Job No. 185657

July 7, 2022

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

Re: Response to Colorado Geological Survey
Creekside at Lorson Ranch, Filing No. 2
El Paso County, Colorado

Dear Client:

RMG – Rocky Mountain Group previously prepared the *Soil and Geology Study* (RMG Job. No. 185657, dated February 21, 2022) for the proposed planned unit development to consist of 38 single-family units on approximately 6.01 acres at Lorson Boulevard and Trappe Drive. The report was reviewed by personnel of the Colorado Geological Survey (CGS), and comments (dated May 24, 2022) were provided. RMG has prepared this document in response to those review comments.

Our responses to the CGS review comments are presented below. For clarity and ease of review, we "snipped" the CGS comment and pasted below, followed by our response.

- **CGS Comment:**

  1. RMG states (page 13), "The BFE's (Base Flood Elevation) along the creek, west of the Creekside South, Filing No. 2 boundary, ranges between 5709.2 and 5704.7 feet." RMG also states, "Provided that the final floodplain extents do not encroach within the boundaries of the proposed buildable lots and the bottom of foundations remain one foot above the BFE, it is our opinion that additional mitigation is not required at this time." The proposed lots are outside the 100-year floodplain based on the PUD plan. However, CGS cannot determine if the basement foundations will be 1 foot above the BFE. Therefore, CGS recommends the project civil and geotechnical engineer verify this condition is met.

  RMG Response:
  Per Landhuis Company, all proposed foundations for this development are to be crawlspaces. No basements are to be constructed within this filing.

  Based on the review of the Early Overlot Grading / Erosion Control Plans by Core Engineering (which have now been revised to show the existing and proposed contours), the bottom of the lowest foundation components (assuming 3- to 4-foot cuts for crawlspace foundations) are anticipated to be approximately 2 to 3 feet above the designated BFE's for Jimmy Camp Creek East Tributary.

- **CGS Comment:**

2. According to the construction drawings (CORE Engineering Group, March 2022), the site will include a groundwater underdrain that will be installed below the sanitary sewer drain that will outfall to the existing detention pond/water quality basin system. A statement indicating that an underdrain system will be installed for the site should also be included in the PUD development plan.

RMG Response:
A note to indicate an underdrain system will be installed for the site is to be added to the PUD development plan by Core Engineering.

- **CGS Comment:**

3. RMG states (page 11) that "It is anticipated basement foundations will have more than 4 to 6 feet of separation from the bottom of foundation floor slabs to groundwater." RMG did not encounter groundwater in their borings during drilling; groundwater measurements following drilling operations were not provided in RMG's report. Groundwater levels as shallow as 12 feet were measured in CGS's previous reviews in the project vicinity (such as Creekside South at Lorson Ranch). Groundwater levels typically rise after development, and measurements of groundwater variations provide a basis for anticipating future groundwater levels.

Since below-grade levels are planned and the proximity to the Jimmy Camp Creek East Tributary floodplain, CGS recommends the groundwater levels are monitored/observed throughout the spring, summer, and fall to verify that proposed floor levels are at least 3 feet (preferably 5 feet) above the maximum anticipated groundwater levels and maintained year-round. We recommend this occurs during the planning stages of the development (PUD/preliminary plan) and not solely during site-specific investigations.

RMG Response:
The groundwater encountered at 12 feet within TB-1 of the referenced study was performed within the banks of Jimmy Camp Creek for the sanitary sewer crossing that was proposed to cross the creek. That test boring was performed at an elevation of approximately 20 to 22 feet lower than the borings of this current study.

Based on the elevation difference noted above, the absence of groundwater in the test borings performed for the current study, and the builder's stated intention that basements are not to be constructed at this site, it is our opinion that there is insufficient basis to require the recommended groundwater monitoring for the proposed crawlspace foundations.

- **CGS Comment:**

4. CGS agrees with RMG (page 18), "A subsurface perimeter drain is recommended around portions of the structures which will have habitable or storage space located below the finished ground surface." RMG notes (page 17) that "depending on the conditions encountered during site-specific subsurface soil investigations and the conditions observed at the time of construction, additional subsurface drainage systems may be recommended." We recommend that subsurface drainage systems (underslab drain) be determined during the preliminary plan stage and not during site-specific investigations.

RMG Response:

RMG disagrees that the requirement for underslab drains be determined "during the preliminary plan stage". The main purpose of a "pre-development" soil and geology study is to identify geologic conditions (hazards or constraints) that may impact the proposed development operations, and to provide mitigation recommendations for those conditions. A secondary purpose of that study is to identify conditions that may impact future home builders and/or home owners, and to provide conceptual mitigation recommendations to demonstrate that the proposed "end-use" product can be constructed. **It is not the purpose of this "pre-development" investigation to provide final, lot-specific construction recommendations for each lot.** To do so would present several challenges:

1. The "pre-development" soil and geology study is typically not initiated until near the end of the "preliminary plan stage", once the developer has completed purchase of the property and generated the majority of the construction documents. Waiting until that point to determine whether or not a groundwater monitoring study is required does not allow adequate time to perform any such study.
2. As noted in both our previous report and CGS's comments, groundwater elevation varies seasonally but can also be affected by development operations. Groundwater readings taken prior to development are not anticipated to represent the final groundwater conditions. Therefore, that information should not be utilized as the sole basis to make lot-specific determinations for the installation of underslab drains.
3. The county requirement for frequency of test borings is 1 boring per 10 acres up to the 100 acres, then 1 boring per 25 acres thereafter. This boring frequency results in an average of approximately 1 boring per 40 lots in this subdivision, and likely more than 40 lots per boring in some developments. This level of investigation does not provide sufficient information to make lot-specific determinations regarding groundwater mitigation.

- **CGS Comment:**

5. RMG states on page 16, "it is our opinion that the existing geologic and engineering conditions can be satisfactorily mitigated through proper engineering, design and contraction practices." This should be "...proper engineering, design, and construction practices...".

RMG Response:
This statement has been updated.

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

Cordially,

RMG – Rocky Mountain Group

Kelli Zigler
Project Geologist

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

Architectural
Structural
Geotechnical

RMG
Engineers / Architects

Materials Testing
Forensic
Civil/Planning

SOIL AND GEOLOGY STUDY

Creekside at Lorson Ranch, Filing No. 2
El Paso County, Colorado

PREPARED FOR:

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

JOB NO. 185657

February 21 2022
Amended July 7, 2022

Respectfully Submitted,
RMG – Rocky Mountain Group

Kelli Zigler

Kelli Zigler
Project Geologist

Reviewed by,
RMG – Rocky Mountain Group

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39818
PROFESSIONAL ENGINEER

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Geotechnical Project Manager

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APPENDIX A

1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in the SE ¼ of the NE ¼ of Section 28, Township 15 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

1.2 Existing Land Use

The site currently consists of two parcels totaling 9.23 acres as denoted on the El Paso County Assessors website. The parcels included are:

- Schedule No. 5523114075 which consists of 6.01 acres, currently addressed as 10786 Luneth Drive and is undeveloped.
- Schedule No. 5523114076 which consists of 3.22 acres, currently addressed as 10762 Luneth Drive and is undeveloped.

The current and proposed zoning for both parcels is PUD" - Planned Unit Development.

The Jimmy Camp Creek East Tributary (JCCET) runs parallel to this development, but it is our understanding that none of the currently proposed lots are located within the designated FEMA floodplain.

1.3 Project Description

The proposed site development is to consist of single-family residential construction on a total of 37 lots. Entrance into the subdivision is to be provided from the north via Trappe Drive, from the east via an extension of the existing Magothy Drive, and the west via an extension of the existing Luneth Drive. Additional proposed land usage includes landscaped easements, one pocket-park/ open space, utility easements, and one large drainage detention facility. It appears the detention facility is to support the new subdivision, as well as a portion of Lorson Ranch East, Filing No. 4 to the east and Creekside South, Filing No. 1 to the south. The Proposed Lot Layout is presented in Figure 2.

The JCCET currently extends along the western boundary of the site. It is our understanding that this tributary is to remain undisturbed during the overlot grading process.

The street configurations were not labeled on the Concept Plan, but it is anticpated all streets within the subdivision are to be public Residential Urban Local with a 50’ R.O.W and constructed to El Paso County standards. The proposed interior roadways are to be extensions of the existing Magothy Drive, Luneth Drive and Akelain Drive. The streets are to be maintained by El Paso County Department of Transportation.

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.

It is our understanding the Jimmy Camp Creek East Tributary is to be dedicated to, owned by, and maintained by the Lorson Ranch Metropolitan District No. 1. Improvements are to be completed by the developer/owner as required.

2.0 QUALIFICATIONS OF PREPARERS

This Soils and Geology Study was prepared by a professional geologist as defined by Colorado Revised Statures section 34-1-201(3) and by a qualified geotechnical engineer as defined by policy statement 15, "Engineering in Designated Natural Hazards Areas" of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors. (Ord. 96-74; Ord. 01-42)

The principle investigators for this study are Kelli Zigler P.G., and Tony Munger, P.E. Ms. Zigler is a Professional Geologist as defined by State Statute (C.R.S 34-1-201) with over 20 years of experience in the geological and geotechnical engineering field. Ms. Kelli Zigler holds a B.S. in Geology from the University of Tulsa. Ms. Zigler has supervised and performed numerous geological and geotechnical field investigations throughout Colorado.

Tony Munger is a licensed professional engineer with over 20 years of experience in the construction engineering (residential) field. Mr. Munger and holds a Bachelor of Science in Architectural Engineering from the University of Wyoming.

3.0 STUDY OVERVIEW

The purpose of this investigation is to characterize the general geotechnical and geologic site conditions, and present our opinions of the potential effect of these conditions on the proposed development of single-family residences within the referenced site. As such, our services exclude evaluation of the environmental and/or human, health-related work products or recommendations previously prepared, by others, for this project.

Revisions to the conclusions presented in this report may be issued based upon submission of the Development Plan. This study has been prepared in accordance with the requirements outlined in the El Paso County Land Development Code (LDC) specifically Chapter 8 last updated August 27, 2019 applicable sections include 8.4.8 and 8.4.9. and the Engineering Criteria Manual (ECM), specifically Appendix C last updated July 9, 2019.

This report presents the findings of the study performed by RMG relating to the geotechnical and geologic conditions of the above-referenced site. 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.

3.1 Scope and Objective

The scope of this study is to include a physical reconnaissance of the site and a review of pertinent, publically available documents including (but not limited to) previous geologic and geotechnical reports, overhead and remote sensing imagery, published geology and/or hazard maps, design documents, etc. Our services exclude the evaluation of the environmental and/or human, health-related work products or recommendations previously prepared, by others, for this project.

The objectives of our study are to:

- Identify geologic conditions that are present on this site,
- Analyze the potential negative impacts of these conditions on the proposed site development,
    - Analyze the potential negative impacts to the surrounding properties and/or public services resulting from the proposed site development as it relates to existing geologic hazards,
    - Provide our opinion of suitable techniques that may be utilized to mitigate the potential negative impacts identified herein.

This report presents the findings of the study performed by RMG relating to the geologic conditions of the above-referenced site. Revisions and modifications to 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,
- Review of pertinent documents (development plans, plat maps, drainage reports/plans, etc.) not available at the time of this study,
- Comments received from the governing jurisdiction and/or their consultants subsequent to submission of this document.

3.2 Site Evaluation Techniques

The information included in this report has been compiled from:

- Field reconnaissance
- Geologic and topographic maps
- Review of selected publicly available, pertinent engineering reports
- Available aerial photographs
- Exploratory soil test borings by RMG
- Laboratory testing of representative site soil and rock samples by RMG
- Geologic research and analysis

Geophysical investigations were not considered necessary for characterization of the site geology. Monitoring programs, which typically include instrumentation and/or observations for changes in groundwater, surface water flows, slope stability, subsidence, and similar conditions, are not known to exist and were not considered applicable for the scope of this report.

3.3 Previous Studies and Field Investigation

Reports of previous geotechnical engineering/geologic investigations for adjacent sites were available for our review and are listed below:

1. *Subsurface Soil Investigation, Lots 1-246, Lorson Ranch East, Filing No. 4, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 177685, last dated February 23, 2021.
2. *Geology and Soils Report, Creekside South at Lorson Ranch, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 173922, last dated February 27, 2020.
3. *Geology and Soils Report, Creekside at Lorson Ranch, Filing No. 1, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 164808, last amended December 4, 2018.
4. *Subsurface Soil Investigation, Lorson Ranch SDS Crossings, Lorson Ranch East, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 159665, last dated November 17, 2017.
5. *Geology and Soils Report, Lorson Ranch East, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 152808, last amended October 5, 2016.

3.4 Additional Documents

Additional documents reviewed during the performance of this study are included in Appendix A.

4.0 SITE CONDITIONS

4.1 Existing Site Conditions

The site is currently vacant. Jimmy Camp Creek East Tributary (JCCET) forms the western boundary of the site. The tributary has undergone improvements such as gravel check dams and rip-rap along portions of the tributary banks.

4.2 Topography

The site topography is generally rolling hills, and does not contain slopes greater than 5 percent other than the banks of the JCCET embankment and isolated areas paralleling Trappe Drive. The approximate elevation varies from 5 to 15 feet across the entire site.

4.3 Vegetation

The majority of the site consists of low-lying native grasses and weeds. The soils exposed along the banks of the JCCET appear to be stable, and consist primarily of moderately-cemented silty sand and trace gravel, where the banks are not lined with gravel. It does not appear that these slopes have experienced significant sloughing, nor do they appear to have been deeply undercut or weakened by erosion features, e.g. rills. JCCET was dry at the time of our site visit.

4.4 Aerial photographs and remote-sensing imagery

Personnel of RMG reviewed aerial photos available through Google Earth Pro dating back to 1999, CGS surficial geologic mapping, and historical photos by historicaerials.com dating back to 1947. Prior to 2011, JCCET and the area remained generally undisturbed farm land and the tributary was in its native state. Sometime after 2013, improvements to JCCET began. Since 2013, minor surficial grading has occured. The detention pond located near the southwest corner of the property was completed in 2021.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

The subsurface conditions within the property were explored by drilling a total of three (3) exploratory borings on September 8, 2021, extending to depths of approximately 20 feet below the existing ground surface. Test borings TB-1 and TB-2 were performed to obtain soil information for the lots and TB-3 was performed near the proposed detention facility. The Proposed Lot Layout with Test Boring Locations is presented in Figure 2.

The number of borings is in excess of the minimum one test boring per 10 acres of development up to 100 acres and one additional boring for every 25 acres of development above 100 acres as required by the ECM, Section C.3.3.

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. An Explanation of Test Boring Logs and the Test Boring Logs are presented in Figures 3 through 5.

5.1 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 6. Soils Classification Data is presented in Figure 7. Swell/Consolidation Test Results are presented in Figures 8 and 9.

5.2 Groundwater

Groundwater was not recorded in the three test borings performed for this study at the time of drilling. However, elevated moisture conditions and low blow counts could potentially indicate groundwater at depths of approximately 19 feet below the existing surface in TB-2 and TB-3.

Based on our knowledge of the area and engineering design and construction techniques commonly employed in the El Paso County area at this time, it is our opinion that there is insufficient reason to preclude full-depth basements on any of the lots in this subdivision at this time. If shallow groundwater conditions are found to exist at the time of the site-specific Subsurface Soil Investigations, the feasibility of basement construction and/or any recommended mitigation measures are to be addressed at that time.

Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Development of the property and adjacent properties may also affect groundwater levels.

6.0 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

6.1 Geologic Conditions

The site is located within the western flank of the Colorado Piedmont section of the Great Plains physiographic province. The Colorado Piedmont, formed during Late Tertiary and Early Quaternary time (approximately 2,000,000 years ago), is a broad, erosional trench which separates the Southern Rocky Mountains from the High Plains. During the Late Mesozoic and Early Cenozoic Periods (approximately 70,000,000 years ago), intense tectonic activity occurred, causing the uplifting of the Front Range and associated downwarping of the Denver Basin to the east. Relatively flat uplands and broad valleys characterize the present-day topography of the Colorado Piedmont in this region.

6.2 Subsurface Soil Conditions

The subsurface materials encountered in the test borings performed for this study were classified within the laboratory using the Unified Soil Classification System (USCS). The materials were identified and classified as man-placed fill and native sandy clay (CL), and sandy claystone of the Pierre Shale Formation.

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented on the Test Boring Logs. The classifications shown on the logs are based upon the engineer's classification of the samples at the depths indicated. Stratification lines shown on the logs represent the approximate boundaries between material types and the actual transitions may be gradual and vary with location.

6.3 Bedrock Conditions

In general, the bedrock (as mapped by Colorado Geologic Survey - CGS) beneath the site is considered to be part of the Pierre Shale formation. Claystone bedrock was encountered in TB-1 at a depth of approximately 14-feet below the existing surface. The bedrock is not anticipated to be encountered in basement foundation excavations, however, may be encountered in utility trenches for the proposed development.

6.4 U.S. Soil Conservation Service

The U.S. Soil Conservation Service along with United States Department of Agriculture (USDA) has identified the soils on the property as:

- 52 – Manzanst clay loam, 0 to 3 percent slopes. The Manzanst clay loam was mapped by the USDA to encompass the western portion of the property along the eastern side of

JCCET. Properties of the clay loam include, well-drained soils, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be low, frequency of flooding and/or ponding is none, and landforms include terraces and drainage-ways.

- 108 – Wiley silt loam, 3 to 9 percent slopes. The Wiley silt loam was mapped by the USDA to encompass a the eastern portion of the property. Properties of the sandy loam include, well-drained soils, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be medium, frequency of flooding and/or ponding is none, and landforms include hills.

The USDA Soil Survey Map is presented in Figure 11.

6.5 General Geologic Conditions

Based on our field observations, the USDA map, and the Geologic Map of the Pueblo 1 degree x 2 degrees quadrangle,south-central Colorado an interpreted geologic map of significant surficial deposits and features was mapped for the site. The identified geologic conditions affecting the development are presented in the Engineering and Geology Map, Figure 10.

The site generally consists of sandy clay overlying claystone bedrock. One geologic unit was mapped at the site as:

- *Kp - Pierre Shale (Upper Cretaceous)* – Predominately siltstone and claystone. Contains sandstone and sandy shale near top and bottom of the formation. Sandstone and shale were not encountered in the test borings performed for this investigation. Claystone bedrock was encountered in one test boring at a depth of 14 feet.

6.6 Structural Features

Structural features such as schistocity, folds, zones of contortion or crushing, joints, shear zones or faults were not observed on the site, in the surrounding area, or in the soil samples collected for laboratory testing.

6.7 Surficial (Unconsolidated) Deposits

Lake and pond sediments, swamp accumulations, sand dunes, marine terrace deposits, talus accumulations, creep, or slope wash were not observed on the site. Slump and slide debris were also not observed on the site. The alluvial deposits are non-marine terrace deposits that have been reworked from either conglomerates in the Dawson Formation up-valley along Jimmy Camp Creek or reworked from gravel-capped mesas from the Pleistocene.

6.8 Engineering Geology

Charles Robinson and Associates (1977) have mapped two environmental engineering units at the site as:

- 2A – Stable alluvium, colluvium and bedrock on flat to 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. Although not mapped within the site boundaries, the unit is mapped to visually show that any recurrent flooding that may have occurred prior to the development, should now be contained in the off-site detention pond.

The Engineering Geology is presented in the Engineering and Geology Map, Figure 10.

6.9 Features of Special Significance

Features of special significance such as accelerated erosion, (advancing gully head, badlands, or cliff reentrants) were not observed on the property. Features indicating settlement or subsidence such as fissures, scarplets, and offset reference features were not observed on the property or surrounding areas.

Features indicating creep, slump, or slide masses in bedrock and surficial deposits were not observed on the property.

6.10 Drainage of Water and Groundwater

The overall topography of the site slopes down from the east to the west, towards JCCET. JCCET is a currently a defined drainageway extending along the western property boundary. The creek is not anticipated to adversely impact the placement of the residences in the subdivision. Construction during land development and of the residential structures are not to encroach with in the creek.

Groundwater was not recorded in the three test borings performed for this study. However, elevated moisture conditions and low blow counts were encountered at 19 feet in TB-2 and TB-3, which may indicate seasonal groundwater at that depth. It is anticipated basement foundations will have more than 4 to 6 feet of separation from the bottom of foundation floor slabs to groundwater.

The two borings where groundwater is suspect was encountered north and south of the existing detention pond. Based on the results of our investigation, our knowledge of the area, and engineering design and construction techniques employed in the El Paso County area at this time, it is our opinion that there is insufficient reason to preclude full-depth basements on any of the proposed lots in the subdivision at this time. If shallow groundwater conditions are found to exist at the time of the site-specific subsurface soil investigations, the feasibility of basement construction and/or any recommended mitigation measures are to be addressed at that time.

7.0 ECONOMIC MINERAL RESOURCES

Under the provision of House Bill 1529, it was made a policy by the State of Colorado to preserve for extraction commercial mineral resources located in a populous county. Review of the *El Paso Aggregate Resource Evaluation Map, Master Plan for Mineral Extraction*, *Map 2* indicates the site is identified as valley fill comprised of sand and gravel with silt and clay deposited by water

in one or a series of stream valley. Extraction of the sand and gravel resources are not considered to be economical compared to materials available elsewhere within the county.

According to the *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands*, the site is mapped within the Denver Basin Coal Region. However, the area of the site has been mapped "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.

8.0 IDENTIFICATION AND MITIGATION OF POTENTIAL GEOLOGIC CONDITIONS

The El Paso County Engineering Criteria Manual recognizes and delineates the difference between hazards and constraints. A geologic hazard is one of several types of adverse geologic conditions capable of causing significant damage or loss of property and life. Geologic hazards are defined in Section C.2.2 Sub-section E.1 of the ECM. A geologic constraint is one of several types of adverse geologic conditions capable of limiting or restricting construction on a particular site. Geologic constraints are defined in Section C.2.2 Sub-section E.2 of the ECM (1.15 Definitions of Specific Terms and Phrases). The following geologic conditions were considered in the preparation of this report, and are not are not anticipated to pose a significant risk to the proposed development:

- Avalanches
- Debris Flow-Fans/Mudslides
- Ground Subsidence
- Hydrocompactive Soils (Moisture Sensitive Soils)
- Landslides
- Rockfall
- Ponding water
- Steeply Dipping Bedrock
- Unstable or Potentially Unstable Slopes
- Scour, Erosion, accelerated erosion along creek banks and drainageways
- Springs and High Groundwater
- Corrosive Minerals

The following sections present geologic conditions that have been identified on the property:

8.1 Expansive Soils and Bedrock

Based on the test borings performed by RMG for this investigation and the previous geotechnical engineering/geologic investigation referenced above, the sandy clay and claystone bedrock generally possess low to high swell potential. It is anticipated that expansive clays soils will be encountered at depths anticipated to affect residential foundations. The claystone bedrock is not anticipated to be encountered in basement excavations. These materials are readily mitigated with typical construction practices common to this region of El Paso County, Colorado.

Mitigation

Shallow foundations are anticipated for structures within this development. Foundation design and construction typically can be adjusted for expansive soils. Mitigation of expansive soils and bedrock are typically accomplished by 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 final determination of mitigation alternatives and foundation design criteria are to be determined in site-specific subsurface soil investigations for each lot.

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.

8.2 Drainageways/Floodplains – Jimmy Camp Creek East Tributary

The JCCET is located along the western property boundary for the site. Based on the FEMA Map Panel number 08041C0975G, effective December 7, 2018, the proposed lots lie outside the designated floodplain. The existing detention pond lies within the 100 year floodplain. It is our understanding the floodplain is to be contained within the JCCET and the detention area. RMG received the Letter of Map Revision, Deamination Document, issue date, effective date May 4, 2020 December 18, 2019, Case No. 19-08-0605P from Core Engineering for the identified Base Flood Elevation (BFE) for JCCET. The BFE's along the creek, west of the Creekside South, Filing No. 2 boundary, ranges between 5709.2 to 5704.7 feet. The revised FEMA Map to reflect the LOMR effective May 4, 2020 is presented in Figure 12.

Mitigation

Provided that the final floodplain extents do not encroach within the boundaries of the proposed buildable lots and the bottom of foundations remain one-foot above the BFE, it is our opinion that additional mitigation is not required at this time. As noted herein, final determination of basement feasibility and foundation drainage measures are to be determined by the site-specific subsurface soil investigations performed at the time of construction.

**Per the latest approved edition of the Pikes Peak Regional Building Code, the lowest finished floor elevation (including basement together with attendant utility and sanitary facilities) shall be elevated one-foot or more above the BFE.*

8.3 Faults and Seismicity

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 0.185g for a short period (S_s) and 0.059g 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.

8.4 Radon

***"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. The US EPA has set an action level of 4 pCi/L. At or above this level of radon, the EPA recommends you take corrective measures to reduce your exposure to radon gas".*

Most of Colorado is generally considered to have the potential for high indoor levels of radon gas, based on the geology, soils, construction type and aerial radiation measurements that have been gathered from indoor testing by the Colorado Department of Public Health and Environment (CDPHE), Radon Outreach Program and Colorado Environmental Public Health Tracking the information provided at:
https://www.elpasocountyhealth.org/sites/default/files/CDPHERadonMap.pdf

There is not believed to be unusually hazardous levels of radioactivity from naturally occurring sources at this site. However, the granular materials found in the area are often associated with the production of radon gas and concentrations may exceed those currently accepted by the EPA.

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. 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.

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

Proposed Grading, Cuts, and Masses of Fill

Fill soils were not encountered at the time of drilling. If fill soils are encountered, they may be considered unsuitable for a variety of reasons. These include (but are not limited to) non-engineered fills, fill soils containing trash or debris, fill soils that appear to have been improperly placed and/or compacted, etc. If unsuitable fill soils are encountered during the site-specific Subsurface Soil Investigation and/or the open excavation observation, they may require removal (overexcavation) and replacement with compacted structural fill.

Based on the test borings for this investigation, the excavations are anticipated to encounter sandy clay. Typical basement foundation depths of 6 to 8 feet below the ground surface are not anticipated to encounter claystone. If limited layers of silty to clayey sand soils are encountered they can generally be used as site-grading fill, though use of claystone within the fill (if encountered) should be avoided where the fill will be located below the proposed foundations.

Prior to placement of overlot fill or removal and recompaction 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 anticipate that the deepest excavation cuts for crawlspace or garage level construction will be approximately 3 to 4 feet below the existing ground surface, and for basement level construction will be approximately 6 to 8 feet below the existing ground surface. We believe the surficial clay soils will classify as Type B as defined by OSHA in 29CFR Part 1926, date January 2, 1990. OSHA requires temporary slopes made in Type B materials be laid back at ratios no steeper than 1:1 (horizontal to vertical) unless the excavation is shored or braced. 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 onsite 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, 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 clays on site were encountered at soft to medium stiff densities and overlaid firm to medium hard weathered claystone bedrock which are 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.

9.0 BEARING OF GEOLOGIC CONDITIONS UPON PROPOSED DEVELOPMENT

Geologic hazards (as described in Section 8.0 of this report) were not found to be present at this site. Geologic constraints (also as described in section 8.0 of this report) such as expansive soils, drainageways/floodplains, faults, seismicity, and radon were found on the site. Where avoidance is not feasible, it is our opinion that the existing geologic and engineering conditions can be satisfactorily mitigated through proper engineering, design, and construction practices.

10.0 BURIED UTILITIES

Based upon the conditions encountered in the test borings, we anticipate that the soils encountered in individual utility trench excavations will consist of native sandy clay and claystone. It is anticipated the sands (if encountered) will be loose to medium dense conditions, the sandy clay at stiff to very stiff conditions, and the claystone at medium hard to hard conditions. Bedrock may be encountered within some of the utility trenches.

We believe the sand (if encountered) will classify as Type C materials and the clay as Type B materials, as defined by OSHA in 29 CFR Part 1926. OSHA requires that temporary excavations made in Type B and C materials be laid back at ratios no steeper than 1:1 (horizontal to vertical) and 1½:1 (horizontal to vertical), respectively, unless the excavation is shored and braced. Excavations deeper than 20 feet, or when water is present, should always be braced or have the slope designed by a professional engineer.

11.0 PAVEMENTS

The proposed roadways with in this development will require a new pavement design prepared in accordance with the El Paso County regulations.

The Concept Plan provided by Matrix did not have the interior roadways classified but it is anticipated the roadways are to be Residential Urban Local. ***The actual pavement section design for individual streets is to be performed following completion of utility installation within the roadways.***

The Lorson Ranch area has generally preferred to construct the roadways with a composite roadway section consisting of Hot Mix Asphalt over Cement-Treated Subgrade (CTS). For purposes of this report, we anticipate the subgrade soils will primarily have American Association of State Highway and Transportation Officials (AASHTO) Soil Classifications of A-6(14-17) with an estimated design subgrade "R-values" on the order of approximately 5 to 15.

The above values are for preliminary planning purposes only, and may vary upon final design depending on the soil materials used for subgrade construction within the proposed roadways. Pavement materials should be selected, prepared, and placed in accordance with the El Paso County specification and the Pikes Peak Region Asphalt Paving Specifications. Tests should be performed in accordance with the applicable procedures presented in the final design.

12.0 ANTICIPATED FOUNDATION SYSTEMS

Based on the information presented previously, conventional shallow foundation systems consisting of standard spread footings/stemwalls are anticipated to be suitable for the proposed residential structures. It is our understanding that crawlspace and/or basement excavations are proposed. The anticipated excavation cuts are approximately 3 to 4 feet below the final ground surface for crawlspaces and 6 to 8 feet for basements, not including overexcavation, if needed.

Expansive sandy clay and claystone were encountered in the test borings performed for this study. Expansive soils are anticipated to be encountered near foundation and/or floor slab bearing levels. Overexcavation and replacement or subexcavation with nonexpansive structural fill will be required. Overexcavation depths of 3 to 6 feet are typical for the soil conditions encountered. However, the final overexcavation depths may be up to 10 feet or more. Overexcavation depths for each lot are to be determined in site-specific subsurface soil investigations, and confirmed at the time of the open excavation observations for each lot.

If undocumented fill is encountered during construction of the structures, it will be assumed that this fill was not moisture conditioned and compacted in a manner consistent with the **Structural Fill** recommendations contained within this report, unless appropriate documentation can be provided. If such fill is encountered, it is not considered suitable for support of shallow foundations. This unsuitable fill will require removal (overexcavation) and replacement with non-expansive, granular structural fill below foundation components and floor slabs. The structural fill should be observed and tested during placement as indicated under the **Structural Fill** section of this report, to ensure proper compaction.

Following completion of the overexcavation and moisture conditioning process, it is imperative that the "as-compacted" moisture content be maintained prior to construction.

The foundation system for each single family residences should be designed and constructed based upon recommendations developed in a site-specific subsurface soil investigation. The recommendations presented in the *Subsurface Soil Investigation* report for each lot should be verified following the excavations of each structure and evaluation of the building loads.

12.1 Foundation Drains

A subsurface perimeter drain is 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.

Shallow groundwater conditions were not encountered in the test boring performed for this study or the previously reviewed geotechnical engineering/geologic investigations. Shallow groundwater conditions are not anticipated, however depending on the conditions encountered during the site-specific subsurface soil investigations and the conditions observed at the time of construction, additional subsurface drainage systems may be recommended.

One such system is an underslab drainage layer to help intercept groundwater before it enters the slab area should the groundwater levels rise. In general, if groundwater was encountered within 4 to 6 feet of the proposed basement slab elevation, an underslab drain should be anticipated. Another such system would consist of a subsurface drain and/or vertical drain board placed around the perimeter of the overexcavation to help intercept groundwater and allow for proper placement and compaction of the replacement structural fill. Careful attention should be paid to grade and discharge of the drain pipes of these systems.

It must be understood that the drain systems are designed to intercept some types of subsurface moisture and not others. Therefore, the drains could operate properly and not mitigate all moisture problems relating to foundation performance or moisture intrusion into the basement area.

13.0 EARTHWORK

13.1 Moisture-Conditioned Structural Fill / Subexcavation

Areas to receive moisture-conditioned expansive soils used as structural fill should have topsoil, organic material, or debris removed. The upper 6 inches of the exposed surface soils should be scarified and moisture conditioned to facilitate compaction (usually within 2 percent of the optimum moisture content) and compacted to a minimum of 98 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D-698) or to a minimum of 95 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D-1557) prior to placing structural fill.

Moisture-conditioned 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.

Moisture conditioned structural fill shall consist of a moisture-conditioned, on-site cohesive fill material. The fill material shall be moisture conditioned and replaced 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.

- When claystone is to be incorporated, 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 do not require processing in a stockpile.

- 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.

- The moisture-conditioned materials should be placed in maximum 6" compacted lifts. These materials should be compacted to a minimum of 98 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D-698). Material not meeting the above requirements shall be reprocessed.

Materials used for moisture-conditioned structural fill should be approved by RMG prior to use. Moisture-conditioned structural fill should not be placed on frozen subgrade or allowed to freeze during moisture conditioning and placement.

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.

It is anticipated that 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 the clay soils 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 subexcavation and moisture-conditioned soils.

Frequent moisture content and density tests shall be performed in the field to verify conformance with the above specifications. Furthermore, representative samples of the moisture-conditioned fill shall be obtained by personnel of RMG on a daily basis for follow-up swell testing to demonstrate that the swell potential has been reduced to not more than 1 percent swell when saturated under a 1,000 psf surcharge pressure. Areas where the follow-up swell tests indicate swells higher than that value shall have the fill material removed, reprocessed, recompacted, and retested.

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. 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 sub-excavation 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.

13.2 Granular Structural Fill

Areas to receive granular (non-expansive) structural fill should have topsoil, organic material, or debris removed. The upper 6 inches of the exposed surface soils should be scarified and moisture conditioned to facilitate compaction (usually within 2 percent of the optimum moisture content) and compacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D-698) or to a minimum of 92 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D-1557) prior to placing structural fill.

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.

Structural fill shall consist of granular, non-expansive material. It should be placed in loose lifts not exceeding 8 to 12 inches, moisture conditioned to facilitate compaction (usually within 2 percent of the optimum moisture content) and compacted to a minimum of 92 percent of the maximum dry density as determined by the Modified Proctor test, ASTM D-1557. The materials should be compacted by mechanical means.

Materials used for structural fill should be approved by RMG prior to use. Structural fill should not be placed on frozen subgrade or allowed to freeze during moisture conditioning and placement.

14.0 ADDITIONAL STUDIES

The findings, conclusions and recommendations presented in this report were provided to evaluate the suitability of the site for future development. Unless indicated otherwise, the test borings, laboratory test results, conclusions and recommendations presented in this report are not intended for use for design and construction. We recommend that a *lot-specific* **Subsurface Soil Investigation** be performed for the proposed structures. The extent of any fill soils encountered during the lot-specific investigation(s) should be evaluated for suitability to support the proposed structures prior to construction. Additionally, the groundwater conditions encountered in the lot-specific investigation should be evaluated to determine the feasibility of basement construction on that lot.

The lot-specific subsurface soil investigation should consider the proposed structure type, anticipated foundation loading conditions, location within the property, and local construction

methods. Recommendations resulting from the investigations should be used for design and confirmed by on-site observation and testing during development and construction.

15.0 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, drainageways/floodplains, faults, seismicity, 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 system for each single family residences should be designed and constructed based upon recommendations developed in a site-specific subsurface soil investigation.

The foundation and floor slabs of the 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.

We believe the surficial clay soils will classify as Type B as defined by OSHA in 29CFR Part 1926, date January 2, 1990. OSHA requires temporary slopes made in Type B materials be laid back at ratios no steeper than 1:1 (horizontal to vertical) unless the excavation is shored or braced. 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 to carefully to familiarize themselves with the geologic hazards associated with construction in this area. This report only addresses the geologic constraints contained within the boundaries of the site referenced above.

16.0 CLOSING

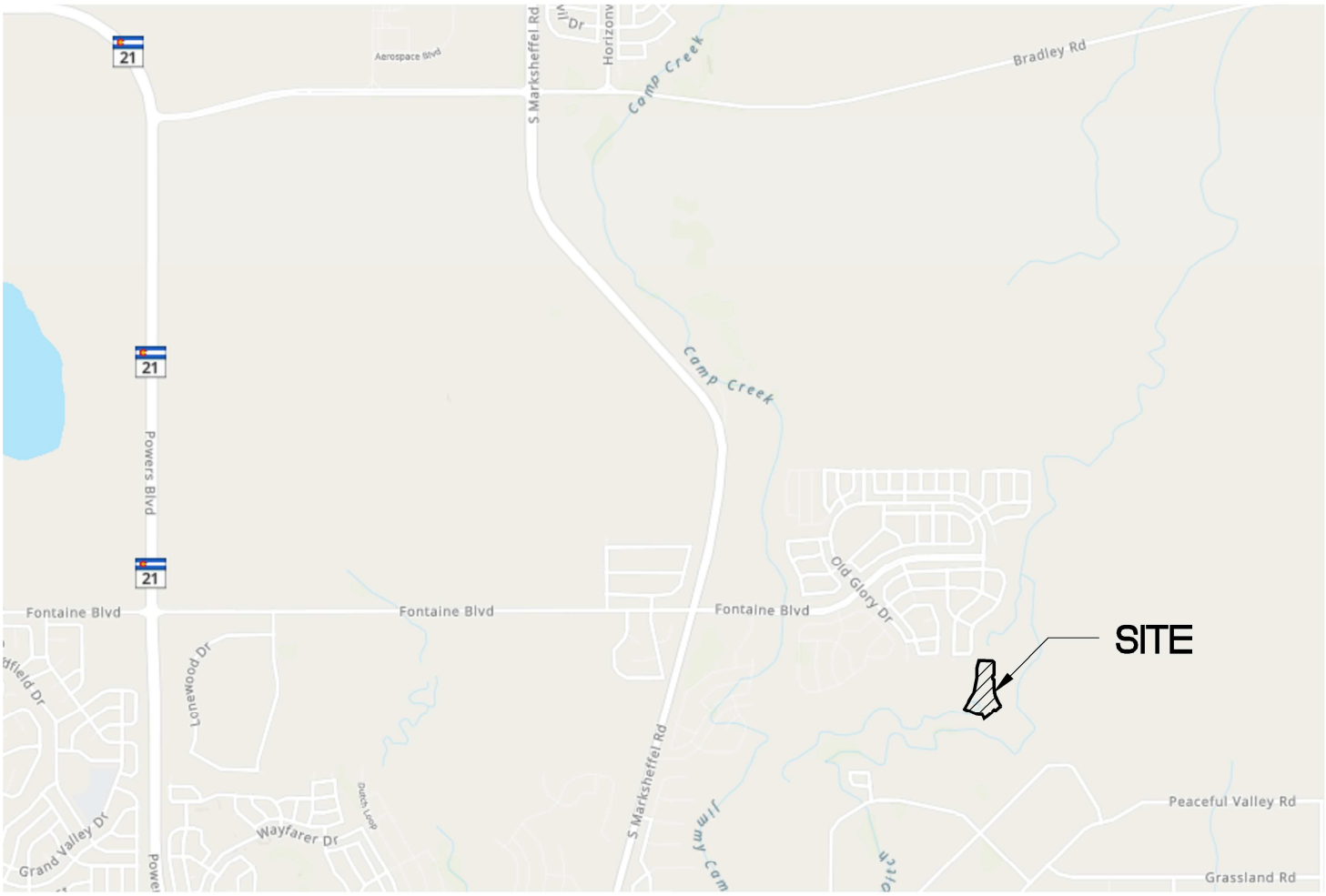
This report is for the exclusive purpose of providing geologic hazards information and preliminary geotechnical engineering recommendations. The scope of services did not include, either specifically or by implication, evaluation of wild fire hazards, environmental assessment of the site, or identification 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.

If we can be of further assistance in discussing the contents of this report or analysis of the proposed development, from a geotechnical engineering point-of-view, please feel free to contact us.

FIGURES



NOT TO SCALE

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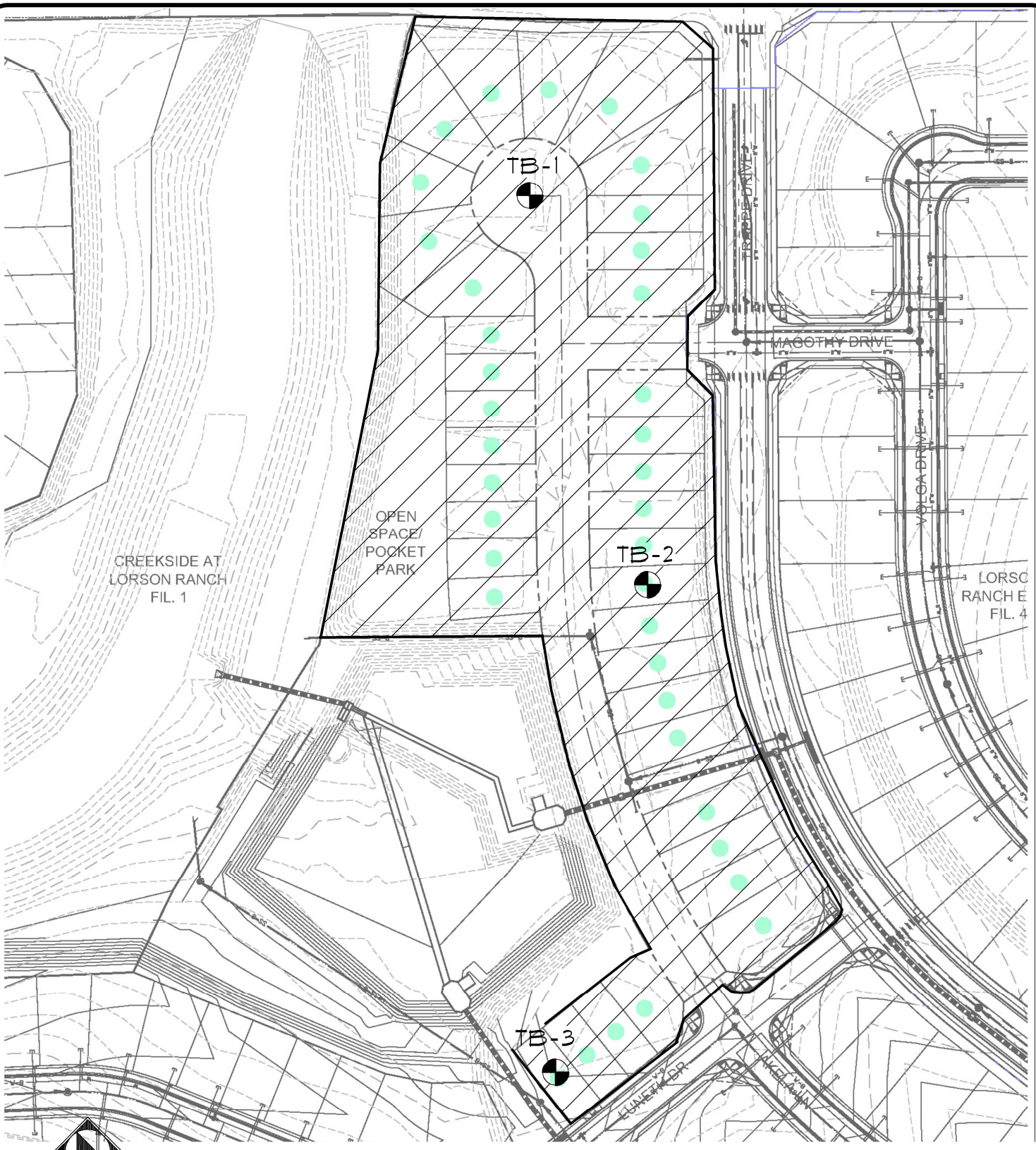
SITE VICINITY MAP

CREEKSIDE AT LORSON RANCH
FILING NO. 2
EL PASO COUNTY, CO
LANDHUIS COMPANY

JOB No. 185657

FIG No. 1

DATE 2-21-2021



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PROPOSED LOT LAYOUT WITH TEST BORING LOCATIONS

CREEKSIDE AT LORSON RANCH
FILING NO. 2
EL PASO COUNTY, CO
LANDHUIS COMPANY

JOB No. 185657

FIG No. 2

DATE 2-21-2021

SOILS DESCRIPTION


CLAYSTONE


SANDY CLAY

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. 185657

FIGURE No. 3

DATE Feb/21/2022

TEST BORING: **1** DATE DRILLED: 9/8/21 NO GROUNDWATER ON 9/8/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown to olive, stiff, moist	5			18	13.1
	10			15	13.6
CLAYSTONE, SANDY, olive to brown, firm to medium hard, moist	15			41	16.9
	20			37	16.0

TEST BORING: **2** DATE DRILLED: 9/8/21 NO GROUNDWATER ON 9/8/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, light brown to olive, medium stiff to stiff, moist	5			8	8.3
	10			12	9.4
	15			12	9.6
	20			7	23.6

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TEST BORING LOG

JOB No. 185657

FIGURE No. 4

DATE Feb/21/2022

TEST BORING: **3**

DATE DRILLED:
9/8/21
NO GROUNDWATER ON
9/8/21

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown to olive, soft to stiff, moist				
5			15	11.0
10			17	14.7
15			14	12.2
20			4	22.0

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TEST BORING LOG

JOB No. 185657

FIGURE No. 5

DATE Feb/21/2022

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
1	4.0	13.1	116.9	39	24		74.3		- 0.8	CL
1	9.0	13.6								
1	14.0	16.9	116.2						2.2	
1	19.0	16.0								
2	4.0	8.3		35	23	0.0	81.4			CL
2	9.0	9.4								
2	14.0	9.6								
2	19.0	23.6								
3	4.0	11.0								
3	9.0	14.7								
3	14.0	12.2	116.2	32	19	0.0	85.3		1.5	CL
3	19.0	22.0								

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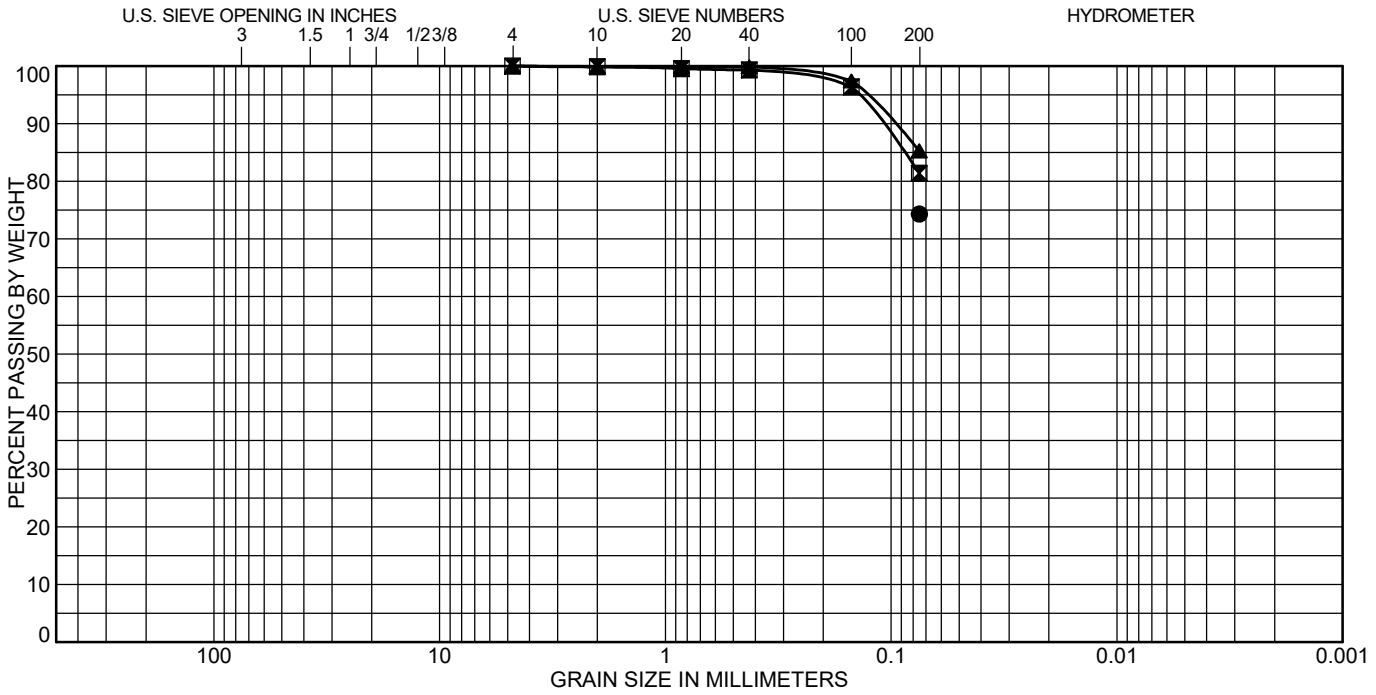
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 185657
FIGURE No. 6
PAGE 1 OF 1
DATE Feb/21/2022



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	1	4.0	LEAN CLAY with SAND(CL)	39	15	24
⊠	2	4.0	LEAN CLAY with SAND(CL)	35	12	23
▲	3	14.0	LEAN CLAY(CL)	32	13	19

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	4.0			74.3	
⊠	2	4.0	0.0	18.6	81.4	
▲	3	14.0	0.0	14.7	85.3	

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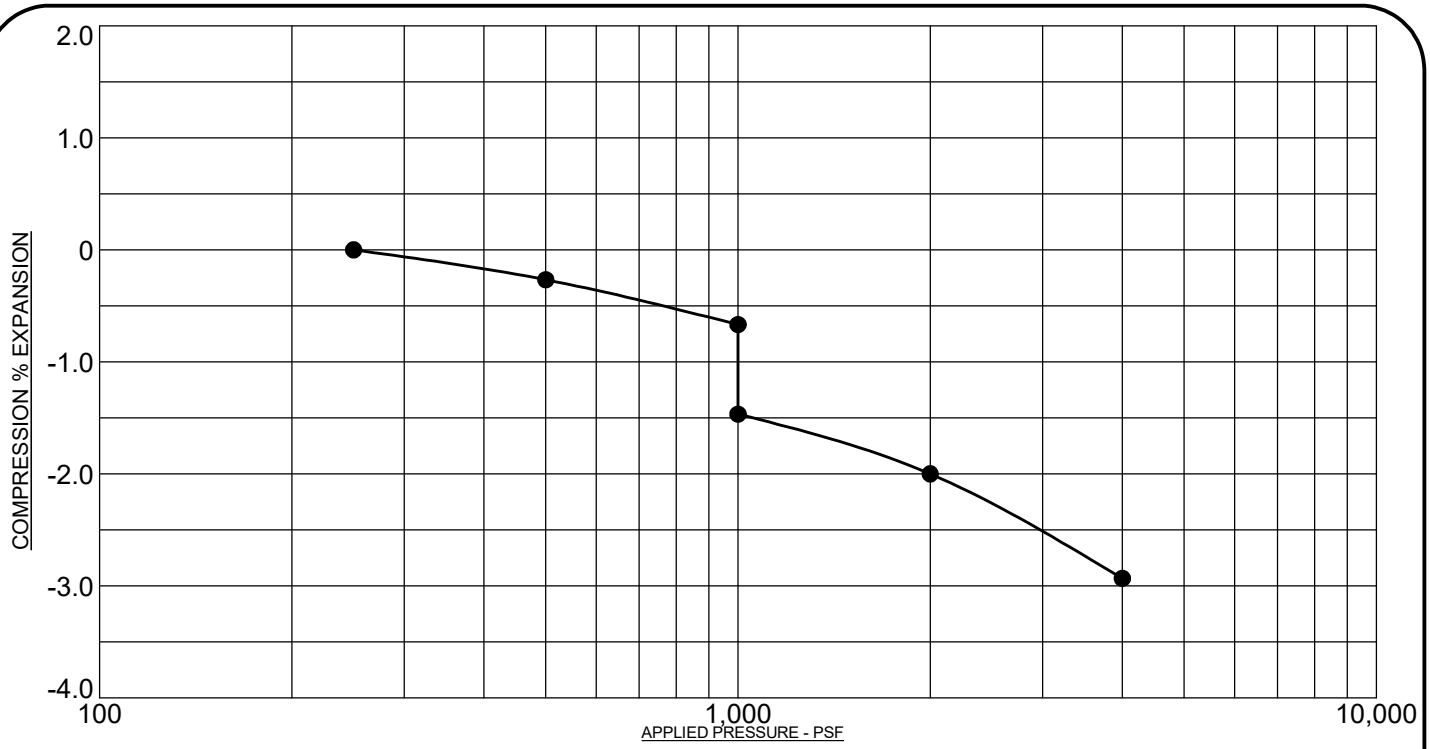
SOIL CLASSIFICATION DATA

JOB No. 185657

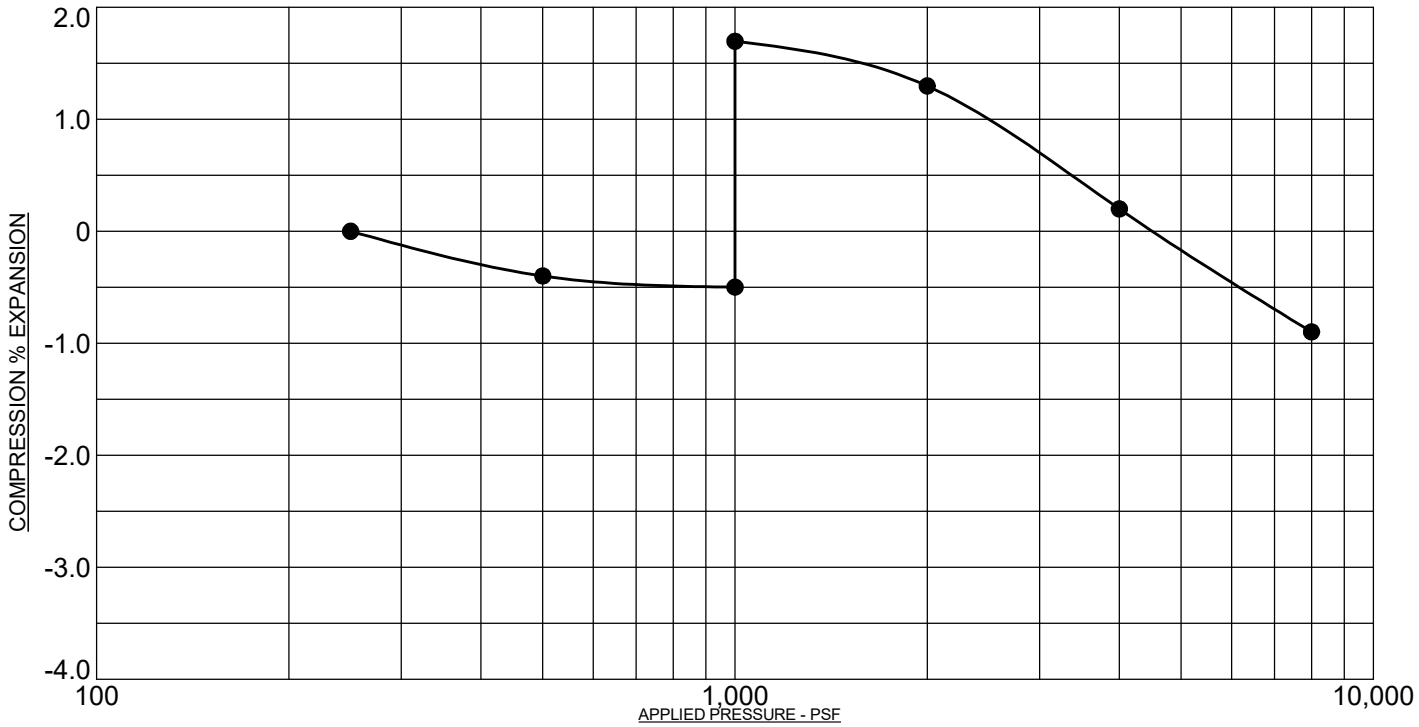
FIGURE No. 7

DATE Feb/21/2022



PROJECT: **Creekside at Lorson Ranch, Filing No. 2 El Paso County, Colorado**
SAMPLE DESCRIPTION: **FILL: CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **1 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **116.9 PCF**
NATURAL MOISTURE CONTENT: **13.1%**
PERCENT SWELL/COMPRESSION: **- 0.8**



PROJECT: **Creekside at Lorson Ranch, Filing No. 2 El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAYSTONE, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **1 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **116.2 PCF**
NATURAL MOISTURE CONTENT: **16.8%**
PERCENT SWELL/COMPRESSION: **2.2**

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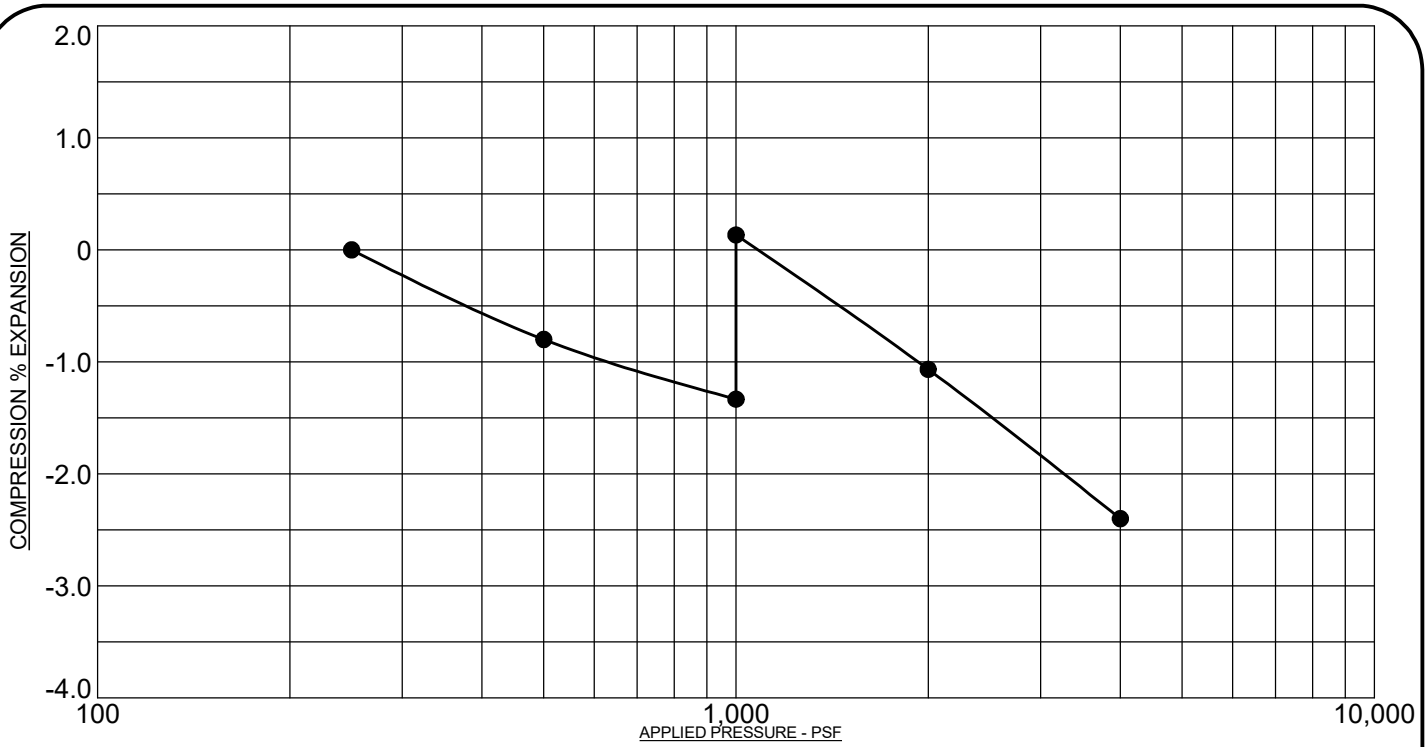
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 185657

FIGURE No. 8

DATE Feb/21/2022



PROJECT: **Creekside at Lorson Ranch, Filing No. 2 El Paso County, Colorado**
SAMPLE DESCRIPTION: **FILL: CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **3 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **116.2 PCF**
NATURAL MOISTURE CONTENT: **12.2%**
PERCENT SWELL/COMPRESSION: **1.5**

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SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

SWELL/CONSOLIDATION TEST RESULTS

JOB No. 185657

FIGURE No. 9

DATE Feb/21/2022

GENERAL GEOLOGY

- *Kp - Pierre Shale (Upper Cretaceous)* - Predominately siltstone and claystone. Contains sandstone and sandy shale near top and bottom of the formation. Sandstone and shale were not encountered in the test borings performed for this investigation. Claystone bedrock was encountered in one test boring at a depth of 14 feet.

ENGINEERING GEOLOGY

- 2A - Stable alluvium, colluvium and bedrock on flat to 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.

NOT TO SCALE

JOB No. 185657

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CREEKSIDE AT LORSON RANCH, FILING NO.2

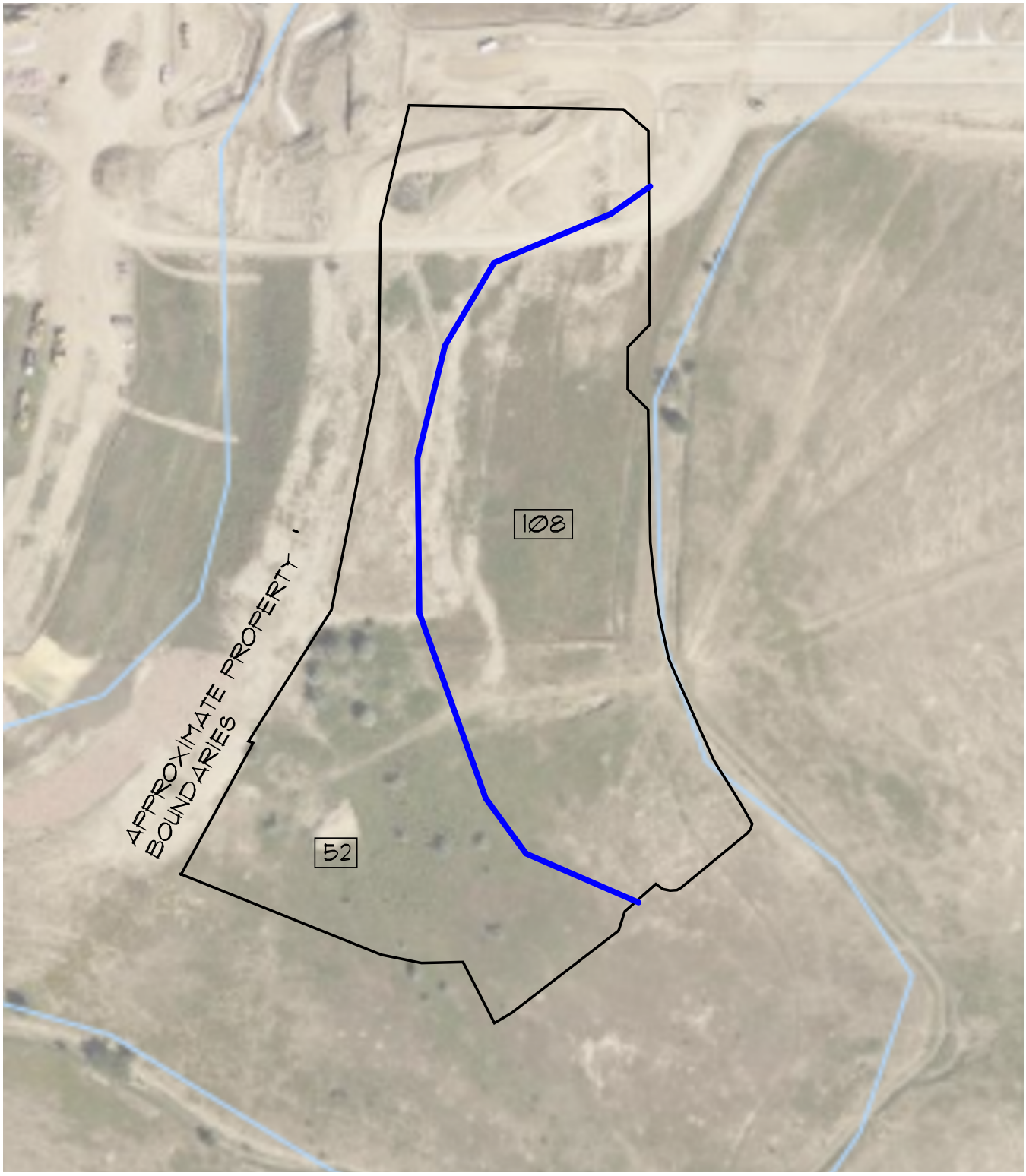
EL PASO COUNTY, CO
LANDHUIS COMPANY

ENGINEER:	TM
DRAWN BY:	KZ
CHECKED BY:	TM
ISSUED:	02-21-2022

REVISION:	DATE: / JOB #:

ENGINEERING GEOLOGY MAP

SHEET No.
FIG-10



NOT TO SCALE

52 - Manzanst clay loam, 0 to 3 percent slopes.
108 - Wiley silt loam, 3 to 9 percent slopes

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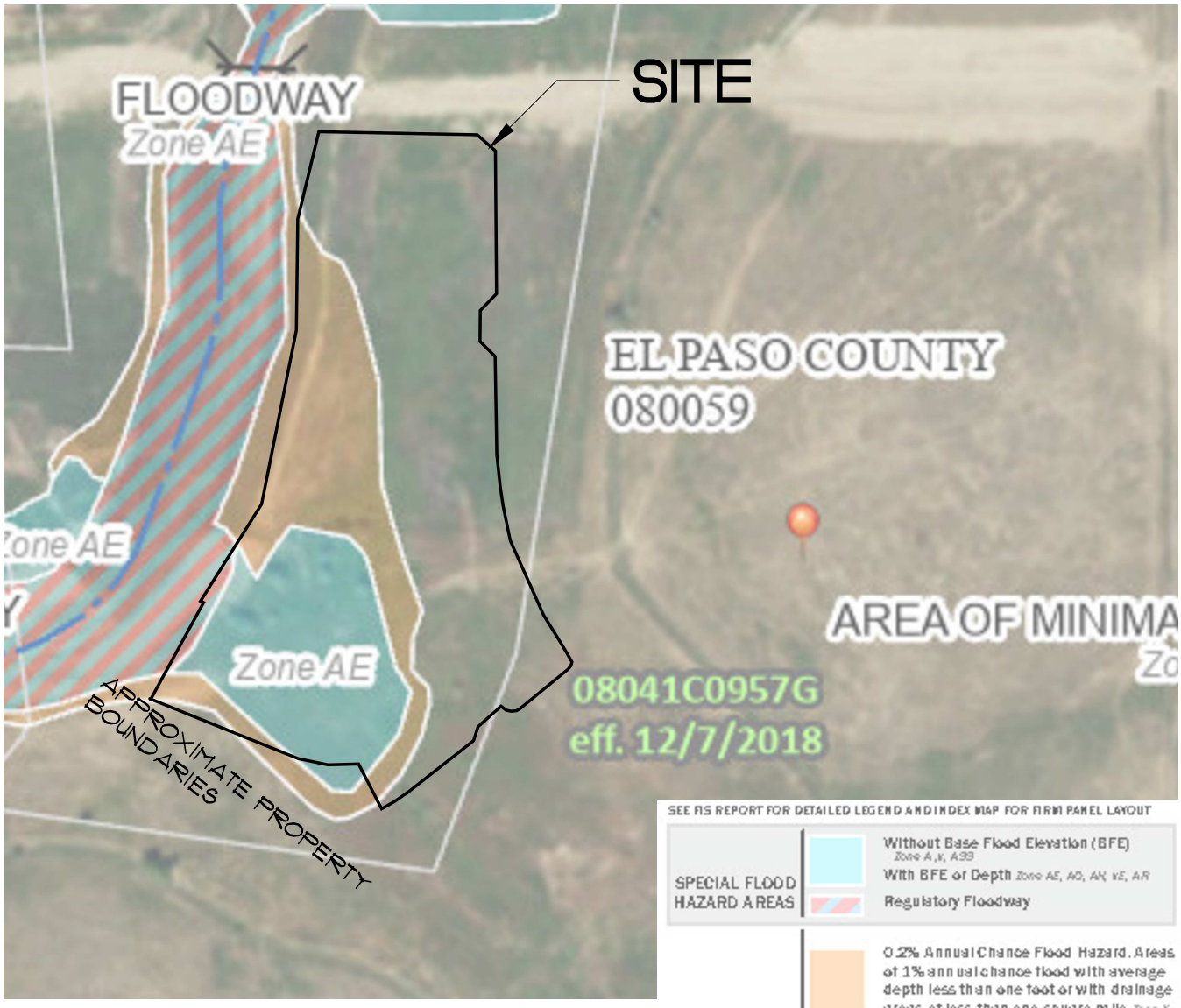
USDA SOILS SURVEY MAP

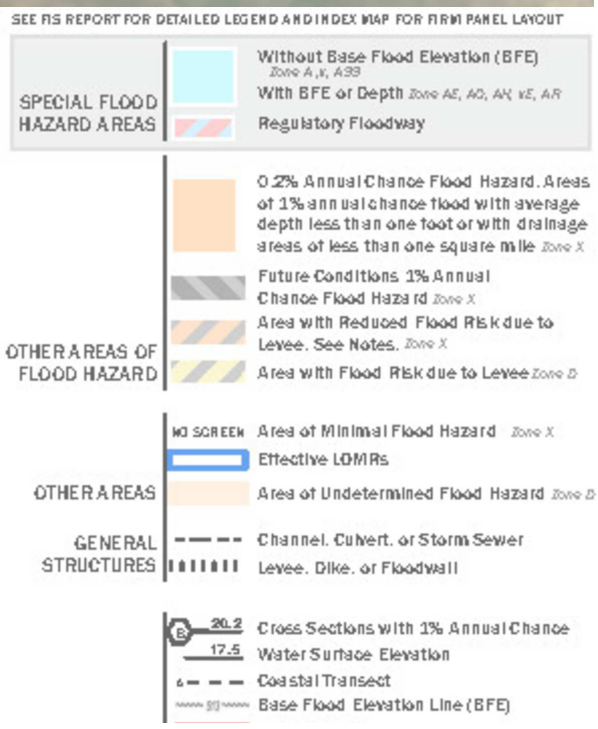
CREEKSIDE AT LORSON RANCH
FILING NO. 2
EL PASO COUNTY, CO
LANDHUIS COMPANY

JOB No. 185657

FIG No. 11

DATE 2-21-2021





NOT TO SCALE

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FEMA MAP

CREEKSIDE AT LORSON RANCH
FILING NO. 2
EL PASO COUNTY, CO
LANDHUIS COMPANY

JOB No. 185657

FIG No. 12

DATE 2-21-2021