Job No. 198337

December 5, 2025
Amended May 4, 2026

Landhuis Company
212 N. Wahsatch Ave. Ste 301
Colorado Springs, CO 80903

Re: Response to Review Comments
PUDSP255 Antelope Ridge at Bull Hill, Phase 1
Bradley Rd
El Paso County, Colorado

Dear Mr. Mark:

RMG Engineers (RMG) prepared the *Soils and Geology Study* (RMG Job No. 198337, last dated March 14, 2025) for the proposed development comprising 471 single-family residential lots located approximately 1 mile east of the intersection of Marksheffel Road and Bradley Road. The report was reviewed by personnel of the Colorado Geological Survey (CGS) and the El Paso County Planning Department. The CGS comments (last dated July 18, 2024) were provided to us by personnel of Matrix Design on October 8, 2025.

The purpose of this letter is to provide RMG's response to the comments provided by El Paso County (EPC) and CGS. For clarity and ease of review we have included a "snippet" of the comments below, each followed by our response to that comment.

EPC Comment:

As previously communicated by CGS (October 13, 2023; March 22, 2024; and July 18, 2024), shallow groundwater conditions need a thorough evaluation at this planning stage.

RMG Response:

RMG has installed three (3) piezometers across the site. The piezometers are to be monitored for a period of 12 months. Groundwater readings will be obtained at a minimum, on a bi-monthly basis to capture the seasonal groundwater fluctuations. Once the monitoring is complete a determination on the use of basement foundations is to be determined. In order to determine if basement

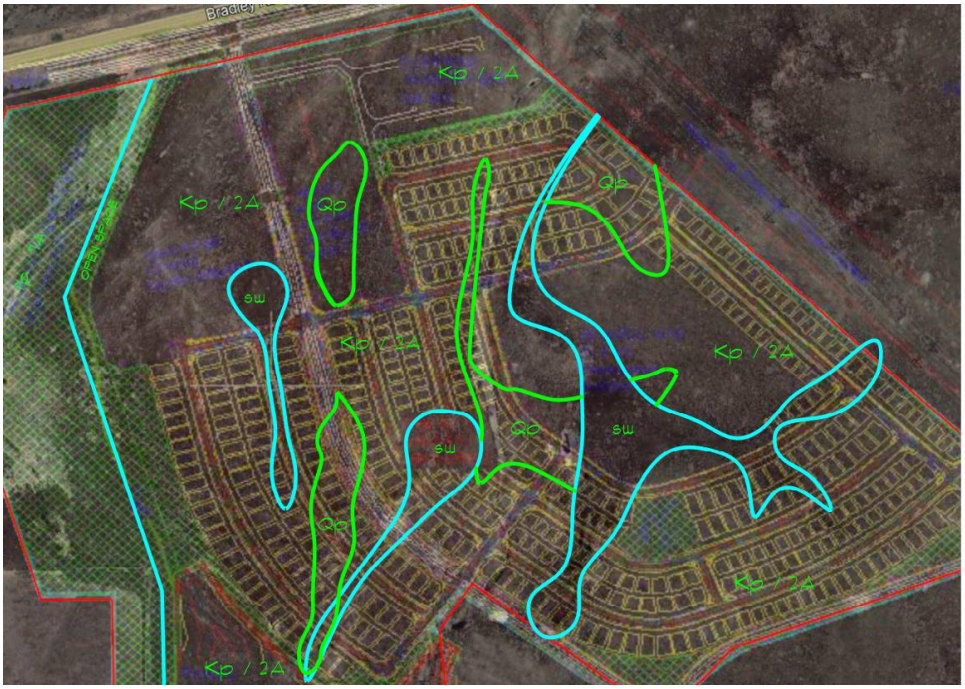
feasibility is an option, a minimum of 6 feet of separation from groundwater to the bottom of the lowest proposed foundation component will be required. The results or our findings will be presented in a summary letter for our Client and available upon request.

EPC Comment:

Provide a map showing geologic hazards & constraints.

RMG Response:

Figure 11, Engineering and Geology Map was included in our report last dated March 14, 2025 and shown below. It is uncertain if the Figure was missed or insufficient. If insufficient we would request further explanation as to what is needed.



General Geology

- *sw - seasonally wet areas* - low lying areas that may collect surface water during heavy precipitation events (rain or snowfall). These areas are likely to be regraded during the land development.
- *fp - floodplain*, as designated by FEMA -Improvements are proposed for JCC to contain the tributary to a designated channel. No construction is proposed within this area.
- *Qp - Piney Creek Alluvium* - Alluvial and pond or bog deposits. Mostly clayey sandy silt and silty sand; very clayey in pond and bog deposits, gravelly along main stream. Thickness is generally 5 to 15 feet, maximum of 50 feet possible.
- *Kp - Pierre Shale, Main part of formation* - Shale, minor siltstone and sandstone beds, and thin concretionary limestone beds. Poorly exposed in general. Total formation thickness is about 5,000 feet.

Engineering Geology

The Engineering Geology is presented below. Charles Robinson and Associates have mapped the following environmental engineering units as:

- 2A - Stable alluvium, colluvium and bedrock on gentle to moderate slopes (5 to 12%).
- 7A - Physiographic floodplain where erosion and deposition presently occur and is generally subject to recurrent flooding. Includes 100-year floodplain along major streams where floodplain studies have been conducted.

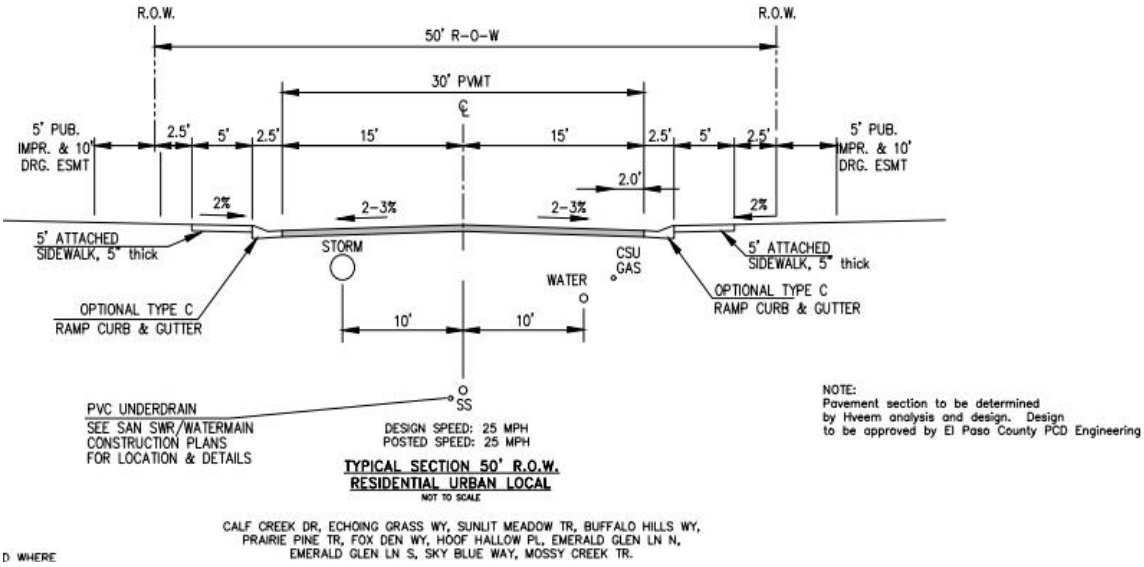
EPC Comment:

Provide a detail for underdrain system

RMG Response:

Core Engineering Group has provided the construction plans for the passive underdrain system for Antelope Ridge, at Bull Hill, Phase 1. It is our understanding the passive underdrain system is to be located 1-foot below the sanitary and stub out to every lot. The outlets for the underdrain system daylights into the E. Tributary, south of the project. Below is a snippet of the Street / Storm Typical Sections as presented in Core Engineering Group's detail (Project No.100.302, sheet C1-3, dated

8-1-25). Rolling Meadows/Bull Hill Metro District No. 1 is responsible for the underdrain maintenance outside the lot limits.



EPC Comment:

Landhuis Company
212 N. Wahsatch Ave. Ste 301
Colorado Springs, CO 80903

Phase 1

Re: Addendum to Soils and Geology Study
Antelope Ridge at Bull Hill
El Paso County, Colorado

PCD File No. PUDSP255

PCD File No. SKP233

Dear Mr. Mark:

RMG – Rocky Mountain Group (RMG) prepared the original *Soils and Geology Study, Rolling Meadows / Bull Hill, Bradley Road, El Paso County, Colorado* (RMG Job No. 187746, last dated January 30, 2024) for the overall proposed development. The site was originally comprised of 8 parcels. The total area of the 8 parcels (entire site) is approximately 1,133 acres. That report was reviewed by personnel of the El Paso County Planning and Community Development and the Colorado Geological Survey (CGS). Comments from CGS, dated 10/13/2023 were taken into consideration and addressed in our: *Response to: Colorado Geological Survey Review Comments, dated October 10, 2023 and El Paso County Planning Community Development Comments, dated October 18, 2023.*

Phase 1.

Since the approval of that report, it has been requested an updated/new report be completed for the

Please provide a clear figure showing all three test borings. If TB-2 is near the proposed pond, that could indicate potential for groundwater flow into the pond which would require mitigation. It is hard to tell without a figure that is clear where the borings are and the potential for this impact.

RMG Response:
The amended report dated December 5, 2025 has been updated to reflect the additional requests. As for the comment on the location of TB-2, it is not located within a proposed pond per the Planned Unit Development provided by Matrix, last dated August 2025. TB-2 was located near Jimmy Camp Creek within the floodplain in Tract B designated for future development. A clearer Test Boring Location Plan, Figure 2 is included in the amended report.

CGS Comment:

- Include a Shallow/Seasonal Groundwater Overlay on the PUD/Preliminary Plan to identify potentially impacted lots/tracts, guided by existing borehole locations.
- Implement a 12-month groundwater monitoring program with elevations surveyed to NAVD88, correlating groundwater fluctuations with regional precipitation data.
- Prohibit basement construction within groundwater overlay areas unless monitoring confirms sufficient groundwater separation or sites are elevated enough.
- Develop a comprehensive sitewide underdrain master plan, consolidating existing notes, and coordinate installation concurrently with grading activities.

RMG Response:
Bullet point 1: A Shallow/Seasonal Groundwater Overlay on the PUD/Preliminary Plan to identify potentially impacted lots/tracts will be completed once the 12-month groundwater monitoring is complete. To complete this request with the existing borehole data seems inappropriate at this time. RMG completed a total of 13 preliminary test borings to depths of 20 and 30 feet in this Phase. None of the test borings indicated groundwater at the time of drilling. Due to the active grazing that was occurring on the property, the borings were immediately backfilled and a subsequent groundwater reading was not obtained. If we utilize the moisture data from the lab testing results to potentially account for groundwater, the highest moistures were encountered in TB-2 within the floodplain, east of Jimmy Camp Creek, outside the proposed designated lot configuration. With this information, there are currently no lots impacted by the assumption of shallow/seasonal groundwater.

Bullet point 2: A 12-month groundwater monitoring program is currently in process. Three monitoring wells have been installed across the site. This information will be available as needed during the 12-month monitoring period.

Bullet point 3: Basement feasibility will be determined once the groundwater monitoring is complete.

Bullet point 4: A comprehensive site-wide underdrain master plan has been completed by Core Engineering. The passive underdrain sanitary sewer construction plans were submitted as part of the PUD.

CGS Comment:
Expansive and Compressible Soils: Expansive soils and bedrock conditions require robust mitigation measures. CGS agrees with RMG's recommendations for subexcavation, moisture-conditioned structural fill beneath foundations and pavement areas, and strict quality assurance testing. Final plans should include drainage and irrigation restrictions to prevent future problems.

RMG Response:
Final Plans currently include drainage and irrigation for the tracts but not the individual lots. Currently there are no irrigation restrictions the lots. However, this is to be discussed with the developer and may change.

CGS Comment:
Slope Stability and Scour: Address slope stability issues near drainageways, especially the East Tributary of Jimmy Camp Creek, with engineered solutions. Final grading plans must include detailed slope stability analyses, define apparent setbacks, and specify erosion control measures that meet ECM and LDC standards. Also, verify geotechnical assumptions related to soil and bedrock in scour assessments for channel and drainage structures.

RMG Response:
The final grading is not complete but it is our understanding Core Engineering has revised the grading to reflect the majority of slopes onsite to be 3:1 or less for the lots. There are isolated slopes that are approximately 2:1 (vertical:horizontal) currently proposed along Hoof Hallow Place, but they are located in a tract owned by the Metro District and are not to disturb the stability of the lots.

RMG and Core Engineering do not believe there are slope stability issues along Jimmy Camp Creek. The proposed slopes along the creek are to be 3:1(vertical:horizontal) or flatter. Defined setbacks are typically not shown on grading plans. However, the lots are located outside the FEMA floodplain. It is our opinion the lots are currently set back sufficiently from Jimmy Camp Creek. Geotechnical assumptions related to soil and bedrock have been discussed with Core Engineering for future channel and drainage structures.

CGS Comment:
Floodplain Hazards: The CLOMR documentation thoroughly covers proposed floodplain improvements. However, final grading and construction must strictly follow FEMA's CLOMR requirements and obtain a final LOMR. Finished floor elevations must stay above the regulatory Base Flood Elevation (BFE).

RMG Response:
A final LOMR has been obtained. Finished floor elevations are to stay above the regulatory Base Flood Elevation.

CGS Response:

Radon: The site is located within EPA Radon Zone 1, indicating a high risk. CGS recommends the use of mandatory radon-resistant new construction (RRNC) techniques, along with post-construction testing for all homes.

RMG Response:
Radon is outside the scope of RMG's recommendations, but we have no objection to this recommendation. The information has been passed along to the developer.

I hope this provides the information you have requested. Should you have questions, please feel free to contact our office.

Cordially,

RMG Engineers

Kelli Zigler
Geotechnical Group Director

Tony Munger, P.E.
Sr. Geotechnical Proj Mgr | COO

Job No. 198337

March 14, 2025
Revised December 5, 2025

Landhuis Company
212 N. Wahsatch Ave. Ste 301
Colorado Springs, CO 80903

Re: Addendum to Soils and Geology Study
PUDSP255 Antelope Ridge at Bull Hill, Phase I
El Paso County, Colorado
PCD File No. PUDSP255

Dear Mr. Mark:

RMG – Rocky Mountain Group (RMG) prepared the original *Soils and Geology Study, Rolling Meadows / Bull Hill, Bradley Road, El Paso County, Colorado* (RMG Job No. 187746, last dated January 30, 2024, PCD File No. - SKP233) for the overall proposed development. The site was originally comprised of 8 parcels. The total area of the 8 parcels (entire site) is approximately 1,133 acres. That report was reviewed by personnel of the El Paso County Planning and Community Development and the Colorado Geological Survey (CGS). Comments from CGS, dated 10/13/2023 were taken into consideration and addressed in our: *Response to: Colorado Geological Survey Review Comments, dated October 10, 2023 and El Paso County Planning Community Development Comments, dated October 18, 2023.*

Since the approval of that report, it has been requested an updated/new report be completed for the first subdivision, which is to contain approximately 165 acres of the original 1,133 acres. This area is to be named Antelope Ridge at Bull Hill, Phase I. This addendum letter is to update and confirm that our findings and recommendations previously presented are still valid and/or to provide new or additional recommendations since the issuance of the original *Soils and Geology Study*. The location of Antelope Ridge at Bull Hill is presented in the Site Vicinity Map, Figure 1.

Existing Land Use

The site is to be comprised of two parcels and is undeveloped. The total area of the proposed site is approximately 165 acres, as denoted on the Planned Unit Development and Preliminary Plan (March 2025) provided by Matrix Design Group. The parcel included is:

- **El Paso County Parcel No. 5500000324 -** currently consists of a total of approximately 593.51 acres and is undeveloped. Of the 593.51 acres, the northern portion is to be developed at this time.
- **El Paso County Parcel No. 5500000383 -** currently consists of a total of approximately 124.76 acres and is undeveloped. Only a portion of this site is to be developed at this time.

Between the two parcels, a total of 164.55 acres is to be developed at this time. The parcels are to maintain the current zoning "PUD" (Planned Unit Development), but a transition from PUD to PUDSP has been requested.

Project Description

The parcels and area consisting of 164.55 acres were previously included in our 2022 *Soils and Geology Study*, referenced below in **Previous Studies and Investigations**.

The proposed site development for Antelope Ridge at Bull Hill is to consist of 472 residential dwelling units with a minimum lot size of 3,800, one 15.0-acre elementary school site, one 5.97-acre electric substation, 10.31 acres of open space, and 18.90 acres set aside for future development. Entrance into the subdivision is to be provided from the north via a new road, Rolling Meadow Parkway, which is to extend south from Drennan Road. A powerline easement runs parallel to the eastern property boundary. It is our understanding the existing powerline easement is to remain an open space. The east tributary of Jimmy Camp Creek (JCC) extends across the western portion of the site. Improvements are proposed for JCC to restrict the tributary to a designated channel. All proposed development currently lies outside the floodway. The Proposed Lot Layout Plan is presented in Figure 2.

The streets within the subdivision are likely to be classified as a mixture of Local and Local (Low Volume) roadways with a 50-foot Right-Of-Way (R.O.W.). The main road into the subdivision, Rolling Meadow Parkway, is likely to be designated as a Residential Collector with a 60-foot to 80-foot R.O.W. All roads within the subdivision are to be constructed to El Paso County standards. Landscaping areas, common open space, and buffers shall be owned and maintained by the Rolling Meadows/Bull Hill Metropolitan District No. 1.

The development is to utilize sewer and water services provided by Widefield Water and Sanitation District. Neither individual wells nor on-site wastewater treatment systems are proposed.

Previous Studies and Investigations

One geologic study for this site was previously provided for our review by El Paso County and is listed below, along with our previous study:

1. *Soil, Geology and Geologic Hazard Study, Norris Ranch – 2000 Acre Site, El Paso County, Colorado*, Entech Engineering, Inc. (Entech), Entech Job No. 52855, dated July 29, 2005.
2. *Soils and Geology Study, Rolling Meadows / Bull Hill, Bradley Road, El Paso County, Colorado* prepared by RMG – Rocky Mountain Group, Job No. 187746, last dated January 30, 2024.

The findings, conclusions and recommendations contained in these reports were considered during the preparation of this updated report. Since the issuance of our original report, the site conditions, topography and vegetation have not changed substantially.

RMG previously completed 70 exploratory test borings between January 9th to 14th, 2022 for the original *Soils and Geology Study*. The borings extended to approximately 20 to 30 feet below the existing ground surface. Ten (10) of the previous test borings (TB-32, TB-33, TB-39-41, and TB-43-47) were located within the 165-acre area to be developed and included in this current study.

Since the site has not undergone significant changes since the issuance of the original report, additional test borings (beyond those additional three borings performed) would not be anticipated to provide new information that would substantially change the recommendations presented herein. The test boring logs and laboratory data for the borings that lie within the boundaries of this first subdivision are included with this study and the Explanation of Test Boring Logs, Test Boring Logs, Summary of Laboratory Results, and Soil Classification Data are presented in Appendix A.

We understand the El Paso County Planning Department (in conjunction with the Colorado Geologic Survey (CGS), their chosen third-party reviewer) prefer a year-round groundwater monitoring programs for the majority of subdivisions in El Paso County where habitable space is to be located below the ground surface (this includes both crawlspace and basement foundations). Additional discussions on groundwater are included in the **Seasonal Surface and Subsurface Water** section of this report.

Field Investigations and Laboratory Testing

The subsurface conditions within the property were explored previously by Entech Engineering, Inc. in June/July 2005 and by RMG in February 2022. For this addendum, RMG also performed three additional borings to update the groundwater data and meet the minimum number of borings as required by the ECM, Section C.3.3.

Each study included drilling exploratory test borings and laboratory testing to provide preliminary recommendations for the development. Each investigation is discussed in more detail below.

Note, some of the test borings presented within those reports were performed outside of the area of investigation for this report, but all data, conclusions, and recommendations from those previous reports were considered for completeness.

RMG (2025) Field Investigation

The subsurface conditions within the property were explored by drilling three (3) exploratory borings across the site on January 15, 2025, extending to depths of approximately 20 to 30 feet below the existing ground surface. The test boring locations were selected by Matrix Design, who were provided guidance from the structural engineers that are to complete the culvert design. It is our understanding they needed additional material properties to design the culvert.

The test borings were drilled with a power-driven, continuous-flight auger drill rig. Samples were obtained during drilling of the test boring in general accordance with ASTM D-1586 and D-3550, utilizing a 2-inch O.D. Split Barrel Sampler and a 2½-inch O.D. California sampler, respectively. Results of the penetration tests are shown on the drilling logs.

The Test Boring Location Plan includes the location of the three new borings performed for this study, along with the previous RMG borings (2022) that lie within the Antelope Ridge at Bull Hill, development boundaries. Entech's 2005 study did not have borings that lie within the boundaries of this development. The Test Boring Location Plan is presented in Figure 3. An Explanation of Test Boring Logs is shown in Figure 4, and the Test Boring Logs are shown in Figures 5 and 6.

Laboratory Testing

Soil laboratory testing was performed as part of this investigation. The laboratory tests included moisture content, dry density, grain-size analyses, Atterberg Limits and Swell/Consolidation tests. A Summary of Laboratory Test Results is presented in Figure 7. Soils Classification Data is presented in Figure 8. Swell/Consolidation Test Results are presented in Figures 9 and 10.

Groundwater

Groundwater was not encountered in the 3 test borings performed for this report, at the time of drilling. Due to the current monitoring well regulations and the land owners request, the borings were immediately backfilled and a subsequent water check was not completed. Generally, it has been our experience that land owners who own cattle or lease their land for cattle usage do not want the borings left open after drilling. Although groundwater may not have been indicated at the time of drilling, the moisture contents provide a preview of the underlying conditions. Test boring TB-2 moisture contents below 15 feet were notably higher at depth than the moisture contents shallower than 15 feet. Groundwater (or perched water) may be probable around the 15-foot depth in TB-2.

It should be noted that in clay and claystone bedrock, some perched water conditions might be encountered due to the variability of the soil profile. Isolated layers within the soil, even those of limited thickness and width, can carry water in the subsurface. Groundwater may also flow atop the underlying bedrock. Builders and planners should always be cognizant of the potential for the occurrence of subsurface water conditions during on-site construction, in order to evaluate and mitigate each individual problem as necessary.

RMG (2022) Field Investigation

The subsurface conditions within the property were explored by drilling seventy (70) exploratory borings across the site between February 9th and 14th, 2022, extending to depths of approximately 20 to 35 feet below the existing ground surface. The test borings were spaced to provide preliminary soil information for the overall development. The development is to be split between multiple future subdivisions.

Laboratory Testing

The laboratory tests included moisture content, dry density, grain-size analyses, Atterberg Limits and Swell/Consolidation tests. The soils classified as silty sand (SM), clayey sand (SC), silty to clayey sand (SC-SM), poorly graded sand (SP), sandy clay/claystone with low to high

plasticity's (CL/CH). The sand generally consolidated and the clay/claystone expanded. The limited sandstone encountered is expected to have nil to low swell. The percent of consolidation ranged between 0.0 to -5.5. The percent of swell ranged between 0.0 to 6.8 percent.

Groundwater

Groundwater was encountered in two of the 70 test borings (TB-11 and TB-15) at the time of drilling at depths of 17 feet and 14 feet, respectively. These two boring are located north of Bradley Road, outside the proposed development.

Entech (2005) Field Investigation

Entech explored the site in 2005 for the then Norris Ranch development. Their investigation reportedly consisted of drilling 40 test borings across the 2,000-acre site between June 28th and July 7th, 2005. The test borings extended to 15 and 20 feet below the ground surface. The soils encountered in their test borings consisted of silty to clayey sand and silty to sandy clay, overlying claystone and clayey to silty sandstone bedrock.

Laboratory Testing

Soil laboratory testing was performed as part of Entech's investigation. Overall, the soils reportedly exhibited percent swell/consolidation results ranging between -1.2% (consolidation) to 6.9% (swell). Their presented laboratory test results are included in Appendix B.

Groundwater

Entech reported groundwater in four of their test borings at depths ranging between 15.5 and 19 feet below ground surface. Groundwater was not encountered in any of their other borings. All of Entech's borings lie outside the currently proposed development area for Antelope Ridge at Bull Hill.

Geologic Conditions

Based upon review of the *Elsmere 7.5 Minute Quadrangle Geologic Map, El Paso County, Colorado*, the site is within an area of the Colorado Piedmont, a region that is distinguished primarily by the fact that is has been stripped of the Miocene fluvial rocks that cap the adjoining High Plains Section of the Great Plains physiographic province. Sand is abundant is the Falcon Highlands area due to the claystone bedrock of the Pierre Shale Formation. Sandy alluvial and pluvial deposits blanket the majority of the area, and are generally 5 feet thick or more. The deposits are considered residuum, unconsolidated material derived from the weathering of the underlying bedrock, and are wide-spread.

General Geology

In general, the bedrock (as mapped by Colorado Geologic Survey - CGS) beneath the site is considered to be part of the Pierre Shale formation. Bedrock was encountered in the majority of the previous test borings performed (by RMG and Entech). For this investigation, claystone bedrock was encountered at 15 feet in TB-2 but was not encountered in TB-1 or TB-3. The bedrock was encountered at a medium hard to very hard consistencies. Depending on final grading, bedrock is anticipated to be encountered in approximately 25 to 30 percent of the excavations and utility trenches for the proposed development. Overall, the majority of site work, excavations, and utility trenches will encounter the sandy clay. The sandstone, claystone and shale within the Pierre Shale formation are generally easily excavatable with standard construction equipment, such as loaders and excavators.

The site generally consists of alluvial sand, silt and clay deposits overlying claystone bedrock of the Pierre Shale formation. The general geology units were mapped in our previous *Soils and Geology Study*, and the units that occur within the currently-proposed development, are noted below:

- *sw – seasonally wet areas* – low lying areas that may collect surface water during heavy precipitation events (rain or snowfall). These areas are likely to be regraded during the land development.

- *fp – floodplain*, as designated by FEMA –Improvements are proposed for JCC to contain the tributary to a designated channel. No construction is proposed within this area.

- *Qp – Piney Creek Alluvium* – Alluvial and pond or bog deposits. Mostly clayey sandy silt and silty sand; very clayey in pond and bog deposits, gravelly along main stream and in areas of high relief; yellowish-brown and brownish-gray to dark-yellowish-brown, commonly has alternating darker and lighter colored flat even beds a few inches to a foot thick. Thickness is generally 5 to 15 feet, maximum of 50 feet possible.

- *Kp – Pierre Shale, Main part of formation* – Shale, minor siltstone and sandstone beds, and thin concretionary limestone beds; marine fossils in some beds; mostly dark to light gray and olive gray. Poorly exposed in general. Total formation thickness is about 5,000 feet.

Engineering Geology

The Engineering Geology is presented below. Charles Robinson and Associates have mapped the following environmental engineering units as:

- 2A – Stable alluvium, colluvium and bedrock on gentle to moderate slopes (5 to 12%).
- 7A – Physiographic floodplain where erosion and deposition presently occur and is generally subject to recurrent flooding. Includes 100-year floodplain along major streams where floodplain studies have been conducted.

The Engineering and Geology Map specific to Antelope Ridge at Bull Hill, is included in Figure 11.

Potential Geologic Conditions

The following geologic constraints were considered in the preparation of the previous report and this addendum, and are not expected to pose a significant risk to the proposed development in Antelope Ridge at Bull Hill.

- Avalanches
- Debris Flow-Fans/Mudslides
- Ground Subsidence
- Landslides
- Rockfall
- Steeply Dipping Bedrock
- History of Landfill or Uncontrolled/Undocumented Fill Placement
- Valley Fill
- Downhill/Down-Slope Creep
- Soil Slumps and Undercutting
- Corrosive Minerals

The geologic conditions that are anticipated to impact Antelope Ridge at Bull Hill are as follows:

Expansive Soils and Bedrock – *constraint*

Expansive soils were encountered across the entire site. Based on our previous and current laboratory testing, review of Entechs laboratory testing, and our experience with the soils and bedrock in the vicinity (Lorson Ranch), the sandy clay and claystone bedrock possess low to very high swell potential. The sandy clay and claystone were encountered in the all of test borings performed by RMG for this investigation and our previous investigation. The sandy clay and claystone was also reportedly encountered in 39 of the 40 test borings performed by Entech in 2005. The expansive soils and bedrock were encountered at depths anticipated to affect proposed foundations, roadways, and utility trenches.

<u>Mitigation</u>
Mitigation of expansive soils and bedrock will need to occur prior to construction. Grading for infrastructure is expected to be substantial. However, it is likely the entire site is to be subexcavated. In general, the subexcavation is to occur below roadways and any proposed structures. Our subexcavation recommendations are presented in the **Subexcavation and Replacement** section of this report.

Note, the recommended subexcavation and replacement process does not guarantee that the swell potential will be reduced to acceptable levels. It is possible that the expansive material will retain swell potential in excess of the allowable value presented herein, even after processing and moisture-conditioning. If (at the time of the lot-specific subsurface soil investigation and/or the open excavation observation) the soil is found to possess swell potential in excess of acceptable levels for the foundation system and design parameters

proposed for construction at that time, overexcavation and replacement of some or all of the previously placed fill material may be required.

As an alternative to subexcavation and replacement, a deep foundation system consisting of drilled piers and a structural floor (wood, concrete, or steel) can be considered as an option to reduce the potential of slab and/or foundation movement related to expansive materials.

Provided that appropriate mitigations and/or foundation design adjustments are implemented, the presence of expansive soils or bedrock is not considered to pose a risk to the proposed structures.

Compressible Soils - *constraint*

Compressible soils generally have low density, uniform grain size, and are deposited by wind. The surficial soils exhibit one or two of these characteristics. Shallow foundations are anticipated for the majority of the development. Subexcavation and replacement with on-site moisture-conditioned structural fill is a commonly utilized method of mitigating compressible soils. Based on the test borings performed by RMG for this investigation, the surficial soils generally possess low to moderate compressibility potential. The Pierre Shale bedrock generally possess low to nil compressibility potential.

Mitigation

The potential for loose and/or compressible soils exist across the entire site at varying depths. As noted above, it is our understanding the development is to be completed in phases. Grading and infrastructure are expected to be substantial. It is unlikely the entire site is to be subexcavated. However, subexcavation is an option to reduce the potential for loose and/or compressible soils. Our subexcavation recommendations are presented in the **Subexcavation and Replacement** section of this report.

As an alternative to subexcavation and replacement, a deep foundation system consisting of drilled piers and a structural floor (wood, concrete, or steel) can be considered as an option to reduce the potential of slab and/or foundation movement related to compressible loose materials.

Settlement is directly related to saturation of the soils adjacent to foundation walls and below the entire foundation areas. Good long-term drainage is imperative to reduce the potential for settlement, for the entirety of the structures life. The ground surface should be sloped from the building with a minimum gradient of 10 percent for the first 10 feet. This is equivalent to 12 inches of fall across this 10-foot zone. If a 10-foot zone is not possible on the upslope side of the structure, then a well-defined swale should be created a minimum 5 feet from the foundation and sloped parallel with the wall with a minimum slope of 2 percent to intercept the surface water and transport it around and away from the structure. Roof drains should extend across backfill zones and landscaped areas to a region that is graded to direct flow away from the structure. Homeowners should maintain the surface grading and drainage recommended in this report to help prevent water from being directed toward and/or ponding near the foundations.

Landscaping should be selected to reduce irrigation requirements. Plants used close to foundation walls should be limited to those with low moisture requirements and irrigated grass should not be located within 5 feet of the foundation. To help control weed growth, geotextiles should be used below landscaped areas adjacent to foundations. Impervious plastic membranes are not recommended.

Irrigation devices should not be placed within 5 feet of the foundation. Irrigation should be limited to the amount sufficient to maintain vegetation. Application of more water will increase the likelihood of slab and foundation movements.

Provided that appropriate mitigations and/or foundation design adjustments are implemented, the presence of compressible soils is not considered to pose a risk to the proposed structures.

Seasonal Surface and Subsurface Water – *constraint*

Groundwater was encountered in two of RMG's previous TB-11 and TB-15 at depths of 17 feet and 14 feet, respectively. Groundwater was reportedly encountered in four of Entech's 2005 test borings at depths ranging between 15.5 to 19 feet.

Entech's test borings are located outside the proposed development area for Antelope Ridge at Bull Hill. Furthermore, RMG test borings TB-11 and TB-15 are located north of Bradley Road, outside the boundaries of the proposed development, in relatively low-lying areas. Groundwater was also not encountered at the time of drilling in the three new borings. Although groundwater may not have been indicated at the time of drilling, the moisture contents provide a preview of the underlying conditions. As mentioned previously, moisture contents below 15 feet were notably "higher" than the moisture contents shallower than 15 feet below the "finished" ground surface. Groundwater (or perched water) may be probable around the 15-foot depth in TB-2.

It is anticipated that groundwater will not affect shallow foundations for the structures or shallow buried utilities proposed on the site. Groundwater may affect areas depending upon grading cuts and within deeper excavations made for installation of utilities. It should be noted that groundwater levels, other than those observed at the time of the subsurface soil investigation, could change due to season variations, changes in land runoff characteristics and future development of nearby areas.

<u>Mitigation</u>
Mitigation of groundwater is most readily accomplished by avoidance. A minimum 3-foot separation is generally recommended between the bottom of the foundation components/floor slabs and the estimated seasonal high-water table levels. However, if the recommended separation cannot be readily achieved, additional drainage, ground stabilization measures may be required, and/or eliminating basement feasibility, as needed.

If perched water conditions are found to exist on a few lots at the time of the site specific subsurface soil investigations, the feasibility of basement construction and/or any recommended mitigation measures for those lots will be addressed at that time. With the 113 borings that have been performed on the site between 2005 and the present, only 7 borings including the assumption of subsurface water in TB-2, performed for this investigation, have encountered groundwater at the time of drilling. With less than 1% of the borings encountering subsurface water, construction is not projected to affect more than a very small percentage of the lots and does not warrant large-scale or development-wide mitigation. Furthermore, the three additional borings completed for this study were located within the JCC floodplain, where the groundwater is anticipated to be at its shallowest. Based on our knowledge of the area and engineering design and construction techniques employed in the El Paso County area, there is insufficient reason to preclude full-depth basements on any of the lots in this subdivision at this time.

We do understand El Paso County and CGS prefer not to mitigate groundwater, subsurface water, and/or perched water at the time of the lot specific investigations. However, once overlot grading is completed and utilities are installed, a site-specific subsurface soil investigation is to be completed for each lot. These investigations will provide additional groundwater data for each included lot in Antelope Ridge at Bull Hill. At that time, additional recommendations with regard to foundation depths relative to subsurface water should be provided. If groundwater is encountered less than 15 feet below the "finished" ground surface, limiting basement feasibility will need to be considered.

Foundations must have a minimum 30-inch depth for frost protection. Perimeter drains are recommended around portions of the structures which will have habitable or storage space located below the finished ground surface. This includes crawlspace areas but not the walkout trench, if applicable. Perimeter drains are recommended for portions of the structures which will have below-grade spaces to help reduce the intrusion of water into areas below grade.

Unstable or Potentially Unstable Slopes – *constraint*

An existing drainageway traverses the site, generally downward from north to south. Steeper slopes exist along the sides of the drainageway. It is our understanding that the site development is to include installation of improvements to the drainageway.

Mitigation

Steeper slopes (generally greater than 17%-25%) have a potential to fail. We have not performed slope stability analysis on the slopes at this time. It is our opinion that long-term cut and fill slopes along the banks of the drainageway should not be steeper than a 2:1 slope (horizontal:vertical), and 3:1 slopes should be utilized where feasible. Additionally, care should be taken to limit surface runoff and to provide and maintain vegetative cover on the slopes to reduce the potential for erosion of the banks of the drainageway. Vegetative cover to be placed along the banks of the drainageway may require recommendations from a qualified landscape architect and/or drainage engineer who may be familiar with special erosion control features that should be implemented in conjunction with newly placed

vegetation. Structures should be separated from the base of the drainageway by a horizontal distance of at least 3 times the height of the drainageway. Based on the lot layout plan this recommendation should be feasible.

Erosion control measures and engineered site drainage should be installed during construction to prevent concentrated runoff from exacerbating erosion along the drainageway. It should also be the responsibility of the metro district to periodically observe the improved drainage to identify signs of new or localized erosion. Areas undergoing active erosion should be promptly corrected and restored to ensure the continuing stability of the slope.

Provided that appropriate improvements and setbacks are implemented, the slopes of the drainageway are not considered to pose a risk to the proposed structures.

Floodplain/Floodway – *hazard*

Based on our review of the available Federal Emergency Management (FEMA) Community Panel No. 08041C0790G and the online ArcGIS El Paso County Risk Map, the site lies within a 100-year floodplain (Zone AE) and regulatory floodway. The Base Flood Elevations (BFE) are defined for the portion of JCC that is to be improved. Based solely on the ground elevations vs the BFE, the existing ground surface prior to overlot grading, is roughly at or within a couple of feet of the BFE.

Mitigation
The floodplain traverses the site down-gradient from the northeast to the southwest. Floodplains when left in their natural state, as development continues to move in and surround the floodplains, they are considered a hazard. As indicated on the *Proposed Lot Layout* map, the western portion of the development, JCC channel/floodplain improvements are to occur within the designated floodplain. All lots and future residences are to remain outside of (and above the new BFE) resulting from the channel/floodplain improvement limits.

Floodplain determination is beyond the scope of the report. Construction within the floodplain area will require approval of the Drainage Basin Report prior to construction. Proposed new foundations should be placed outside the 100-year floodplain. New structures constructed within the revised 100-year floodplain and FEMA floodway should take into consideration the recommendation presented in the Pikes Peak Residential Building Code, 2017 Edition, **R322 Flood-Resistant Construction**. https://up.codes/viewer/florida/fl-residential-code-2017/chapter/3/building-planning#R322.

Additionally, at the time of permit submittal, the building department may require the preparation of either a Zero Rise Certification or a Less Than One Foot Rise Certification to demonstrate that the proposed structures will cause zero or less than one foot of rise (respectively) in the established BFE. If this certification cannot be obtained, more extensive submittals to FEMA may be required.

Scour and Accelerated Erosion Along Creek Banks and Drainageways – *constraint*

Scour generally refers to a localized loss of soil, often around a foundation element(s). Erosion generally refers to lowering the ground surface over a wide area.

Mitigation
Drainage improvements are proposed to mitigate potential localized surficial sloughing and erosion along the JCC drainageway. The proposed lots are currently located sufficiently away from the slopes of the new JCC channel that slope instability from potential scour and erosion should not be impacted by foundation construction.

Faults and Seismicity - *hazard*

Based on review of the Earthquake and Late Cenozoic Fault and Fold Map Server provided by CGS located at http://dnrwebmapgdev.state.co.us/CGSOnline/ and the recorded information dating back to November of 1900, Colorado Springs has not experienced a recorded earthquake with a magnitude greater than 1.6 during that time period. The nearest recorded earthquakes over 1.6 occurred in December of 1995 in Manitou Springs, which experienced magnitudes ranging between 2.8 to 3.5. Additional earthquakes over 1.6 occurred between 1926 and 2001 in Woodland Park, which experienced magnitudes ranging from 2.7 to 3.3. Both of these locations are in the vicinity of the Ute Pass Fault, which is greater than 10 miles from the subject site.

Earthquakes felt at this site will most likely result from minor shifting of the granite mass within the Pikes Peak Batholith, which includes pull from minor movements along faults found in the Denver basin. It is our opinion that ground motions resulting from minor earthquakes may affect structures (and the surrounding area) at this site if minor shifting were to occur.

Mitigation
The Pikes Peak Regional Building Code, 2017 Edition, indicates maximum considered earthquake spectral response accelerations of 0.181g for a short period (S_s) and 0.055g for a 1-second period (S_1). Based on the results of our experience with similar subsurface conditions, we recommend the site be classified as Site Class B, with average shear wave velocities ranging from 2,500 to 5,000 feet per second for the materials in the upper 100 feet.

Radon – *constraint*

***"Radon Act 51** passed by Congress set the natural outdoor level of radon gas (0.4 pCi/L) as the target radon level for indoor radon levels.*
Southern El Paso County and the 80929 zip code located in Rolling Meadows / Bull Hill are has an EPA assigned Radon Zone of 1. A radon zone of 1 predicts an average indoor radon screening level greater than 4 pCi/L, which is above the recommended levels assigned by

the EPA. Rolling Meadows / Bull Hill is located in a high risk area of the country. *The EPA recommends you take corrective measures to reduce your exposure to radon gas.*

Most of Colorado is generally considered to have the potential of high levels of radon gas, based on the information provided at: https://www.elpasocountyhealth.org/sites/default/files/CDPHERadonMap.pdf. There is not believed to be unusual hazardous levels of radon from naturally occurring sources at this site.

Mitigation

Radon hazards are best mitigated at the building design and construction phases. Providing increased ventilation of basements, crawlspaces, creating slightly positive pressures within structures, and sealing of joints and cracks in the foundations and below-grade walls can help mitigate radon hazards. Radon hazards are best mitigated at the building design and construction phases. Providing increased ventilation of basements, crawlspaces, creating slightly positive pressures within structures, and sealing of joints and cracks in the foundations and below-grade walls can help mitigate radon hazards. Passive radon mitigation systems are also available.

Passive and active mitigation procedures are commonly employed in this region to effectively reduce the buildup of radon gas. Measures that can be taken after the residence is enclosed during construction include installing a blower connected to the foundation drain and sealing the joints and cracks in concrete floors and foundation walls. If the occurrence of radon is a concern, it is recommended that the residence be tested after they are enclosed and commonly utilized techniques are in place to minimize the risk.

Recommendations presented in our original Soils and Geology Study, pertaining to Economic Mineral Resources, Buried Utilities, Preliminary Pavement, and Anticipated Foundation Systems are still valid. The Subexcavation and Replacement is reiterated below for clarity.

Subexcavation and Replacement

The proposed lots and roadways within Antelope Ridge at Bull Hill contain expansive soils and bedrock at depths that are anticipated to effect the performance of foundations, floor slabs, and roadways. It is our understanding that subexcavation and replacement with moisture-conditioned and recompacted on-site material is the preferred mitigation for expansive soils/bedrock below foundations, roadways and flatwork. This type of subexcavation and replacement is commonly utilized throughout this region and is generally considered an acceptable alternative to the typical lot-by-lot overexcavation or drilled pier foundations.

Subexcavation depths are anticipated to range between 6 and 10 feet below the bottom of foundations, floor slabs, and roadways, and at least those same distances (laterally) beyond the proposed "buildable" area on each lot.

Moisture-Conditioned Structural Fill

Only approved materials as described above may be used for structural fill. If materials are to be imported for use as structural fill, they should be approved by RMG prior to delivery to the site. Structural fill should not be placed on frozen subgrade or allowed to freeze during moisture conditioning and placement.

Areas to receive structural fill should have topsoil, organic material, or debris removed. The upper 6 inches of the exposed surface soils should be scarified, moisture conditioned, and compacted as indicated in the table below. After preparation of the subgrade, structural fill placement can commence. Moisture-conditioned structural fill shall consist of a moisture-conditioned, on-site (expansive) fill material. The fill material shall be processed as follows:

- Fill shall be free of deleterious material and shall not contain rocks or cobbles greater than 6 inches in diameter.

- Claystone fill shall be thoroughly "pulverized" and shall not contain claystone chunks greater than 1 1/2 inches in diameter if being processed and/or placed by a loader, or not greater than 3 inches in diameter if being processed/placed as part of "mass" fill (scrapers and disking) operations.

- When claystone is to be incorporated using a loader, the fill materials shall be processed in a stockpile **(processing these materials in the excavations will not be permitted)**. These stockpiled fill materials shall be moisture-conditioned to a minimum of 1 percent to 4 percent above optimum moisture content (as determined by the Standard Proctor test, ASTM D-698), with an average of not less than 1 1/2 percent above optimum moisture content. These materials, once moisture conditioned and thoroughly mixed, should rest in the stockpile a minimum of 24 hours to ensure proper distribution of the moisture through the material. After resting, the materials should be re-wet and re-mixed to replace the surficial moisture lost to evaporation during the resting period.

- Fill materials not containing claystone and/or fill materials being processed/placed as part of "mass" fill (scrapers and disking) operations do not require processing in a stockpile, but shall be moisture-conditioned to a minimum of 1 percent to 4 percent above optimum moisture content (as determined by the Standard Proctor test, ASTM D-698), with an average of not less than 1 1/2 percent above optimum moisture content.

- The moisture-conditioned materials should be placed in maximum 6" compacted lifts. These materials shall be moisture-conditioned and compacted as indicated in the following table.

Soil Type	Moisture-Conditioning	Compaction
Native Subgrade	As required to facilitate compaction (generally within 2% of Optimum Moisture Content)	95% of Standard Proctor or 92% of Modified Proctor
Moisture-Conditioned (Expansive) Structural Fill	Between 1% and 4% above Optimum Moisture Content	

Material not meeting the above requirements shall be reprocessed.

Structural fill placed on slopes should be benched into the slope. Maximum bench heights should not exceed 4 feet, and bench widths should be wide enough to accommodate compaction equipment.

Earthwork operations should be observed and compaction of structural fill materials should be tested by the project's geotechnical consultant (additional fees apply for observations and testing of fill). It is the **responsibility of the builder or contractor to schedule with this office** to conduct compaction tests. Without a strict quality assurance program, the fill may not be of sufficient quality to achieved required performance. **To verify the condition of the compacted soils, density tests should be performed during placement. The first density tests should be conducted when 24 inches of fill have been placed.** RMG should be contacted a minimum of 3 days prior to initiation of subexcavation and moisture-conditioning processes in order to schedule appropriate field services.

The existing soils will require the addition of water to achieve the required moisture content. The fill soils should be thoroughly mixed or disked to provide uniform moisture content through the fill. It should be noted that clay and claystone materials compacted at the above moisture contents are likely to result in wet, slick conditions. We recommend that the excavation contractor retained to perform this work have significant experience processing subexcavated and moisture-conditioned soils.

Fill shall not be placed on frozen subgrade or allowed to freeze during processing. The time of the year when night temperatures are above freezing are the most optimal period for a subexcavation operation.

Following completion of the subexcavation and moisture conditioning process, it is imperative that the "as-compacted" moisture content be maintained prior to construction and establishment of landscape irrigation. This may require reprocessing of materials and addition of supplemental water to prevent remobilization of swell potential within the fill.

Proposed Grading, Erosion Control, Cuts and Masses of Fill and Erosion Control

Based on the test borings for this investigation, the excavations and utility trenches are anticipated to encounter silty to clayey sand, claystone and sandstone. The on-site soils can generally be used as site-grading fill.

Prior to placement of overlot fill or removal and re-compaction of the existing materials, topsoil, low-density native soil, fill and organic matter should be removed from the fill area. The subgrade should be scarified, moisture conditioned to within 2% of the optimum moisture content, and recompacted to the same degree as the overlying fill to be placed. The placement and compaction of fill should be periodically observed and tested by a representative of RMG during construction.

If unsuitable fill soils are encountered at the time of construction for the single-family residences, they should be removed (overexcavated) and replaced with compacted structural fill. The zone of overexcavation shall extend to the bottom of the unsuitable fill zone and shall extend at least that same distance beyond the building perimeter (or lateral extent of any fill, if encountered first). Provided that this recommendation is implemented, the presence of this fill is not considered to pose a risk to proposed structures.

We believe the sandy clay and claystone will classify as Type A material and the clayey sand, silty sand, silty to clayey sand, and sandstone will classify as Type C materials as defined by OSHA in 29 CFR Part 1926. OSHA requires that temporary excavations made in Type A materials be laid back at ratios no steeper than 3/4:1 (horizontal to vertical) and temporary excavations made in Type C materials be laid back at ratios no steeper than 1 1/2:1 (horizontal to vertical), unless the excavation is shored and braced. Excavations deeper than 20 feet, or when water is present, should always be braced or the slope designed by a professional engineer. Long term cut slopes in the upper soil should be limited to no steeper than 3:1 (horizontal to vertical). Flatter slopes will likely be necessary should groundwater conditions occur. It is recommended that long term fill slopes be no steeper than 3:1 (horizontal to vertical).

Erosion Control

Erosion generally refers to lowering the ground surface over a wide area. The soils on-site are mildly to moderately susceptible to wind and water erosion. Temporary problems may arise due to minor wind erosion and dust during and immediately after construction. Watering of the cut areas or the use of chemical palliatives may be needed to control dust. However, once construction has been completed and vegetation reestablished, the potential for wind erosion and dust will be considerably reduced.

Loose soils are the most susceptible to water erosion. The residually weathered sands on site were encountered at medium densities and overlaid medium hard to very hard sandstone bedrock which is increasingly less susceptible to water erosion.

Cut and fill areas may be subjected to sheetwash (surface) erosion. Unchecked erosion could eventually lead to concentrated flows of water. Generally, the most effective means to control erosion is to re-vegetate the cut and fill slopes with native vegetation.

Detention Pond Storage Criteria

This section has been prepared in accordance with the requirements outlined in the El Paso County Land Development Code (LDC), the Engineering Criteria Manual (ECM) Section 2.2.6 and Appendix C.3.2.B, and the El Paso County (EPC) Drainage Criteria Manual, Volume 1 Section 11.3.3.

Soil and Rock Design Parameters

Pond C is to be a WQ/Detention Pond located near the southwest property boundary. Site contours for Pond C topography were provided by Core Engineering. A site grading plan with retention/retention pond specifications has not been provided to RMG.

RMG has performed laboratory tests of soil from across the proposed development boundaries and well as the site in its entirety. Based upon field and laboratory testing, the following soil and rock parameters are typical for the soils likely to be encountered, and are recommended for use in detention/retention pond embankment design.

Soil Description	Unit Weight (lb/ft^3)	Friction Angle (degree)	Active Earth Pressure, Ka	Passive Earth Pressure, Kp	At Rest Earth Pressure, Ko
Clay to Sandy Clay	115	17	0.548	1.826	0.708
Claystone	125	17	0.548	1.826	0.708
Silty to Clayey Sand	120	28	0.361	2.770	0.531
Sandstone	130	30	0.333	3.000	0.500

Detention Pond Considerations

All pond side slopes are to be constructed with a maximum 3:1 (horizontal:vertical) slope. Side slopes should be constructed in accordance with applicable sections of the El Paso County Engineering Criteria Manual, the El Paso County Drainage Criteria Manual, and the El Paso County Land Development Code.

Conclusions

Based upon our evaluation of the geologic conditions, it is our opinion that the proposed development is feasible. The geologic conditions identified (expansive soils and bedrock, compressible soils, seasonally fluctuating groundwater, faults/seismicity, floodplain/floodways, and radon) are not considered unusual for the Front Range region of Colorado. Mitigation of geologic conditions is most effectively accomplished by avoidance. However, where avoidance is not a practical or acceptable alternative, geologic conditions should be mitigated by implementing appropriate planning, engineering, and local construction practices.

In addition to the previously identified mitigation alternatives, surface and subsurface drainage systems should be implemented. Exterior, perimeter foundation drains should be installed around below-grade habitable or storage spaces. Surface water should be efficiently removed from the building area to prevent ponding and infiltration into the subsurface soil.

The foundation systems for all proposed structures should be designed and constructed based upon recommendations developed in a site-specific subsurface soil investigation.

Foundation selection and design should consider the potential for subsurface expansive soil-related movements. Mitigation techniques commonly used in the El Paso County area include overexcavation and replacement with structural fill, subexcavation and replacement with on-site moisture-conditioned soils, and/or the installation of deep foundation systems all of which are considered common construction practices for this area.

The foundation and floor slabs of each structure should be designed using the recommendations provided in the lot-specific subsurface soil investigation performed for each lot. In addition, appropriate surface drainage should be established during construction and maintained by the homeowner.

Irrigation devices should not be placed within 5 feet of the foundation. Irrigation should be limited to the amount sufficient to maintain vegetation. Application of more water will increase the likelihood of slab and foundation movements.

Additionally, the ground surface should be sloped from the building with a minimum gradient of 10 percent for the first 10 feet. This is equivalent to 12 inches of fall across this 10-foot zone. If a 10-foot zone is not possible on the upslope side of the structure, then a well-defined swale should be created a minimum 5 feet from the foundation and sloped parallel with the wall with a minimum slope of 2 percent to intercept the surface water and transport it around and away from the structure. Roof drains should extend across backfill zones and landscaped areas to a region that is graded to direct flow away from the structure. Owners should maintain the surface grading and drainage recommended in this report to help prevent water from being directed toward and/or ponding near the foundations.

Landscaping should be selected to reduce irrigation requirements. Plants used close to foundation walls should be limited to those with low moisture requirements and irrigated grass should not be located within 5 feet of the foundation. To help control weed growth, geotextiles should be used below landscaped areas adjacent to foundations. Impervious plastic membranes are not recommended.

The recommendations listed in this report are intended to address normal surface drainage conditions, assuming the presence of groundcover (established vegetation, paved surfaces, and/or structures) throughout the regions upslope from this structure. However, groundcover may not be present due to a variety of factors (ongoing construction/development, wildfires, etc.). During periods when groundcover is not present in the "upslope" regions, higher than normal surface drainage conditions may occur, resulting in perched water tables, excess runoff, flash floods, etc. In these cases, the surface drainage recommendations presented herein (even if properly maintained) may not mitigate all groundwater problems or moisture intrusion into the structure. We recommend that the site plan be prepared with consideration of increased runoff during periods when groundcover is not present on the upslope areas.

We believe the sandy clay and claystone will classify as Type A material and the clayey sand, silty sand, silty to clayey sand, and sandstone will classify as Type C materials as defined by OSHA in 29 CFR Part 1926. OSHA requires that temporary excavations made in Type A materials be laid back at ratios no steeper than 3/4:1 (horizontal to vertical) and temporary excavations made in

Type C materials be laid back at ratios no steeper than 1 1/2:1 (horizontal to vertical), unless the excavation is shored and braced. Flatter slopes will likely be necessary should groundwater conditions occur.

Long term cut slopes in the upper soil should be limited to no steeper than 3:1 (horizontal to vertical). Flatter slopes will likely be necessary should groundwater conditions occur. It is recommended that long term fill slopes be no steeper than 3:1 (horizontal to vertical).

Revisions and modifications to the conclusions and recommendations presented in this report may be issued subsequently by RMG based upon additional observations made during grading and construction which may indicate conditions that require re-evaluation of some of the criteria presented in this report.

It is important for the Owner(s) of these properties read and understand this report, as well as the previous reports referenced above, and too carefully familiarize themselves with the geologic constraints associated with construction in this area. This report only addresses the geologic constraints contained within the boundaries of the site referenced above.

Closing

This report is for the exclusive purpose of providing geologic hazards information and preliminary geotechnical engineering recommendations. The scope of services did not include, either specifically or by implication, evaluation of wild fire hazards, environmental assessment of the site, or identification of contaminated or hazardous materials or conditions. Development of recommendations for the mitigation of environmentally related conditions, including but not limited to, biological or toxicological issues, are beyond the scope of this report. If the owner is concerned about the potential for such contamination or conditions, other studies should be undertaken.

This report has been prepared for **Landhuis Company** in accordance with generally accepted geotechnical engineering and engineering geology practices. The conclusions and recommendations in this report are based in part upon data obtained from review of available topographic and geologic maps, review of available reports of previous studies conducted in the site vicinity, a site reconnaissance, and research of available published information, soil test borings, soil laboratory testing, and engineering analyses. The nature and extent of variations may not become evident until construction activities begin. If variations then become evident, RMG should be retained to re-evaluate the recommendations of this report, if necessary.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers and engineering geologists practicing in this or similar localities. RMG does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report. No warranty, express or implied, is made by the preparation of this report. Third parties reviewing this report should draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

I hope this provides the information you have requested. Should you have questions, please feel free to contact our office.

Cordially,

RMG Engineers

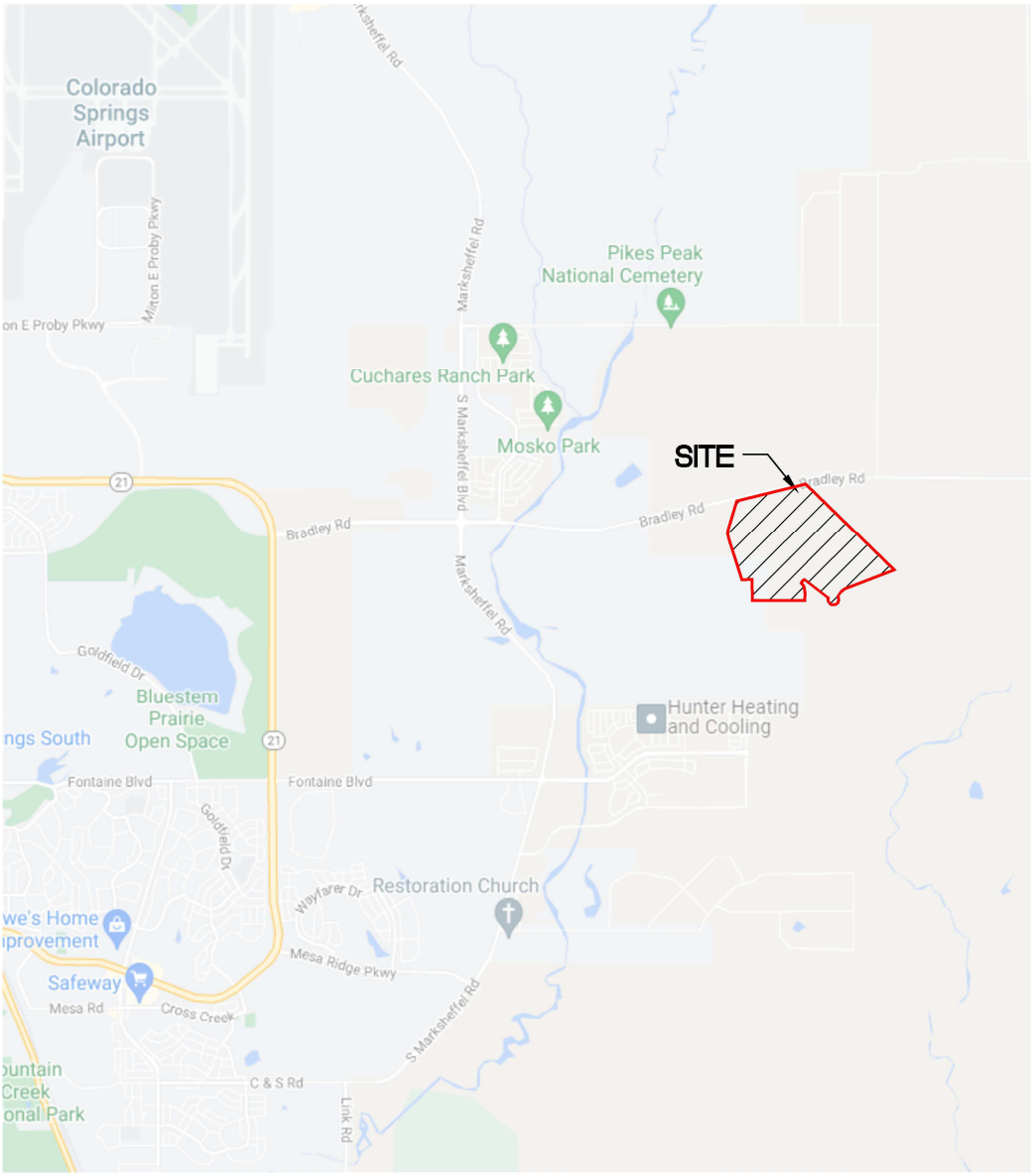
Kelli Zigler

Kelli Zigler
Sr. Project Geologist

Reviewed by,

RMG Engineers

Tony Munger, P.E.
Sr. Geotechnical Project Manager



NOT TO SCALE

Architecture
Structural
Geotechnical

Materials Testing
Forensics
Civil / Planning

Engineers / Architects
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5085 LIST DRIVE, SUITE 200,
COLORADO SPRINGS, CO 80919
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SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

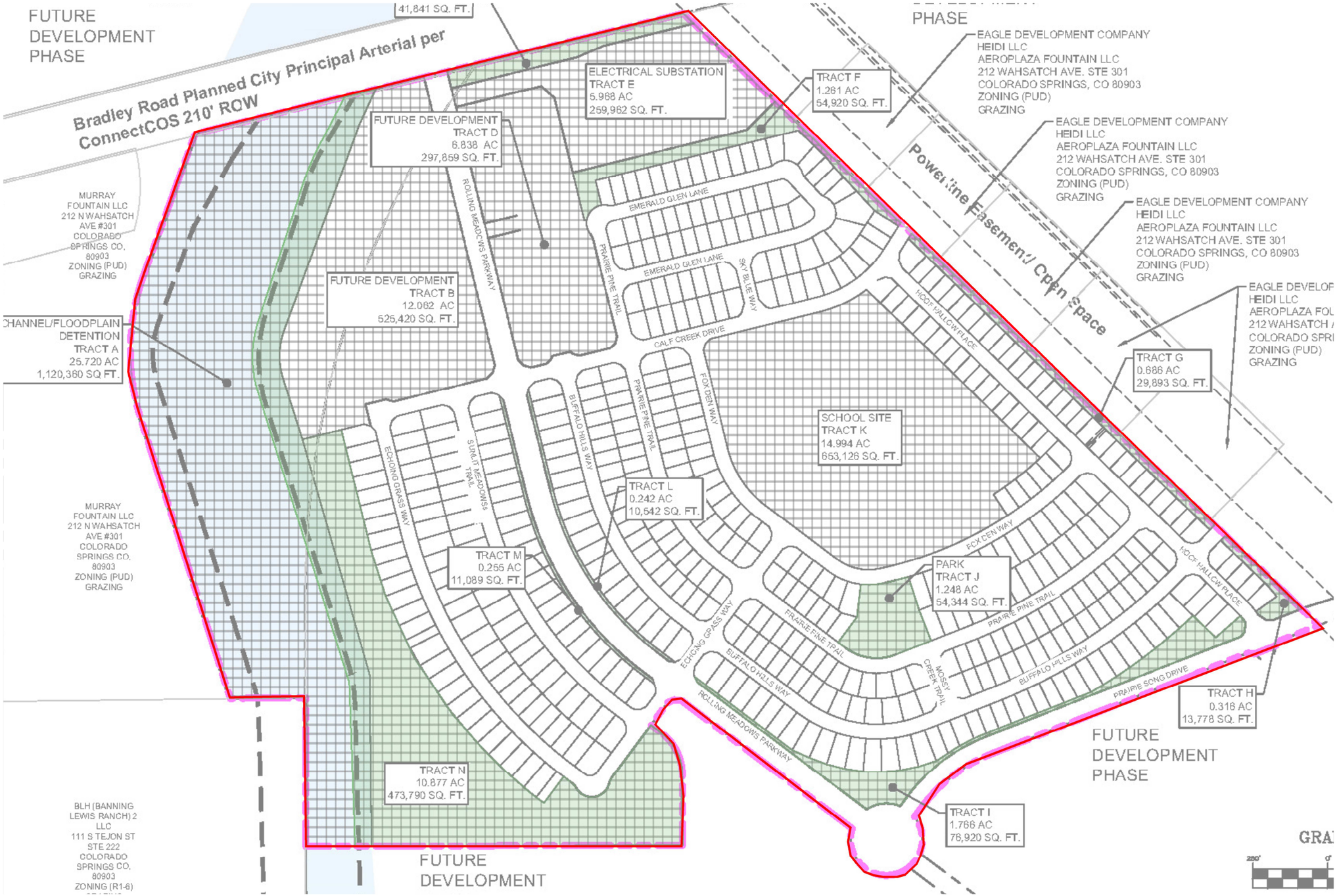
SITE VICINITY MAP

ANTELOPE RIDGE AT BULL HILL
EAST OF MARKSHEFFEL AND
SOUTH OF BRADLY ROAD
EL PASO COUNTY, COLORADO
LANDHUIS COMPANY

JOB No. 198337

FIG No. 1

DATE 3-14-2025



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JOB No. 198337

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Forensics
Civil / Planning

Architecture
Structural
Geotechnical

Engineers / Architects

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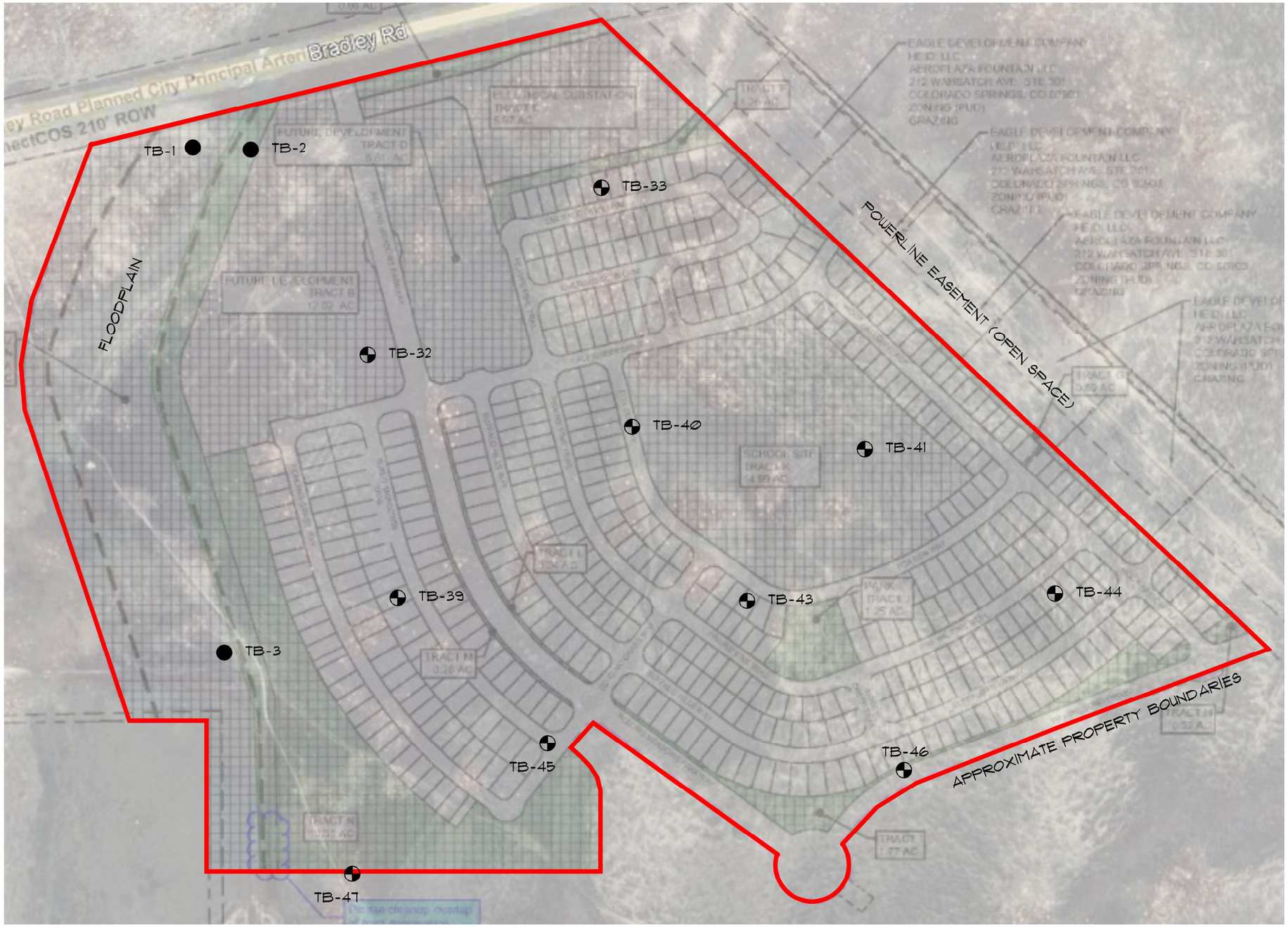
ANTELOPE RIDGE AT BULL HILL
EAST OF MARKSHEFFEL AND SOUTH OF BRADLEY ROAD
EL PASO COUNTY, COLORADO
LANDHUIS COMPANY

ENGINEER:	TM
DRAWN BY:	KZ
CHECKED BY:	TM
ISSUED:	3/14/2025

PROPOSED LOT LAYOUT

SHEET No.
FIG-2



● DENOTES APPROXIMATE LOCATION OF TEST BORINGS PERFORMED FOR THIS STUDY

⊕ DENOTES APPROXIMATE LOCATION OF TEST BORINGS PERFORMED FOR THE OVERALL PROPOSED DEVELOPMENT, RMG JOB NO. 187746, LAST DATED JANUARY 24, 2024

NOT TO SCALE

JOB No. 198337

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ANTELOPE RIDGE AT BULL HILL
EAST OF MARKSHEFFEL AND SOUTH OF BRADLEY ROAD
EL PASO COUNTY, COLORADO
LANDHUIS COMPANY

ENGINEER:	TM
DRAWN BY:	KZ
CHECKED BY:	TM
ISSUED:	3/14/2025
REVISED:	12-5-2025
Update base map	

TEST BORING LOCATION PLAN

SHEET No.
FIG-3

SOILS DESCRIPTION


CLAYSTONE


SANDY CLAY

UNLESS NOTED OTHERWISE, ALL LABORATORY
TESTS PRESENTED HEREIN WERE PERFORMED BY:
RMG - ROCKY MOUNTAIN GROUP
5085 LIST DRIVE, SUITE 200
COLORADO SPRINGS, COLORADO

SYMBOLS AND NOTES


XX — STANDARD PENETRATION TEST - MADE BY DRIVING A SPLIT-BARREL SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-1586. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).


XX — UNDISTURBED CALIFORNIA SAMPLE - MADE BY DRIVING A RING-LINED SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-3550. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).


FREE WATER TABLE


DEPTH AT WHICH BORING CAVED


BULK — DISTURBED BULK SAMPLE


AUG — AUGER "CUTTINGS"

4.5 — WATER CONTENT (%)

ROCKY MOUNTAIN GROUP

Structural
Geotechnical

Materials Testing
Forensic

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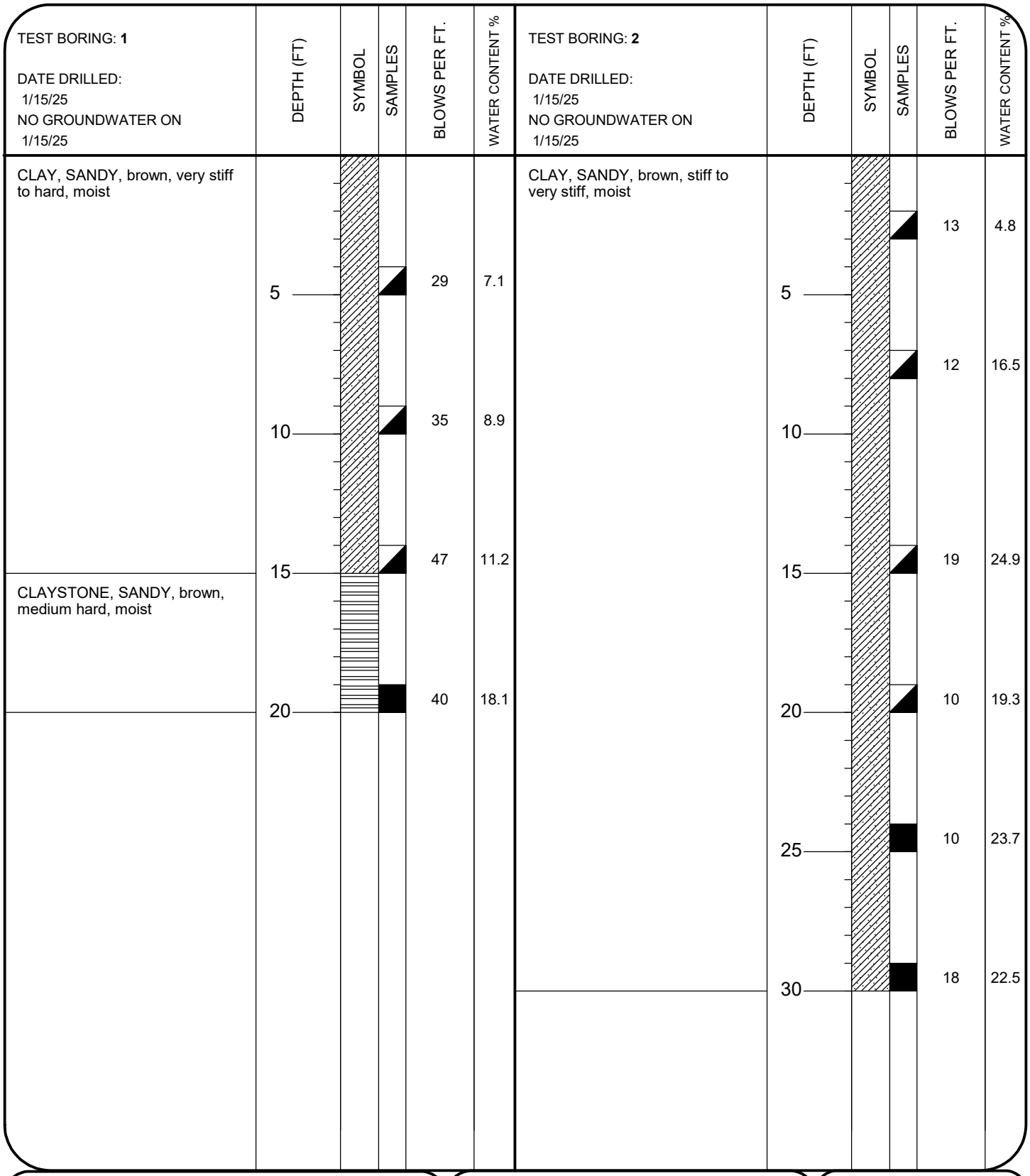
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

EXPLANATION OF TEST BORING LOGS

JOB No. 198337

FIGURE No. 4

DATE Mar/14/2025



ROCKY MOUNTAIN GROUP

Structural
Geotechnical

RMG

Materials Testing
Forensic

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SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

TEST BORING LOG

JOB No. 198337

FIGURE No. 5

DATE Mar/14/2025

TEST BORING: **3**

DATE DRILLED:
1/15/25
NO GROUNDWATER ON
1/15/25

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, medium stiff to stiff, moist				
5			17	6.4
10			13	8.9
15			7	3.2
20			7	11.5

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TEST BORING LOG

JOB No. 198337

FIGURE No. 6

DATE Mar/14/2025

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
1	4.0	7.1								
1	9.0	8.9	86.3	31	13		66.5		- 5.3	CL
1	14.0	11.2								
1	19.0	18.1								
2	2.0	4.8								
2	7.0	16.5								
2	14.0	24.9	98.0	54	32		53.9		1.2	CH
2	19.0	19.3								
2	24.0	23.7		47	24					
2	29.0	22.5								
3	4.0	6.4								
3	9.0	8.9								
3	14.0	3.2								
3	19.0	11.5	100.9						- 0.8	

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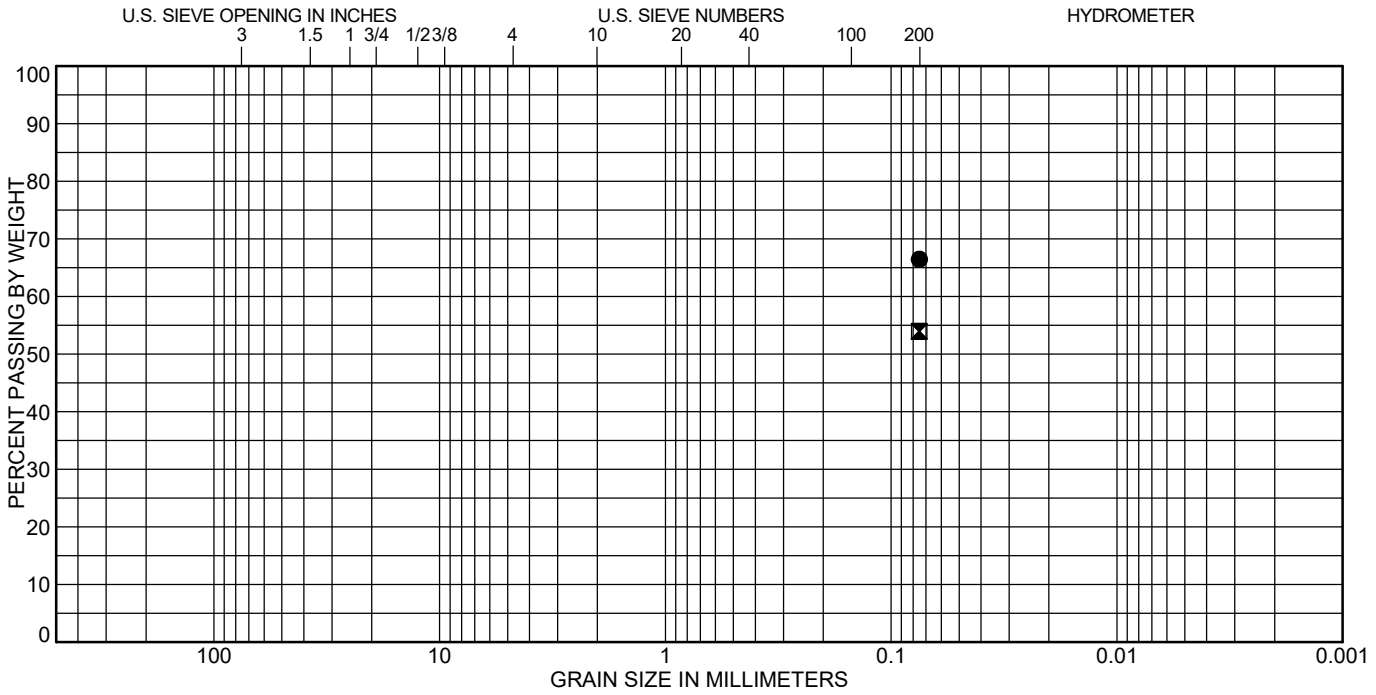
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 198337
FIGURE No. 7
PAGE 1 OF 1
DATE Mar/14/2025



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	1	9.0	SANDY LEAN CLAY(CL)	31	18	13
⊠	2	14.0	SANDY FAT CLAY(CH)	54	22	32

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	9.0			66.5	
⊠	2	14.0			53.9	

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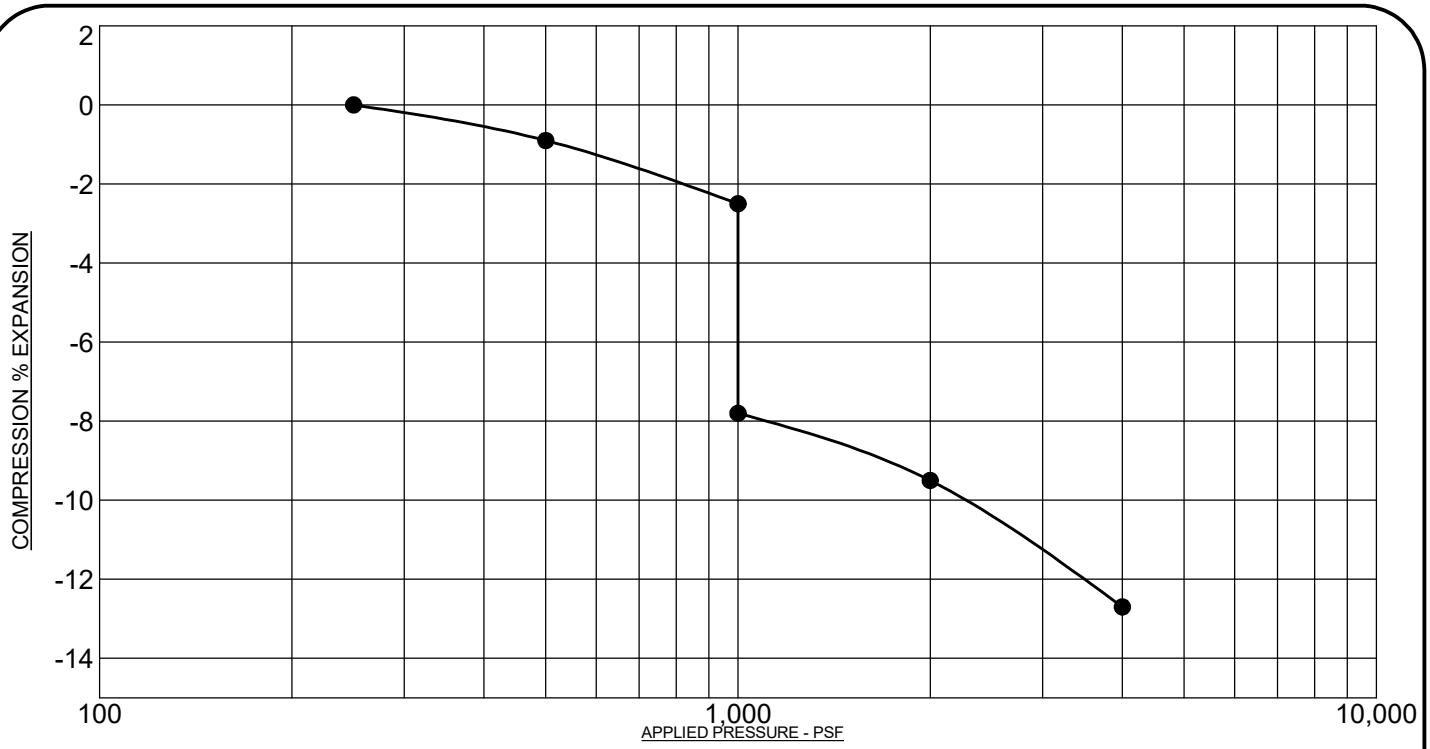
SOIL CLASSIFICATION DATA

JOB No. 198337

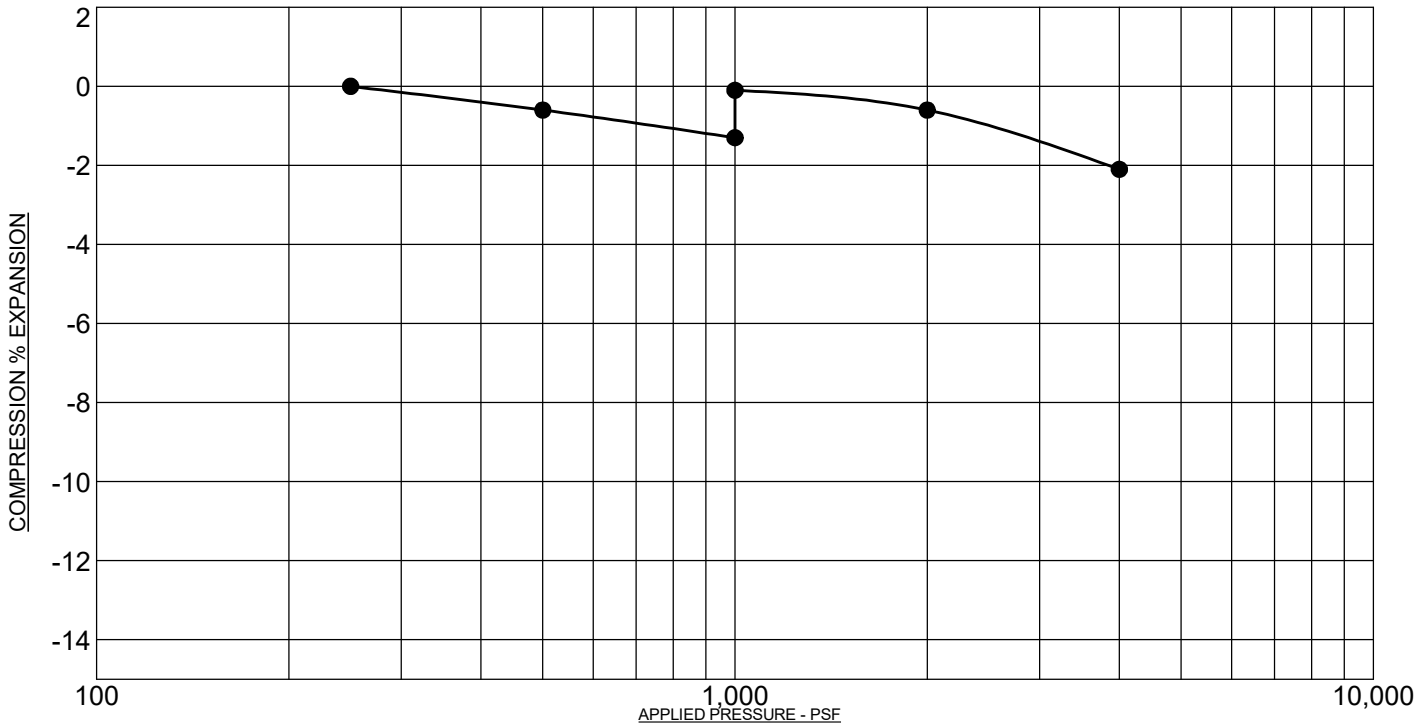
FIGURE No. 8

DATE Mar/13/2025



PROJECT: **Antelope Ridge at Bull Hill El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **1 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **86.3 PCF**
NATURAL MOISTURE CONTENT: **8.9%**
PERCENT SWELL/COMPRESSION: **- 5.3**



PROJECT: **Antelope Ridge at Bull Hill El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **2 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **98.0 PCF**
NATURAL MOISTURE CONTENT: **24.9%**
PERCENT SWELL/COMPRESSION: **1.2**

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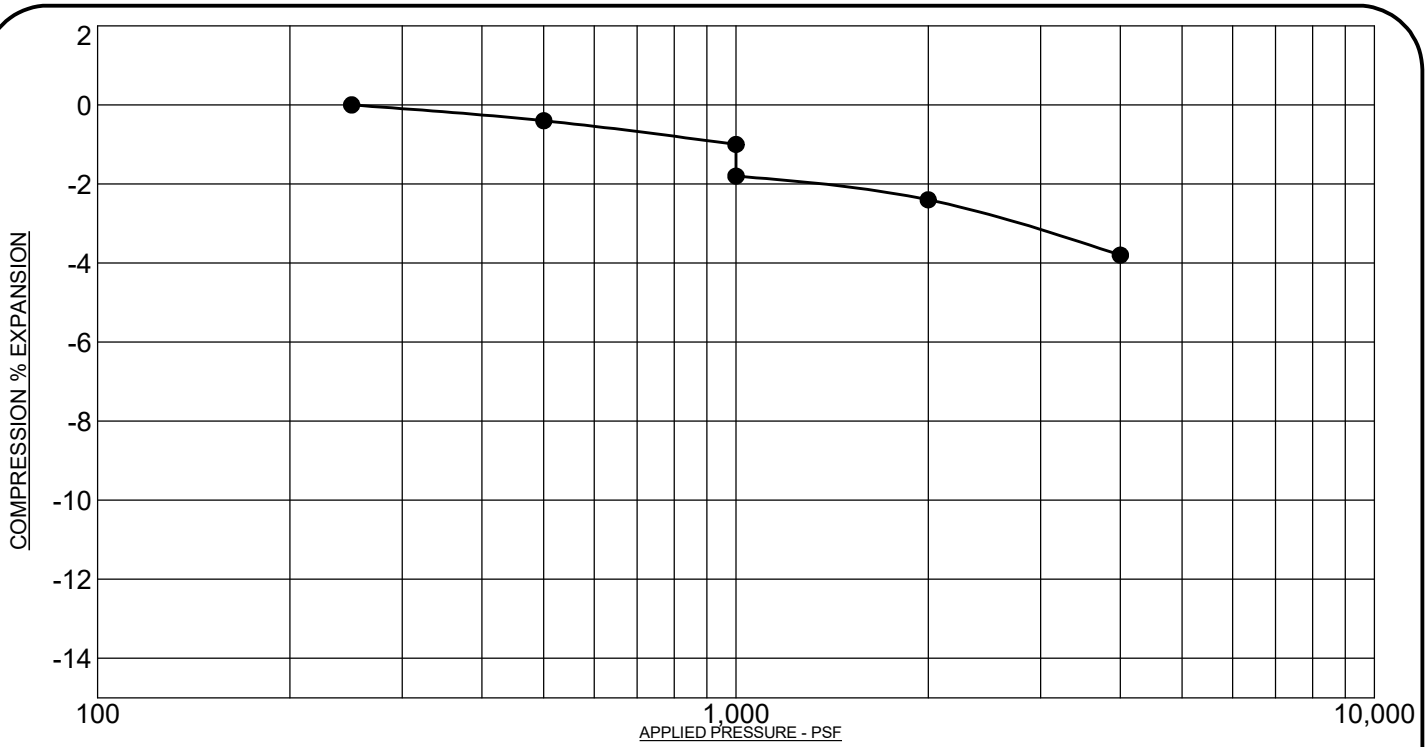
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 198337

FIGURE No. 9

DATE Mar/14/2025



PROJECT: **Antelope Ridge at Bull Hill El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **3 @ 19 FT**
NATURAL DRY UNIT WEIGHT: **100.9 PCF**
NATURAL MOISTURE CONTENT: **11.5%**
PERCENT SWELL/COMPRESSION: **- 0.8**

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SWELL/CONSOLIDATION TEST RESULTS

JOB No. 198337

FIGURE No. 10

DATE Mar/14/2025

NOT TO SCALE

General Geology

- *sw - seasonally wet areas* - low lying areas that may collect surface water during heavy precipitation events (rain or snowfall). These areas are likely to be regraded during the land development.
- *fp - floodplain*, as designated by FEMA -Improvements are proposed for JCC to contain the tributary to a designated channel. No construction is proposed within this area.
- *Qp - Piney Creek Alluvium* - Alluvial and pond or bog deposits. Mostly clayey sandy silt and silty sand; very clayey in pond and bog deposits, gravelly along main stream. Thickness is generally 5 to 15 feet, maximum of 50 feet possible.
- *Kp - Pierre Shale, Main part of formation* - Shale, minor siltstone and sandstone beds, and thin concretionary limestone beds. Poorly exposed in general. Total formation thickness is about 5,000 feet.

Engineering Geology

The Engineering Geology is presented below. Charles Robinson and Associates have mapped the following environmental engineering units as:

- 2A - Stable alluvium, colluvium and bedrock on gentle to moderate slopes (5 to 12%).
- 7A - Physiographic floodplain where erosion and deposition presently occur and is generally subject to recurrent flooding. Includes 100-year floodplain along major streams where floodplain studies have been conducted.

JOB No. 198337

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ANTELOPE RIDGE AT BULL HILL
EAST OF MARKSHEFFEL AND SOUTH OF
BRADLEY ROAD
EL PASO COUNTY, COLORADO
LANDHUIS COMPANY

ENGINEER:	TM
DRAWN BY:	KZ
CHECKED BY:	TM
ISSUED:	3/14/2025
AMENDED Sketch Plan	1-30-2024

ENGINEERING GEOLOGY MAP

SHEET No.
FIG-11

APPENDIX A

RMG Test Boring Logs, Summary of Laboratory Results, and Soil Classification Data

(2022 Soil and Geology Study)

SOILS DESCRIPTION


CLAYEY SAND


CLAYSTONE


SANDSTONE


SANDY CLAY


SILTY SAND


SILTY TO CLAYEY SAND

UNLESS NOTED OTHERWISE, ALL LABORATORY
TESTS PRESENTED HEREIN WERE PERFORMED BY:
RMG - ROCKY MOUNTAIN GROUP
2910 AUSTIN BLUFFS PARKWAY
COLORADO SPRINGS, COLORADO

SYMBOLS AND NOTES


XX — STANDARD PENETRATION TEST - MADE BY DRIVING A SPLIT-BARREL SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-1586. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).


XX — UNDISTURBED CALIFORNIA SAMPLE - MADE BY DRIVING A RING-LINED SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-3550. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).


FREE WATER TABLE


DEPTH AT WHICH BORING CAVED


BULK — DISTURBED BULK SAMPLE


AUG — AUGER "CUTTINGS"

4.5 — WATER CONTENT (%)

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EXPLANATION OF TEST BORING LOGS

JOB No. 187746

FIGURE No. 4

DATE Aug/05/2022

TEST BORING: **31**

DATE DRILLED:
3/14/22
NO GROUNDWATER ON
3/14/22

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5			40	10.2
10			40	11.6
15			50/8"	12.5
20			50/9"	14.4

CLAYSTONE, SANDY, brown and olive to gray, firm to hard, moist

TEST BORING: **32**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5			19	13.4
10			9	4.7
15			9	7.0
20			6	6.8

CLAY, SANDY, brown, very stiff, moist

SAND, SILTY, with gravel, tan to brown, loose, moist

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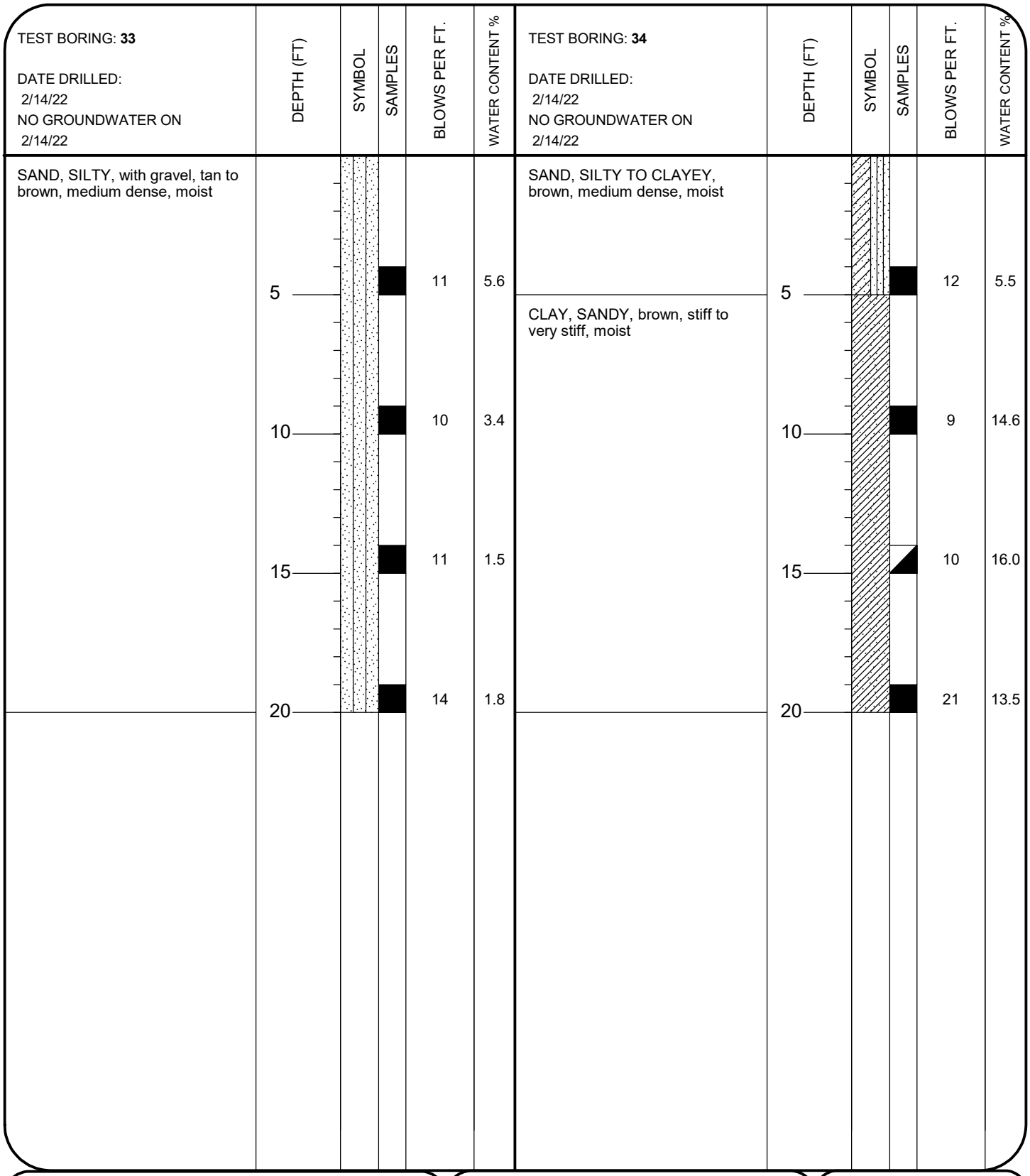
TEST BORING LOG

JOB No. 187746

FIGURE No. 20

DATE Aug/05/2022



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TEST BORING LOG

JOB No. 187746

FIGURE No. 21

DATE Aug/05/2022

TEST BORING: **39**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, with gravel, light brown to tan, loose to medium dense, moist				
5			12	10.6
10			10	3.3
15			9	5.2
20			19	2.6

TEST BORING: **40**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, with gravel, tan to brown, medium dense, moist				
5			12	6.3
CLAY, SANDY, brown, very stiff, moist				
10			16	20.0
SAND, SILTY, with gravel, brown, loose to medium dense, moist				
15			6	4.1
20			19	2.6

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TEST BORING LOG

JOB No. 187746

FIGURE No. 24

DATE Aug/05/2022

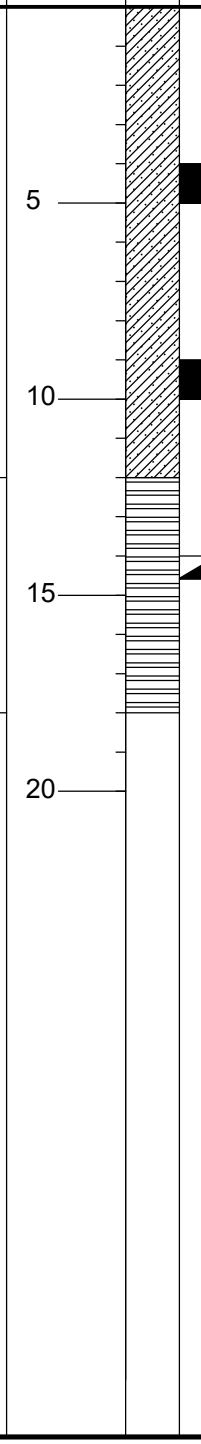
TEST BORING: **41**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

CLAY, SANDY, brown, stiff to very stiff, moist

CLAYSTONE, SANDY, brown, medium hard to very hard, moist

AUGER REFUSAL AT 18 FEET DUE TO VERY HARD BEDROCK



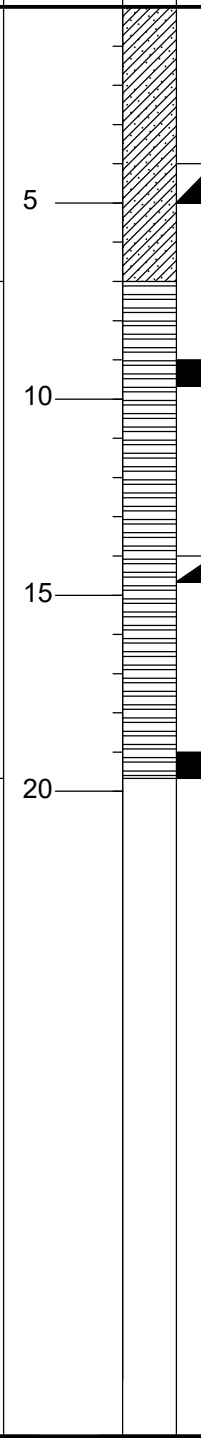
BLOWS PER FT.	WATER CONTENT %
9	7.4
23	12.2
50/7"	12.8

TEST BORING: **42**

DATE DRILLED:
2/14/22
NO GROUNDWATER ON
2/14/22

CLAY, SANDY, brown, very stiff, moist

CLAYSTONE, SANDY, gray, medium hard to hard, moist



BLOWS PER FT.	WATER CONTENT %
19	18.2
50/8"	13.0
50/8"	14.5
50/8"	14.3

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TEST BORING LOG

JOB No. 187746

FIGURE No. 25

DATE Aug/05/2022

TEST BORING: **43**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5			39	12.9
10			16	10.2
15			17	15.5
20			48	18.6

SAND, SILTY, light brown, moist

CLAY, SANDY, light brown to dark brown, stiff to very stiff, moist

CLAYSTONE, SANDY, brown, firm, moist

TEST BORING: **44**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5			33	12.6
10			41	13.2
15			50/9"	11.9
20			50/9"	12.6

CLAY, SANDY, brown, very stiff, moist

CLAYSTONE, SANDY, brown, medium hard, moist

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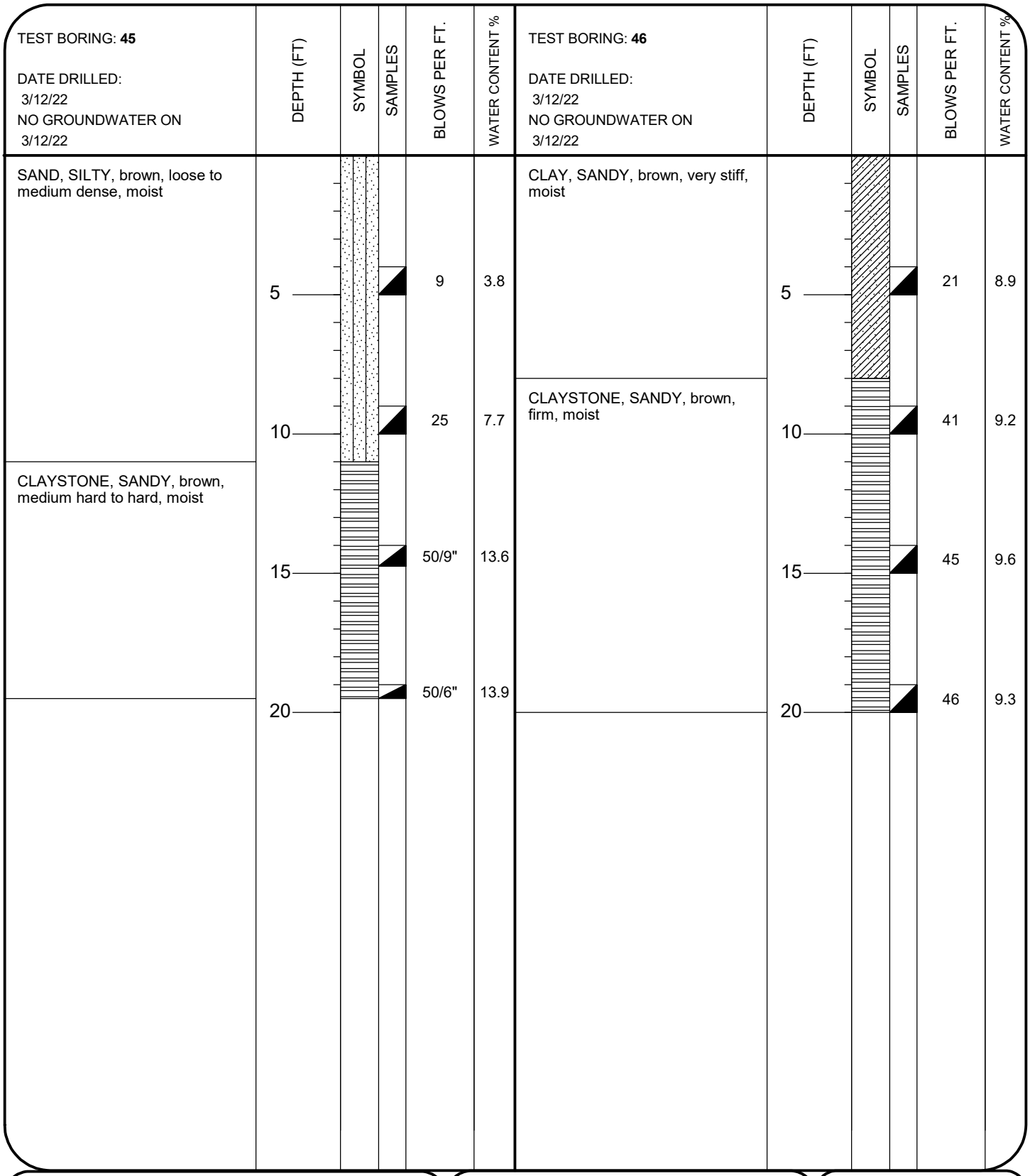
TEST BORING LOG

JOB No. 187746

FIGURE No. 26

DATE Aug/05/2022



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TEST BORING LOG

JOB No. 187746

FIGURE No. 27

DATE Aug/05/2022

TEST BORING: **47**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, tan to brown, loose, moist				
5			10	3.9
10			10	6.2
15			9	11.7
20			6	18.1

TEST BORING: **48**

DATE DRILLED:
3/12/22
NO GROUNDWATER ON
3/12/22

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, stiff to very stiff, moist				
5			12	9.4
10			18	10.8
15			16	9.5
20			25	13.6
CLAYSTONE, SANDY, brown, medium hard, moist				
25				
30			50/7"	13.7

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TEST BORING LOG

JOB No. 187746

FIGURE No. 28

DATE Aug/05/2022

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
25	4.0	7.8								
25	9.0	9.6								
25	14.0	7.7	106.0	32	17				0.7	
25	19.0	7.9								
25	24.0	7.0		32	17		61.7			CL
25	29.0	8.2		35	22		61.0			CL
26	4.0	8.3								
26	9.0	9.3	114.8	33	22		71.9		0.8	CL
26	14.0	9.0								
26	19.0	9.1								
27	4.0	7.3	85.0				58.2		4.3	
27	9.0	14.0								
27	14.0	12.4								
27	19.0	8.9								
28	4.0	8.5								
28	9.0	9.4				0.0	82.4			
28	14.0	9.8								
28	19.0	13.0								
29	4.0	14.3	117.0				98.1		4.9	
29	9.0	12.9								
29	14.0	13.2								
29	19.0	11.3								
30	4.0	7.6								
30	9.0	8.0		31	14		70.0			CL
30	14.0	6.9								
30	19.0	14.5								
31	4.0	10.2								
31	9.0	11.6	127.4	49	32		87.5		4.8	CL
31	14.0	12.5								
31	19.0	14.4								
32	4.0	13.4	96.4	49	30	0.0	86.6		- 0.4	CL
32	9.0	4.7								
32	14.0	7.0								
32	19.0	6.8								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 187746
FIGURE No. 40

DATE Aug/05/2022

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
33	4.0	5.6								
33	9.0	3.4				2.1	26.4			
33	14.0	1.5								
33	19.0	1.8								
34	4.0	5.5								
34	9.0	14.6		33	19		89.3			CL
34	14.0	16.0								
34	19.0	13.5								
35	4.0	9.7		38	23		73.0			CL
35	9.0	12.5								
35	14.0	11.2								
35	19.0	10.8								
35	29.0	19.2		59	39	0.0	92.2			CH
36	4.0	6.0	101.6	27	9		53.4		- 1.5	CL
36	9.0	6.3								
36	14.0	6.8								
36	19.0	10.1								
37	4.0	7.3								
37	9.0	6.0								
37	14.0	10.2	106.2				84.2		1.2	
37	19.0	10.9								
37	24.0	13.1								
37	29.0	13.7		45	30		79.3			CL
38	4.0	11.0								
38	9.0	20.4	102.5				98.0		2.2	
38	14.0	17.6								
38	19.0	16.6								
38	29.0	17.5	108.9				97.4		- 0.8	
39	4.0	10.6								
39	9.0	3.3		59	36	0.5	24.9			SC
39	14.0	5.2								
39	19.0	2.6								
40	4.0	6.3								
40	9.0	20.0		40	24	0.0	85.3			CL

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 187746
FIGURE No. 40

DATE Aug/05/2022

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
40	14.0	4.1								
40	19.0	2.6								
41	4.0	7.4		29	10	0.0	64.2			CL
41	9.0	12.2								
41	14.0	12.8								
42	4.0	18.2	111.8	48	32	0.0	71.7		4.7	CL
42	9.0	13.0								
42	14.0	14.5								
42	19.0	14.3								
43	4.0	12.9	112.0	48	32		82.0		5.6	CL
43	9.0	10.2								
43	14.0	15.5								
43	19.0	18.6								
44	4.0	12.6								
44	9.0	13.2	118.6				90.7		6.2	
44	14.0	11.9								
44	19.0	12.6								
45	4.0	3.8				0.5	31.4			
45	9.0	7.7								
45	14.0	13.6								
45	19.0	13.9								
46	4.0	8.9								
46	9.0	9.2								
46	14.0	9.6	118.9			0.0	80.6		4.3	
46	19.0	9.3								
47	4.0	3.9				0.1	25.4			
47	9.0	6.2								
47	14.0	11.7								
47	19.0	18.1								
48	4.0	9.4								
48	9.0	10.8		36	22		73.4			CL
48	14.0	9.5								
48	19.0	13.6								
48	29.0	13.7	121.2	47	31		92.8		4.9	CL

ROCKY MOUNTAIN GROUP

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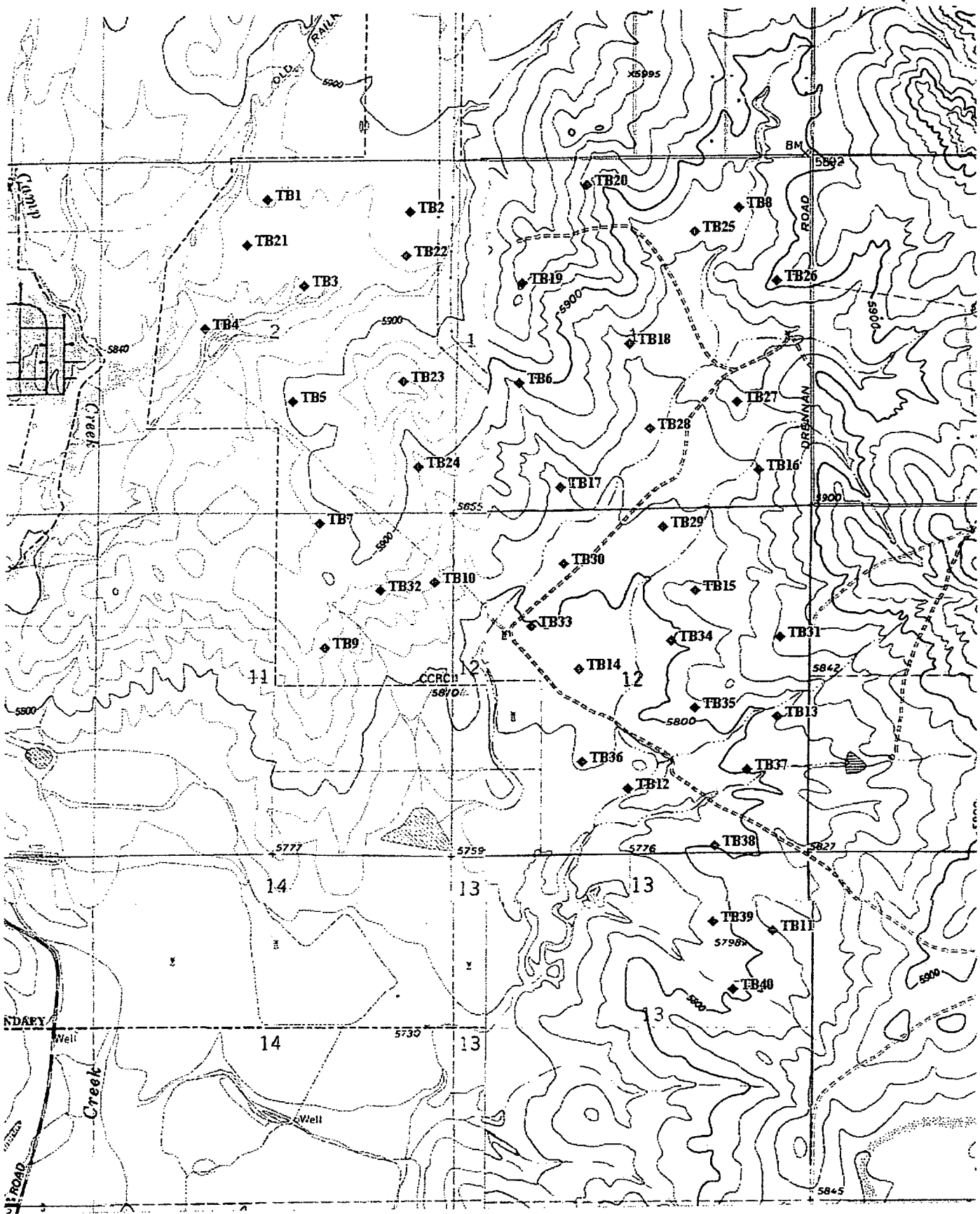
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 187746
FIGURE No. 40
PAGE 6 OF 9
DATE Aug/05/2022

APPENDIX B

Entech (2005) Test Boring Location Plan
Summary of depth to Bedrock, Groundwater, and
Summary of Laboratory Test Results



ENTECH ENGINEERING, INC.
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COLORADO SPRINGS, CO. 80907
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TEST BORING LOCATION PLAN
NORRIS RANCH
COLORADO SPRINGS, CO.
FOR: ZEPHYR DEVELOPMENT

DRAWN:	DATE:	CHECKED:	DATE:
R.OLSON	13JUL05		

JOB NO.: 52855

FIG NO.: 4

Table 2: Summary of Depth to Bedrock and Groundwater

Zephyr Development
Norris Ranch
Job No. 52855

Test Boring Number	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
1	>20	>20
2	>20	>20
3	>20	>20
4	>20	19'
5	>20	>20
6	>20	>20
7	18	>20
8	>20	15.5
9	8	>15
10	>20	>20
11	18	>20
12	>20	>20
13	5	>15
14	>20	>20
15	4	>15
16	>20	>20
17	>20	>20
18	19	>20
19	13	>20
20	14	>20
21	>20	>20
22	>20	>20
23	>20	>20
24	>20	>20
25	>20	16
26	1	>15
27	>20	>20
28	19	>20
29	>20	18
30	>20	>20
31	2	>15
32	9	>15
33	>20	>20
34	9	>15
35	14	>20
36	>20	>20
37	>20	>20
38	4	>15
39	4	>15
40	10	>15

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT ZEPHYR DEVELOPMENT
PROJECT NORRIS RANCH
JOB NO. 52855

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	TB-6	5'	6%	104.5	41.0%			0.01		-0.2%	SC	SAND, VERY CLAYEY
1	TB-8	10'	6%	98.6	14.9%	NV	NP			-0.5%	SM	SAND, SILTY
1	TB-12	10'			28.8%						SM	SAND, SILTY
1	TB-19	5'			17.1%						SM	SAND, SILTY
1	TB-2	5'	11%	82.7						-0.6%	SM	SAND, SILTY
1	TB-21	5'			48.0%	27	5				SC-SM	SAND, VERY CLAYEY-SILTY
1	TB-22	4-5'			45.7%	33	19				SC	SAND, VERY CLAYEY
1	TB-29	15'			3.5%						SW	SAND, GRAVELLY
1	TB-37	10'	5%	95.0						-1.2%	SM	SAND, SILTY
1	TB-33	5'	10%	97.1						0.4%	SC	SAND, CLAYEY
2	TB-1	5'	21%	76.5	95.9%					3.2%	CL	CLAY, SILTY
2	TB-3	2-5'			97.7%				5167		CL	CLAY
2	TB-16	5'	11%	101.9	60.1%			0.23		0.7%	CL	CLAY, VERY SILTY, SANDY
2	TB-17	10'	13%	110.9	87.6%	40	24			6.9%	CL	CLAY, SANDY
2	TB-10	2-5'			82.4%				1276		CL	CLAY, VERY SILTY
2	TB-18	2-5'							2093		CL	CLAY, SILTY
2	TB-4	15'	24%	98.8						0.6%	CL	CLAY, SANDY
2	TB-22	2-3'							3761		CL	CLAY, SANDY
2	TB-25	2-3'							2424		CL	CLAY, SANDY
2	TB-35	5'			78.1%				1953		CL	CLAY, VERY SILTY
2	TB-5	5'	10%	87.1						-0.6%	CL	CLAY, VERY SILTY
2	TB-7	10'	10%	94.3						0.0%	CL	CLAY, VERY SILTY
2	TB-13	5'	9%	95.6						0.8%	CL	CLAY, SILTY
2	TB-10	2-5'			82.4%				1276		CL	CLAY, VERY SILTY
2	TB-18	2-5'							2093		CL	CLAY, SILTY
2	TB-23	5'	9%	110.6						3.0%	CL	CLAY, SANDY
2	TB-24	10'	12%	113.1						5.3%	CL	CLAY, SANDY
2	TB-27	2-3'	8%	92.3						-0.9%	CL	CLAY, SANDY
3	TB-20	20'			46.4%	27	10				SC	SANDSTONE, VERY CLAYEY
3	TB-26	9-10'				NV	NP		955		SM	SANDSTONE, SILTY
3	TB-26	14-15'			21.8%						SC	SANDSTONE, CLAYEY