance and measurements, and aerial photo reconnaissance and interpretation. The field mapping was performed by personnel of Entech Engineering, Inc. on October 13, 2021.

Eight test borings were drilled and ten test pits were excavated on the site to determine general suitability of the soil characteristics for residential construction and on-site wastewater treatment systems. The locations of the test borings are indicated on the Site Plan/Test Boring Location Map, Figure 3. The Test Boring Logs are presented in Appendix B, and Laboratory Testing results are included in Appendix C.

SOIL AND GEOLOGIC CONDITIONS

Soil Survey

The Natural Resource Conservation Service (NRCS) (Reference 2, Figure 4), previously the Soil Conservation Service (Reference 3) has mapped four soil types on the site. Complete descriptions of the soils are presented in Appendix D. In general, the soils consist of loamy sand and sandy loam. The soils are described as follows:

Type	Description
8	Blakeland Loamy Sand, 1 – 9% Slopes
95	Truckton Loamy Sand, 1 – 9% Slopes
96	Truckton Sandy Loam, 0 – 3% Slopes
97	Truckton Sandy Loam, 3 – 9% Slopes

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The soils have been described to have moderate to rapid permeabilities. The soils are described as well suited for use as home sites. Possible hazards with soils erosion are present on the site. The erosion potential can be controlled with vegetation. The soils have been described to have moderate erosion hazards (Reference 2).

Soils

One soil type was encountered in the test borings on the site, slightly silty to very silty sand and clean sand (SM, SM-SW, SW). Bedrock was not encountered in the test borings which were drilled to 20 feet bgs. Each soil type was classified in accordance with the Unified Soil Classification System (USCS) using the laboratory testing results.

Soil Type 1 classified as slightly silty to very silty sand and clean sand (SM, SM-SW, SW). The sand was encountered in all of the test borings at the existing ground surface extending to the termination of test borings (20 feet). Standard Penetration Testing on the sand resulted in N-values of 3 to 30 bpf indicating very loose to dense states. The majority of the sands were encountered at medium dense states. Water content and grain size testing resulted in approximately 2 to 11 percent water content with 3 to 41 percent of the soil size particles passing the No. 200 sieve.

Groundwater

Groundwater was not encountered in the test borings or test pits at the time of our site investigation. It should be noted that fluctuation in groundwater levels could change due to seasonal variations, changes in land runoff characteristics and future development of nearby areas. Isolated sand layers within the soil profile can carry water in the subsurface. Contractors should be cognizant of the potential for the occurrence of subsurface water during construction.

Geology

Approximately 22½ miles west of the site is the southern extent of a major structural feature known as the Rampart Range Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within a large structural feature known as the Denver Basin. Bedrock in the area is typically gently dipping in a northerly direction (Reference 4). Overlying the Dawson Formation are deposits of man-made fill soils and alluvial deposited sands and clays.

The geology of the site was evaluated using the *Geologic Map of Pueblo 1-degree x 2degrees' quadrangle, South-Central Colorado*, by Scott, G.R., et.al. in 1976, (Reference 4). The Geology Map for the site is presented in Figure 6. One mappable unit was identified on this site which is described as follows:

Qes **Eolian Sands of Quaternary Age:** These are wind-blown sands deposited by the action of prevailing winds. The materials typically consist of silty sands and may contain sandy silt layers.

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The soils listed above were mapped from site-specific mapping, the *Geologic map of the Pueblo 1-degree x 2-degrees' quadrangle, south-central Colorado* published by the U.S. Geologic Survey in 1976 (Reference 4). The test borings and test pits were used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 6.

ENGINEERING GEOLOGIC HAZARDS

Mapping has been performed on this site to identify areas where various geologic conditions exist of which developers should be cognizant during the planning, design and construction stages should new construction be proposed. The engineering geologic hazards identified on this site include hydrocompactive soils, and potentially seasonal shallow groundwater areas. These hazards and recommended mitigation techniques are discussed as follows:

Hydrocompaction and Collapsible Soils – Constraint

Areas in which hydrocompaction have been mapped across the site mapped as Eolian Sands of Quaternary Age (Qes). 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 may be encountered in other areas 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 be such that water directed away from one structure is not directed against an adjacent building. Planting and watering in the immediate vicinity of the structures, as well as general lawn irrigation, should be minimized.

Should loose or collapsible soils be encountered beneath foundations, removal and recompaction of the upper 2 to 3 feet with thorough moisture conditioning and recompaction at 95% of Modified Proctor Dry Density, ASTM D-1557 will be necessary. **Specific recommendations should be made after additional investigation of each building site.**

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Drainage Areas/Floodplains – Constraint

The site does not lie within a mapped floodplain zone according to the FEMA Map Nos. 08041CO805G dated December 7, 2018 (Figure 7, Reference 6). Finished floor levels must be a minimum of one foot above any floodplain level. Exact locations of floodplain and specific drainage studies are beyond the scope of this report. No drainages were observed on the site and surface flows are anticipated to be to the south.

Potentially Seasonal Shallow Groundwater Area – Constraint

Blowouts associated with the windblown sands are located in some areas across the site and that have been mapped as potentially seasonally shallow groundwater areas and are discussed in the following section. These low-lying areas are indicated in the Geology/Engineering Geology Map (Figure 6). Due to the lot sizes these areas can be avoided. Lots affected by the potentially seasonal shallow groundwater are Lots 12, 25, 33, 44, and 45. In these areas, we would anticipate the potential for periodically high subsurface moisture conditions, frost heave potential and highly organic soils. Construction in any portions of these areas, if required, or immediately adjacent to these areas should follow these precautions.

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

RELEVANCE OF GEOLOGIC CONDITIONS TO LAND USE PLANNING

The proposed development will consist of subdividing the parcels for rural residential lots, and associated site improvements. The existing geologic and engineering geologic conditions will impose some minor constraints on development and construction. The geologic conditions on the site include hydrocompactive soils, and potentially seasonal shallow groundwater areas which can be satisfactorily mitigated through proper engineering design and construction practices, or avoidance.

The upper granular soils in the borings drilled on the site were encountered at very loose to dense states. Loose or collapsible soils, if encountered beneath foundation or floor slabs, will require recompaction. Expansive layers may also be encountered on this site. Expansive soils, if encountered, will require mitigation/special foundation design. These soils will not prohibit development. Overexcavation and replacement with non-expansive soils at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. Floor slabs on expansive soils should be expected to experience movement.

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In summary, the granular soils will likely provide suitable support for shallow foundations. The geologic conditions encountered on site can be mitigated with avoidance or proper engineering and construction practices. **Individual investigations for new building sites and septic systems will be required prior to construction.**

EROSION CONTROL

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

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

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

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ROADWAY AND EMBANKMENT CONSTRUCTION RECOMMENDATIONS

In general, the site soils are suitable for the proposed roadways and embankments. Groundwater should be expected to be encountered in deeper cuts and along drainage areas. If excavations encroach on the groundwater level unstable soil conditions may be encountered. Excavation of saturated soils will be difficult with rubber-tired equipment. Stabilization using shot rock or geogrids may be necessary.

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

New fill should be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 95% of its maximum Modified Proctor Dry Density, ASTM D-1557. These materials should be placed at a moisture content conducive to compaction, usually 0 to $\pm 2\%$ of Proctor optimum moisture content. The placement and compaction of fill should be observed and tested by Entech during construction. Entech should approve any import materials prior to placing or hauling them to the site. Additional investigation will be required for pavement designs once roadway grading is completed and utilities are installed.

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 6), the area is mapped as upland deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 6), surrounding areas to the site are mapped as U – Upland Deposits: sand resource and E3 – Eolian Deposits: sand resource. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 7), the area of the site has been mapped as “Good” for industrial minerals. Generally, the Dawson formation does not contain significant industrial mineral resources. The sands associated with the eolian and alluvial deposits may be considered a sand resource. Considering the silty to clayey nature of much of these materials and abundance of similar materials through the region, they would be considered to have little significance as an economic resource.

According to the *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 7), the site is mapped within the Denver Basin Coal Region. However, the area of the site has been mapped as “Poor” for coal resources. No active or inactive mines have been mapped in the area of the site. No metallic mineral resources have been mapped on the site (Reference 7).

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Areas neighboring the site have been mapped as "Fair" for oil and gas resources (Reference 7). No oil or gas fields have been discovered in the area of the site. Two wells were previously drilled in the area to 537 feet in 1924 to an unknown formation, and to 6,514 feet deep to the Jurassic Morrison Formation in 1972. No oil or gas was reported and both wells were plugged. The sedimentary rocks in the area may lack the geologic structure for trapping oil or gas; therefore, it would not be considered a significant resource.

CLOSURE

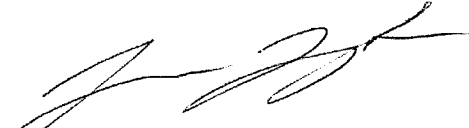
It should be pointed out that because of the nature of data obtained by random sampling of such variable nonhomogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Any new construction considered on this site will require additional investigation. Construction and design personnel should be made familiar with the contents of this report. Specific construction and foundation recommendations will be provided when investigations are completed at each building site prior to new construction.

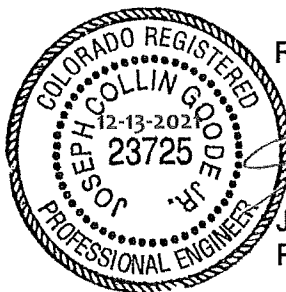
This report has been prepared for Rockwood Homes for application to the proposed development in accordance with generally accepted geologic, soil and engineering practices. No other warranty expresses or implied is made.

We trust that this report has provided you with all the information that you required. Should you have any questions or require additional information, please do not hesitate to contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC.


Logan L. Langford, P.G.
Geologist



Reviewed by:


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

LLL

Encl.

Entech Job No. 212655
AAprojects/2020/212655 sg&ghs

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BIBLIOGRAPHY

1. Natural Resource Conservation Service, June 5, 2020. *Web Soil Survey*. United States Department Agriculture, <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>.
2. United States Department of Agriculture Soil Conservation Service. June 1981. *Soil Survey of El Paso County Area, Colorado*.
3. Scott, G.R., Taylor R.B, Epis, R.C., and Wobus, R.A., 1976. Geologic map of the Pueblo 1-degree x 2-degrees' quadrangle, south-central Colorado. USGS, Map MF-775.
4. Federal Emergency Management Agency. December 7, 2018. *Flood Insurance Rate Maps for the City of Colorado Springs, Colorado*. Map Numbers 08041CO805G & 08041CO805G.
5. El Paso County Planning Development. December 1995. *El Paso County Aggregate Resource Evaluation Maps*.
6. Schwochow, S.D.; Shroba, R.R. and Wicklein, P.C. 1974. *Atlas of Sand, Gravel, and Quarry Aggregate Resources, Colorado Front Range Counties*. Colorado Geological Survey. Special Publication 5-B.
7. Keller, John W.; TerBest, Harry and Garrison, Rachel E. 2003. *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands Administered by the Colorado State Land Board*. Colorado Geological Survey. Open-File Report 03-07.

TABLE

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

CLIENT ROCKWOOD HOMES
PROJECT 20040 HIGHWAY 94
JOB NO. 212655

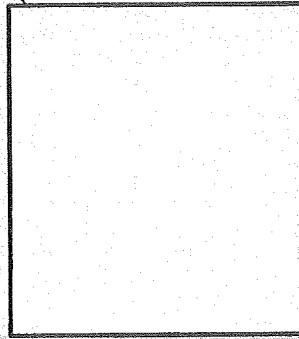
SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	2-3			26.4						SM	SAND, SILTY
1	2	10			2.9						SW	SAND
1	3	2-3			41.4	NV	NP	<0.01			SM	SAND, VERY SILTY
1	4	10			23.1						SM	SAND, SILTY
1	5	5			39.6						SM	SAND, VERY SILTY
1	6	2-3			18.2						SM	SAND, SILTY
1	7	15			9.3	NV	NP	<0.01			SM-SW	SAND, SLIGHTLY SILTY
1	8	10			31.7						SM	SAND, SILTY

FIGURES

Manisa Ranch

Manisa Ranch
Suri Alpacas

SITE



94

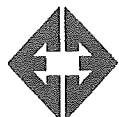
Peyton Hwy

94

S Peyton Hwy

38°51'06.2"N, 104°23'24.1"W (38.85173, -104.39004)

2000 ft



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VICINITY MAP
TRINITY RANCH
20040 HIGHWAY 94
EL PASO COUNTY, CO.
FOR: ROCKWOOD HOMES

DRAWN:
LLL

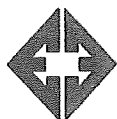
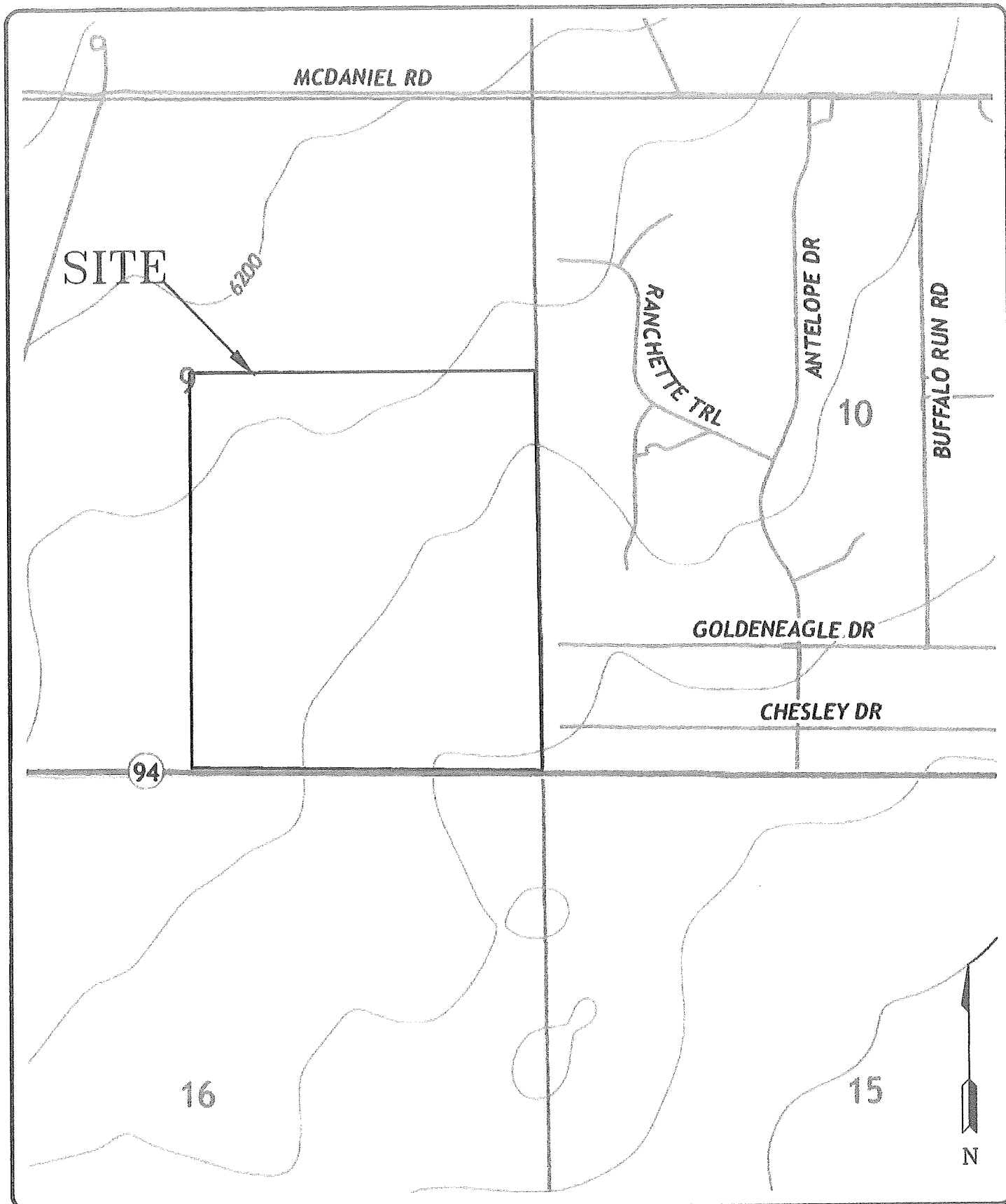
DATE:
11/17/21

CHECKED:

DATE:

JOB NO.:
212655

FIG NO.:
1



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USGS MAP TOPOGRAPHY MAP
TRINITY RANCH
20040 HIGHWAY 94
EL PASO COUNTY, CO.
FOR: ROCKWOOD HOMES

DRAWN:
LLL

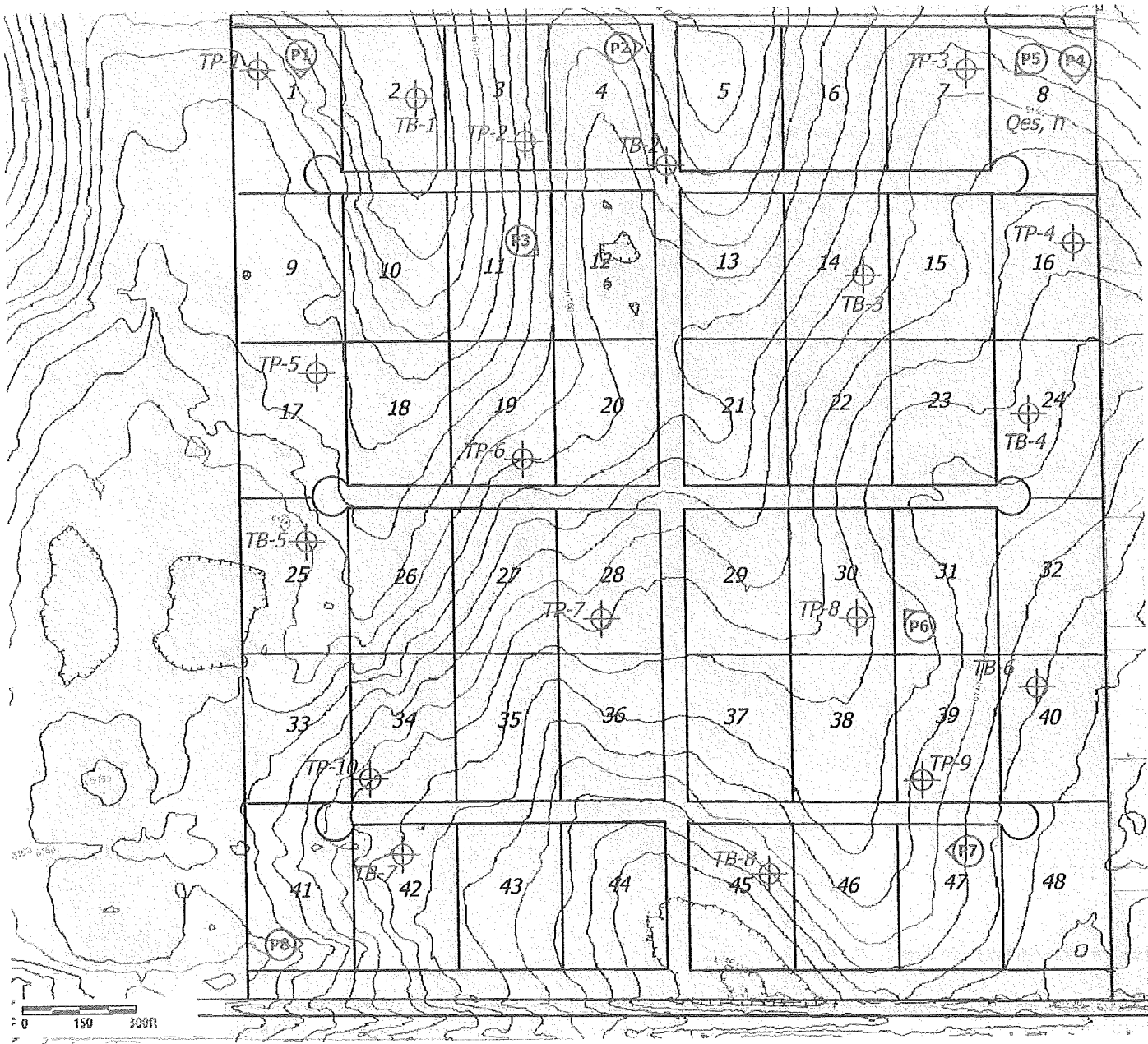
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11/17/21

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DATE:

JOB NO.:
212655

FIG NO.:
2



- APPROXIMATE TEST BORING LOCATION



- APPROXIMATE PHOTOGRAPH LOCATION AND DIRECTION



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SITE PLAN/TESTING LOCATION MAP
TRINITY RANCH
20040 HIGHWAY 94
EL PASO COUNTY, CO.
FOR: ROCKWOOD HOMES

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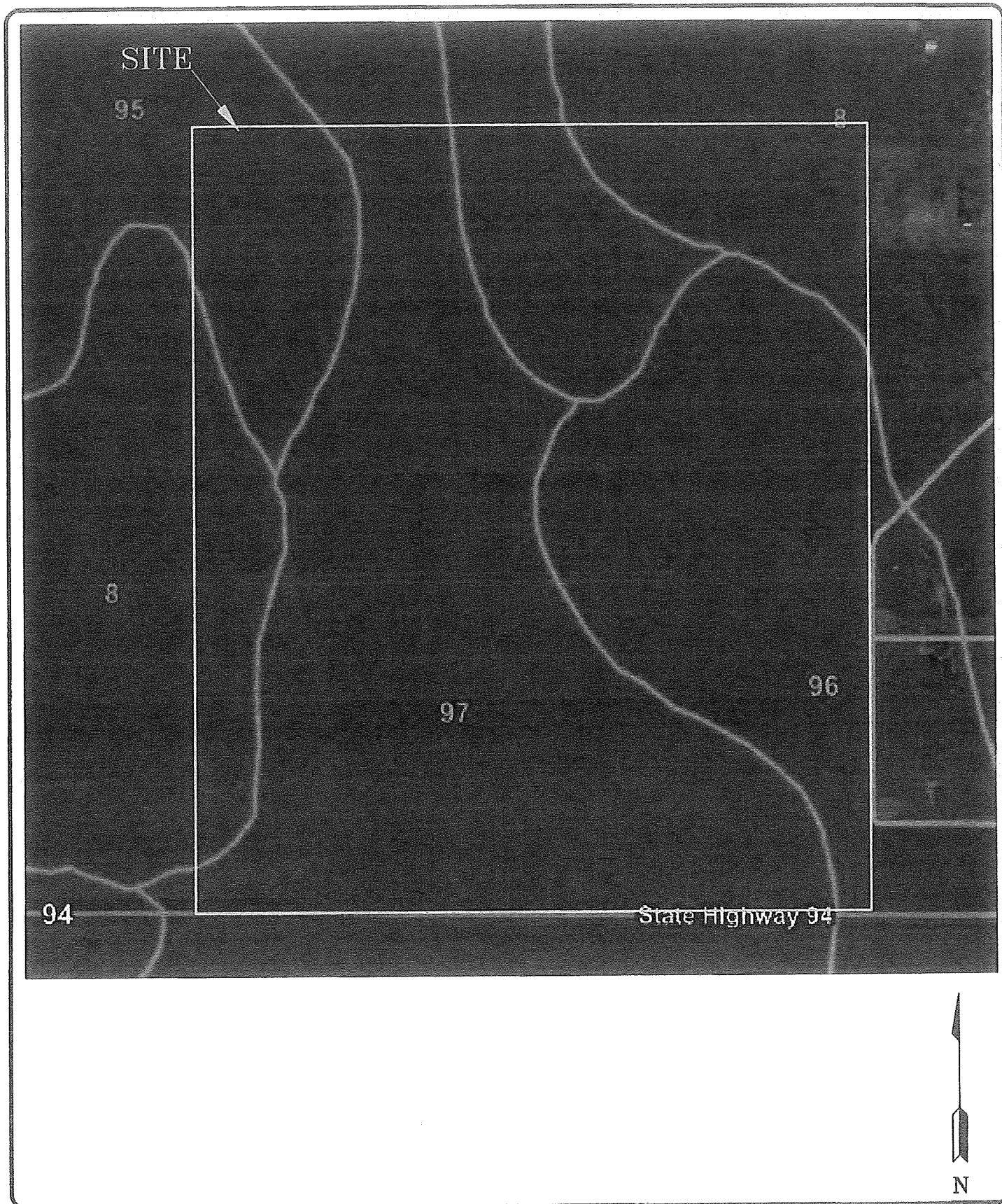
DATE:
11/17/21

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DATE:

JOB NO.:
212655

FIG NO.:
3



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SOIL SURVEY MAP
TRINITY RANCH
20040 HIGHWAY 94
EL PASO COUNTY, CO.
FOR: ROCKWOOD HOMES

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LLL

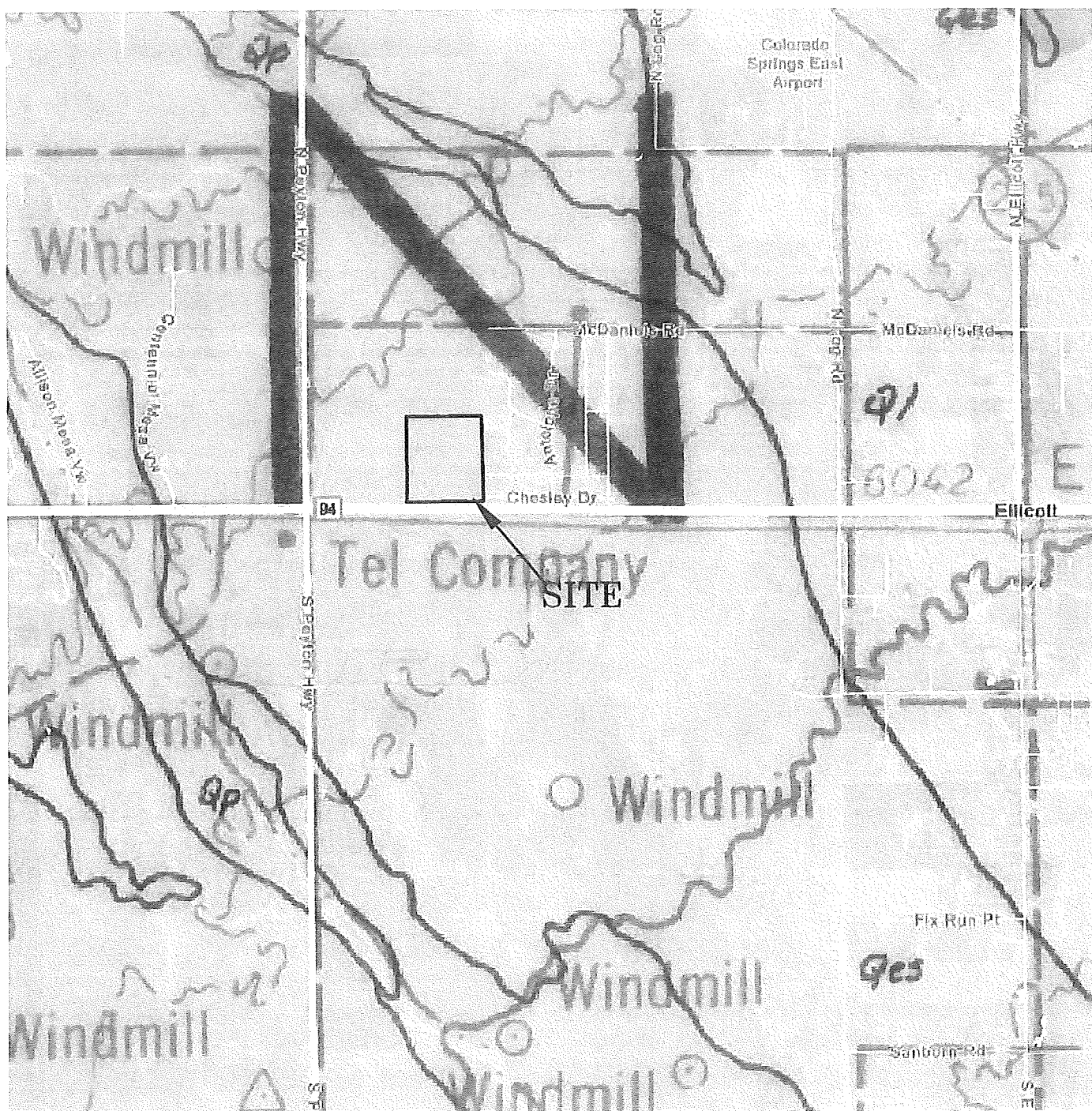
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DATE:

JOB NO.:
212655

FIG NO.:
4



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GEOLOGIC MAP OF THE PUEBLO 1° X 2° QUADRANGLE
TRINITY RANCH
20040 HIGHWAY 94
EL PASO COUNTY, CO.
FOR: ROCKWOOD HOMES

DRAWN:
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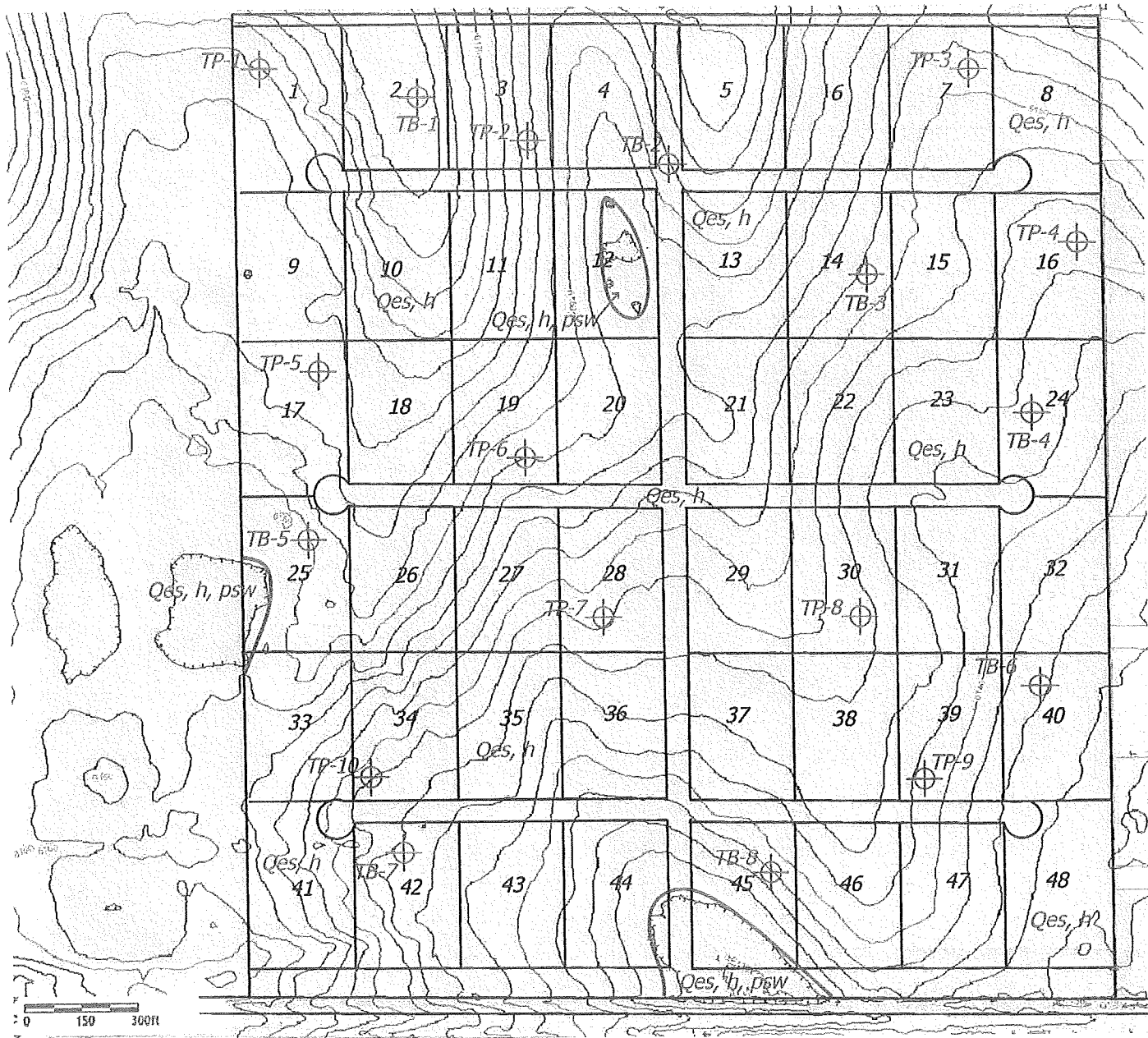
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11/17/21

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DATE:

JOB NO.:
212655

FIG NO.:
5



Legend:

- Qes - Eolian Sands of Quaternary Age:
wind blown sediments
- h - hydrocompactive soil
- psw - potentially seasonally shallow groundwater area

N



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GEOLOGY/ENGINEERING GEOLOGY MAP
TRINITY RANCH
20040 HIGHWAY 94
EL PASO COUNTY, CO.
FOR: ROCKWOOD HOMES

DRAWN:
LLL

DATE:
11/17/21

CHECKED:

DATE:

JOB NO.:
212655

FIG NO.:
6

SITE

08041C0805G
eff. 12/7/2018

600'

104.446 38.841 Degrees

N



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FEMA FLOODPLAIN MAP
TRINITY RANCH
20040 HIGHWAY 94
EL PASO COUNTY, CO.
FOR: ROCKWOOD HOMES CO.

DRAWN:
LLL

DATE:
11/17/21

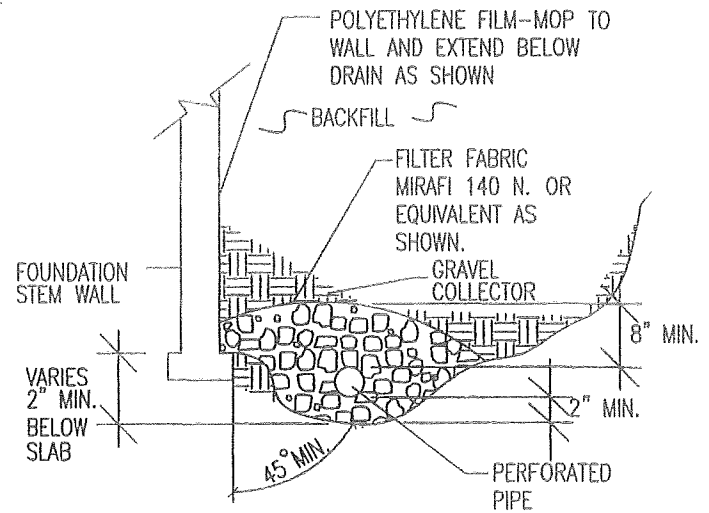
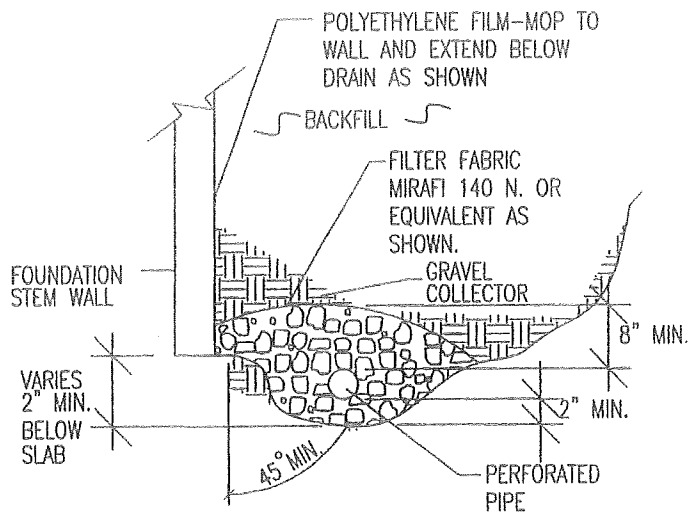
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DATE:

JOB NO.:
212655

FIG NO.:

7



NOTES:

-GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS-85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

-PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4-INCH DIAMETER IS MOST OFTEN USED.

-ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON-PERFORATED PIPE.

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

-MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

-DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.



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PERIMETER DRAIN DETAIL

DRAWN:

DATE:

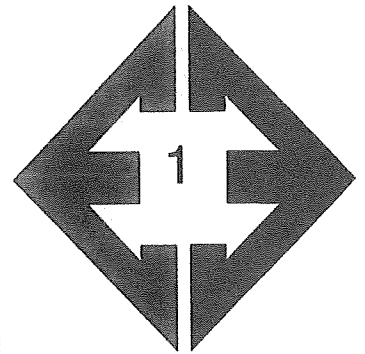
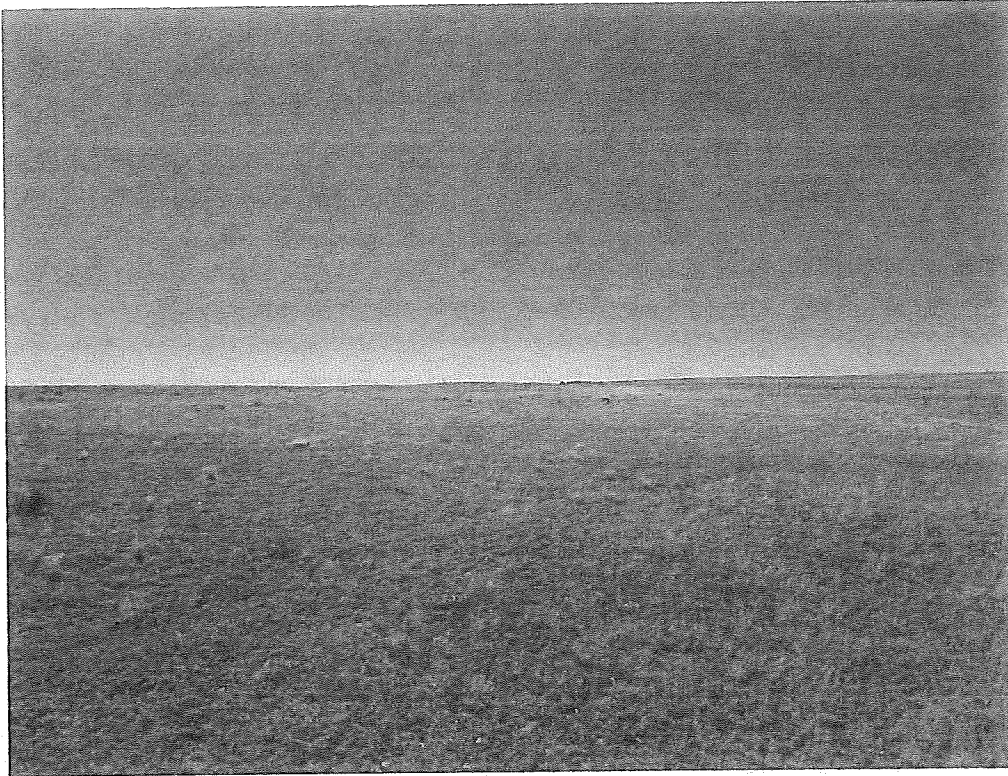
DESIGNED:
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L.L.L.

JOB NO.:
212655

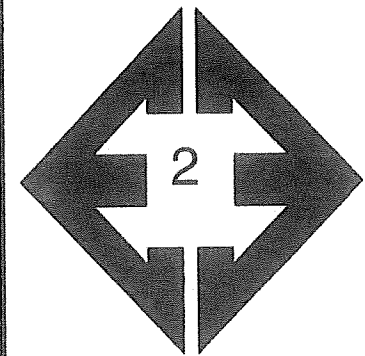
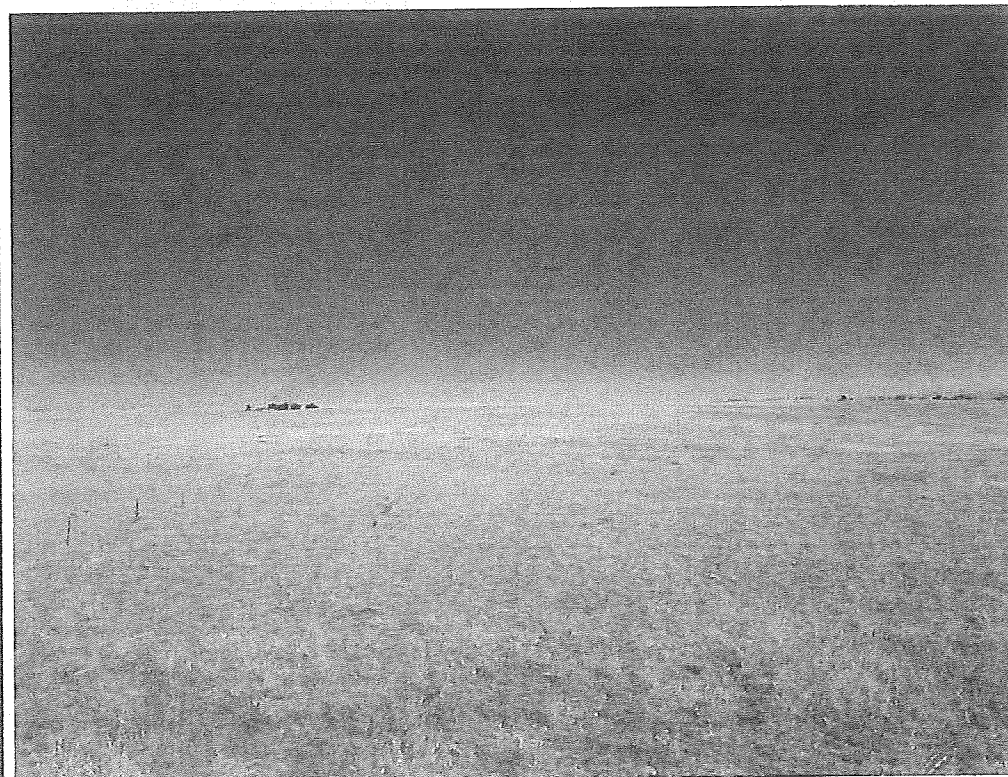
FIG NO.:
8

APPENDIX A: Site Photographs



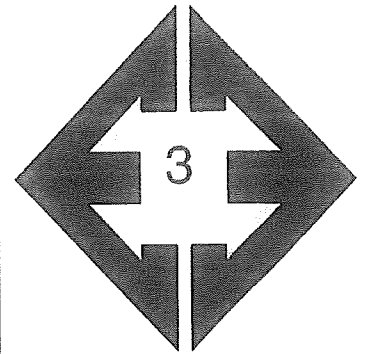
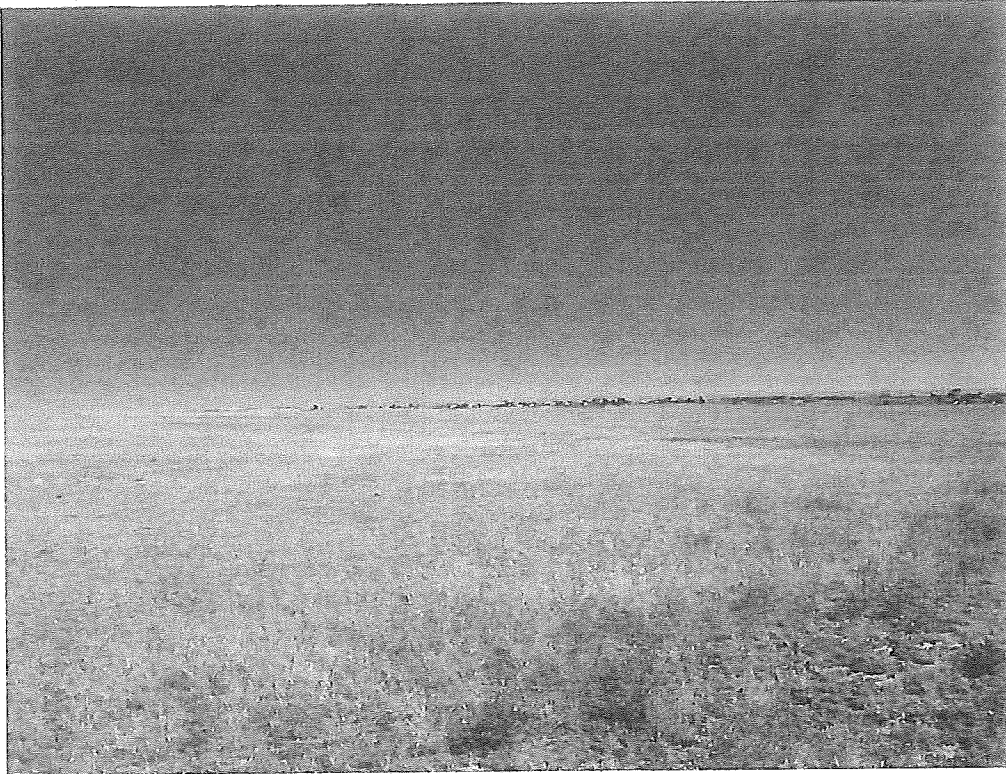
**Looking south from
the northeastern
corner of the site.**

October 13, 2021



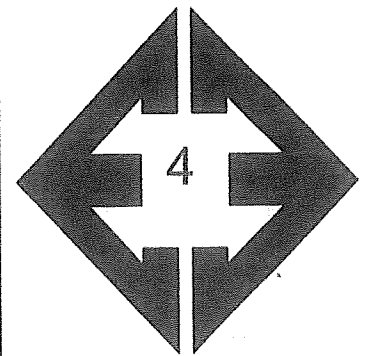
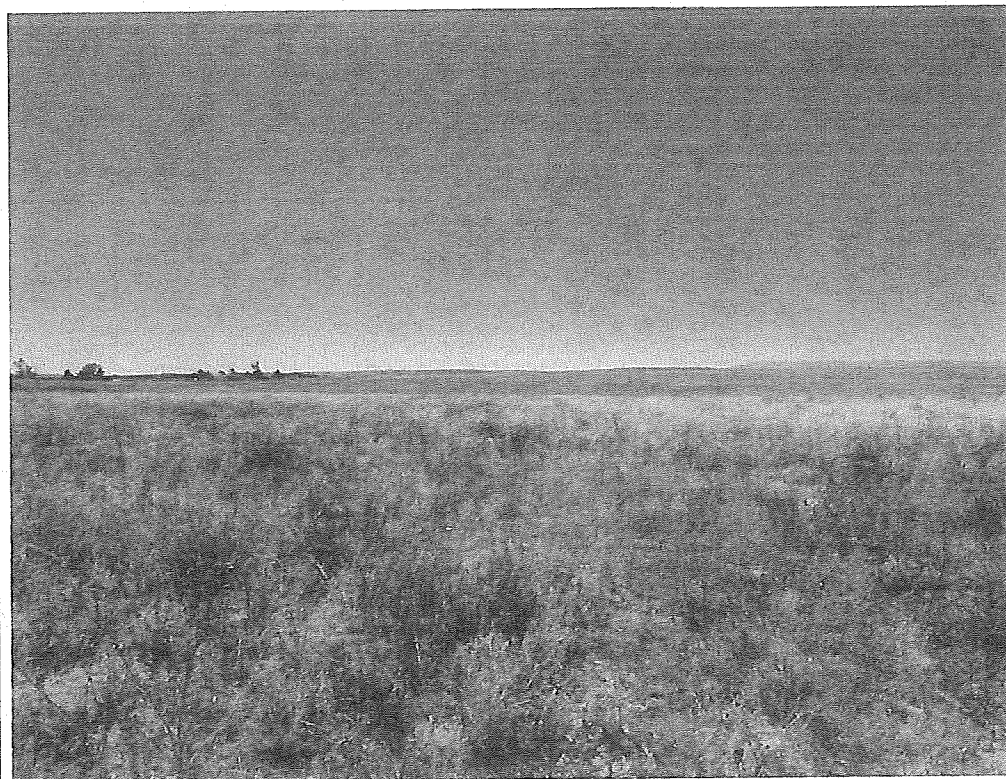
**Looking east from the
northern side of the
site.**

October 13, 2021



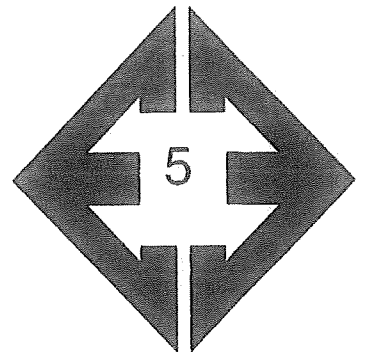
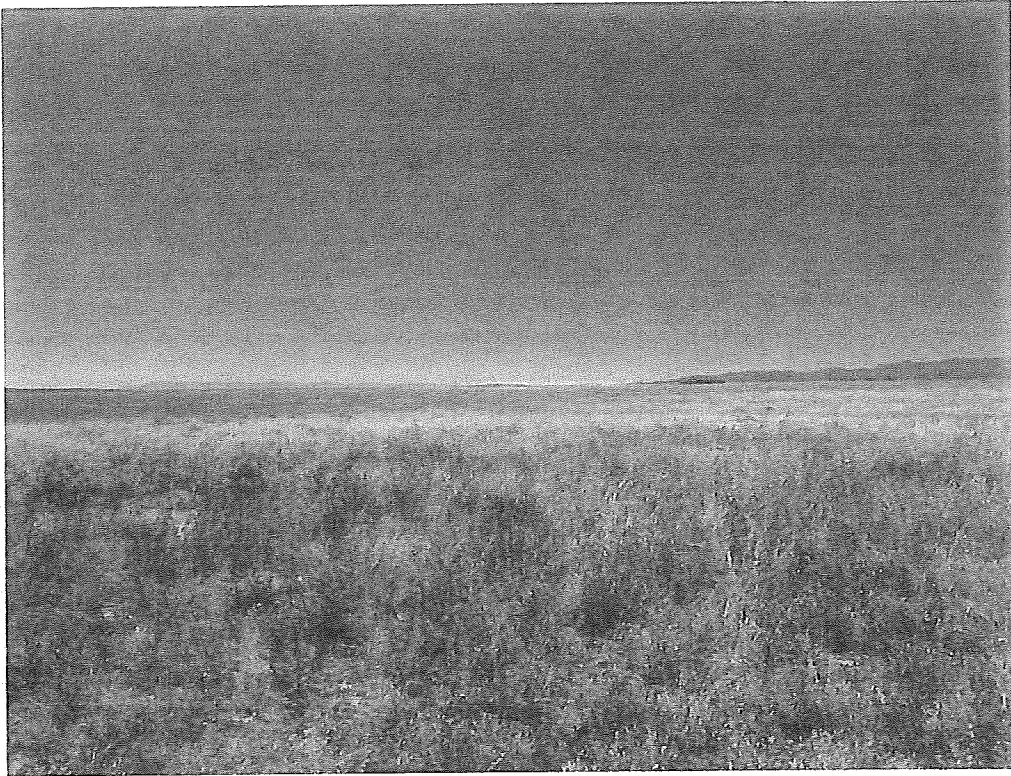
**Looking southeast
from the north-central
portion of the site.**

October 13, 2021



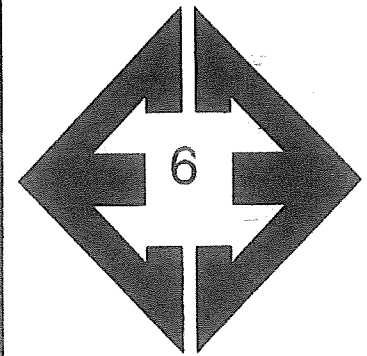
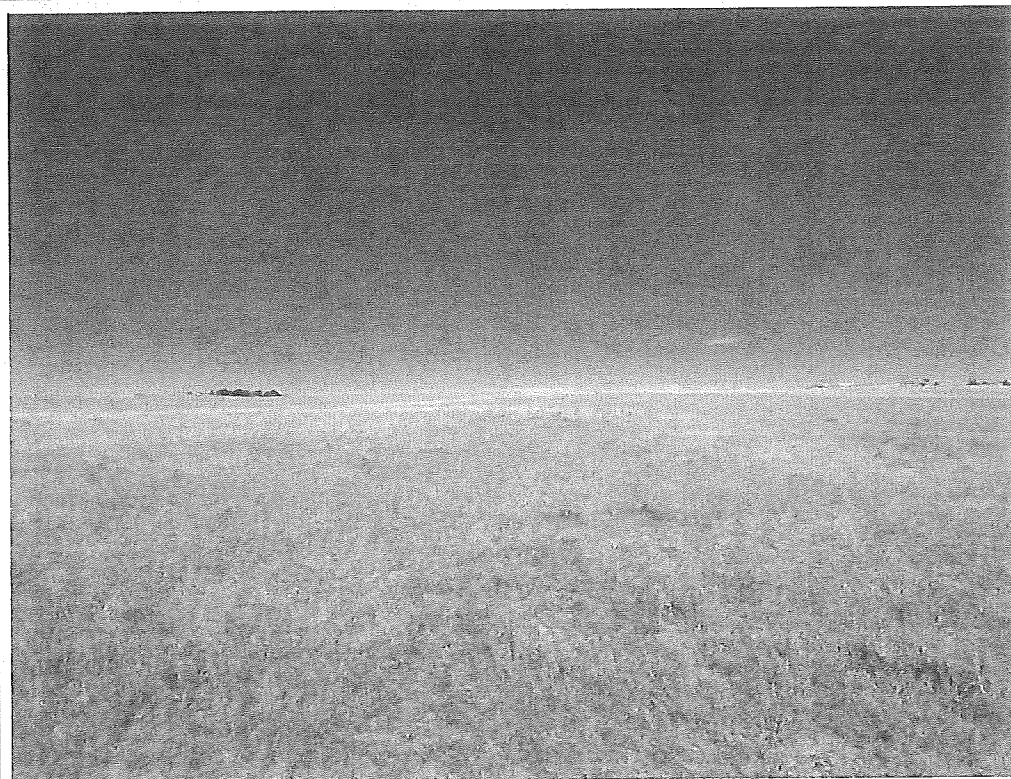
**Looking west from the
northeastern portion of
the site.**

October 13, 2021



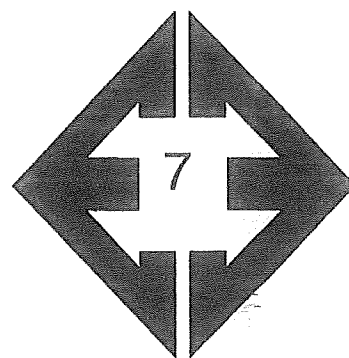
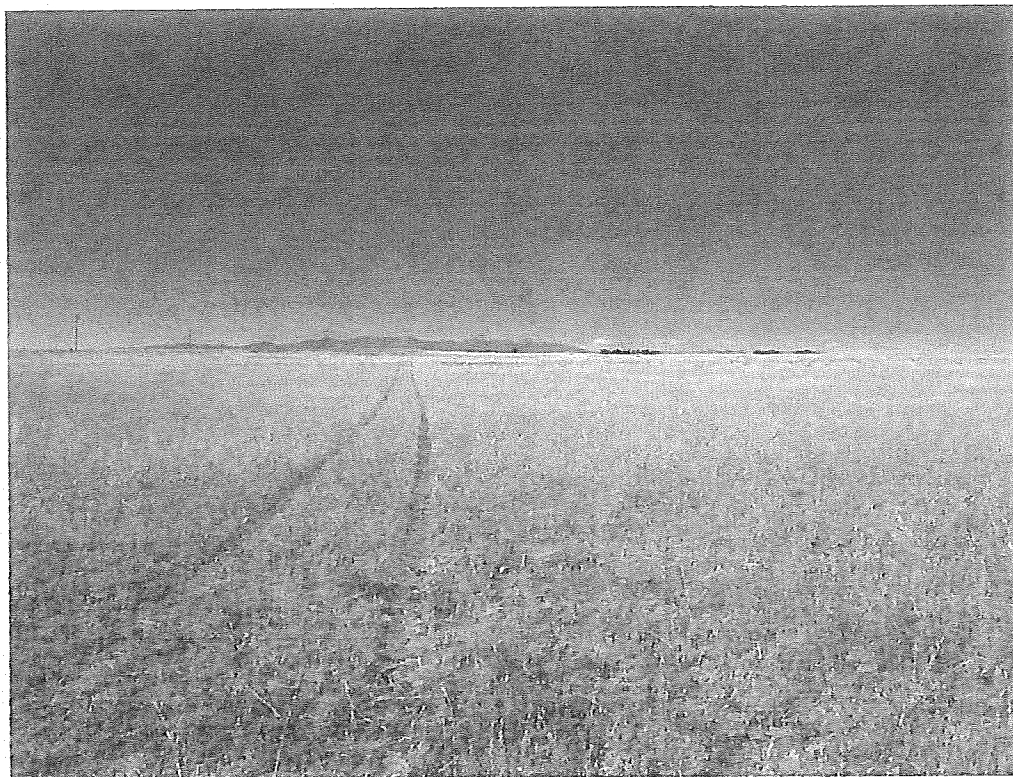
**Looking southwest
from the northeastern
portion of the site.**

October 13, 2021



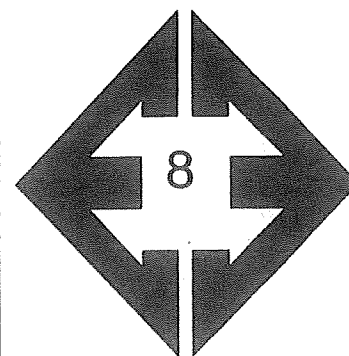
**Looking northwest
from the southeastern
portion of the site.**

October 13, 2021



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

October 13, 2021



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

October 13, 2021

APPENDIX B: Test Boring Logs

TEST BORING NO. 1
 DATE DRILLED 10/13/2021
 Job # 212655

TEST BORING NO. 2
 DATE DRILLED 10/13/2021
 CLIENT ROCKWOOD HOMES
 LOCATION 20040 HIGHWAY 94

REMARKS

DRY TO 20', 10/13/21

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			13	2.1	1
			14	1.8	1
10			11	2.9	1
15			14	1.7	1
20			12	2.6	1

REMARKS

DRY TO 20', 10/13/21

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			16	2.6	1
			7	3.0	1
10			3	3.1	1
15			17	5.3	1
20			27	6.1	1



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

L L L

10/29/21

JOB NO.:
 212655

FIG NO.:
 B-1

TEST BORING NO. 3
 DATE DRILLED 10/14/2021
 Job # 212655

TEST BORING NO. 4
 DATE DRILLED 10/14/2021
 CLIENT ROCKWOOD HOMES
 LOCATION 20040 HIGHWAY 94

REMARKS

DRY TO 20', 10/14/21
 SAND, VERY SILTY TO SILTY,
 FINE TO COARSE GRAINED, TAN,
 MEDIUM DENSE TO LOOSE,
 MOIST TO DRY

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			11	3.3	1
			15	2.1	1
10			8	2.6	1
15			14	4.6	1
20			12	3.4	1

REMARKS

DRY TO 20', 10/14/21
 SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM DENSE,
 DRY TO MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			19	1.6	1
			20	2.3	1
10			26	3.9	1
15			12	4.9	1
20			13	2.1	1



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ENGINEERING, INC.

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:
 LLL

DATE:
 10/29/21

JOB NO.:
 212655

FIG NO.:
 B-2

TEST BORING NO. 5
 DATE DRILLED 10/14/2021
 Job # 212655

TEST BORING NO. 6
 DATE DRILLED 10/14/2021
 CLIENT ROCKWOOD HOMES
 LOCATION 20040 HIGHWAY 94

REMARKS

DRY TO 20', 10/14/21
 SAND, VERY SILTY TO SILTY,
 FINE TO COARSE GRAINED,
 TAN, MEDIUM DENSE TO LOOSE,
 MOIST TO DRY

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			11	3.1	1
			16	2.6	1
10			15	8.5	1
15			9	9.8	1
20			23	1.6	1

REMARKS

DRY TO 20', 10/14/21
 SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, LOOSE TO MEDIUM
 DENSE, DRY TO MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			9	2.9	1
			5	4.7	1
10			5	3.4	1
15			11	4.0	1
20			24	2.1	1



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

LLL

10/29/21

JOB NO.:
 212655

FIG NO.:
 B-3

TEST BORING NO. 7
 DATE DRILLED 10/14/2021
 Job # 212655

TEST BORING NO. 8
 DATE DRILLED 10/14/2021
 CLIENT ROCKWOOD HOMES
 LOCATION 20040 HIGHWAY 94

REMARKS

DRY TO 20', 10/14/21

SAND, SILTY TO SLIGHTLY SILTY,
 FINE TO COARSE GRAINED, TAN,
 LOOSE TO DENSE, MOIST TO
 DRY

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			14	2.8	1
			15	3.1	1
10			7	3.7	1
15			30	3.7	1
20			16	6.3	1

REMARKS

DRY TO 20', 10/14/21

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

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			19	2.6	1
			13	2.1	1
10			7	5.2	1
15			12	11.3	1
20			19	2.1	1



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

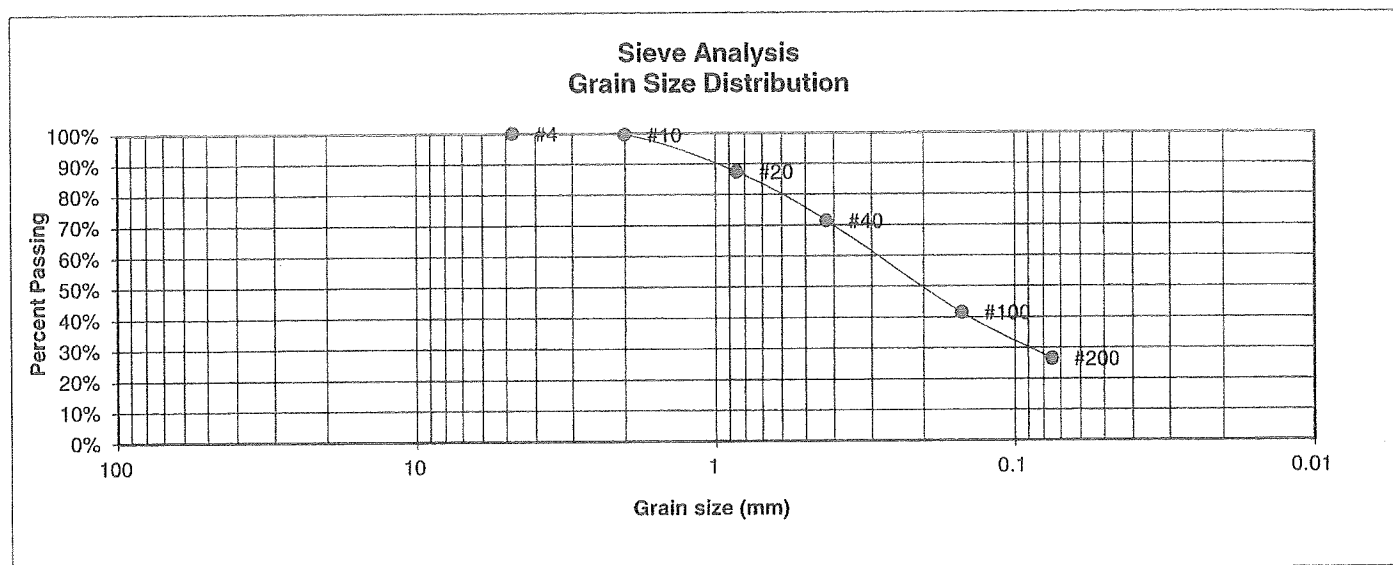
LLL 10/29/21

JOB NO.:
 212655

FIG NO.:
 B-4

APPENDIX C: Laboratory Testing Results

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	ROCKWOOD HOMES
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	20040 HIGHWAY 94
<u>TEST BORING #</u>	1	<u>JOB NO.</u>	212655
<u>DEPTH (FT)</u>	2-3	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.5%
20	87.4%
40	71.4%
100	41.5%
200	26.4%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

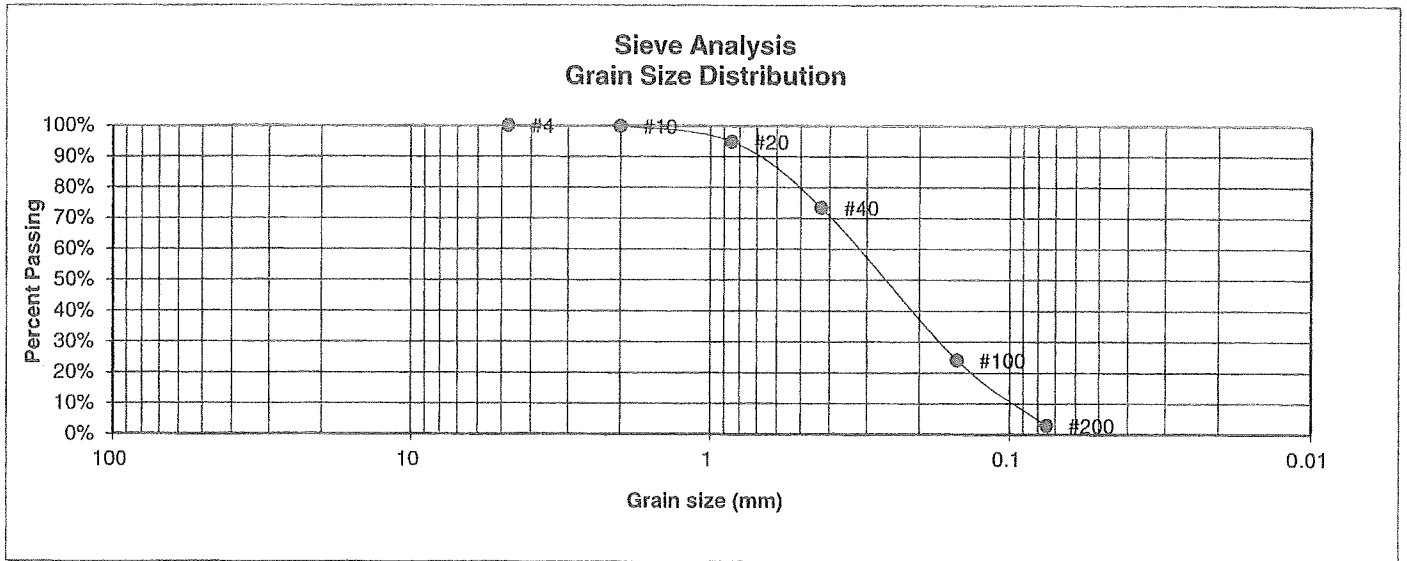
LLC

10/29/21

JOB NO.:
212655

FIG NO.:
C-1

UNIFIED CLASSIFICATION	SW	CLIENT	ROCKWOOD HOMES
SOIL TYPE #	1	PROJECT	20040 HIGHWAY 94
TEST BORING #	2	JOB NO.	212655
DEPTH (FT)	10	TEST BY	BL



U.S.
Sieve #

Percent
Finer

Atterberg
Limits

3"

Plastic Limit

1 1/2"

Liquid Limit

3/4"

Plastic Index

1/2"

3/8"

4

100.0%

10

99.8%

20

94.7%

40

73.3%

100

24.1%

200

2.9%

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)



**ENTECH
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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

LL

10/29/21

JOB NO.:
212655

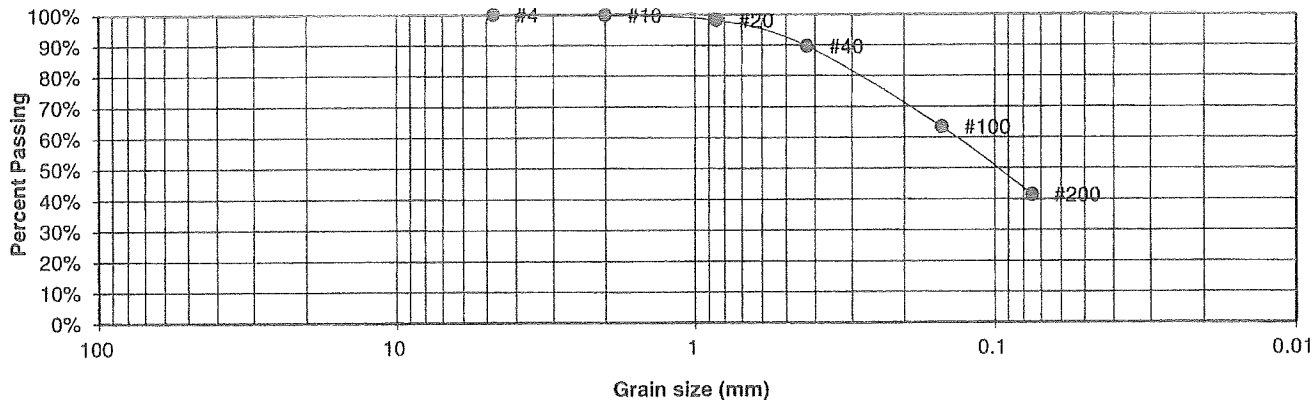
FIG NO.:

C-2

<u>UNIFIED CLASSIFICATION</u>	SM
<u>SOIL TYPE #</u>	1
<u>TEST BORING #</u>	3
<u>DEPTH (FT)</u>	2-3

<u>CLIENT</u>	ROCKWOOD HOMES
<u>PROJECT</u>	20040 HIGHWAY 94
<u>JOB NO.</u>	212655
<u>TEST BY</u>	BL

Sieve Analysis Grain Size Distribution



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.8%
20	98.1%
40	89.6%
100	63.4%
200	41.4%

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

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH
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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

LLL

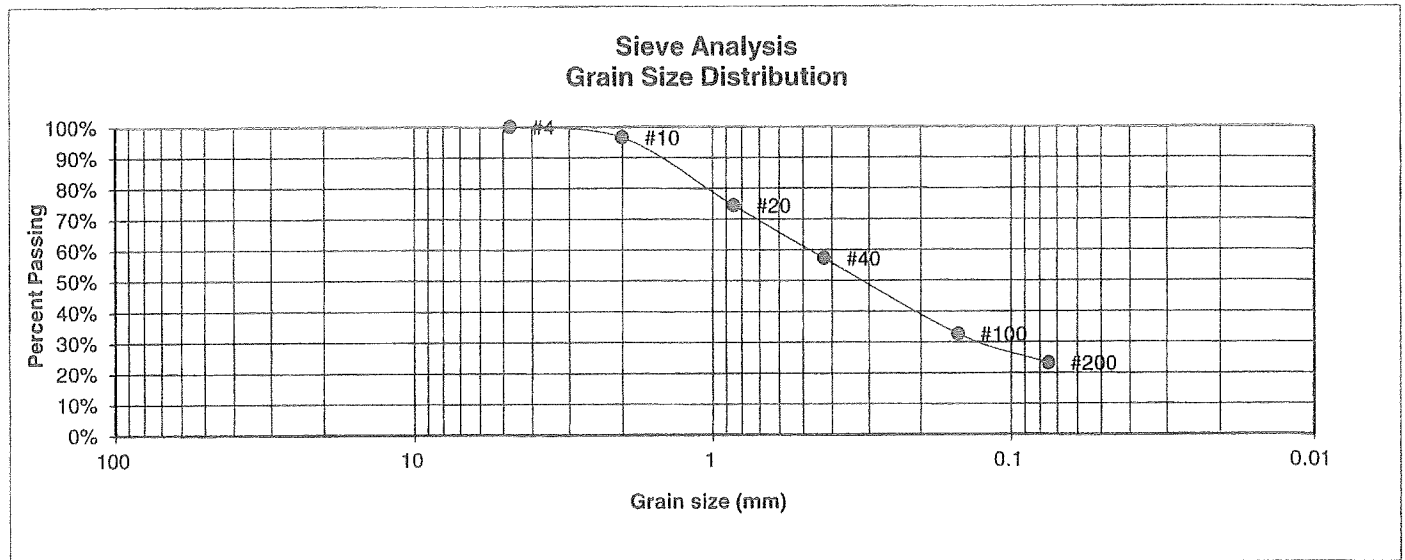
10/29/21

JOB NO.:
212655

FIG NO.:

C-3

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	ROCKWOOD HOMES
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	20040 HIGHWAY 94
<u>TEST BORING #</u>	4	<u>JOB NO.</u>	212655
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	96.5%
20	74.4%
40	57.2%
100	32.6%
200	23.1%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

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



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

LL

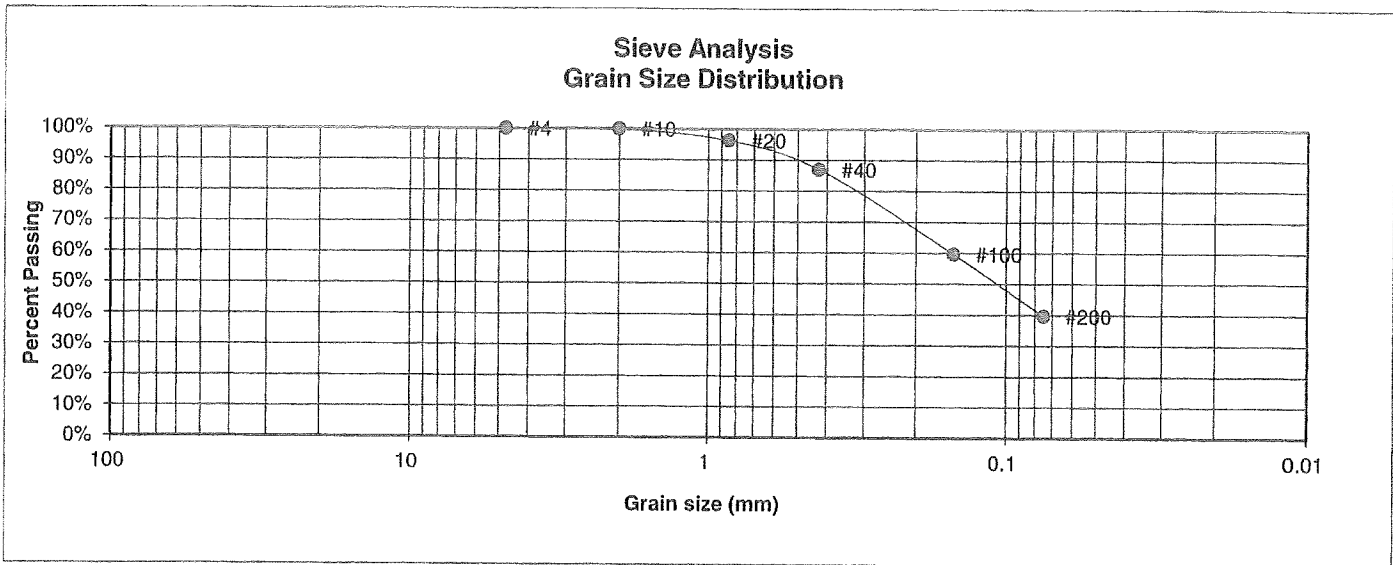
10/29/21

JOB NO.:
212655

FIG NO.:

C-4

UNIFIED CLASSIFICATION	SM	CLIENT	ROCKWOOD HOMES
SOIL TYPE #	1	PROJECT	20040 HIGHWAY 94
TEST BORING #	5	JOB NO.	212655
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	99.9%
20	96.3%
40	86.9%
100	59.7%
200	39.6%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

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



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

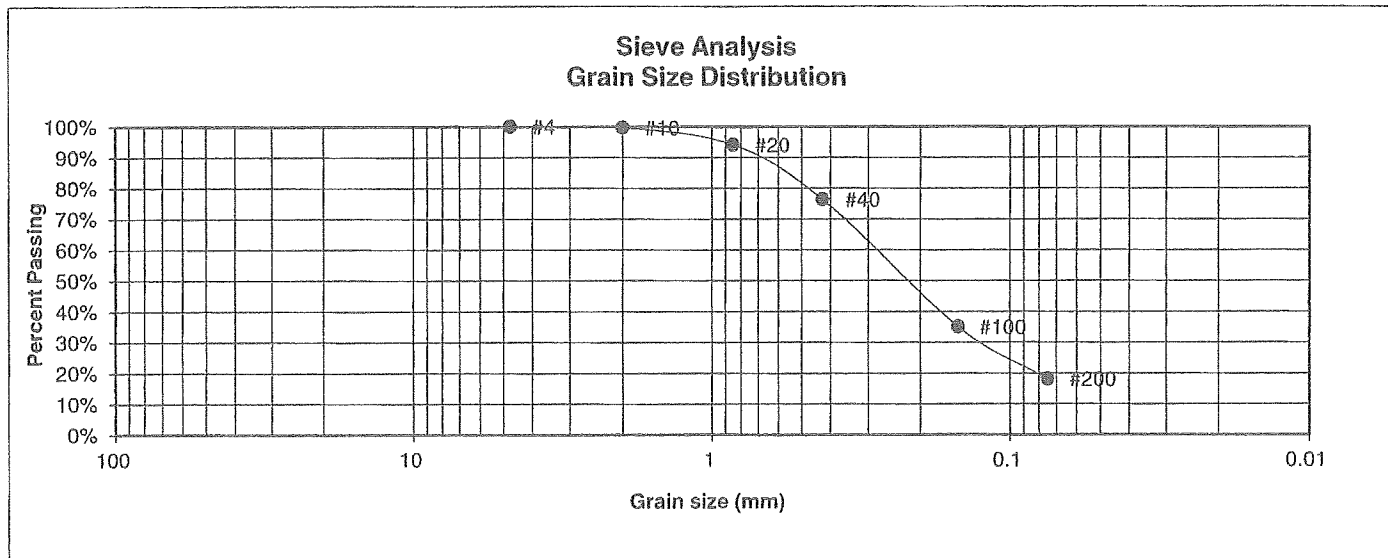
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	10/29/21

JOB NO.:
212655

FIG NO.:
C-5

UNIFIED CLASSIFICATION	SM	CLIENT	ROCKWOOD HOMES
SOIL TYPE #	1	PROJECT	20040 HIGHWAY 94
TEST BORING #	6	JOB NO.	212655
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	94.1%
40	76.3%
100	35.1%
200	18.2%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

LL

10/29/21

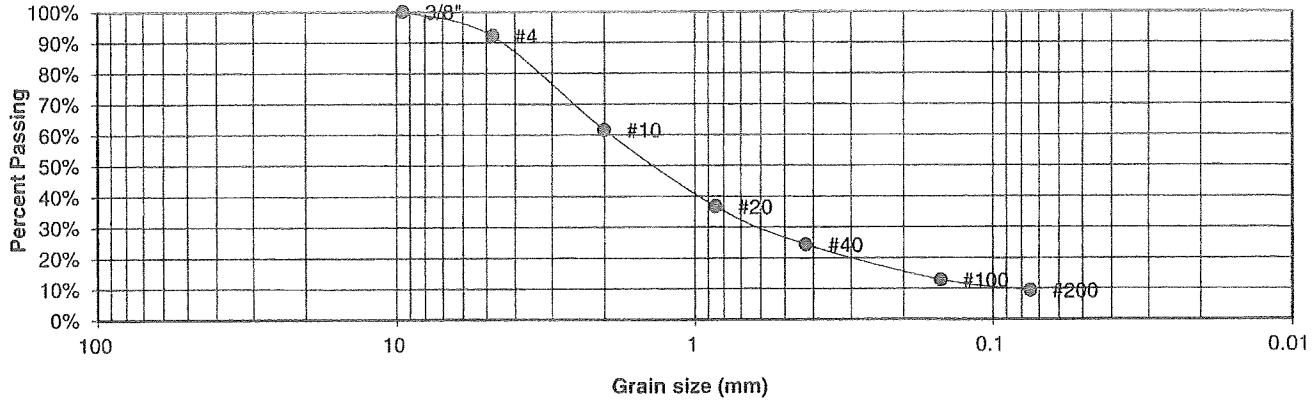
JOB NO.:
212655

FIG NO.:

C-6

UNIFIED CLASSIFICATION	SM-SW	CLIENT	ROCKWOOD HOMES
SOIL TYPE #	1	PROJECT	20040 HIGHWAY 94
TEST BORING #	7	JOB NO.	212655
DEPTH (FT)	15	TEST BY	BL

Sieve Analysis Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.1%
10	61.5%
20	36.7%
40	24.3%
100	12.7%
200	9.3%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

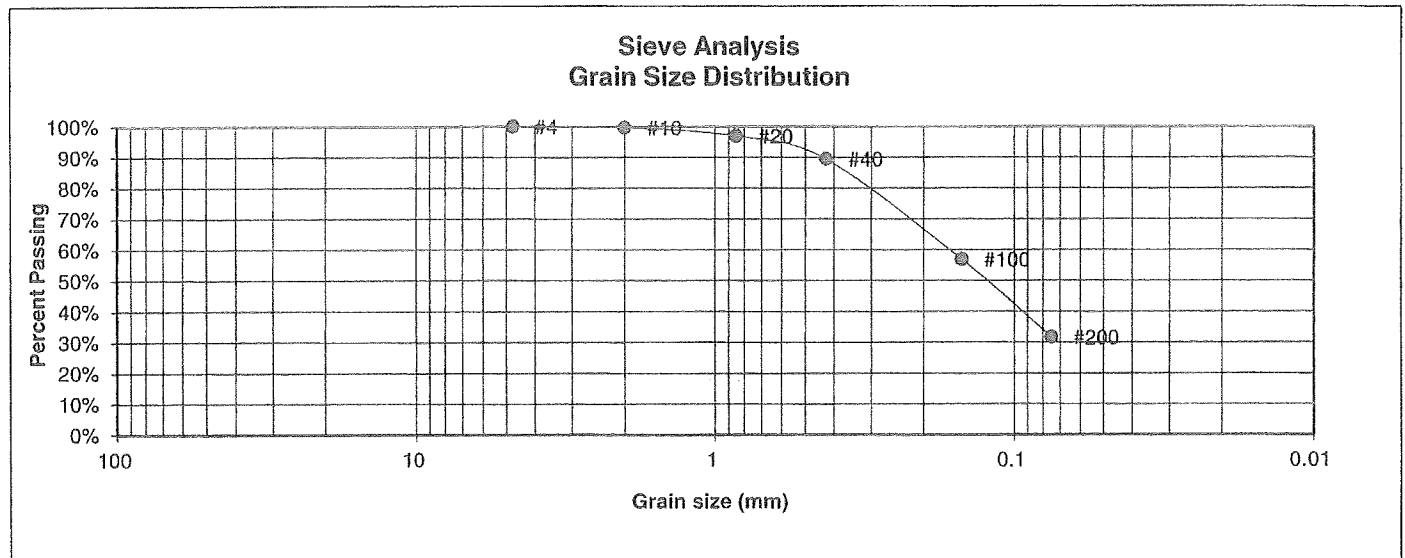
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LL	10/29/21

JOB NO.:
212655

FIG NO.:
C-7

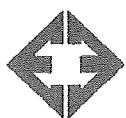
UNIFIED CLASSIFICATION	SM	CLIENT	ROCKWOOD HOMES
SOIL TYPE #	1	PROJECT	20040 HIGHWAY 94
TEST BORING #	8	JOB NO.	212655
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.6%
20	96.9%
40	89.4%
100	56.9%
200	31.7%

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

10/29/21

JOB NO.:
212655

FIG NO.:
C-8

APPENDIX D: Soil Survey Descriptions

El Paso County Area, Colorado

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 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

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

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or
eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to
very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
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

95—Truckton loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2yvrn
Elevation: 5,800 to 7,100 feet
Mean annual precipitation: 12 to 19 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 90 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Truckton and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Fan remnants, interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind re-worked alluvium derived from arkose

Typical profile

A - 0 to 4 inches: loamy sand
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: 1 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 to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.5 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: 5 percent

Landform: Hills, interfluves

Landform position (two-dimensional): Shoulder, backslope, summit

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: 5 percent

Landform: Terraces, interfluves

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R049XB210CO - Sandy Foothill

Hydric soil rating: No

Urban land

Percent of map unit: 2 percent

Hydric soil rating: No

Ellicott, occasionally flooded

Percent of map unit: 1 percent

Landform: Drainageways, flood plains

Down-slope shape: Linear

Across-slope shape: Concave, linear

Ecological site: R067BY031CO - Sandy Bottomland

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

96—Truckton sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2yvr

Elevation: 5,400 to 7,000 feet

Mean annual precipitation: 14 to 23 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 155 days

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

Map Unit Composition

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: Interfluvies, fan remnants

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Wind 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: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High
(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 to very slightly saline (0.1 to 2.0
mmhos/cm)

Available water supply, 0 to 60 inches: Moderate (about 6.6
inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 4e

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

Minor Components

Blakeland

Percent of map unit: 5 percent
Landform: Interfluves, hills
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: 5 percent
Landform: Interfluves, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Pleasant, frequently ponded

Percent of map unit: 2 percent
Landform: Closed depressions
Down-slope shape: Concave, linear
Across-slope shape: Concave
Ecological site: R067BY010CO - Closed Upland Depression
Hydric soil rating: Yes

Urban land

Percent of map unit: 2 percent
Hydric soil rating: No

Ellicott, occasionally flooded

Percent of map unit: 1 percent
Landform: Flood plains, drainageways
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: R067BY031CO - Sandy Bottomland
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): Foothslope, 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